

# **Ecology of Distributed Mediated Practice**

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## ABSTRACT:

This paper explores distributed mediated practice as an ecology of knowledge workers, mediations, knowledge objects, documents and data repositories in which representations are continuously being written and read, design is being enacted and evaluated and implementations are being produced and reproduced. A central feature of this ecology of distributed knowledge work is the tension that individuals experience, both as knowledge workers and as knowledge objects, between the expectations of a local logic and those of a global logic. These two logics create a kind of space in which the individual must navigate, and pose an irreducible contradiction between competing contexts for responsible action. Some research relevant to this ecological view is summarized, and some of its existential qualities are discussed.

# **Ecology of Distributed Mediated Practice**

## **Introduction**

In September of 2000, a workshop was held in Paris by a collaboration of American and European scholars on Distributed Mediated Practice. In summarizing the workshop discussions, Geoff Bowker and Bill Turner organized it with three main headings: Representation, Design and Implementation. These three are a wonderful choice for capturing the dynamic nature of distributed mediated practice, especially as I will view it here. I take representation, design and implementation to be three interrelated aspects of the experience of engaging in distributed mediated practice, which are ubiquitous, pervasive and intertwining. I view distributed mediated practice as an ecology of knowledge workers, mediations, knowledge objects, documents and data repositories. In this ecology, representations are continuously being written and read, design is being enacted and evaluated and implementations are being produced and reproduced.

Representing, designing and implementing are, in a sense, the “stuff” that distributed practices are made of. Because representations are being created and interpreted by actors at many levels of a distributed system, it is a multi-layered hermeneutic process. Because designs of the system are always being enacted and evaluated, it is a path creating, innovative process. And because implementations of the system are continuously being produced and reproduced it is a process of responsible human agency. At any moment, any of the actors could interpret their situation differently, could resist the prescribed path or could intervene to change accepted practices.

## **An Ecology of Distributed Mediated Practice**

In figure 1, I present a simplified image of how knowledge workers, mediations, knowledge objects, documents and data repositories form an ecology of distributed mediated practice. It is a fragile, recursive network ecology in which humans are both the principle knowledge workers and also the principle knowledge objects. Non-human actants (Latour, Callon) have a role to play, to be sure, but it is the experience of the human being as knowledge worker and knowledge object that is of interest to me. Judging the value of a distributed system will always involve an assessment of how it is experienced by the professionals operating within it and the human clients who are affected by it. It will always come down to how a person is affected by the system, internally or externally, and that is where I want to put my focus. In addition to non-human actants, there are many other important elements that are not in this simple diagram, such as culture, history and status. My intention is to bring them up as needed through the human beings who are involved as its workers and objects.

The knowledge workers and knowledge objects of figure one are engaged in reading and writing documents that mediate their own interaction, as well as documents that feed into and out of the data repositories. They, and other social science actors who are not depicted, are also engaged in the design of those very documents and interaction processes. As they engage in these systems, resisting sometimes, struggling to improve them at other times, they are engaged in implementing the distributed system of practice. Representing, designing and implementing, then, are the way that distributed practices are carried out.

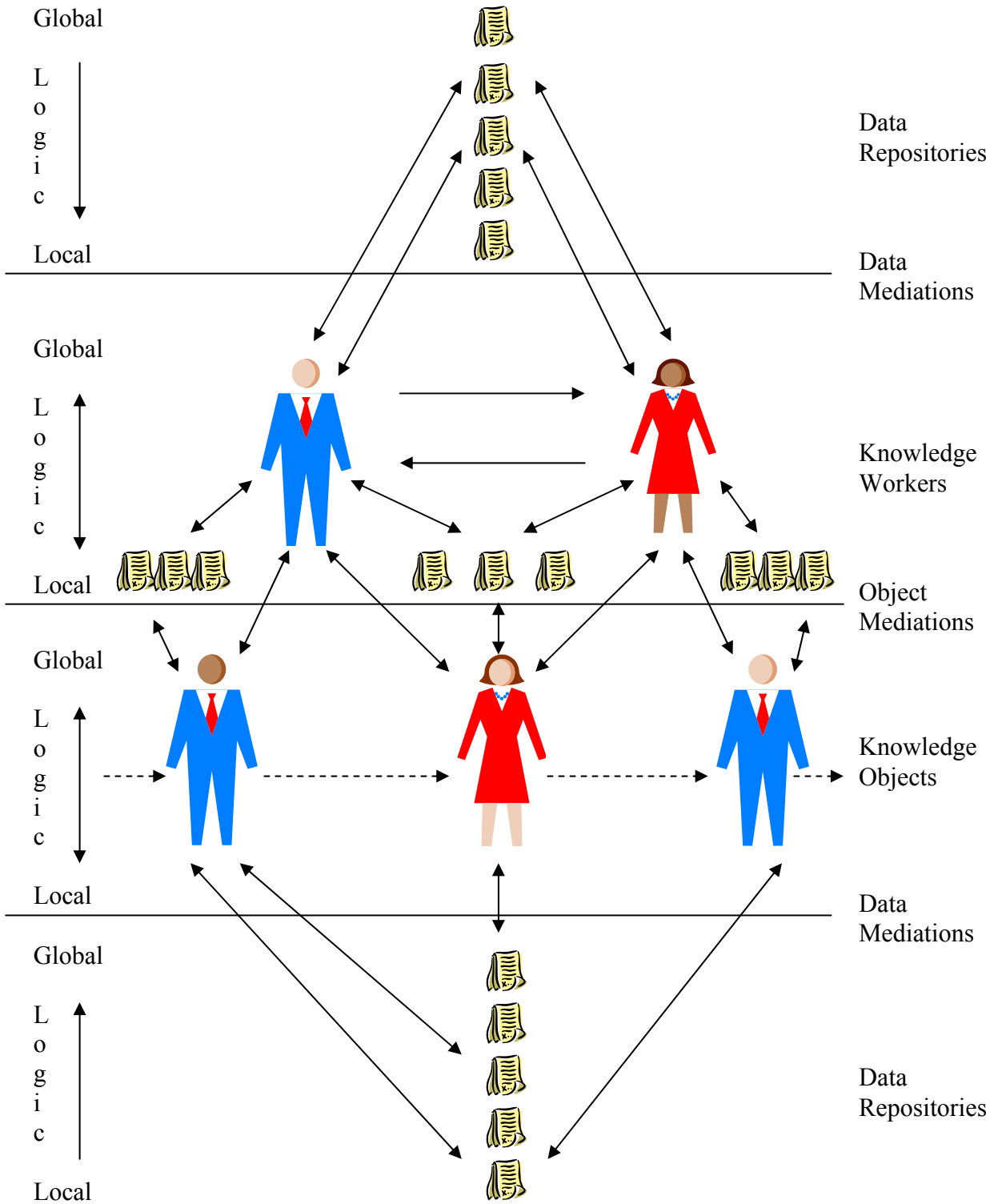


Figure 1  
An Ecology of Distributed Mediated Practice

The data repositories shown at both the top and bottom of figure 1 are meant to be the same ones, and if I were talented enough, I would draw them as connected, forming a circle. I would draw the circle in the form of a mobius strip, so that each time the circle was traversed, the surface on which one was traveling would always seem to be new. That would capture in some degree the sense of eternal progress that we associate with technology in general and the advanced forms of distributed mediated practice, in particular.

Each of the three layers of the mobius strip figure has an indication of different forms of logic that operate within it. In each level, these different forms of logic range from the most local and concrete to the most global and abstract. I see these ranges of logic and the two extreme anchor points of the local and the global to be an important defining characteristic of the experience of action in any system, especially distributed mediated practice. Local logics, at the extreme, are the logics of face-to-face interaction in historically bound moments of action. Culture, traditions, symbols, honor, history and sense of future are all present and operating in determining the appropriate thing to do. Global logics, on the other hand, are experienced when a person engages in abstract analysis with logical relations among concepts, economic calculations, and attention to institutional or professional rules so that an accountable, defensible reason can be given for a choice that is made.

In figure 1, knowledge workers are shown as being in a constant tension between the two logics of the local and the global. They engage in abstract, global logics when they write to or read from data repositories that are created and accessed by a wide range of professionals working across multiple disciplines. In dealing with a data repository, the logics they employ are not of the concrete moment, but of how the concrete moment “fits” the closest approximation of the categories, measurements and policies operating at the global logic level. At the same time, the documents they create and read in working with knowledge objects involve a local logic of their practice. Take for example the physician who is treating a patient in a large teaching hospital. Her vocabulary will be unique to her own specialty and even to the local categories of patients, treatments, and relations with other medical and technical staff. To the knowledge object (or patient), these documents are not a local, but a global presence of logic. The patient’s direct experience is translated into the higher order constructs of a medical specialty, and the local logic which unites a patient’s understanding of his disease or his treatment within the medical system are of little or no consequence. As the individual moves from specialist to specialist within the hospital network, his immediate experience of local logic is carried through from location to location, but it is not a part of the global logic of the documentation that is being made of them by the knowledge worker physicians.

At the data repository level, something strange seems to happen. The most global logics of the physicians, insurance companies, government policy makers or social scientists are turned into very local issues of measurement, standardization, detailed definitions of particularities and exacting techniques for ensuring common and understandable formats for data entry and retrieval. At the same time, the most abstract, summarized syntheses of those categories and measurements become the existential ground for the local logics of the everyday person as a knowledge object (patient, citizen, etc.). They become the potent

categories by which we are known as individuals, to all but our most intimate friends. They become the terrain, which must be navigated by ordinary people day-to-day in order to get things done in the institutionalized worlds of health care, education or government services.

The tension of the local and global logics as they cross each other from level to level in this simple depiction of distributed mediated practice is the tension of reason versus experience which has been with us in Western thought since at least Plato. I believe that the emerging field of distributed mediated practice is an important step in bringing these age-old tensions to our conscious awareness. As computing and communication technologies become universal and pervasive in our lives, the questions which first stirred humans on a reflective, philosophical path return to us in a socio-technical presence. The computing and communication technologies which mediate distributed practice and make virtual teams possible, also serve to raise philosophical issues about the nature of the modern world which remain unnoticed and unexamined in their absence. Fundamental tensions between the local and the global which are present even in the most basic forms of human interaction are made visible and problematic when we introduce advanced technologies to mediate organizational practice.

I first used a simplified version of figure one in a panel session on “Documenting across space and time” at the International Information on Systems Conference in December 2001. Other members of the panel were eager to point out that the distinction between local and global logics was somewhat artificial and was not to their liking, so I realize that it is at best an analytic distinction, but I think that some of the ways that their work seemed to fit into the diagram are worth mentioning. Michael Barrett reported on his study of auditors and their documenting practices in large-scale corporate financial audits. He argued that as their documentation practices changed, their identities as auditors changed – which I read as saying that the documentation practices at the global level of their audit work led to a change in their local sense of identity. He also reported an earlier study of his showing a similar relation of documentation practices and professional identity in the insurance industry.

Carsten Osterland reported on a study he had performed in a large teaching hospital (the example I used above) in which the intensity of documentations and the apparently repetitious documentation of the same patient’s symptoms and history was hard to comprehend. Why, the medical informatics community asked, couldn’t the patient history be collected once and electronically across all the specialists as the patient moved among them? Why, in other words, can’t a global logic be used to structure the data collection? His answer was found in the multiple roles that documentation played in that distributed system. First, each specialist has unique categories, which are not duplicated by others, but more importantly, each specialist is not just treating the patient but is communicating with themselves in a process of learning about medical care generally and that patient specifically. Also, each doctor is also communicating with specialists on their own team across shifts, as well as with other teams of specialists. Each of these modes of communication raises unique requirements of local logic, which they, as professionals, resist to homogenize. The patient, in turn, becomes an object in a global vocabulary of disease categories, syndromes of complications and standardized test results. Her actual experience is subordinated to the

local and global tensions of the physicians.

### **Some Relevant Results from our own Research**

I will briefly review some of the studies that we have done on distributed teams which are relevant to the ecology of distributed mediated practices discussed above. There are many projects, which we have done that have relevance here, but I will select just a few in order to maintain some coherence in the presentation. I will focus on projects with two colleagues, Ulrike Schultze and Alex Citurs, which informed the dynamics of local and global logics by studying the experience of space and time by team members and the process of learning in a distributed system.

First, a recent project with Alex Citurs explored the dynamics of language use in distributed teams of software developers. Alex proposed that software development teams periodically experience moments of crisis during a project, and that these moments of crisis are occasions of learning. He proposed that moments of learning would be characterized by 1) a shift from the use of implicit language to the use of more explicit language, 2) the emergence of new vocabulary elements, and 3) an increase in the level of integrative complexity of their language practice. (Integrative complexity is measured as the number of distinct concepts being dealt with as an integrated whole and the number of relations understood to exist among those concepts). In a six-month study of three teams working across the USA, India and the UK, he found that they did indeed experience periodic crisis in their work. He also found that the periods of crisis were associated with a shift from implicit to explicit language, the emergence of new vocabulary items, and an increase in integrative complexity. After the crisis passed, language patterns returned to their pre-crisis state of implicit language use, fewer new vocabulary items and reduced integrative complexity. But what was even more interesting to me was the finding that this type of oscillation in language practice continued in wave patterns throughout the project. Moments of crisis were correlated with peaks in these oscillations, but the oscillations were ongoing, even when the team members did not identify a crisis as occurring.

I take the oscillation in language use as an element in the tension between local and global logics that are experienced by knowledge workers in a distributed mediated practice. The tension and the resulting oscillation between the local and the global are continuous. In a sense, language is always breaking down in the face of this tension, and is always being repaired, but in ways that lead to further breakdown. As language becomes more implicit, relying on existing vocabulary items, and integrative complexity is reduced; the knowledge worker is coming closer to the local experience and relying more intimately on the local logic of practice. As this trend progresses, the global logic is threatened. Things happen in the local practice for which no global term applies. Communication between teams suffers. Their language then begins to shift in the face of this breakdown, becoming more explicit, inventing new vocabulary items to capture the local experience that is escaping the global logic and building more integratively complex arguments to bring the diversity of local experience within a global language. As this trend to strengthen the global proceeds, new problems emerge in which the local practice is burdened by the emphasis on global logics

and vocabularies. It is inefficient for the team to spend time being explicit, using integrative complex reasoning and inventing new vocabulary items. Their language practice then begins a reverse shift toward a greater use of implicit vocabulary, less integrative complexity and reliance on the existing lexicon.

I am really excited by the image of language as always breaking down and always being repaired in ways that keep reversing themselves. I see this as an aspect of our existence which is not apparent to us in our day to day experience, but that is highlighted for us in distributed mediated practice. That this language dynamic generally remains hidden from us is, I believe, related to the way we privilege space over time in our thought. Temporality is almost impossible for us to express in language or think about in its own terms. The very idea of temporality has to be translated into a spatial representation in order to be conceptualized in language. Time is shown as a line in Cartesian space. Temporal duration is discussed as movement along the line. An instant of experience is a limitlessly small point on the line. Just so, our ability to conceptualize the dynamic nature of language use and learning has built-in inhibitions against a thorough going temporality. Learning is associated with the concepts learned, a spatialized representation of the temporal process of learning, not the ongoing process of breakdown and repair in language. But that is a topic for another paper.

Alex also had another most interesting finding in these studies of distributed software development teams – the phenomenon of “unblackboxing”. Teams, in writing the software, would come across an element of code created previously and used as a modularized “black box” which no longer seemed to work as intended. They would then have to engage in “unblackboxing” in order to unearth the logics behind its creation, which extended into the organizational processes and social context that were assumed in its original construction. In essence, they were confronted by an element of their global logic (the blackbox module) which no longer covered their local practice and they would have to reverse engineer an understanding of the lost local logics that went into its construction. Once again, we see language breaking down and being repaired as part of the continuous process of learning in the team stemming from the tension between local and global logics. To paraphrase Latour, we like to think of language as being ready made, but instead it is always being made. And I would add, being made in the tension of local and global logics.

My work with Ulrike Schultze explored the experience of space and time by outsourced computer administrators and revealed the importance of the space-time continuums of space and place. Place is the sense of being in place, having a place, understanding how things work because of the place we are in. Place is local logic, tradition, accepted practice and shared sense of “how we do things here”. Space, on the other hand, is the sense of an abstract, homogeneous, limitless world in which laws of nature hold universally, and in which local practices are quaint anachronisms of limited significance. The computer system administrators that Ulrike studied were caught between a desire to be aligned with a sense of space in order to strengthen their claim to professional expertise with high consulting rates, and a desire to belong in the organization – to have a sense of place that could make their day-to-day work more humanly satisfying. Ulrike’s ethnographic study of these teams showed how their attempts to break out of the tension they experienced only served to

reproduce the very conditions that made the tensions possible. In order to have professional satisfaction in their work, they sought to define themselves as “third level” computer system workers. This meant that they dealt increasingly with the most arcane and deeply embedded system level aspects of the computer installation. Yet, this attempt to gain professional satisfaction and to enable them to be more marketable as consultants on future assignments meant that they were less able to experience a sense of place in the organization. Further, they were increasingly seen as “commodity workers” who had so little organizational knowledge that they could easily be replaced. This, in turn, caused them to seek to strengthen their professional competence and value by moving even further into the sense of space found in the highest levels of the computing system software. In short, the tension of local and global logics as manifest in the experience of space and place resulted in behaviors that served to reinforce the field of tensions that initially gave rise to their discomfort. As in the language breakdowns which drove learning in Alex’s work, the tensions of local and global logics had created a cycle of breakdown and repair, which served to reinforce the very tensions they tried to escape.

### **Concluding Thoughts**

I propose that distributed mediated practices can be productively viewed as a multi-level ecology in which each level is characterized by a tension between local and global logics as they are experienced by human actors. I have given some examples from our research that are relevant to understanding the dynamics of these local – global tensions. It suggests that there is a recursive, self-propelling process of language use in which breakdown and repair create and recreate the very conditions that give rise to the tensions in the field. There are many other elements of our work that are relevant to this image of a distributed mediated practice ecology, but I have avoided bringing them in for fear of losing the main point of local / global tensions. During the seminar I will present some of them, including a discussion of the way that narrative and conversation in move work forward in the face of this tension.

A larger issue raised by the ecological view of knowledge work presented above is the shift it suggests in the emphasis of our research on knowledge work and virtual teams. The new direction that an ecological view suggests is one that emphasizes the existential experience of the individual as they engage the tension of local and global logics. It is a study of organizational life as processual, temporal and dynamic, focused on the individual and their subjectivity. This new direction also emphasizes the importance of structuralist analysis to the study of organizational life. By structuralist analysis I mean an approach to studying knowledge work that unpacks the oppositions associated with the tensions experienced in organizational life, such as local versus global, and how those oppositions create a space for playing out knowledge work. An existential study of knowledge work will reveal how actors partition their ongoing flow of experience with oppositional language that symbolizes differences between self and other, core and periphery, freedom and control, and other binary oppositions forming their field of action. Hopefully, this existential approach would strengthen a more thoroughgoing sense of the temporal flow of organizational life and an appreciation of the unavoidably ethical basis for our engagement with that flow as we produce and reproduce through language the conditions we experience. Through their

processes of representing, designing and implementing, organizational actors both make and navigate a space for engaging with the tensions that characterize organizational life. An ecological approach to the study of work as a distributed mediated practice gives us a way to begin studying the existential experience of making and moving within that space.