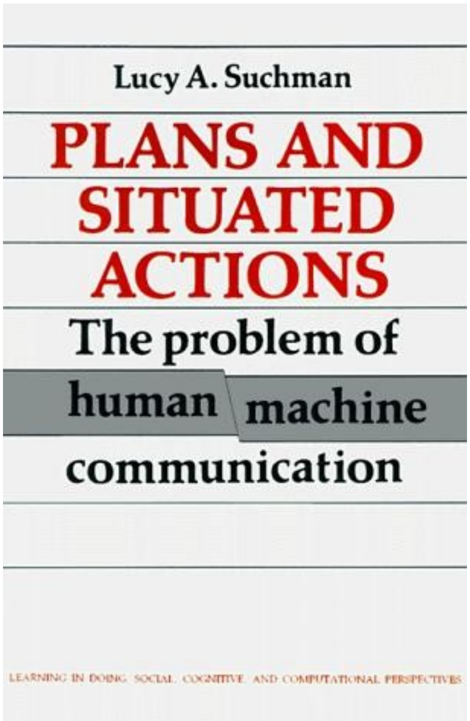
Le Libellio d'AEGIS
Vol. 8, n° 2 – Été 2012
pp. 3-9

On rereading. Suchman and Situated Action

Paul Duguid
University of California, Berkeley

We all struggle with digital technology, frustrated at times by anything from the lack of dexterity of the machine in our hand to the opacity of "the cloud" above. When we do, it is likely that, directly or indirectly, our frustration is soothed by the promise of Moore's Law. In 1966, Gordon Moore, one of the founders of the chipmaker Intel, noted that the power of computer processing had roughly doubled every year since the invention of the microchip. Computing enthusiasts recast this historical observation into a futuristic "law", one that promised endless, exponential growth in computer power. One useful role for this law, enthusiasts found, lay in the way in which it could deflect criticism. Those who complained that machines failed to live up to expectation could simply be told "they will improve" and Moore's Law suggested how. With more and ever cheaper computing megahertz, this year's limitations would disappear by the next, the ponderous object on your desk would become a light gadget in your palm, the inanimate interface would transform itself into an interactive "personal assistant", all driven by a relentless growth in computational power.

In many cases, more power has fulfilled this promise. Where searching the Internet was once a slow and dubious process, now we get impatient if the results fail to appear before we finish typing. Google, moreover, can not only anticipate search results in nanoseconds, it can also experiment with driverless cars, which like ants (long used by computer scientists as a model for human behaviour–see Simon, 1969), move in harmony with one another. Without Moore's law, such an outcome would have been almost unimaginable, for not too long ago it took not just a car but a small truck to carry the computing power now found in a car's radio alone. On the other hand, some challenges whose solution we are regularly told lie "just over the horizon" remain stubbornly resistant to Moore's Law. Natural Language processing, for example, seems to be one of those things that William Wordsworth (in another context) described as "something ever more about to be". That may be why the jokes about mistakes by Apple's Siri (the "Intelligent Personal Assistant" that "speaks" from Apple's iPhone) do not sound very different from the ones made about the voice transcription technology in the Newton (the "Personal Digital Assistant" Apple produced in the early 1990s). Apple's description of Siri as "intelligent" reminds us that Moore's Law has helped to keep open the long-term promise of Artificial Intelligence (AI).



One problem with Moore's law, however, is that it often allowed principled objections to appear as merely practical ones. It can be hard to tell whether we might be going in the right direction but running out of computing power, a problem that Moore's Law should solve, or whether, on the contrary, we are driving with great confidence down a dead end because we have misunderstood the nature of the problem at issue. As we try to distinguish practical problems–ones that are theoretically well grounded–from principled problems–ones in which the task is fundamentally misconceived–it is useful to look back at an early challenge to confident assumptions that in the case of AI, we were on the right track and "almost there". From the realm of AI grew ideas about human-machine "interaction" or "communication" and the superficially simple idea that machines could, in a sustained way, understand and respond intelligently to humans. I call these "superficially simple" because the assumption was built a set of complex ideas that could be traced back to Alan Turing, the notion of an ideal "Logical Computing" or "Turing" machine, and the Turing Thesis that what one Turing machine could do, any Turing machine (given enough time) could do too. One extension of this hypothesis is that if humans are themselves Turing machines, then in principle whatever humans can do, computers (as archetypal Turing machines) can do too. AI, in its strongest form then, held out the promise that a computer could not simply replicate human intelligence, but engage and communicate intelligently with people. When machines fail to live up to this promise, we might assume that the problem is lack of computational power–a problem to be resolved by Moore's Law. Or we might consider that there is something wrong with the idea and that humans and machines are not, in principle, reducible to one another, or at least not in the way envisaged by the conventions of Cognitive Science.

Lucy Suchman's *Plans and Situated Actions: The Problem of Human-Machine Communication*, published twenty-five years ago and revised five years ago (Suchman, 1987, 2007), is a landmark in the history of principled challenges to the assumptions of "strong" AI and Cognitive Science. The book is based on a doctoral dissertation submitted to the department of anthropology at the University of California, Berkeley, in 1984. The study at the centre of the book and dissertation was undertaken at Xerox Corporation's famous Palo Alto Research Center (PARC). In the first instance, PARC is famous for its contribution to development of the personal computer and, among other things, what became the Apple and then Windows interface. But it is also admired for its role in bringing social scientists into corporate research laboratories, among whom Suchman was an early pioneer.

Suchman's research explored the corporation's response to a central problem of technological innovation. The problem was that, to keep ahead of the competition, Xerox was producing ever more complex and versatile machines. But as a result of that increasing complexity and versatility, people found the machines harder to understand and use. If your competitive edge relies on producing a machine that has 100 available functions where your competitor's has only 50, then your position is awkward if your customers can only use three or four of these functions, and these three or four are common to both your and your competitor's machines. Initial responses to the problem, included more detailed instructions, but these too often threatened to overwhelm the user. (Someone is said to have proposed a second set of instructions to help explain the first, which sets up the intriguing image of a photocopier carrying sets of instructions, each one offering to clarify the one before it and all collectively stretching out towards infinity.) The alternative approach, which Xerox followed, was to try to use computer power to produce "intelligent machines" with "expert help systems" that allowed for human-machine "communication".

The idea of the expert system was, in essence that, if the user could not understand the machine, then the machine could be designed to understand the user and guide him or her to the desired end. Human problems could be reduced to a goal and the machine could then develop and execute the appropriate plan to achieve that goal. Goals, plans, and problem solving, the core ingredients of AI at the time, were assumed to be adequate descriptions of both human and machine behaviour. Suchman, however, studied numerous human-machine interactions and revealed that these rarely went according to plan–either the human's or the machine's. In one celebrated video study that became known as "When User Hits Machine", Suchman showed two men trying to follow a plan for photocopying documents. Stymied by the machines' instructions and behaviour, they produced not a tidy set of photocopies, but what can look like a deliberately comic performance. The resonance of this unintended comedy was heightened by the revelation that of the two subjects studied, on was a senior computational linguist at PARC and the other Allan Newell, a father figure of AI.

The clash between the users and the machine, Suchman argued, was the result of a clash between the designers' idea of how plans are ideally made and executed and how they are actually made and executed in practice. Following earlier studies by Emanuel Schegloff and Harvey Sacks, two California-based sociologists and pioneers of "ethnomethodology", Suchman showed that "communication" between a user and the machine was not, as designers assumed, between two comparable intelligences. Ordinary conversation, ethnomethodologists had showed, with its efficient use of linguistic indexicals, its suggestive silences and gestures, its rituals of turn taking, its reliance on contextual resources, and its open-ended trajectory, was extraordinarily complex. In contrast, the idea of "interaction" and "intelligence" embedded (but not embodied) in the machines were remarkably impoverished. Fundamental to the ethnomethodological approach is the idea of sense-making. As humans try to make sense of their environment and develop and pursue their goals, they draw on an array of situated constraints, many of which they manage to turn, improvisationally, into communicative, sense-making resources. Such improvisation is anathema to a machine built to follow (and to assume that humans will follow) a pre-ordained plan.

Major AI theorists have repeatedly characterized Suchman as suggesting that situated action was an alternative to planning (see, for example, Simon and Vera, 1993; Vera, 2003). So doing, they have been able to reaffirm faith in plans as a guide to human action while undermining her argument, for people clearly do use plans. In fact, as her title suggests, Suchman did not present situated action as an alternative to planning. Rather she showed how plans were themselves "discursive tools" that required interpretation through situated action. As such, they could not be offered as an external, preordained means to control action, but only as one among many resources. Suchman sought not to dismiss plans, but to understand them, and to explain to those whose work relied so heavily the concept how plans were executed in practice. So doing, she drew a distinction between devices built to execute preordained plans with accuracy and efficiency, and humans who use plans in context and improvisationally as one among many guides to action. This reconceptualization of the plan presented a profound challenge to the assumptions of AI, Cognitive Science, and Human-Computer Interaction and their faith that Moore's Law could get them out of trouble.

Suchman's influence has not been limited to these fields alone. It can also be seen in the workplace studies of Julian Orr (1996), in the community of practice studies of

Jean Lave and Etienne Wenger (1991), and my own work with John Seely Brown on the socially situated character of information (Brown and Duguid, 2000). (All of us were connected through Xerox PARC and the Institute for Research on Learning in Palo Alto.) The work also contributed to the then developing the fields of Science and Technology Studies and Computer-Supported Cooperative Work. Indeed, the shift of attention away from "human-machine communications" towards "computer-supported" work, and from an emphasis on the highly individualized "expert system" to the social system embraced by the notion of "cooperative" captures the trajectory of Suchman's influence. The sense of complementarity rather than equivalence between humans and machines has roots deep in the history of computer science. Charles Babbage, one of the forefathers of modern computing, after a study of machines in use in Britain and France, gave an influential account of the division of manual and mental labour between people and machines in *On the Economy of Machinery and Manufactures* (1832). AI's assumptions, however, might be more aptly traced to Frederick Taylor's "scientific management" with its belief that work could be decomposed into small, systematic routines that could then be coordinated according to an overarching plan. To preserve the efficiency of such plans, human intuition and interpretation should be replaced by conformity and obedience. (Taylor's view was best anticipated by Thomas Troubridge, a British admiral who is reputed to have said of his subordinates, "Whenever I see a fellow look as if he was thinking, I say that's mutiny.")

Suchman's work argues, to the contrary, that as pre-ordained plans are rigid but context ever changing, intuition and interpretation in work are essential rather than unnecessary for deploying a plan. The argument is important for understanding what actually goes on in even the most tightly managed workplace. There a great deal of work is likely to involve a process of "routinization", whereby people put effort into making the changing world appear to conform to the preordained plan. Thus Orr's (1996) work showed how Xerox technicians appeared to repair machines according to their instructions because that was what was expected of them, whereas in reality they had to improvise creatively because the instructions were wholly inadequate for many of the unpredicted problems the technicians faced (Duguid, 2007). These processes of surreptitious routinization, brought about by the demand for conformity, present two problems. On the one hand, they conceal the extent of the inadequacy of the work plan, as Suchman's work indicated. (All plans, her work suggests, are inadequate, but some are more inadequate than others.) On the other, they conceal the insight gained through the improvisation, as Orr's work revealed.

Principle and theory

As I have claimed, Suchman's work represents an important, principled, and successful attack on some of the undertheorized assumptions of AI and Cognitive Science, and also on management theory. Her success would suggest that her approach would present a more adequate theory. Yet on rereading the book, it is interesting to note how a-theoretical it can seem. This absence is to some degree characteristic of ethnomethodology, which has been portrayed as a field over reliant on empirical observation and lacking in theory. Yet oddly, Sacks and Schegloff aside, there is another, highly theoretical influence stalking this book. It is obliquely captured in the introduction to a symposium on Suchman's work published in 2003. There, Timothy Koschmann notes that "Three important books appeared in 1986, *Mind over Machine* by Hubert and Stuart Dreyfus, *Understanding Computers and Cognition* by Terry Winograd and Fernando Flores, and *Plans and Situated Actions* by Lucy Suchman ...[these were] harbingers of a paradigmatic shift that was to take place within the cognitive sciences" (Koschmann, 2003, p. 257) Though wrong about the date (Suchman's book appeared a year after the other two), Koschmann is right about the shift signaled by these three books from the environs of Silicon Valley. But the conjunction of the three also point to a common intellectual heritage. Winograd and Flores and Suchman are all significantly in debt to Hubert Dreyfus. (He was, among other things, a member of Suchman's and Flores's dissertation committees.) And Dreyfus in turn is quite openly in debt to Heidegger's work, of which he is one of the major North American exponents.

In fact, Heideggerian ideas pervade Suchman's work. He is there in the tendentious history that demonizes Descartes and the "modern constitution" that Heidegger accused him of ushering in in the seventeenth century. More substantively he is there in her resistance to the easy separation of person and world, of mind and body, and of objective and subjective–a separation that underpins AI and is the focus of much of Suchman's analysis. And he is there again in the trope of breakdown and repair as a way of bringing unseen assumptions into the light. In their book, Winograd and Flores lay out the distinctively Heideggerian assumptions that drive their argument: "implicit assumptions cannot all be made explicit ... Practical understanding is more fundamental than detached theoretical understanding ... We do not relate to things through having representations of them ... Meaning is fundamentally social, and cannot be reduced to the meaning-giving activity of individual subjects." (1986, pp. 32-33). I cannot imagine Suchman disagreeing with any. Through Hubert Dreyfus, through Winograd and Flores and also, if unacknowledged, through Suchman, Heidegger has provided central tools for the critique of AI and Cognitive Science and the general understanding of human-machine interaction and communication.

Distaste for theory is more noticeable in the second edition of Suchman"s work (Suchman, 2007). Where Heidegger at least appeared in the "Author Index" of the first, he is not indexed at all in the second. Yet, in some ways, theoretical discussion plays a larger role (and empirical analysis a lesser one) in the second. While Heidegger slips from the index and bibliography, the most significant addition to the both is Bruno Latour followed by the English Actor Network theorist John Law. The disappearance of one and appearance of the other may be related–Latour too can be determinedly anti-Heideggerian (Latour, 1999) and has been accused of attempting to hide (or take credit for) the Heideggerian ideas that pervade social studies of science and technology (Kochan, 2010). Yet Latour's presence is equally curious given his tendency to elide human and non-human "actants" and Suchman's success, in the face of similar elisions in AI and Cognitive Science, at separating the two. In the end, however, the second edition of *Plans and Situated Action* turns out to be primarily a detour through Latour, who is finally set aside. Having acknowledged concern that her work might privilege the human, Suchman nonetheless holds to a distinction between the human–or rather the "social"–and the machine, and insists on a "durable dissymmetry among human and nonhuman actors". "We need", she argues near the end of the book, "a story that can tie humans and nonhumans together without erasing the culturally and historically constituted differences among them ... [and] to keep in view ... the ways in which it matters when things travel across the human-artifact boundary" (Suchman, 2007, 270). Here, in particular, a reader can feel Suchman's commitment to a stronger account of ethics and politics in technology studies than analysis of indivisible actants might provide.

In the end, the pervasive influence of this book is less Latour than his former co-author Steve Woolgar. For from Woolgar and his new co-author Keith Grint, Suchman takes the idea of the design and use of technology as a process similar to writing and reading (Grint & Woolgar, 1997). The idea is clearly evocative in this second edition, which is itself an intriguing rereading: the text of the first edition lies almost unchanged at the heart of this book, but now comes wrapped around with a new introduction and opening chapter, 100 concluding pages, and new footnotes that provide a running commentary on the old text. The new opening chapter is resonantly called "Readings and Responses". While the title primarily refers to Suchman's attempts to respond to others' readings of the book, it inevitably reflects her own role as an author rereading her own work, and still trying to clarify and stabilize the text for new (or in this case old) readers. That task, which all authors know is a trying one, serves well to underline the insight of the original book. Henry Fielding, the eighteenth-century author, paused in the middle of his novel *Tom Jones* to lament that authors cannot "like a *jure divino* tyrant" control the reading of his book, making his readers into his slaves. Nor can Suchman, for all her trying, control hers. But in failing to control her argument and readers, she simultaneously reinforces that very argument and endorses the comparison between machine design and writing. For neither, can the designers of "human-machine communication" control through their plans the unintended, inventive, and improvisational uses to which their devices are inevitably put, no matter how many cycles Moore's Law may give them in future years.

References

Babbage Charles (1832) *On the Economy of Machinery and Manufacture,* London, Charles Knight.

Brown John Seely & Paul Duguid (2000) *The Social Life of Information*, Boston (MA), Harvard Business School Press.

Dreyfus Hubert L. & Dreyfus Stuart E. (1986) *Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer*, New York, Free Press.

Duguid Paul (2007) "Situation de travail, apprentissage et organisation : retour sur le travail de Julian Orr", *Le Libellio d'Aegis*, vol. 3, n° 1, pp. 13-16.

Grint Keith & Woolgar Steve (1997) *The Machine at Work: Technology, Work and Organization*, Cambridge, Polity Press.

Kochan Jeff (2010) "Latour's Heidegger", *Social Studies of Science*, vol. 40, n° 4, pp. 579-598.

Koschmann Timothy (2003) "Plans and Situated Actions: A Retro-Review", *Journal of the Learning Sciences*, vol. 12, n° 2, pp. 257-258.

Simon Herbert A. (1969) *The Sciences of the Artificial*, Cambridge (MA), MIT Press.

Latour Bruno (1999) *Pandora's Hope: Essays on the Reality of Science Studies,* Cambridge (MA), Harvard University Press.

Lave Jean & Wenger Etienne (1991) *Situated Learning: Legitimate Peripheral Participation*, Cambridge, Cambridge University Press.

Orr Julian (1996) *Talking About Machines: An Ethnography of Modern Job*, Ithaca (NY), ILR Press.

Suchman Lucy (1987) *Plans and Situated Actions: The Problem of Human-Machine Communication*, New York, Cambridge University Press.

Suchman Lucy (2007, 2nd ed.) *Human Machine Configurations: Plans and Situated Actions,* New York, Cambridge University Press.

Vera Alonso H (2003) "By the Seat of Our Pants: The Evolution of Research on Cognition and Action", *Journal of Learning Sciences* vol. 12, n° 2, pp. 279-284.

Vera Alonso H. & Simon Herbert A. (1993) "Situated Action: A Symbolic Interpretation", *Cognitive Science*, vol. 17, n° 1, pp. 7-48.

Winograd Terry & Fernando Flores (1986) *Understanding Computers and Cognition: A New Foundation for Design*, Reading (MA), Addison-Wesley ■