

Introduction

Work Practice Analysis at Xerox

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One commonly tends to avoid making “obvious” observations because it is not obvious what thereafter is to be done with them. . . . Rather, we need to see that with some such mundane recurrences we are picking up things which are so overwhelmingly true that if we are to understand that sector of the world, they are something we will have to come to terms with. And, as it happens, they are a tremendous resource.

(Sacks, 1987)

Making work visible¹ – discovering and describing how people accomplish their tasks, how work actually gets done – reveals what was previously hidden, albeit in plain view. As work practice analysts, our job is to make unbiased observations despite business goals or technology design requirements. If we do our job well, our insights are obvious in retrospect, but by making those insights visible, they become a resource, and we are able to build on them.

More than 30 years ago, Xerox pioneered the involvement of social science researchers from anthropology and sociology in the innovation and design of technology and better ways of working. Today, Xerox supports social science groups at three research centers: the Palo Alto Research Center (PARC), located in the heart of California’s Silicon Valley; Xerox Research Center Webster (XRCW, just outside Rochester in upstate New York; and Xerox Research Centre Europe (XRCE), in Grenoble, France. This volume presents examples of the work of this community of work practice researchers with the goal of showing how the research has been carried out and its constructive impact on the ways people work and the technologies that support that work.

¹ We thank Lucy Suchman for allowing us to appropriate this title from an ACM article she published about the implications of “Making Work Visible” (1995).

It all began in the late 1970s when John Seely Brown (JSB) brought a sensibility for social scientific research to the Palo Alto Research Center. He credits this sensibility to his early career at the University of California, Irvine where he held a joint appointment as Professor of Computer Science and Cognitive Social Sciences. Here he taught a class with sociologist Harvey Sacks, cofounder of the field of Conversation Analysis (Sacks, 1992); came in contact with sociologist Harold Garfinkel, responsible for initiating the movement towards studies in ethnomethodology (Garfinkel, 1967; see also Heritage, 1984); and socialized with anthropologists Brigitte Jordan (Jordan, 1997; Jordan and Henderson, 1995) and Jean Lave (Lave, 1988; Lave and Wenger, 1991). Before coming to PARC, JSB deepened his conviction that social scientific inquiry is powerful while working at BBN Technologies, where he realized that the challenge is not the building of technologies, but the creation of technologies that fit into the workplace – that “organizations can appropriate and people can understand” (personal communication, August 27, 2009).

Recalling his job interview with then Xerox Chief Scientist Jack Goldman, JSB explains how he convinced Goldman to hire him. On Goldman’s desk were two telephones: a rather stylish multi-feature device and a very basic phone. So JSB asked, “Jack, why two phones?” And just as JSB had hoped, Goldman gestured at the fancy device and said, “Oh my God, who the hell can use this phone?!? I have it on my desk because everyone has to have one, but when real work gets done, I’ve got to use a regular phone.” With this simple noticing, the importance of designing technology for usability had been brought to Xerox’s attention.

Accordingly, JSB came to PARC in 1978 to start a new research area called Cognitive and Instructional Sciences (CIS). At the time, PARC already had its first “ethnoids”: Jeff Rulifson, Manager of the center’s Office Research Group, had hired six University of California, Berkeley anthropology graduate students as summer interns in 1976; one of those students, Eleanor Wynn, stayed on to write her PhD thesis. Once at PARC, JSB successfully persuaded George Pake, Founding Director of the center, and Bert Sutherland, head of the laboratory in which CIS was based, System Sciences, to allow him to hire broadly. He then appointed technologists that gravitated towards or were at least sympathetic to social science, including Richard Burton, Johan de Kleer, Austin Henderson, David Levy, and Brian Smith. The members of CIS expanded to such a number that after only three years, the area became its own laboratory headed by JSB.

In 1979, Lucy Suchman joined PARC’s Office Research Group as a research intern to write her PhD thesis, which would later become her

influential book, *Plans & Situated Actions: The problem of human-machine communication* (1987). Five years later Suchman became a permanent member of the research staff, and in 1989, she began her own group, Work Practice and Technology, which anchored ethnographic methodology within the organization (Suchman, this volume). Ten years later, sociologists Marilyn Whalen and Jack Whalen came to PARC to lead more applied work practice studies, contributing to successful socio-technical interventions like Eureka² (Whalen and Bobrow, this volume), experimental work-scapes (Whalen and Whalen, this volume), and eventually organizational transformations (Kishimoto and Whalen, this volume). This was part of a trend across all Xerox labs of work practice studies becoming much more closely tied to design (whether of technology or organizational process – or more likely both, as was the case with Eureka and its progeny). And through these years, Brigitte Jordan was an enduring presence in the PARC work practice community, coming to PARC in 1981 while on sabbatical from Michigan State University, joining the research staff full-time in 1988, and continuing as a consultant today.

PARC succeeded in spreading work practice across the organization in the late 1980s. In 1986, JSB cofounded the Institute for Research on Learning (IRL) an interdisciplinary research laboratory tightly coupled with PARC (see Jordan, this volume; Whalen and Whalen, this volume). Also in 1986, EuroPARC was created as an allied laboratory in Cambridge, England with a coordinated research program around human-computer interaction (Moran, 1989). Like PARC, EuroPARC was established to be an interdisciplinary lab that joined computer, cognitive and social science. The work practice efforts of this lab were formalized in 1992, when the then-Director Bob Anderson (1994, 1997), an ethnomethodologist, hired fellow ethnomethodologist Graham Button to establish the Studies of Technology, Organizations and Work area (Sharrock and Button, this volume). Button would later move to Xerox Research Centre Europe in Grenoble, France, when EuroPARC closed because of Xerox's financial problems in 1993. Peter Tolmie led the group from 2005–2006 before Antonietta Grasso became manager of the Work Practice Technology group at XRCE.

The spread of work practice studies to Xerox Research Center Webster was viral. In the early 1980s, Austin Henderson (1986) championed a Trillium

² It was PARC researcher, Olivier Raiman (Barth, 2000), who discovered the informal knowledge sharing among the service technicians that inspired the development of Eureka.

User Interface Design Tool, and Jeanette Blomberg became the Trillium Core's observing anthropologist, watching as a Xerox-wide community grew around this tool (Blomberg and Henderson, 1990). During this time, there were joint projects between PARC and the Industrial Design/Human Interface group (IDHI) in Henrietta, New York to explore the application of ethnography and product design; in 1992, PARC anthropologist Francoise Brun-Cottan joined IDHI (see Brun-Cottan and Wall, this volume). A year later, Bob Bauer founded the Advanced Systems Development laboratory³ (ASD) a group that bridged PARC and XRCW with the goal of creating value from the integration of work practice study insights for technology and solutions development. Within ASD, the Work Practice and Co-Development (WPC) Group was led by anthropologist Susan Anderson, who migrated to Rochester after five years at PARC and involvement with IRL. Several people from IDHI were recruited to Anderson's group, including Brun-Cottan, Andrea Mosher, and Patricia Wall; they brought a combined competency in ethnography and design including a representational "tool kit" for describing work practice observations and insights (Brun-Cottan and Wall, 1995; Wall and Mosher, 1994). WPC, now named Work Practice and Technology, has been lead by Wall since 2001.

As awareness of our work practice competency grew throughout the organization, Xerox business groups began to solicit work practice researchers' involvement in client engagements. Wall's work practice group at XRCW was the go-to group for these business units and the relationships her team built with them led to an initiative to teach some of the skills necessary to carry out work practice studies to Xerox's consultancy division (Plurkowski et al., this volume). Building on the Work Practice Toolkit (Button et al., 2003) and our experience with external clients, training materials and workshops were developed for Xerox consultants and others, including Fujitsu system engineers (see Kishimoto and Whalen, this volume). As a result of our training efforts, consultants and others new to social science research have been able to generate the kinds of knowledge that had previously only been generated by researchers.

Orientations and Influences

These Xerox social scientists helped inspire a very broad program of work practice studies undertaken in other corporate laboratories as well as the

³ The lower case was intentional to distinguish ASD from the other "Laboratories" at PARC whose acronym ended with "L" as in CSL, EML, and so forth.

academy – a significant body of work that has informed the design and development of advanced technologies as well as new ways of working over several decades. Other collections have documented and carefully scrutinized these developments (see for example Engeström and Middleton, 1998; Luff, Hindmarsh, and Heath, 2000; Luff and Heath, 2000; Dourish, 2001; Brown and Duguid, 2000; Cefkin, 2009; Llewellyn and Hindmarsh, 2010); here we will only sketch out some of the intellectual currents and lines of investigation that both influenced and were influenced by work that began at PARC in the late 1970s.

It is important to first recognize the distinctive character of that work, both then and now. Plainly, as social scientists these researchers were committed to understanding the fundamentally *socio-cultural* organization of human reasoning and action, whether at work or in any other endeavor. This represented a significant development in what was once commonly called “human factors engineering,” a field that had been dominated by psychologists and physiologists and where the relevant “factors” were limited to what could be learned about the minds and bodies of individuals rather than the interactions between people and their shared ways of reasoning about and acting on the world.

Moreover, these researchers were equally committed to naturalistic observation of that action – to leaving the highly controlled environment of the laboratory so that what humans did and how they did it could be studied in real-world habitats and settings, under ordinary, everyday conditions. This immersion in the everyday world meant that researchers could actively participate in the ordinary activities of subjects’ lives, as this would afford detailed understanding of the natural organization of such activities and of the competencies required of participants to produce them. This strategy was another historic departure from the methods of the psychologists and other laboratory-based researchers who dominated the human factors work being carried out at that time to support the design of new technologies. This kind of direct, first-hand observation of daily life is of course, the very essence of cultural anthropology and its ethnographic methodology, as well as basic to the field of “community studies” in anthropology’s sister discipline, sociology.

It turned out that recordings, particularly video records, were especially useful for such naturalistic studies, for they serve as an important control on the limitations and fallibilities of intuition and recollection. If the recorded data was collected in an appropriate manner, it exposed the researcher to a wide range of natural materials and circumstances, and provided some guarantee that the analytic conclusions would not arise as artifacts of intuitive

idiosyncrasy, selective attention or recollection. And perhaps most important, the availability of a taped record enabled repeated and close examination of the events in question and hence greatly enhanced the range and precision of the observations that could be made (Heritage and Atkinson, 1984). For these reasons, audio-video data, beginning with Suchman's now famous recording of two renowned PARC computer scientists struggling mightily (and futilely) to make sense of the instructions for a purportedly user-friendly copier, have become absolutely central to work practice studies in Xerox and elsewhere, evidenced by the extensive use of recorded data in this volume.

But ethnography of the sort practiced in Xerox has been more than an observational methodology. These studies have been committed from the start to a *holistic* understanding of work, and thus concerned with far more than simply jobs and tasks; rather, the focus has always been on entire “worksapes” – configurations not only of people and their communal practices (the methodical means they use to organize and accomplish their work) but also the environments where this work gets done and the artifacts and devices that populate these sites and are thus intimately involved in the work's achievement. The argument has been that these phenomena are all closely related, and need to be analyzed in terms of that interrelatedness, and thus holistically, whenever possible. To be clear, this is not to say that analysis of a specific phenomenon of interest in a workscape, such as the way the workers in a retail setting take up and make use of certain artifacts while interacting with customers over the counter (to use an example drawn from Vinkhuyzen's chapter in this volume), cannot be undertaken, only that it should not be done in isolation from the other features of that workscape.

Further, the analysis of these worksapes is built upon more than holistic naturalism; as the chapters in this collection demonstrate, Xerox social scientists have tended to adopt a very distinct analytic stance, beginning with the principle that any social organization or communal gathering, however mundane or exotic, simple or complex, is a local and thus thoroughly *endogenous* production. It is not a case, then, of “one great blooming, buzzing confusion” (to borrow from William James), a chaotic mess of action and sound bombarding the ethnographer and obfuscating their vision, which then requires a theory to create – indeed, to conceptually stipulate – any recognizable orderliness; instead, Xerox social scientists understood that they confronted a world whose orderly features and properties has been produced by their fellow humans, by the participants in that world and its diverse activities, and that their task as researchers was to then explain, in fine detail, just how this methodically endogenous organization was accomplished. And while this stance is certainly fundamental to the

ethnomethodological tradition (as is explained with eminent clarity in Button and Sharrock's chapter in this volume), it also has deep roots in cultural anthropology's concern with first describing the "native" understanding of any behavior or belief – how it is meaningful to members, to persons inside the culture – as a prerequisite to developing any scientifically valid account by a nonmember (see especially Headland, Pike, and Harris, 1990).

This distinct analytic stance played a crucial role in the design-oriented work Xerox social scientists carried out in collaboration with the computer scientists, engineers, computational linguists, mathematicians, and physicists at PARC and the other centers. From this view, design begins from the presumption that any truly useful technology must support and enhance native human capacities and practices. And in making this argument, these social scientists were in fact building on the intellectual breakthrough that had been achieved in computer design at PARC in the mid-1970s. At that time most of what we now regard as standard, essential features of the personal computer – things that make the computer a device that can be used by ordinary people, not just engineers or "techie," like the graphic user interface and the mouse – were ingeniously brought together in the development of the Xerox Star, which was based on PARC's Alto computer (Johnson, Roberts, Verplank, Smith, Irby, Beard, and Mackey, 1989).

The Star – and its research forerunner, the Alto – was a machine explicitly designed to capitalize on native human skills and abilities. The user interface was built around the remarkable visual capacities of humans; that is, the deeply visual ways in which humans perceive, represent, and interact with objects in the world. Additionally, the Alto and Star made use of pictorial representations whose form straightforwardly suggested their meaning (icons), in large part because the images were of familiar office and desktop objects: folders, documents, a trashcan, and so forth. The design of this "graphic user interface" thus took ordinary work practice into account; not only the visual capacities of humans but also the ways many of the objects essential for their work could be visually represented, by employing what came to be called the desktop metaphor (the Star relied on icons even more than did the Alto, in an attempt to further simplify the interface). And the mouse was designed to serve as an extension of the body, of the hand, in order to leverage the human predilection for pointing and thus couple the body with the device in a more natural manner than was possible with a keyboard. As several of the Star's designers once summarized their intentions, "an important design goal was to make the 'computer' as invisible to users as possible" (Johnson et al., 1989, p. 12).

The design of the Star also took into account the common and highly functional human practice of working in concert with others to accomplish shared goals (certainly a natural way for people to work). It was not conceived primarily as a stand-alone device, but rather as a tool for cooperation and collaboration in offices and other workplaces. The Xerox corporate strategy at the time centered on building devices that would support the “architecture for information” in the “office of the future.” A number of researchers at that time, at PARC and elsewhere, recognized that trafficking in information is an essentially social activity, and that such an “architecture” required computer technology that would allow individuals to collaboratively manage and share their information. If the Star were to effectively support this need, it would require a means of linking many computers and peripherals – like printers and mass storage devices – together, and transferring or sharing data between them at high speeds (the Ethernet communications protocol, also invented at PARC but prior to the development of the Alto, served this purpose quite well).

Plainly, then, while there were no social science researchers at PARC at the time of the Star’s development, the work of the center’s engineers and computer scientists unquestionably drew upon a “human centered” philosophy of design. They strongly believed in the notion of “eat your own dog food,” that is, becoming users of everything they were designing. And not just experimental users – people who might try out this or that for a short time, and give some feedback – but rather full time users who had to rely on the system to do their work, and thus were forced to confront all its problems and explore all its possibilities. This incipient human-centered approach of PARC technologists was then significantly advanced through the disciplined, empirically driven study of naturally occurring behavior by the anthropologists, sociologists, and like-minded field researchers who joined the research staff in the following years. For what better way is there to discover human capacities for reasoning and action, and the systematic manner in which people endogenously and concertedly organize their actions, than to closely observe and record their everyday behavior as it takes place in their natural environments?

At the same time, research undertaken from this perspective has also made a prominent contribution to design through studies of people using already existing technologies, investigating the place and significance of this technology in the everyday conduct of human affairs – what we might best term “the social life of a technology.” For these investigations, as the research reported in this volume demonstrates, the key problem to address is not so much whether technology is in some fundamental way “social” but rather to show precisely *how* it is social; accordingly, studies of the social life

of technology must obviously consider “not only the material objects but the collage of activities involved in making technology into an instrument which is incorporated into a weave of working tasks” (Shapiro, Hughes, Harper, Ackroyd, and Soothill, 1991, p. 3).

The impact of this style of research can be seen in its adoption by other corporate laboratories, most conspicuously IBM, Intel, Microsoft, and Yahoo!, all of whom have produced important results in social science-inspired IT research and development (for the most recent examples see Cefkin, 2009; Bell and Dourish, forthcoming; Harper, forthcoming; Churchill, 2008). Indeed, a number of researchers who worked and trained at PARC or other Xerox research centers went on to staff these and other corporate labs. Interestingly, the work of private consulting firms that specialize in or devote significant resources to ethnographic research – such as the Doblin Group, Ideo, and Ethnographic Insight – can also be traced back to the movement initiated at Xerox PARC (and some of the ethnographers who worked there).

And researchers in the academy have been equally influenced by the work practice studies initiated at PARC. Particularly important examples here are the Work, Interaction and Technology Research Centre, led by Christian Heath at King’s College London (for a recent example of their work see Heath, Hindmarsh and Luff, 2010) and the Work, Technology and Organizations group, headed by Steve Barley at Stanford’s School of Engineering (see, e.g., Barley and Kunda, 2001; Barley and Kunda, 2004). Other university-based scholars that have collaborated with PARC and XRCE researchers or spent significant time in these labs include anthropologists Chuck Goodwin and Candy Goodwin of UCLA; sociologist Harold Garfinkel of UCLA, the founder of the ethnomethodological movement; sociologist Paul Drew of the University of York; sociologists Geoff Raymond and Don Zimmerman of University of California, Santa Barbara; sociolinguists Ron Scollon and Suzie Wong Scollon; and of course the authors of several chapters in this collection.

Additionally, the line of research first taken up in Xerox has shaped the emergence of critical intellectual currents, particularly what has come to be known as “computer supported cooperative work” (see for example Hughes, Randall and Shapiro, 1992; Grudin, 1994; Ackerman, 2000), where the spirit of Scandinavian social democracy and management-worker consultation (as well as an aversion to the American-led trend of using computers to replace workers and their native intelligence) seems to have been joined with technologists’ continued fascination with groupware. Ideas about “human centered design” and a more socio-cultural understanding of the human dimension in the field of human computer interaction (HCI) have similarly

been shaped by Xerox's social science tradition. Finally, sympathetic but parallel – although occasionally intersecting – bodies of work by researchers concerned with “distributed cognition” (see especially Hutchins, 1995) and “situated cognition” (Clancey, 1997), both of which represent a sharp break with the individualistic bias of conventional cognitive science and its dependence on a “mind as computer” model of human reasoning, owe more than a little to the ethnomethodologically-informed analytic stance of Xerox's work practice studies. All in all, then, what began at Xerox PARC almost four decades ago continues to resonate with contemporary research and developments in various disciplines including organizational analysis, studies of work and organizations, technology, and system design.

There have been interesting changes in Xerox's social science research over these years, however. The most important of these took place in 2001 when, in a cost-cutting move by Xerox, PARC was spun-out to become a wholly owned-subsiary of the company: PARC, Incorporated. This meant that the customer for PARC's research was no longer simply Xerox and its focus on the reprographic technology market, which was almost exclusively made up of businesses, of other corporations or small firms. This change naturally greatly expanded PARC research opportunities. While there had been PARC fieldwork projects for clients other than Xerox (such as the project with Fujitsu, recounted in the chapters by Kishimoto and Whalen; Yamauchi; and Vinkhuyzen and Ikeya), those projects were nevertheless oriented to workplaces, either because the client's customers were other businesses (as was the case for Fujitsu system engineering) or the client was interested in redesigning or innovating in their own workplace (as was the case for Eureka-inspired projects with General Motors and Telecom Italia). But the move to PARC, Inc. opened up possibilities for research not only on the workscapes (including their customers) found in other types of businesses and markets, but areas of social life that were not work-related, particularly studies devoted to the design of consumer products (detailed in the chapter by Schiano and Bellotti). Accordingly, the ethnographers and other field researchers at PARC now orient their studies to “client services” quite broadly.

Organization of the Book⁴

Throughout this volume there are numerous chapters that describe projects that Xerox work practice analysts have undertaken in collaboration with

⁴ We thank and acknowledge several contributors to the writing of this section: Patricia Wall, Robert S. Bauer, Gabriele McLaughlin, Daniel G. Bobrow, and Graham Button.