Making Work Visible

Ethnographically Grounded Case Studies of Work Practice

In the 1970s, Xerox pioneered the involvement of social science researchers in technology design and in developing better ways of working. The Xerox legacy is a hybrid methodology that combines an ethnographic interest in direct observation in settings of interest with an ethnomethodological concern to make the study of interactional work an empirical, investigatory matter. This edited volume is an overview of Xerox's social science tradition. It uses detailed case studies that show how the client engagement was conducted over time and how the findings were consequential for business impact. Case studies in retail, production, office, and home settings cover four topics: practices around documents, the customer front, learning and knowledge-sharing, and competency transfer. The impetus for this book was a 2003 Xerox initiative to transfer knowledge about how to conduct ethnographically grounded work-practice studies to its consultants so that they may generate the kinds of knowledge generated by the researchers themselves.

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Series Foreword

This series for Cambridge University Press is widely known as an international forum for studies of situated learning and cognition. Innovative contributions are being made by anthropology; by cognitive, developmental, and cultural psychology; by computer science; by education; and by social theory. These contributions are providing the basis for new ways of understanding the social, historical, and contextual nature of learning, thinking, and practice that emerges from human activity. The empirical settings of these research inquiries range from the classroom to the workplace, to the high-technology office, and to learning in the streets and in other communities of practice. The situated nature of learning and remembering through activity is a central fact. It may appear obvious that human minds develop in social situations and extend their sphere of activity and communicative competencies. But cognitive theories of knowledge representation and learning alone have not provided sufficient insight into these relationships. This series was born of the conviction that new exciting interdisciplinary syntheses are underway as scholars and practitioners from diverse fields seek to develop theory and empirical investigations adequate for characterizing the complex relations of social and mental life, and for understanding successful learning wherever it occurs. The series invites contributions that advance our understanding of these seminal issues.

Roy Pea
Christian Heath
Lucy Suchman

Foreword

I was delighted to learn that this book was being written covering the pioneering efforts of the social scientists at Xerox, especially given that many of these efforts were undertaken long before ethnographic research had become de rigueur in today's corporate and design worlds. For me, personally, this journey has been extraordinary. After all, I started out as a hard-core computer scientist and an AI junkie with a strong leaning toward cognitive modeling. To many, I have now become a softie, questioning nearly all of the ontological and epistemological assumptions I had embraced in graduate school. This transformation emerged from my rich interactions with many of the authors in this book – especially Lucy Suchman, Gitti Jordan, Jack Whalen, and Marilyn Whalen – but it also emerged from the frequent encounters PARC had with the challenges that were arising in the Xerox world as copiers became more complex to operate and maintain and as the document became the currency of the modern age. These challenges were often more usefully unpacked by the methodologies and sensibilities discussed in this book than by the more formal tools and sensibilities of traditional computer science, engineering, and operations research. These challenges, when properly framed, were tied to the context of work and were more easily met by leveraging the "invisible" resources in the context both to get the job done and to facilitate collective learning. Take a particular task out of its context and it becomes more difficult, often relying on algorithmic solutions. But look at a task in context and one begins to see all kinds of possible resources to deploy in order to make the task easier or even to make it seem as if there is no task at all.

Let me recall a few instances of this which ended up radically changing my own perspective and starting me down the path of the social life of information and learning. These instances are more than just personal stories. They were also part of a broader array of examples that helped propel Xerox down a transformational path much like my own.

The first encounter, one that accelerated my appreciation of the importance of context, happened just after I arrived at PARC. It was when I was asked to meet with a master troubleshooter, who all the technicians in the company looked up to, in order to discuss new ways to expedite troubleshooting by applying AI techniques to build intelligent job performance aids for the technicians. I knew the meeting was not going to go well given the deep suspicion the folks in the trenches had of the suits (which they deemed me to be since I had been sent there from corporate headquarters). Before a minute had passed, the master threw out a challenge – well Mr. PhD., suppose this copier sitting here had an intermittent image quality fault, how would you go about troubleshooting it? Here is what the official procedure in the manual says to do – what would you do? The official procedure was relatively simple: using this carefully constructed image quality test sheet run 1000 copies, sort through the output, find a few bad ones and compare them against a diagnostic sheet. Hmmm, 1000 copies even on this superfast machine would take 20 minutes. I knew this was something of a trick question and I knew he was looking for an answer that was better than the blind, mechanistic official procedure.

He could tell I was hesitant to offer a solution so he jumped in with a disgusted look on his face. Well, he said, unless you are looking for a coffee break, surely you wouldn't follow that procedure. Here is what I do – I walk over to the trashcan sitting here by the copier, tip it upside down, and sort through its contents looking at all copies that have been thrown away. The trashcan is a filter between good copies and bad ones – people keep the good copies and throw the bad ones away. So just go to the trashcan to find the bad copies and then from scanning all bad ones interpret what connects them all. Brilliant, I thought to myself. And yes, I had seen the trashcan sitting there but had failed to see it as a resource for the problem at hand. Tapping resources "ready-at-hand" is easy but only when they really are ready-at-hand and not something invisible or out of bounds to your organizational routines or to your cognitive modeling lens.

This experience was soon to be built upon when Julian Orr began his now seminal research on how Xerox's technicians actually went about their daily work of fixing machines in the field and developed his clever proposal for providing a sociotechnical support system for them. I still remember the day that Julian walked in my office to discuss his findings after several months in the field studying these tech reps. This encounter might be best captured by his opening comment to me that nearly everything I had written about troubleshooting was simply wrong. No, these folks do not do in-depth, differential diagnosis using deep, and logically coherent mental models of

the machine, but rather they weave together fragments of their own experiences and stories that they and others have constructed around similar faults of this class of machines. And when their troubleshooting efforts were failing to converge on the fault they would often call in a tech rep buddy and together they would knit together a story that eventually made sense of all the data from their tests on the machine. Troubleshooting to them was making sense of the faulty machine through a story construction process, thus reframing troubleshooting as an inherently social activity. From this purchase, building sophisticated AI-based job performance aids made little sense. Julian realized that what was called for was a social technology – a two-way radio (like the early Motorola phones with the push-to-talk button) so each tech rep in a region could easily tap the collective expertise of others in his community. Although framed through very minimal comments, this very thin line of communication conveyed great meaning since the technicians all shared the same practices, having learned and worked together on similar machines. Now, several decades later, we see how this foreshadowed one of the roles now played by Twitter in the corporate landscape.

Julian Orr's fieldwork on tech reps influenced PARC's efforts on another project that decisively shaped my thinking about social technology – Eureka, a system for sharing technical tips authored by technicians that was first developed by researchers at PARC in the mid-1990s and is now used in the field by many thousands of Xerox technicians worldwide. A chapter in this volume by Jack Whalen and Danny Bobrow tells the full story of Eureka, so here I will simply note that it greatly extended the peer-to-peer communication afforded by the two-way radio, allowing technicians to write up their discoveries about machine problems and the solutions they invented – stories presented as practical lessons from their everyday experience in the field, things that the engineers who designed the machines and developed the repair procedures could never have imagined, no matter how smart their planning – and then share them not only with their local work group but across the country and around the globe. Before any tip could be shared, though, it was first vetted by another technician, someone who was regarded by the tech rep community (not management) as an expert on that machine. No one received a financial reward for submitting a tip, either. They did have their name prominently displayed on any tip they wrote, though. As you can see, the system ran on reputational and social capital alone!

As Whalen and Bobrow also explain, the service organization's management was skeptical about sanctioning what today's social media proponents call "user-generated content." It represented a radical challenge to the company's long-standing and strictly controlled reliance on carefully

documented repair instructions to ensure quality machine service. But PARC's researchers went directly to the tech reps themselves, enlisting them as codesigners of the system and fervent advocates for its implementation. This enthusiastic support from the front lines, together with convincing evidence of the system's value that emerged from PARC-sponsored field tests in France, Canada, and the United States, eventually won the day. And just as the tech reps' use of the radio foreshadowed Twitter, their practice with Eureka was a forerunner of contemporary wikis and weblogs.

At about the same time as Eureka, another important experience of mine with the power of social learning was unfolding, at the Institute for Research on Learning, located a few blocks from PARC and established only a few years before with the strong support of the Xerox Foundation. I served on IRL's Board of Directors and the Institute also had PARC anthropologist Gitti Jordan sharing her time with them, along with sociologists Jack Whalen and Marilyn Whalen, who had been lured by Gitti from the University of Oregon to work with her on an experimental Xerox call center in Dallas, Texas. Gitti, Jack, and Marilyn all describe what happened out there in Texas in two of the chapters that follow. Suffice it to say that their work with call center employees was remarkably successful. It led to the development of a peer-to-peer learning strategy – an "everyone a teacher, everyone a learner" process that the employees helped design – that eventually became the basis for a new learning strategy for all of Xerox, with the strong support of then-CEO Paul Allaire. What was most impressive, however, was the way this learning strategy enabled the employees to make the jump, as they put it themselves, from task to knowledge workers.

The work of Orr, Jordan, and the Whalens thus became foundational for rethinking corporate training, and more generally knowledge capture and sharing across communities. At a personal level, this work opened my eyes to just how social the process of learning is. But it also opened my eyes to how pervasive sense making is in our daily and often ho-hum interactions with the world of machines and people and how the cues we use are often invisible, to ourselves and to others, without many of the tools and methods discussed herein.

My purpose in recounting parts of my own personal journey from a hard-core geek to a softie, a believer in the power of the social lens, is to call attention to the back stage for much of the work described in this volume. Just as I had to make this journey with the patient help of so many of my colleagues in this book, each of them has had to find ways to help their management come to see the power of the social life of work. Often this was (or is) not an easy task. And it is far from finished. We must continue to find

ways to get our institutions to appreciate the power and significance of the ideas discussed in this book, especially as we enter the rapidly changing knowledge age where we must replace the pursuit of scalable efficiency with the pursuit of scalable, peer-based learning.

John Seely Brown

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Transcription Conventions

[ ]	overlapping talk
( )	unsure hearing
(( ))	transcriber's and analyst's comments
:	lengthened pronunciation
?	final rising intonation
,	listing intonation (e.g., more is expected)
.	final falling intonation
!	exclaiming intonation
(·)	micropause
(0.2)	two tenths of a second pause
bye	stressed pronunciation
=	latching of speaker's utterances
-	cut off (e.g., what ti- what time is it?)
↑less	increased pitch in relation to surrounding talk
OKAY	increased volume in relation to surrounding talk

Historical Overview

1970s	1976	J. Rulifson hires 6 'ethnoids', grad students in Office Research Group; E. Wynn stays to write thesis.
	1978	J.S. Brown establishes Cognitive and Instructional Sciences (CIS) area at PARC.
	1979	L. Suchman interns with Office Research Group at PARC.
1980s	1982	L. Suchman and J. Blomberg conduct studies of Xerox copiers' use.
	1983	Institute for Research and Learning (IRL) founded, Palo Alto, CA.
		EuroPARC founded, Cambridge, England.
	1987	Suchman publishes *Plans and Situated Actions.*
	1989	Suchman forms Work Practice & Technology (WPT) area at PARC.
1990s	1990	PARC /WPT collaborates with Industrial Design/Human Interface to explore application of ethnography in product design.
	1992	Studies of Technology, Organizations and Work (STOW) at EuroPARC formed by G. Button.
		PARC anthropologist F. Brun-Cottan moves to Industrial Design/Human Interface (ID/HI) in Rochester.
	1993	EuroPARC becomes Cambridge Lab of Xerox Research Center Europe (XRCE) in Grenoble, France.
		Advanced Systems Development (ASD) formed by B. Bauer to bridge PARC and Xerox Research Center Webster (XRCW)
		ASD/Work Practice & Codevelopment (WPC) area formed by S. Anderson. Several IDHI people join WPC.
	1999	Social science at PARC continues with Knowledge Interaction and Practice area formed by M. Whalen.
2000s	2000	WPC becomes KnowledgeWorks area in XRCW managed by P. Wall.
	2002	KnowledgeWorks begins to collaborate with Xerox Global Services (XGS) in client engagements.
		Cambridge facility closes and the work practice competency is transferred to XRCE; Work Practice Technology (WPT) is formed by G. Button.
	2003	Work Practice ConsultancyToolkit developed (XRCE, XRCW collaboration).
	2004	KnowledgeWorks area renamed Work Practice & Technology in XRCW.
	2007	Work Practice Center of Excellence forms in Webster, NY (PARC, XRCW collaboration with XGS)