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ORGANIZATIONAL LEARNING AND COMMUNITIES-OF-PRACTICE: TOWARD A UNIFIED VIEW OF WORKING, LEARNING, AND INNOVATION*

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Recent ethnographic studies of workplace practices indicate that the ways people actually work usually differ fundamentally from the ways organizations describe that work in manuals, training programs, organizational charts, and job descriptions. Nevertheless, organizations tend to rely on the latter in their attempts to understand and improve work practice. We examine one such study. We then relate its conclusions to compatible investigations of learning and of innovation to argue that conventional descriptions of jobs mask not only the ways people work, but also significant learning and innovation generated in the informal communities-of-practice in which they work. By reassessing work, learning, and innovation in the context of actual communities and actual practices, we suggest that the connections between these three become apparent. With a unified view of working, learning, and innovating, it should be possible to reconceive of and redesign organizations to improve all three.

(LEARNING; INNOVATION; GROUPS; DOWNSKILLING; ORGANIZATIONAL CULTURES NONCANONICAL PRACTICE)

Introduction

Working, learning, and innovating are closely related forms of human activity that are conventionally thought to conflict with each other. Work practice is generally viewed as conservative and resistant to change; learning is generally viewed as distinct from working and problematic in the face of change; and innovation is generally viewed as the disruptive but necessary imposition of change on the other two. To see that working, learning, and innovating are interrelated and compatible and thus potentially complementary, not conflicting forces requires a distinct conceptual shift. By bringing together recent research into working, learning, and innovating, we attempt to indicate the nature and explore the significance of such a shift.

The source of the oppositions perceived between working, learning, and innovating lies primarily in the gulf between precepts and practice. Formal descriptions of work (e.g., "office procedures") and of learning (e.g., "subject matter") are abstracted from actual practice. They inevitably and intentionally omit the details. In a society that attaches particular value to "abstract knowledge," the details of practice have come to be seen as nonessential, unimportant, and easily developed once the relevant abstractions have been grasped. Thus education, training, and technology design generally focus on abstract representations to the detriment, if not exclusion of actual practice. We, by contrast, suggest that practice is central to understanding work. Abstractions *detached from practice* distort or obscure intricacies of that practice. Without a clear understanding of those intricacies and the role they play, the practice itself cannot be well understood, engendered (through training), or enhanced (through innovation).

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We begin by looking at the variance between a major organization's formal descriptions of work both in its training programs and manuals and the actual work practices performed by its members. Orr's (1990a, 1990b, 1987a, 1987b) detailed ethnographic studies of service technicians illustrate how an organization's view of work can overlook and even oppose what and who it takes to get a job done. Based on Orr's specific insights, we make the more general claim that reliance on espoused practice (which we refer to as *canonical practice*) can blind an organization's core to the actual, and usually valuable practices of its members (including *noncanonical practices*, such as "work arounds"). It is the actual practices, however, that determine the success or failure of organizations.

Next, we turn to learning and, in particular, to Lave and Wenger's (1990) practice-based theory of learning as "legitimate peripheral participation" in "communities-of-practice." Much conventional learning theory, including that implicit in most training courses, tends to endorse the valuation of abstract knowledge over actual practice and as a result to separate learning from working and, more significantly, learners from workers. Together Lave and Wenger's analysis and Orr's empirical investigation indicate that this knowledge–practice separation is unsound, both in theory and in practice. We argue that the composite concept of "learning-in-working" best represents the fluid evolution of learning through practice.

From this practice-based standpoint, we view learning as the bridge between working and innovating. We use Daft and Weick's (1984) interpretive account of "enacting" organizations to place innovation in the context of changes in a community's "way of seeing" or interpretive view. Both Orr's and Lave and Wenger's research emphasize that to understand working and learning, it is necessary to focus on the formation and change of the communities in which work takes place. Taking all three theories together, we argue that, through their constant adapting to changing membership and changing circumstances, evolving communities-of-practice are significant sites of innovating.

1. Working

a. *Canonical Practice*

Orr's (1990a, 1990b, 1987a, 1987b) ethnography of service technicians (reps) in training and at work in a large corporation paints a clear picture of the divergence between espoused practice and actual practice, of the ways this divergence develops, and of the trouble it can cause. His work provides a "thick" (see Geertz 1973), detailed description of the way work actually progresses. Orr contrasts his findings with the way the same work is thinly described in the corporation's manuals, training courses, and job descriptions.¹

The importance of such an approach to work in progress is emphasized by Bourdieu (1973), who distinguishes the *modus operandi* from the *opus operatum*—that is, the way a task, as it unfolds over time, looks to someone at work on it, while many of the options and dilemmas remain unresolved, as opposed to the way it looks with hindsight as a finished task. (Ryle (1954) makes a similar point.) The *opus operatum*, the finished view, tends to see the action in terms of the task alone and cannot see the way in which the process of doing the task is actually structured by the constantly changing conditions of work and the world. Bourdieu makes a useful analogy with reference to a journey as actually carried out on the ground and as seen on a map ("an abstract space, devoid of any landmarks or any privileged centre" (p. 2)). The latter, like the *opus operatum*, inevitably smooths over the myriad

¹For a historical overview of anthropology of the workplace, see Burawoy (1979).

decisions made with regard to changing conditions: road works, diversions, Memorial Day parades, earthquakes, personal fatigue, conflicting opinions, wrong-headed instructions, relations of authority, inaccuracies on the map, and the like. The map, though potentially useful, *by itself* provides little insight into how *ad hoc* decisions presented by changing conditions can be resolved (and, of course, each resolved decision changes the conditions once more). As a journey becomes more complex, the map increasingly conceals what is actually needed to make the journey. Thick description, by contrast, ascends from the abstraction to the concrete circumstances of actual practice, reconnecting the map and the mapped.

Orr's study shows how an organization's maps can dramatically distort its view of the routes its members take. This "misrecognition," as Bourdieu calls it, can be traced to many places, including pedagogic theory and practice. Often it has its more immediate cause in the strategy to downskill positions. Many organizations are willing to assume that complex tasks can be successfully mapped onto a set of simple, Tayloristic, canonical steps that can be followed without need of significant understanding or insight (and thus without need of significant investment in training or skilled technicians). But as Bourdieu, Suchman (1987a), and Orr show, actual practice inevitably involves tricky interpolations between abstract accounts and situated demands. Orr's reps' skills, for instance, are most evident in the improvised strategies they deploy to cope with the clash between prescriptive documentation and the sophisticated, yet unpredictable machines they work with. Nonetheless, in the corporation's eyes practices that deviate from the canonical are, by definition, deviant practices. Through a reliance on canonical descriptions (to the extent of overlooking even their own noncanonical improvisations), managers develop a conceptual outlook that cannot comprehend the importance of noncanonical practices. People are typically viewed as performing their jobs according to formal job descriptions, despite the fact that daily evidence points to the contrary (Suchman 1987b). They are held accountable to the map, not to road conditions.²

In Orr's case, the canonical map comes in the form of "directive" documentation aimed at "single point failures" of machines. Indeed, the documentation is less like a map than a single predetermined route with no alternatives: it provides a decision tree for diagnosis and repair that assumes both predictable machines and an unproblematic process of making diagnoses and repairs through blindly following diagnostic instructions. Both assumptions are mistaken. Abstractions of repair work fall short of the complexity of the actual practices from which they were abstracted. The account of actual practice we describe below is anything but the blind following of instructions.

The inadequacies of this corporation's directive approach actually make a rep's work more difficult to accomplish and thus perversely demands more, not fewer, improvisational skills. An ostensible downskilling and actual upskilling therefore proceed simultaneously. Although the documentation becomes more prescriptive and ostensibly more simple, in actuality the task becomes more improvisational and more complex. The reps develop sophisticated noncanonical practices to bridge the gulf between their corporation's canonical approach and successful work practices, laden with the dilemmas, inconsistencies, and unpredictability of everyday life. The directive documentation does not "deprive the workers of the skills they have;" rather, "it merely reduces the amount of information given them" (Orr 1990a, 26). The burden

²Not all the blame should be laid on the managers' desk. As several anthropologists, including Suchman (1987a) and Bourdieu (1977) point out, "informants" often describe their jobs in canonical terms though they carry them out in noncanonical ways. Lave (1988) argues that informants, like most people in our society, tend to privilege abstract knowledge. Thus they describe their actions in its terms.

of making up the difference between what is provided and what is needed then rests with the reps, who in bridging the gap actually protect the organization from its own shortsightedness. If the reps adhered to the canonical approach, their corporation's services would be in chaos.

Because this corporation's training programs follow a similar downskilling approach, the reps regard them as generally unhelpful. As a result, a wedge is driven between the corporation and its reps: the corporation assumes the reps are untrainable, uncooperative, and unskilled; whereas the reps view the overly simplistic training programs as a reflection of the corporation's low estimation of their worth and skills. In fact, their valuation is a testament to the depth of the rep's insight. They recognize the superficiality of the training because they are conscious of the full complexity of the technology and what it takes to keep it running. The corporation, on the other hand, blinkered by its implicit faith in formal training and canonical practice and its misinterpretation of the rep's behavior, is unable to appreciate either aspect of their insight.

In essence, Orr shows that in order to do their job the reps must—and do—learn to make better sense of the machines they work with than their employer either expects or allows. Thus they develop their understanding of the machine not in the training programs, but in the very conditions from which the programs separate them—the authentic activity of their daily work. For the reps (and for the corporation, though it is unaware of it), learning-in-working is an occupational necessity.

b. *Noncanonical Practice*

Orr's analyses of actual practice provide various examples of how the reps diverge from canonical descriptions. For example, on one service call (Orr 1990b, 1987b) a rep confronted a machine that produced copious raw information in the form of error codes and obligingly crashed when tested. But the error codes and the nature of the crashes did not tally. Such a case immediately fell outside the directive training and documentation provided by the organization, which tie errors to error codes. Unfortunately, the problem also fell outside the rep's accumulated, improvised experience. He summoned his technical specialist, whose job combines "trouble-shooting consultant, supervisor, and occasional instructor." The specialist was equally baffled. Yet, though the canonical approach to repair was exhausted, with their combined range of noncanonical practices, the rep and technical specialist still had options to pursue.

One option—indeed the only option left by canonical practice now that its strategies for repair had been quickly exhausted—was to abandon repair altogether and to replace the malfunctioning machine. But both the rep and the specialist realized that the resulting loss of face for the company, loss of the customer's faith in the reps, loss of their own credit within their organization, and loss of money to the corporation made this their last resort. Loss of face or faith has considerable ramifications beyond mere embarrassment. A rep's ability to enlist the future support of customers and colleagues is jeopardized. There is evidently strong social pressure from a variety of sources to solve problems without exchanging machines. The reps' work is not simply about maintaining machines; it is also and equally importantly, about maintaining social relations: "A large part of service work might better be described as repair and maintenance of the social setting" (Orr 1990b, 169). The training and documentation, of course, are about maintaining machines.

Solving the problem *in situ* required constructing a coherent account of the malfunction out of the incoherence of the data and documentation. To do this, the rep and the specialist embarked on a long story-telling procedure. The machine, with its erratic behavior, mixed with information from the user and memories from the technicians, provided essential ingredients that the two aimed to account for in a

composite story. The process of forming a story was, centrally, one of diagnosis. This process, it should be noted, *begins* as well as ends in a communal understanding of the machine that is wholly unavailable from the canonical documents.

While they explored the machine or waited for it to crash, the rep and specialist (with contributions from the ethnographer) recalled and discussed other occasions on which they had encountered some of the present symptoms. Each story presented an exchangeable account that could be examined and reflected upon to provoke old memories and new insights. Yet more tests and more stories were thereby generated.

The key element of diagnosis is the situated production of understanding through narration, in that the integration of the various facts of the situation is accomplished through a verbal consideration of those facts with a primary criterion of coherence. The process is situated, in Suchman's terms, in that both the damaged machine and the social context of the user site are essential resources for both the definition of the problem and its resolution They are faced with a failing machine displaying diagnostic information which has previously proved worthless and in which no one has any particular confidence this time. They do not know where they are going to find the information they need to understand and solve this problem. In their search for inspiration, they tell stories (Orr 1990b, 178–179).

The story-telling process continued throughout the morning, over lunch, and back in front of the machine, throughout the afternoon, forming a long but purposeful progression from incoherence to coherence: "The final trouble-shooting session was a five hour effort This session yielded a dozen anecdotes told during the trouble shooting, taking a variety of forms and serving a variety of purposes" (Orr 1990b, 10).

Ultimately, these stories generated sufficient interplay among memories, tests, the machine's responses, and the ensuing insights to lead to diagnosis and repair. The final diagnosis developed from what Orr calls an "antiphonal recitation" in which the two told different versions of the same story: "They are talking about personal encounters with the same problem, but the two versions are significantly different" (Orr 1987b, 177). Through story-telling, these separate experiences converged, leading to a shared diagnosis of certain previously encountered but unresolved symptoms. The two (and the ethnographer) had constructed a communal interpretation of hitherto uninterpretable data and individual experience. Rep and specialist were now in a position to modify previous stories and build a more insightful one. They both increased their own understanding and added to their community's collective knowledge. Such stories are passed around, becoming part of the repertoire available to all reps. Orr reports hearing a concise, assimilated version of this particular false error code passed among reps over a game of cribbage in the lunch room three months later (Orr 1990b, 181ff.). A story, once in the possession of the community, can then be used—and further modified—in similar diagnostic sessions.

c. Central Features of Work Practice

In this section, we analyze Orr's thick description of the rep's practice through the overlapping categories, "narration," "collaboration," and "social construction"—categories that get to the heart of what the reps do and yet which, significantly, have no place in the organization's abstracted, canonical accounts of their work.

Narration. The first aspect of the reps' practice worth highlighting is the extensive narration used. This way of working is quite distinct from following the branches of decision tree. Stories and their telling can reflect the complex social web within which work takes place and the relationship of the narrative, narrator, and audience to the specific events of practice. The stories have a flexible generality that makes them both adaptable and particular. They function, rather like the common law, as a usefully

underconstrained means to interpret each new situation in the light of accumulated wisdom and constantly changing circumstances.

The practice of creating and exchanging of stories has two important aspects. First of all, telling stories helps to diagnose the state of a troublesome machine. Reps begin by extracting a history from the users of the machine, the users' story, and with this and the machine as their starting point, they construct their own account. If they cannot tell an adequate story on their own, then they seek help—either by summoning a specialist, as in the case above, or by discussing the problem with colleagues over coffee or lunch. If necessary, they work together at the machine, articulating hunches, insights, misconceptions, and the like, to dissect and augment their developing understanding. Story telling allows them to keep track of the sequences of behavior and of their theories, and thereby to work towards a coherent account of the current state of the machine. The reps try to impose coherence on an apparently random sequence of events in order that they can decide what to do next. Unlike the documentation, which tells reps *what* to do but not *why*, the reps' stories help them develop causal accounts of machines, which are essential when documentation breaks down. (As we have suggested, documentation, like machines, will always break down, however well it is designed.) What the reps do in their story telling is develop a causal map out of their experience to replace the impoverished directive route that they have been furnished by the corporation. In the absence of such support, the reps Orr studied cater to their own needs as well as they can. Their narratives yield a story of the machine fundamentally different from the prescriptive account provided by the documentation, a story that is built in response to the particulars of breakdown.

Despite the assumptions behind the downskilling process, to do their job in any significant sense, reps need these complex causal stories and they produce and circulate them as part of their regular noncanonical work practice. An important part of the reps' skill, though not recognized by the corporation, comprises the ability to create, to trade, and to understand highly elliptical, highly referential, and to the initiated, highly informative war stories. Zuboff (1988) in her analysis of the skills people develop working on complex systems describes similar cases of story telling and argues that it is a necessary practice for dealing with "smart" but unpredictable machines. The irony, as Orr points out, is that for purposes of diagnosis the reps have no smart machines, just inadequate documentation and "their own very traditional skills."

It is worth stressing at this point that we are not arguing that communities simply can and thus should work without assistance from trainers and the corporation in general. Indeed, we suggest in our conclusion that situations inevitably occur when group improvisation simply cannot bridge the gap between what the corporation supplies and what a particular community actually needs. What we are claiming is that corporations must provide support that corresponds to the real needs of the community rather than just to the abstract expectations of the corporation. And what those needs are can only be understood by understanding the details and sophistications of actual practice. In Orr's account, what the reps needed was the means to understand the machine causally and to relate this causal map to the inevitable intricacies of practice. To discern such needs, however, will require that corporations develop a less formal and more practice-based approach to communities and their work.

The second characteristic of story telling is that the stories also act as repositories of accumulated wisdom. In particular, community narratives protect the reps' ability to work from the ravages of modern idealizations of work and related downskilling practices. In Orr's example, the canonical decision trees, privileging the decontextualized over the situated, effectively sweep away the clutter of practice. But it is in the

face of just this clutter that the reps' skills are needed. Improvisational skills that allow the reps to circumvent the inadequacies of both the machines and the documentation are not only developed but also preserved in community story telling.

Jordan's (1989) work similarly draws attention to the central, dual role of informal stories. She studied the clash between midwifery as it is prescribed by officials from Mexico City and as it is practiced in rural Yucatan. The officials ignore important details and realities of practice. For instance, the officials instruct the midwives in practices that demand sterile instruments though the midwives work in villages that lack adequate means for sterilization. The midwives' noncanonical practices, however, circumvent the possibility of surgical operations being carried out with unsterile instruments. These effective practices survive, despite the government's worryingly decontextualized attempts to replace them with canonical practices, through story telling. Jordan notes that the two aspects of story telling, diagnosis and preservation, are inseparable. Orr also suggests that "The use of story-telling both to preserve knowledge and to consider it in subsequent diagnoses coincides with the narrative character of diagnosis" (Orr 1990b, 178). We have pulled them apart for the purpose of analysis only.

Collaboration. Based as it is on shared narratives, a second important aspect of the reps' work is that it is obviously communal and thereby *collaborative*. In Orr's example, the rep and specialist went through a collective, not individual process. Not only is the learning in this case inseparable from working, but also individual learning is inseparable from collective learning. The insight accumulated is not a private substance, but socially constructed and distributed. Thus, faced with a difficult problem reps like to work together and to discuss problems in groups. In the case of this particular problem, the individual rep tried what he knew, failed, and there met his limits. With the specialist he was able to trade stories, develop insights, and construct new options. Each had a story about the condition of the machine, but it was in telling it antiphonally that the significance emerged.

While it might seem trivial, it is important to emphasize the collaborative work within the reps' community, for in the corporation's eyes their work is viewed individually. Their documentation and training implicitly maintain that the work is individual and the central relationship of the rep is that between an individual and the corporation:

The activities defined by management are those which one worker will do, and work as the relationship of employment is discussed in terms of a single worker's relationship to the corporation. I suspect the incidence of workers alone in relations of employment is quite low, and the existence of coworkers must contribute to those activities done in the name of work The fact that work is commonly done by a group of workers together is only sometimes acknowledged in the literature, and the usual presence of such a community has not entered into the definition of work (Orr 1990a, 15).

In fact, as Orr's studies show, not only do reps work with specialists, as in the example given here, but throughout the day they meet for coffee or for meals and trade stories back and forth.

Social Construction. A third important aspect of Orr's account of practice, and one which is interfused with the previous two and separated here only to help in clarification, involves *social construction*. This has two parts. First and most evident in Orr's example, the reps constructed a shared understanding out of bountiful conflicting and confusing data. This constructed understanding reflects the reps' view of the world. They developed a *rep's* model of the machine, not a trainer's, which had already proved unsatisfactory, nor even an engineer's, which was not available to

them (and might well have been unhelpful, though Orr interestingly points out that reps cultivate connections throughout the corporation to help them circumvent the barriers to understanding built by their documentation and training). The reps' view, evident in their stories, interweaves generalities about "this model" with particularities about "this site" and "this machine."

Such an approach is highly situated and highly improvisational. Reps respond to whatever the situation itself—both social and physical—throws at them, a process very similar to Levi-Strauss's (1966) concept of *bricolage*: the ability to "make do with 'whatever is to hand'" (p. 17). What reps need for *bricolage* are not the partial, rigid models of the sort directive documentation provides, but help to build, *ad hoc* and collaboratively, robust models that do justice to particular difficulties in which they find themselves. Hutchins, in his analysis of navigation teams in the U.S. Navy (in press, 1991), similarly notes the way in which understanding is constructed within and distributed throughout teams.

The second feature of social construction, as important but less evident than the first, is that in telling these stories an individual rep contributes to the construction and development of his or her own identity as a rep and reciprocally to the construction and development of the community of reps in which he or she works. Individually, in telling stories the rep is becoming a member. Orr notes, "this construction of their identity as technicians occurs both in doing the work and in their stories, and their stories of themselves fixing machines show their world in what they consider the appropriate perspective" (Orr 1990b, 187). Simultaneously and interdependently, the reps are contributing to the construction and evolution of the community that they are joining—what we might call a "community of interpretation," for it is through the continual development of these communities that the shared means for interpreting complex activity get formed, transformed, and transmitted.

The significance of both these points should become apparent in the following sections, first, as we turn to a theory of learning (Lave and Wenger's) that, like Orr's analysis of work, takes formation of identity and community membership as central units of analysis; and second as we argue that innovation can be seen as at base a function of changes in community values and views.

2. Learning

The theories of learning implicated in the documentation and training view learning from the abstract stance of pedagogy. Training is thought of as the *transmission* of explicit, abstract knowledge from the head of someone who knows to the head of someone who does not in surroundings that specifically exclude the complexities of practice and the communities of practitioners. The setting for learning is simply assumed not to matter.

Concepts of knowledge or information transfer, however, have been under increasing attack in recent years from a variety of sources (e.g., Reddy 1979). In particular, learning theorists (e.g. Lave 1988; Lave and Wenger 1990) have rejected transfer models, which isolate knowledge from practice, and developed a view of learning as social construction, putting knowledge back into the contexts in which it has meaning (see also Brown, Collins, and Duguid 1989; Brown and Duguid, in press; Pea 1990). From this perspective, learners can in one way or another be seen to construct their understanding out of a wide range of materials that include ambient social and physical circumstances and the histories and social relations of the people involved. Like a magpie with a nest, learning is built out of the materials to hand and in relation to the structuring resources of local conditions. (For the importance of

including the structuring resources in any account of learning, see Lave 1988.) What is learned is profoundly connected to the conditions in which it is learned.

Lave and Wenger (1990), with their concept of *legitimate peripheral participation* (LPP), provide one of the most versatile accounts of this constructive view of learning. LPP, it must quickly be asserted, is *not* a method of education. It is an analytical category or tool for understanding learning across different methods, different historical periods, and different social and physical environments. It attempts to account for learning, not teaching or instruction. Thus this approach escapes problems that arise through examinations of learning from pedagogy's viewpoint. It makes the conditions of learning, rather than just abstract subject matter, central to understanding what is learned.

Learning, from the viewpoint of LPP, essentially involves becoming an "insider." Learners do not receive or even construct abstract, "objective," individual knowledge; rather, they learn to function in a community—be it a community of nuclear physicists, cabinet makers, high school classmates, street-corner society, or, as in the case under study, service technicians. They acquire that particular community's subjective viewpoint and learn to speak its language. In short, they are enculturated (Brown, Collins, and Duguid 1989). Learners are acquiring not explicit, formal "expert knowledge," but the embodied ability to behave as community members. For example, learners learn to tell and appreciate community-appropriate stories, discovering in doing so, all the narrative-based resources we outlined above. As Jordan (1989) argues in her analysis of midwifery, "To acquire a store of appropriate stories and, even more importantly, to know what are appropriate occasions for telling them, is then part of what it means to become a midwife" (p. 935).

Workplace learning is best understood, then, in terms of the communities being formed or joined and personal identities being changed. The central issue in learning is *becoming* a practitioner not learning *about* practice. This approach draws attention away from abstract knowledge and cranial processes and situates it in the practices and communities in which knowledge takes on significance. Learning about new devices, such as the machines Orr's technicians worked with, is best understood (and best achieved) in the context of the community in which the devices are used and that community's particular interpretive conventions. Lave and Wenger argue that learning, understanding, and interpretation involve a great deal that is not explicit or explicable, developed and framed in a crucially *communal* context.

Orr's study reveals this sort of learning going on in the process of and inseparable from work. The rep was not just an observer of the technical specialist. He was also an important participant in this process of diagnosis and story telling, whose participation could legitimately grow in from the periphery as a function of his developing understanding not of some extrinsically structured training. His legitimacy here is an important function of the social relations between the different levels of service technician, which are surprisingly egalitarian, perhaps as a result of the inherent incoherence of the problems this sort of technology presents: a specialist cannot hope to exert hierarchical control over knowledge that he or she must first construct cooperatively. "Occupational communities... have little hierarchy; the only real status is that of member" (Orr 1990a, 33).

a. *Groups and Communities*

Having characterized both working and learning in terms of communities, it is worth pausing to establish relations between our own account and recent work on groups in the workplace. Much important work has been done in this area (see, for example, the collections by Hackman (1990) and Goodman and Associates (1988)) and many of the findings support our own view of work activity. There is, however, a

significant distinction between our views and this work. Group theory in general focuses on groups as canonical, bounded entities that lie within an organization and that are organized or at least sanctioned by that organization and its view of tasks. (See Hackman 1990, pp. 4–5.). The communities that we discern are, by contrast, often noncanonical and not recognized by the organization. They are more fluid and interpenetrative than bounded, often crossing the restrictive boundaries of the organization to incorporate people from outside. (Orr's reps can in an important sense be said to work in a community that includes both suppliers and customers.) Indeed, the canonical organization becomes a questionable unit of analysis from this perspective. And significantly, communities are emergent. That is to say their shape and membership emerges in the process of activity, as opposed to being created to carry out a task. (Note, by contrast, how much of the literature refers to the *design* or *creation* of new groups (e.g. Goodman and Associates 1988). From our viewpoint, the central questions more involve the *detection* and *support* of emergent or existing communities.)

If this distinction is correct then it has two particularly important corollaries. First, work practice and learning need to be understood not in terms of the groups that are ordained (e.g. "task forces" or "trainees"), but in terms of the communities that emerge. The latter are likely to be noncanonical (though not necessarily so) while the former are likely to be canonical. Looking only at canonical groups, whose configuration often conceals extremely influential interstitial communities, will not provide a clear picture of how work or learning is actually organized and accomplished. It will only reflect the dominant assumptions of the organizational core.

Second, attempts to introduce "teams" and "work groups" into the workplace to enhance learning or work practice are often based on an assumption that without impetus from above, an organization's members configure themselves as individuals. In fact, as we suggest, people work and learn collaboratively and vital interstitial communities are continually being formed and reformed. The reorganization of the workplace into canonical groups can wittingly or unwittingly disrupt these highly functional noncanonical—and therefore often invisible—communities. Orr argues:

The process of working and learning together creates a work situation which the workers value, and they resist having it disrupted by their employers through events such as a reorganization of the work. This resistance can surprise employers who think of labor as a commodity to arrange to suit their ends. The problem for the workers is that this community which they have created was not part of the series of discrete employment agreements by which the employer populated the work place, nor is the role of the community in doing the work acknowledged. *The work can only continue free of disruption if the employer can be persuaded to see the community as necessary to accomplishing work* (Orr 1990, 48, emphasis added).

b. *Fostering Learning*

Given a community-based analysis of learning so congruent with Orr's analysis of working, the question arises, how is it possible to foster learning-in-working? The answer is inevitably complex, not least because all the intricacies of context, which the pedagogic approach has always assumed could be stripped away, now have to be taken back into consideration. On the other hand, the ability of people to learn *in situ*, suggests that as a fundamental principle for supporting learning, attempts to strip away context should be examined with caution. If learners need access to practitioners at work, it is essential to question didactic approaches, with their tendency to separate learners from the target community and the authentic work practices. Learning is fostered by fostering access to and membership of the target

community-of-practice, not by explicating abstractions of individual practice. Thus central to the process are the recognition and legitimation of community practices.

Reliance on formal descriptions of work, explicit syllabuses for learning about it, and canonical groups to carry it out immediately set organizations at a disadvantage. This approach, as we have noted, can simply blind management to the practices and communities that actually make things happen. In particular, it can lead to the isolation of learners, who will then be unable to acquire the implicit practices required for work. Marshall (in Lave and Wenger 1990) describes a case of apprenticeship for butchers in which learning was extremely restricted because, among other things, "apprentices . . . could not watch journeymen cut and saw meat" (p. 19). Formal training in cutting and sawing is quite different from the understanding of practice gleaned through informal observation that copresence makes possible and absence obviously excludes. These trainees were simply denied the chance to become legitimate peripheral participants. If training is designed so that learners cannot observe the activity of practitioners, learning is inevitably impoverished.

Legitimacy and peripherality are intertwined in a complex way. Occasionally, learners (like the apprentice butchers) are granted legitimacy but are denied peripherality. Conversely, they can be granted peripherality but denied legitimacy. Martin (1982) gives examples of organizations in which legitimacy is explicitly denied in instances of "open door" management, where members come to realize that, though the door is open, it is wiser not to cross the threshold. If either legitimacy or peripherality is denied, learning will be significantly more difficult.

For learners, then, a position on the periphery of practice is important. It is also easily overlooked and increasingly risks being "designed out," leaving people physically or socially isolated and justifiably uncertain whether, for instance, their errors are inevitable or the result of personal inadequacies. It is a significant challenge for design to ensure that new collaborative technologies, designed as they so often are around formal descriptions of work, do not exclude this sort of implicit, extendable, informal periphery. Learners need legitimate access to the periphery of communication—to computer mail, to formal and informal meetings, to telephone conversations, etc., and, of course, to war stories. They pick up invaluable "know how"—not just information but also manner and technique—from being on the periphery of competent practitioners going about their business. Furthermore, it is important to consider the periphery not only because it is an important site of learning, but also because, as the next section proposes, it can be an important site for innovation.

3. Innovating

One of the central benefits of these small, self-constituting communities we have been describing is that they evade the ossifying tendencies of large organizations. Canonical accounts of work are not only hard to apply and hard to learn. They are also hard to change. Yet the actual behaviors of communities-of-practice are constantly changing both as newcomers replace old timers and as the demands of practice force the community to revise its relationship to its environment. Communities-of-practice like the reps' continue to develop a rich, fluid, noncanonical world view to bridge the gap between their organization's static canonical view and the challenge of changing practice. This process of development is inherently innovative. "Maverick" communities of this sort offer the core of a large organization a means and a model to examine the potential of alternative views of organizational activity through spontaneously occurring experiments that are simultaneously informed and checked by experience. These, it has been argued (Hedberg, Nystrom and Starbuck

1976; Schein 1990), drive innovation by allowing the parts of an organization to step outside the organization's inevitably limited core world view and simply try something new. Unfortunately, people in the core of large organizations too often regard these noncanonical practices (if they see them at all) as counterproductive.

For a theoretical account of this sort of innovation, we turn to Daft and Weick's (1984) discussion of interpretive innovation. They propose a matrix of four different kinds of organization, each characterized by its relationship to its environment. They name these relationships "undirected viewing," "conditioned viewing," "discovering," and "enacting." Only the last two concern us here. It is important to note that Daft and Weick too see the community and not the individual "inventor" as the central unit of analysis in understanding innovating practice.

The *discovering organization* is the archetype of the conventional innovative organization, one which responds—often with great efficiency—to changes it detects in its environment. The organization presupposes an essentially prestructured environment and implicitly assumes that there is a correct response to any condition it discovers there. By contrast, the *enacting organization* is proactive and highly interpretive. Not only does it respond to its environment, but also, in a fundamental way, it creates many of the conditions to which it must respond. Daft and Weick describe enacting organizations as follows:

These organizations construct their own environments. They gather information by trying new behaviors and seeing what happens. They experiment, test, and stimulate, and they ignore precedent, rules, and traditional expectations (Daft and Weick 1984, p. 288).

Innovation, in this view, is not simply a response to empirical observations of the environment. The source of innovation lies on the interface between an organization and its environment. And the process of innovating involves actively constructing a conceptual framework, imposing it on the environment, and reflecting on their interaction. With few changes, this could be a description of the activity of inventive, noncanonical groups, such as Orr's reps, who similarly "ignore precedent, rules, and traditional expectations" and break conventional boundaries. Like story telling, enacting is a process of interpretive sense making and controlled change.

A brief example of enacting can be seen in the introduction of the IBM Mag-I memory typewriter "as a new way of organizing office work" (Pava cited in Barley 1988). In order to make sense and full use of the power of this typewriter, the conditions in which it was to be used had to be reconceived. In the old conception of office work, the potential of the machine could not be realized. In a newly conceived understanding of office practice, however, the machine could prove highly innovative. Though this new conception could not be achieved without the new machine, the new machine could not be fully realized without the conception. The two changes went along together. Neither is wholly either cause or effect. Enacting organizations differ from discovering ones in that in this reciprocal way, instead of waiting for changed practices to emerge and responding, they enable them to emerge and anticipate their effects.

Reregistering the environment is widely recognized as a powerful source of innovation that moves organizations beyond the paradigms in which they begin their analysis and within which, without such a reformation, they must inevitably end it. This is the problem which Deetz and Kersten (1983) describe as closure: "Many organizations fail because . . . closure prohibits adaptation to current social conditions" (p. 166). Putnam (1983) argues that closure-generating structures appear to be "fixtures that exist independent of the processes that create and transform them" (p. 36). Interpretive or enacting organizations, aware as they are that their environ-

ment is not a given; can potentially adopt new viewpoints that allow them to see beyond the closure-imposing boundary of a single world view.

The question remains, however, how is this reregistering brought about by organizations that seem inescapably trapped within their own world view? We are claiming that the actual noncanonical practices of interstitial communities are continually developing new interpretations of the world because they have a practical rather than formal connection to that world. (For a theoretical account of the way practice drives change in world view, see Bloch 1977.) To pursue our connection with the work of the reps, closure is the likely result of rigid adherence to the reps' training and documentation and the formal account of work that they encompass. In order to get on with their work, reps overcome closure by reregistering their interpretation of the machine and its ever changing milieu. Rejection of a canonical, predetermined view and the construction through narration of an alternative view, such as Orr describes, involve, at heart, the complex intuitive process of bringing the communicative, community schema into harmony with the environment by reformulating both. The potential of such innovation is, however, lost to an organization that remains blind to noncanonical practice.

An enacting organization must also be capable of reconceiving not only its environment but also its own identity, for in a significant sense the two are mutually constitutive. Again, this reconceptualization is something that people who develop noncanonical practices are continuously doing, forging their own and their community's identity in their own terms so that they can break out of the restrictive hold of the formal descriptions of practice. Enacting organizations similarly regard both their environment and themselves as in some sense unanalyzed and therefore malleable. They do not assume that there is an ineluctable structure, a "right" answer, or a universal view to be discovered; rather, they continually look for innovative ways to impose new structure, ask new questions, develop a new view, become a new organization. By asking different questions, by seeking different *sorts* of explanations, and by looking from different points of view, different answers emerge—indeed different environments and different organizations mutually reconstitute each other dialectically or reciprocally. Daft and Weick (1984) argue, the interpretation can "shape the environment more than the environment shapes the interpretation" (p. 287).

Carlson's attempts to interest people in the idea of dry photocopying—xerography—provide an example of organizational tendencies to resist enacting innovation. Carlson and the Batelle Institute, which backed his research, approached most of the major innovative corporations of the time—RCA, IBM, A. B. Dick, Kodak. All turned down the idea of a dry copier. They did not reject a flawed machine. Indeed, they all agreed that it worked. But they rejected the *concept* of an office copier. They could see no use for it. Even when Haloid bought the patent, the marketing firms they hired consistently reported that the new device had no role in office practice (Dessauer 1971). In some sense it was necessary both for Haloid to reconceive itself (as Xerox) and for Xerox's machine to help bring about a reconceptualization of an area of office practice for the new machine to be put into manufacture and use.

What the evaluations saw was that an expensive machine was not needed to make a record copy of original documents. For the most part, carbon paper already did that admirably and cheaply. What they failed to see was that a copier allowed the proliferation of copies and of copies of copies. The quantitative leap in copies and their importance independent of the original then produced a qualitative leap in the way they were used. They no longer served merely as records of an original. Instead, they participated in the productive interactions of organizations' members in a unprecedented way. (See Latour's (1986) description of the organizational role of

“immutable mobiles.”) Only in use in the office, enabling and enhancing new forms of work, did the copier forge the conceptual lenses under which its value became inescapable.

It is this process of seeing the world anew that allows organizations reciprocally to see themselves anew and to overcome discontinuities in their environment and their structure. As von Hippel (1988), Barley (1988), and others point out, innovating is not always radical. Incremental improvements occur throughout an innovative organization. Enacting and innovating can be conceived of as at root sense-making, congruence-seeking, identity-building activities of the sort engaged in by the reps. Innovating and learning in daily activity lie at one end of a continuum of innovating practices that stretches to radical innovation cultivated in research laboratories at the far end.

Alternative world views, then, do not lie in the laboratory or strategic planning office alone, condemning everyone else in the organization to submit to a unitary culture. Alternatives are inevitably distributed throughout all the different communities that make up the organization. For it is the organization's communities, at all levels, who are in contact with the environment and involved in interpretive sense making, congruence finding, and adapting. It is from any site of such interactions that new insights can be coproduced. If an organizational core overlooks or curtails the enacting in its midst by ignoring or disrupting its communities-of-practice, it threatens its own survival in two ways. It will not only threaten to destroy the very working and learning practices by which it, knowingly or unknowingly, survives. It will also cut itself off from a major source of potential innovation that inevitably arises in the course of that working and learning.

4. Conclusion: Organizations as Communities-of-Communities

The complex of contradictory forces that put an organization's assumptions and core beliefs in direct conflict with members' working, learning, and innovating arises from a thorough misunderstanding of what working, learning, and innovating are. As a result of such misunderstandings, many modern processes and technologies, particularly those designed to downskill, threaten the robust working, learning, and innovating communities and practice of the workplace. Between Braverman's (1974) pessimistic view and Adler's (1987) optimistic one, lies Barley's (1988) complex argument, pointing out that the intent to downskill does not *necessarily* lead to downskilling (as Orr's reps show). But the intent to downskill may first drive noncanonical practice and communities yet further underground so that the insights gained through work are more completely hidden from the organization as a whole. Then later changes or reorganizations, whether or not intended to downskill, may disrupt what they do not notice. The gap between espoused and actual practice may become too large for noncanonical practices to bridge.

To foster working, learning, and innovating, an organization must close that gap. To do so, it needs to reconceive of itself as a community-of-communities, acknowledging in the process the many noncanonical communities in its midst. It must see beyond its canonical abstractions of practice to the rich, full-blooded activities themselves. And it must legitimize and support the myriad enacting activities perpetrated by its different members. This support cannot be intrusive, or it risks merely bringing potential innovators under the restrictive influence of the existing canonical view. Rather, as others have argued (Nystrom and Starbuck 1984; Hedberg 1981; Schein 1990) communities-of-practice must be allowed some latitude to shake themselves free of received wisdom.

A major entailment of this argument may be quite surprising. Conventional wisdom tends to hold that large organizations are particularly poor at innovating and

adapting. Tushman and Anderson (1988), for example, argue justifiably that the *typical*, large organization is unlikely to produce discontinuous innovation. But size may not be the single determining feature here. Large, *atypical*, enacting organizations have the potential to be highly innovative and adaptive. Within an organization perceived as a collective of communities, not simply of individuals, in which enacting experiments are legitimate, separate community perspectives can be amplified by interchanges among communities. Out of this friction of competing ideas can come the sort of improvisational sparks necessary for igniting organizational innovation. Thus large organizations, *reflectively structured*, are perhaps particularly well positioned to be highly innovative and to deal with discontinuities. If their internal communities have a reasonable degree of autonomy and independence from the dominant world view, large organizations might actually accelerate innovation. Such organizations are uniquely positioned to generate innovative discontinuities incrementally, thereby diminishing the disruptiveness of the periodic radical reorganization that Nadler calls “frame breaking” (Nadler 1988). This occurs when conventional organizations swing wholesale from one paradigm to another (see also Bartunek 1984). An organization whose core is aware that it is the synergistic aggregate of agile, semiautonomous, self-constituting communities and not a brittle monolith is likely to be capable of extensible “frame bending” well beyond conventional breaking point.

The important interplay of separate communities with independent (though inter-related) world views may in part account for von Hippel’s (1988) account of the sources of innovation and other descriptions of the innovative nature of business alliances. Von Hippel argues that sources of innovation can lie outside an organization among its customers and suppliers. Emergent communities of the sort we have outlined that span the boundaries of an organization would then seem a likely conduit of external and innovative views into an organization. Similarly, the alliances Powell describes bring together different organizations with different interpretive schemes so that the composite group they make up has several enacting options to choose from. Because the separate communities enter as independent members of an alliance rather than as members of a rigid hierarchy, the alternative conceptual viewpoints are presumably legitimate and do not get hidden from the core. There is no concealed noncanonical practice where there is no concealing canonical practice.

The means to harness innovative energy in any enacting organization or alliance must ultimately be considered in the design of organizational architecture and the ways communities are linked to each other. This architecture should preserve and enhance the healthy autonomy of communities, while simultaneously building an interconnectedness through which to disseminate the results of separate communities’ experiments. In some form or another the stories that support learning-in-working and innovation should be allowed to circulate. The technological potential to support this distribution—e-mail, bulletin boards, and other devices that are capable of supporting narrative exchanges—is available. But narratives, as we have argued, are embedded in the social system in which they arise and are used. They cannot simply be uprooted and repackaged for circulation without becoming prey to exactly those problems that beset the old abstracted canonical accounts. Moreover, information cannot be assumed to circulate freely just because technology to support circulation is available (Feldman and March 1981). Eckert (1989), for instance, argues that information travels differently within different socio-economic groups. Organizational assumptions that given the “right” medium people will exchange information freely overlook the way in which certain socio-economic groups, organizations, and in particular, corporations, implicitly treat information as a commodity to be hoarded and exchanged. Working-class groups, Eckert contends, do pass information freely and Orr (1990a) notes that the reps are remarkably open with each other about what

they know. *Within* these communities, news travels fast; community knowledge is readily available to community members. But these communities must function within corporations that treat information as a commodity and that have superior bargaining power in negotiating the terms of exchange. In such unequal conditions, internal communities cannot reasonably be expected to surrender their knowledge freely.

As we have been arguing throughout, to understand the way information is constructed and travels within an organization, it is first necessary to understand the different communities that are formed within it and the distribution of power among them. Conceptual reorganization to accommodate learning-in-working and innovation, then, must stretch from the level of individual communities-of-practice and the technology and practices used there to the level of the overarching organizational architecture, the community-of-communities.

It has been our unstated assumption that a unified understanding of working, learning, and innovating is potentially highly beneficial, allowing, it seems likely, a synergistic collaboration rather than a conflicting separation among workers, learners, and innovators. But similarly, we have left unstated the companion assumption that attempts to foster such synergy through a conceptual reorganization will produce enormous difficulties from the perspective of the conventional workplace. Work and learning are set out in formal descriptions so that people (and organizations) can be held accountable; groups are organized to define responsibility; organizations are bounded to enhance concepts of competition; peripheries are closed off to maintain secrecy and privacy. Changing the way these things are arranged will produce problems as well as benefits. An examination of both problems and benefits has been left out of this paper, whose single purpose has been to show where constraints and resources lie, rather than the rewards and costs of deploying them. Our argument is simply that for working, learning, and innovating to thrive collectively depends on linking these three, in theory and in practice, more closely, more realistically, and more reflectively than is generally the case at present.

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