

Readings and Responses

This chapter provides a synopsis and some contextualization of the analysis offered in the original edition of *Plans and Situated Actions (P&SA)*, published in 1987, followed by my reflections on the reception and readings of that text. My engagement with the question of human-machine interaction, from which the book arose, began in 1979, when I arrived at PARC as a doctoral student interested in a critical anthropology of contemporary American institutions¹ and with a background as well in ethnomethodology and interaction analysis. My more specific interest in the question of interactivity at the interface began when I became intrigued by an effort among my colleagues to design an interactive interface to a particular machine. The project was initiated in response to a delegation of Xerox customer service managers, who traveled to PARC from Xerox's primary product development site in Rochester, New York, to report on a problem with the machine and to enlist research advice in its solution.² The machine was a relatively large, feature-rich photocopier that had just been "launched," mainly as a placeholder to establish the company's presence in a particular market niche that was under threat from other, competitor, companies. The machine was advertised with a figure dressed in the white lab coat of the scientist/engineer but reassuring the viewer that all that was required to activate the machine's extensive functionality was to "press the green [start] button" (see Fig. 1.1).

¹ A defining text of what came to be known as "anthropology as cultural critique" is Marcus and Fischer (1986). See also Gupta and Ferguson (1997); Marcus (1999); Strathern (1999).

² The project is discussed at length in Suchman (2005).



FIGURE 1.1. “Pressing the green button” Advertisement for the Xerox 8200 copier, circa 1983 © Xerox Corporation.

It seemed that customers were refuting this message, however, complaining instead that the machine was, as the customer service managers reported it to us, “too complicated.” My interest turned to investigating just what specific experiences were glossed by that general complaint, a project that I followed up among other ways by convincing my colleagues that we should install one of the machines at PARC and invite our co-workers to try to use it. My analysis of the troubles evident in these videotaped encounters with the machine by actual scientists/engineers led me to the conclusion that its obscurity was not a function of any lack of general technological sophistication on the part of its users but rather of their lack of familiarity with this particular machine. I argued that the machine’s complexity was tied less to its esoteric technical characteristics than to mundane difficulties of interpretation characteristic of any unfamiliar artifact. My point was that making sense of a new artifact is an inherently problematic activity. Moreover, I wanted to suggest that however improved the machine interface or instruction set might be, this would never eliminate the need for active sense-making on the part of prospective users. This in turn called into

question the viability of marketing the machine as “self-explanatory,” or self-evidently easy to use.³

My colleagues, meanwhile, had set out on their own project: to design an “intelligent, interactive” computer-based interface to the machine that would serve as a kind of coach or expert advisor in its proper use. Their strategy was to take the planning model of human action and communication prevalent at the time within the AI research community as a basis for the design. More specifically, my colleagues were engaged with initiatives in “knowledge representation,” which for them involved, among other things, representing “goals” and “plans” as computationally encoded control structures. When executed, these control structures should lead an artificially intelligent machine imbued with the requisite condition–action rules to take appropriate courses of action.

My project then became a close study of a second series of videotaped encounters by various people, including eminent computer scientists, attempting to operate the copier with the help of the prototype interactive interface. I took as my focus the question of interactivity and assumptions about human conversation within the field of AI, working those against findings that were emerging in sociological studies of face-to-face human conversation. The main observation of the latter was that human conversation does not follow the kind of message-passing or exchange model that formal, mathematical theories of communication posit. Rather, humans dynamically coconstruct the mutual intelligibility of a conversation through an extraordinarily rich array of embodied interactional competencies, strongly situated in the circumstances at hand (the bounds and relevance of which are, in turn, being constituted through that same interaction). I accordingly adopted the strategy of taking the premise of interaction seriously and applying a similar kind of analysis to people’s encounters with the machine to those being

³ As Balsamo succinctly points out, “to design an interface to be ‘idiot-proof’ projects a very different level of technical acumen onto the intended users than do systems that are designed to be ‘configurable’” (Balsamo in press: 29). It should be noted that this argument carried with it some substantial – and controversial – implications for technology marketing practices as well, insofar as it called into question the assertion that technology purchasers could invest in new equipment with no interruption to workers’ productivity and with no collateral costs. On the contrary, this analysis suggests that however adequate the design, long-term gains through the purchase of new technology require near-term investments in the resources that workers need to appropriate new technologies effectively into their working practices. Needless to say, this is not a message that appears widely in promotional discourses.

done in conversation analysis. The result of this analysis was a renewed appreciation for some important differences – more particularly asymmetries – between humans and machines as interactional partners and for the profound difficulty of the problem of interactive interface design.

Although the troubles that people encountered in trying to operate the machine shifted with the use of the “expert advisor,” the task seemed as problematic as before. To understand those troubles better, I developed a simple transcription device for the videotapes (see Chapter 9), based in the observation that in watching them I often found myself in the position of being able to see the difficulties that people were encountering, which in turn suggested ideas of how they might be helped. If I were in the room beside them, in other words, I could see how I might have intervened. At the same time I could see that the machine appeared quite oblivious to these seemingly obvious difficulties. My question then became the following: What resources was I, as (at least for these purposes) a full-fledged intelligent observer, making use of in my analyses? And how did they compare to the resources available to the machine? The answer to this question, I quickly realized, was at least in part that the machine had access only to a very small subset of the observable actions of its users. Even setting aside for the moment the question of what it means to observe, and how observable action is rendered intelligible, the machine could only “perceive” that small subset of the users’ actions that actually changed its state. This included doors being opened and closed, buttons being pushed, paper trays being filled or emptied, and the like. But in addition to those actions, I found myself making use of a large range of others, including talk and various other activities taking place around and in relation to the machine, which did not actually change its state. It was as if the machine were tracking the user’s actions through a very small keyhole and then mapping what it saw back onto a prespecified template of possible interpretations. Along with limitations on users’ access to the design script,⁴ in other words, I could see clearly the serious limitations on the machine’s access to its users.

My analysis, in sum, located the problem of human–machine communication in continued and deep asymmetries between person and machine. I argued that so-called interactive programs such as the

⁴ On scripts and their configuration of users, see Woolgar (1991) and Akrich (1992). I discuss these ideas more fully in Chapter 11.

expert system devised by my colleagues exploit certain characteristics of human conversation in ways that encourage attributions of interactivity to machines by their human interlocutors. At the same time, those attributions belie the profoundly different relations of person and machine to the unfolding situation and their associated capacities to interact within and through it. So the machine's users will read instructions offered by an expert help system as comments on the activity underway that *should be* intelligible, a strategy that proves extremely powerful for moving things along. Human interaction succeeds to the extent that it does, however, due not simply to the abilities of any one participant to construct meaningfulness but also to the possibility of mutually constituting intelligibility, in and through the interaction. This includes, crucially, the detection and repair of mis- (or different) understandings. And the latter in particular, I argued, requires a kind of presence to the unfolding situation of interaction not available to the machine.

My discussion of these problems was carefully framed not to take a position on the ultimate possibility that machines could ever be intelligent and interactive but to suggest at least that the problem of interactive interface design is a much more subtle and interesting one than what it was assumed to be by my colleagues at the time. Basically, it seemed to me, their assumption was that computational artifacts just *are* interactive, in roughly the same way that we are, albeit with some more and less obvious limitations. However ambitious, the problem as they saw it was a fairly straightforward task of overcoming the limitations of machines by encoding more and more of the cognitive abilities attributed to humans into them.⁵ My purpose in emphasizing the limits on machine interactivity was not, in other words, to argue from any a priori assumptions about essential aspects of "human nature" (Sack 1997: 62). As I hope will become clear in the following pages, I take the boundaries between persons and machines to be discursively and materially enacted rather than naturally effected and to be available, for better and worse and with greater and lesser resistances, for refiguring. It is precisely because the distinction between person and machine rests on the traffic back and forth between the two terms that questions of human–machine identity and difference matter. With that said, my observation continues to be that although the language of interactivity

⁵ For closely considered arguments regarding the problems with this premise, see, for example, Dreyfus ([1972]1992); Collins (1990); Button, Coulter, Lee, and Sharrock (1995); Adam (1998).

and the dynamics of computational artifacts obscure enduring asymmetries of person and machine, people inevitably rediscover those differences in practice.

The prevailing view within AI in the early to mid-1980s was that the relation of plans to actions was a determining one.⁶ A primary aim of the argument of *P&SA* was to suggest a shift in the status of plans, from cognitive control structures that universally precede and determine actions to cultural resources produced and used within the course of certain forms of human activity. A starting premise of my argument was that planning is itself a form of situated activity that results in projections that bear some interesting, and as yet unexplicated, relation to the actions that they project. In ordinary affairs, “planning” is an imaginative and discursive practice (now underwritten by a wide range of more and less effective technologies) through which actors project what they might do and where they might go, as well as reflect on where they are in relation to where they imagined that they might be.⁷

Having reopened the question of what plans are and how they work, I then suggested that we locate the answer to that question in what Garfinkel and Sacks (1970: 342) have named the “observable-reportable” accountability of practical reasoning and practical action. A central feature of planning in this sense is that it is among the many everyday practices that we, as participants in Euro-American cultural traditions at least, call out as a foundation for the rationality of our actions. The planned character of our actions is not, in this sense, inherent but is demonstrably achieved. It is a reflexive feature of our (inter-)actions insofar as we are able, on an ongoing basis, to indicate (to others and/or to ourselves) what we are aiming to do and to account for our actions as close enough for all practical purposes to what we had intended. Note that *reflexivity* as used here is not a synonym for reflection but rather as a statement that the sense of our actions is found in and through the very same methods that we employ to enact them intelligibly in the first place.

An unanticipated but welcome development in the progress of my work on the original text occurred when I discovered a resonance between my project and another underway at the time inside the AI community. In the 1980s Phil Agre and David Chapman, themselves

⁶ The central text being Miller, Galanter, and Pribram (1960).

⁷ On the status of plans as prospective and retrospective resources for action, see also Agre (1997: 5–9) and Agre and Chapman (1990).

doctoral students at the Massachusetts Institute of Technology (MIT) AI Lab, were engaged in a kind of endogenous critique of prevailing assumptions and practices within the field, particularly in the area of AI planning (Agre and Chapman 1987, 1990). Brought together through the closely linked networks of PARC and MIT, we discovered an unexpected complementarity in our projects. In particular, Agre and Chapman were troubled by what they found to be a logical and, they argued, fatal flaw in the machinery of AI planning. Committed to questioning the planning paradigm on a technical basis, they were interested to find an anthropologist engaged in the same project on the basis of the framework's adequacy as an account of everyday practice. I, correspondingly, was delighted to find allies capable of opening up the planning framework to critical inspection on its own terms. Our connection resulted in a rich exchange, not simply of the idea that plans needed reconceptualization in AI, but of theoretical and empirical resources to aid in that project. Agre subsequently developed the implications of an ethnomethodological critique for AI, and research into computation more broadly, through his conception of a "critical technical practice," one in which attention to the rhetorics and technologies through which a field constructs its research objects becomes an integral part of its research practice.⁸ As Agre explains:

Instead of seeking foundations it would embrace the impossibility of foundations, guiding itself by a continually unfolding awareness of its own workings as a historically specific practice. It would make further inquiry into the practice of AI an integral part of the practice itself. It would accept that this reflexive inquiry places all of its concepts and methods at risk. And it would regard this risk positively, not as a threat to rationality but as the promise of better ways of doing things. (1997: 23)

Although these more complex lines of intellectual exchange remained generally unrecognized in the wider AI community, the trope of the "situated" traveled through Agre to his supervisor, Rod Brooks, at MIT.⁹ Sengers (2004) observes that, by now, references to "situated action"

⁸ Agre's argument, of course, has strong resonance with Harding's notion of a "successor science" (1986, 1991) and related writings in feminist science studies, in its emphasis on critical engagement with the location and limits of knowledge production as an integral part of scientific practice. For a recent discussion of the interchange between *P&SA* and the field of AI, read through the lens of this history and Agre's proposal, see Sengers (2004).

⁹ Interview with Rod Brooks, March 20, 2003. I discuss Brooks's approach further, particularly with respect to notions of embodiment, in Chapter 13 of this volume.

have been incorporated into business as usual within AI research. But unlike the case of Agre's critical technical practice, she argues, AI researchers have for the most part failed to see the argument's implications for their own relations to their research objects and, relatedly, have adhered to an unreconstructed form of realism in their constitution of the "situation." Brooks in particular embraces an idea of situated action as part of his campaign against representationalism in AI and within a broader argument for an evolutionarily inspired model of intelligence.¹⁰ For Brooks, *situated* means that creatures reflect in their design an adaptation to particular environments. Following a lineage traceable to the founding premises of cybernetics, Brooks's situatedness is one evacuated of sociality, at least as other than a further elaboration of an environment understood primarily in physical terms. The creature's "interactions" with the environment, similarly, comprise variations of conditioned response, however tightly coupled the mechanisms or emergent the effects.

A reading of *situated* as nonrepresentational has led in some cases to the term's appropriation in support of various forms of neobehaviorism. Brooks's robots evidence one version of this, as does the reading put forward by Vera (2003), for whom *situated* comes, in an ironic twist, to mean "predetermined," a sense antithetical to the orientation toward the flexible, ongoing (re-)production of intelligible action that I would take it to convey. Vera makes the interesting point that a difference between Simon's famous ant (1969) and the Micronesian navigator invoked in the opening of *P&SA* is that the former is impeded by the contingencies of the environment, whereas the latter takes advantage of them. But, remarkably, he concludes from this, "In this sense, the ant's behavior seems truly situated, in the strongest theoretical sense" (Vera 2003: 283). Although I am unsure what being situated "in the strongest theoretical sense" could mean, I am sure that my use of *situated* does not mean acting in the absence of culturally and historically constituted resources for meaning making. On the contrary, as I have reiterated (perhaps for some ad nauseum), situatedness is presupposed by such practices and the condition of possibility for their realization. Behavior is not simply "reactive and contingent on the external world" (*ibid.*: 283) but rather is reflexively constitutive of the world's significance, which in turn gives behavior its sense.

¹⁰ For formulations of Brooks' position written for a general reader, see Brooks (1999, 2002).

The unfortunate separation of planned and situated as somehow two kinds of action (of which more below) contributes to an inverse reading of *situated*, also very different from my own, which treats the term as synonymous with spontaneous or improvisational. Set in opposition to predetermining conditions, this leads to an interpretation of *situated* as involving a kind of erasure of context, as implying that action happens *de novo*, without reference to prior histories. This is of course antithetical to the kind of strong orientation to the circumstances of action that my use of the term was meant to support and is understandable only in the context of long-standing debates within the social sciences over how we should understand the obdurate and enduring character of normative and institutionalized social orders. More sympathetically, Gordon Wells (2003) raises the question of the relation between an orientation to the *in situ* achievement of social order and the problem of the durability of orders of ordinary action over time and across space. To my understanding, ethnomethodology's insistence on the "just here, just now" achievement of social order is not aimed at an erasure of history. Rather, it is a move away from the structuralist premise that prior conditions fully specify what it means to act within the prescripts that institutionalized society provides. As in the analysis of prescriptive representations more broadly, social institutions and the rules that they imply do not reproduce themselves apart from ongoing activity. And like instructions, plans, and other forms of prescriptive representation, both institutions and rules of conduct presuppose *in situ* forms of social action that they can never fully specify.

There is in my view no inherent conflict between an ethnomethodological approach to studies of situated action and an interest in cultural historical continuities and their effects. The commitment to situated action orients us, however, always to the question of just how, and for whom, culturally and historically recognizable formations take on their relevance to the moment at hand. With respect to the durability and reach of established social orders, the dichotomies of "micro" and "macro," "local" and "global," are replaced by questions of location and extent. Tropes of "large" and "small," "top and bottom," give way to analyses of the cumulative durability and force of practices and artifacts extended through repeated citation and *in situ* reenactment. Ethnomethodology and other poststructuralist approaches to social order propose, in sum, that it is only through their everyday enactment and reiteration that institutions are reproduced and rules of conduct realized.

Two published forums in the years 1993 and 2003 comprise the most intensive discussion of the original text of *P&SA*, both located at the intersection of the cognitive and social sciences.¹¹ These discussions traversed some of the thornier underbrush in my original articulation of the argument, demonstrating weaknesses and gaps as well as some surprisingly enduring and, for me, puzzling, (mis-)readings. Along with whatever contributions I have unwittingly made to the latter, I believe that they are evidence for the multiplicity of different, sometimes antithetical, premises with which I and my interlocutors approach our subject matter. Perhaps the most direct critique of the original text came in an article by Alonso Vera and Herbert Simon (1993) titled “Situating Action: A Symbolic Interpretation.” Aimed more broadly at refuting the growing interest in nonsymbolic forms of AI promoted by Brooks and others, Vera and Simon discuss what they name “the congeries of theoretical views collectively referred to as ‘situated action (SA).’”¹² In their representation of my argument, Vera and Simon reiterate the (mis-) reading most frequent among those who cite it, whether sympathetic or not. In particular, they claim that I assert planning to be “irrelevant in everyday human activity” (ibid.: 7). I took the opportunity of responding to their article to restate that the primary agenda of my writing on the topic was not to dismiss plans as phenomena of interest but, on the contrary, to recover them as objects of investigation. My concern was that as long as plans were treated as determining of the actions projected, a theory of plans became not only necessary but also sufficient for an account of human activity. One might have to worry about cases in which for one reason or another a planned action could not be executed, but the fundamental assumption was that once you knew the plan, the action simply followed.

¹¹ See *Cognitive Science* 17(1), 1993; *Journal of the Learning Sciences* 12(2), 2003. My representation of this debate is drawn from Suchman (1993, 2003). For other careful and generative readings of the original text, see Heath and Luff (2000: Chapter 1); Dourish (2001: Chapter 3). Clancey (1997) offers an extended discussion of the sense of *situated* for the cognitive sciences. For a cogent analysis of appropriations of a notion of “situatedness” in service of general critiques of education, and the identification of an alternate programme of classroom research, see Macbeth (1996).

¹² I have attempted scrupulously to avoid the use of acronyms such as SA or initial capitals with the phrase “situated action,” hoping to forestall the introduction of a hardened theoretical object and to maintain the descriptive character of the adjective. Of course all action is situated: the adjective is meant not as a qualifier, but rather as a reminder of that fact.

Perhaps in part because of their commitment to this conception of plans, Vera and Simon read my argument that plans are not determining of the actions that they project (at least not in any strong sense of the word *determining*) as a rejection of the notion of planning altogether.¹³ The main justification for this reading of my argument seemed to be the example I offered of taking a canoe through a set of rapids (see Chapter 6). Vera and Simon claimed that I had said that “a person would plan a course down the river but this plan would serve no purpose when the rapids were finally run” (1993: 16). As evidence for this, they cite a sentence of mine meant to point to the priority of embodied action in such an activity: “When it really comes down to the details of responding to the currents and handling a canoe, you effectively abandon the plan and fall back on whatever skills are available to you” (Suchman 1987: 52). Although I admit that the phrase “effectively abandon” was an unfortunate one and legitimately prone to such a reading, I pointed out that the sense would change in a subtle but important way had Vera and Simon included the next sentence as well: “The purpose of the plan in this case is not to get your canoe through the rapids, but rather to orient you in such a way that you can obtain the best possible position from which to use those embodied skills on which, in the final analysis, your success depends” (ibid.: 52). The plan, in sum, has a purpose.¹⁴ The interesting question, I proposed, is just how it fulfills that purpose. Vera and Simon argued that I did not “appear to recognize that most plans

¹³ Vera and Simon asserted as well that I, along with Winograd and Flores (1986), argued that “the methods and terminology of situated action should replace current human–computer interaction methods in psychology and AI” and that “we must focus on how people use [interfaces] instead of how people think, or what computers can do” (1993: 11). I do not believe that I ever used such exclusionary language in speaking of these things. Rather, my interest had been (a) to redress a situation of *disattention to* human–computer interaction as situated activity and (b) to take the idea of human–computer interaction seriously *as interaction*, in the sense that I understand it between people. Doing the latter actually led me to the limits of the notion that what goes on between people and machines is usefully compared to interaction between people. In any case, in no way was my approach meant to replace investigations of how people think or of what computers can do. If anything, it was meant to reframe them.

¹⁴ In response to my concern with this partial citation after reading a draft of Vera and Simon’s article, they included the following footnote in the published version: “Elsewhere on this same page, Suchman retreated a bit from this strong language, and acknowledged that, even in this kind of situation, the plan may determine initial conditions for the behavior. However, her discussion is at best contradictory, and in general, wholly skeptical of planning” (1987: 16). Note that the sentence in question does not propose that plans are “initial conditions”: I would maintain that the confusion here is Vera and Simon’s, not my own.

are not specifications of fixed sequences of actions, but are strategies that determine each successive action as a function of current information about the situation" (1993: 17). Although I wonder about terms like *most plans* and *determine...as a function of*, the question of just how plans relate to the actions they formulate does constitute our common interest, as well as the real point of debate.

My discussion of the canoeing example was meant to emphasize *both* the utility of projecting future actions *and* the reliance of those projections on a further horizon of activity that they do not exhaustively specify. The case of whitewater canoeing seemed to me to offer a perspicuous example of both. My choice of wording has clearly contributed to the reading of my argument as saying that the plan is irrelevant once one is in the water. This despite the fact that the surrounding text makes clear that I take *both* the projected course *and* the work done within the rapids to be crucial. Again, the interesting question is just how the activity of projecting a course has its effects in the subsequent activity of finding one in situ. It is those effects, understood as a situated achievement of the very same course of action that the plan projects, that constitute the plan's practical adequacy as an orienting device for action.

Vera and Simon come in the end to what they say is "the central claim of hard SA: that behavior can only be understood in the context of complex real-world situations. Interpreted literally, this claim is surely wrong, since no organism, natural or artificial, ever deals with the real-world situation in its full complexity" (ibid.: 45). Setting aside the question of just what it would mean to "interpret literally" this claim, I proposed a rewording that would make it closer to a claim to which I would in fact subscribe, namely "that behavior can only be understood in its relations with real-world situations." There are two changes here, one subtle, one less so. The more subtle shift, from "in the context of" to "in its relations with," is meant to get away from the container-like connotation of the term *context* and emphasize instead that the structuring of behavior is done not a priori, but in reflexive relation to circumstances that are themselves in the process of being generated, through the same actions that they in turn work to make comprehensible. The less subtle correction is elimination of the term *complex*, a term more from Vera and Simon's discourse than from my own. In my view the complexity or simplicity of situations is a distinction that inheres not in situations but in our characterizations of them; that is, all situations are complex under some views and simple under others. Similarly, I cannot imagine what it could mean to deal with a situation in its "full" complexity, because

situations are not quantities of preexisting properties dealt with more and less fully. The point of the claim as reworded is just that actions are structured in relation to specific circumstances and need to be understood in those terms.

To summarize, my position then and now has been that plans are conceptual and rhetorical devices (often materialized in various ways, as texts, diagrams and the like) that are deeply consequential for the lived activities of those of us who organize our actions in their terms. Just how plans are consequential for the actions they project defined, at least potentially, a territory of mutual interest for the social and cognitive sciences. Vera and Simon's position, in contrast, seems based on the premise that planning – or more accurately plan execution – and situated action comprise two different, alternative forms of activity: that, as they put it, a function of a plan is that it “minimizes the number of occasions when an emergency calling for SA will arise,” namely, those requiring reaction to “severe, real-time requirements” or “unexpected events” (1993: 41). Planning and plan execution, in other words, are still the primary forms of activity, with what is now called “SA” (which in its “pure” form according to Vera and Simon is made up entirely of predetermined responses) coming into play only in certain cases. As I tried to make clear in my response at the time, this is not the view of situated action that I hold. Nor, I believe, is it the view that will lead us closer to an understanding of how plans might be generated within situated activity and then brought to bear on some future course of action. To reach that understanding will require an account of the relation between planning-as-activity, the artifacts of that activity, and the subsequent activities to which those artifacts (conceptual, linguistic, or otherwise) are meaningfully related.¹⁵

The publication of a Books and Ideas section in the *Journal of the Learning Sciences* (2003) afforded another, more recent opportunity for a response to readings of the original text of *P&SA*. In their generally sympathetic critique in that volume, Sharrock and Button call attention to a deeper vulnerability in my original argument. They close their commentary with a valuable clarification, by pointing to ambiguities in the verb “to determine.” More specifically, they point out that the sense implied by a statement like “our position on the high seas is determined . . . by consulting a chart” presupposes not an axiomatically causal relation, but an act by which things are brought into relation (2003: 263). Bringing

¹⁵ I return to this topic in Chapter 11.

things into relation may be done more and less easily, as we become familiar with particular, recurring configurations iterated over time (for example, relations between the laws governing where one may and may not park, the signs and artifacts that mark the urban landscape, the practices of driving and parking, the documents used to indicate an infraction, the ability of drivers to read those signs and documents, and so forth). Despite the seeming automaticity of these relations, however, they do not run by themselves but must be continually reiterated and reproduced, as well as elaborated, resisted, and/or transformed. Consistent with this position, I wanted to suggest that plans are just one among many types of discursive artifacts through which we achieve the rational accountability of action. As such, they arise through activity and are incorporated into the activities that they project.

In the interest of challenging the cognitive science view of plans as determinates of action, however, I uncoupled plans and actions and reframed their relation as problematic. By implicitly suggesting that plans were somehow outside of action, this move invited just the kind of separation on which the plan versus execution dichotomy, which I was trying to displace, relies. Where I had hoped to direct attention instead was precisely to *the relation between the activity of planning and the conduct of actions-according-to-plan*. My aim was not to define that relation but to pose it as a question for our collective research agendas and to suggest that ethnomethodology had some crucial contributions toward an answer.

Viewing the plan as an artifact or tool (the hammer being the iconic case) seemed helpful in further clarifying the plan/action relation. Although the durable materiality of the hammer supports the statement that it exists before and after the moments of its use, it is nonetheless clear that its status as a hammer rests on its incorporation into the practice of some form of carpentry. By the same token, being a carpenter involves, *inter alia*, the competent practice of hammering. The possibility of uncoupling the hammer from its use in carpentry does not mean that the two are separable in practice. Similarly, calling out a plan as a self-standing artifact is a situated action in its own right and does not diminish the reliance of the plan for its significance on its effective incorporation into practice.

Most fundamentally, I wanted to draw attention to the ways in which plans and other formulations of action open out onto a sphere of embodied action and lived experience that extends always beyond their bounds and at the same time gives them their sense and efficacy. It is this relation

that forms a core topic for ethnomethodology, exemplified as Sharrock and Button remind us in the work of instruction following. The efficacy of plans, instructions, and the like – their generality and their “immutable mobility” (to use Latour’s famous phrase; 1986: 7) – relies precisely on the ability of those who make use of them to find the relation of these general prescriptions to the particular occasion that faces us now. It is in this respect that instructions do not precede the work of their enactment but rather that their sense is found in and through, and only in and through, that work. As should be evident, this is an extraordinarily general phenomenon of social life, though it can only be understood in its specifics.

In his broadly generous reading of *P&SA*, John Carroll (2003) points to what I agree is another weak link of the original book; that is, its conclusions. He suggests that it was my use of conversation analysis as a foundation for my study that limited my ability to draw out the argument’s design implications. Rather, I would say that it was my own fledgling relation to the fields of system design and their possibilities, the limits of my experience at the time, which constrained my ability to imagine how it could be otherwise. As Carroll takes care to point out, I have been involved in the years since in exploring the design implications of the critique through my own developing practice. More specifically, this has involved a series of initiatives aimed at practicing alternative approaches, demonstrated as cases of ethnographically based, work-oriented participatory design.¹⁶

So what would I conclude now, given the benefit of all the developments since 1987 both in my own working life and in the projects of AI and HCI? In the original project I adopted the methodological strategy of applying analytic techniques and insights from the study of human interaction to see what would happen if we took the metaphor of human–computer interaction seriously. I begin my conclusions now by reiterating the basic finding of the analysis in *P&SA*; namely, that

¹⁶ See Blomberg, Suchman, and Trigg (1996); Suchman (1999, 2001, 2002a, 2002b); Suchman, Blomberg, Orr, and Trigg (1999); Suchman, Trigg, and Blomberg (2002); Trigg, Blomberg, and Suchman (1999). I am a bit less encouraged than Carroll at the extent to which “ethnographic workplace studies and worker participation in design are standard engineering practices” (2003: 278). In some respects I have the contrary sense that the spaces for this kind of design practice are closing down with the economic turns of the industry and associated retrenchments in old values of (at least apparently, in up-front costs) faster and cheaper production. I return to these problems and possibilities in Chapter 15.

there is (still) no evidence for the achievement of conversation between humans and machines in the strong sense that we know it to go on between humans. Interaction, as Emanuel Schegloff reminds us (1982), is not the stage on which the exchange of messages takes place, or the means through which intentionality and interpretation operationalize themselves. Rather, interaction is a name for the ongoing, *contingent coproduction* of a shared sociomaterial world. Interactivity as engaged participation with others cannot be stipulated in advance but requires an autobiography, a presence, and a projected future. In this strong sense, I would argue, we have yet to realize the creation of an interactive machine.

At the same time, given recent demonstrations within science and technology studies and the media arts of the many ways in which things do participate with us, I now emphasize the proposition that they must be allowed to do so in their own particular ways. Initial observations suggest that a more productive metaphor than conversation to describe our relations with computational artifacts may be that of writing and reading (see Grint and Woolgar 1997: 70; Chapter 11). But these are new forms of writing and reading, with new materials or media. What characterizes those new media are their unprecedented dynamics, based in their underlying computational mechanisms. More than conversation at the interface, we need the creative elaboration of the particular dynamic capacities that these new media afford and of the ways that through them humans and machines together can perform interesting new effects. These are avenues that have just begun to be explored, primarily in the fields of new media, graphics and animation, art and design. Not only do these experiments promise innovations in our thinking about machines, but they also open up the equally exciting prospect of new conceptualizations of what it means to be human, understood not as a bounded, rational entity but as an unfolding, shifting biography of culturally specific experience and relations, inflected for each of us in uniquely particular ways.