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Technologies, Texts and Affordances

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ABSTRACT In contrast to recent sociological emphases on the social shaping of technology, this article proposes and illustrates a way of analysing the technological shaping of sociality. Drawing on the concept of affordances (Gibson 1979), the article argues for a recognition of the constraining, as well as enabling, materiality of artefacts. The argument is set in the theoretical context of one of the most recent and comprehensive statements of anti-essentialism (Grint and Woolgar 1997). The position is illustrated through a reinterpretation of some case studies used by proponents of the radical constructivist position.

KEYWORDS Affordances, materiality, realism, social constructivism, social shaping of technology.

Recent years have seen a resurgence of interest in technology as an object of sociological investigation. Technology has always figured in the list of sociology's key topics, along with themes such as power, bureaucracy, work, class and, more recently, deviance, gender and ethnicity. But during the 1990s technology took on a new lease of sociological life in the form of 'social studies of science and technology'. This is an offshoot of the more well-established sociology of scientific knowledge (SSK) (Woolgar 1991a). Drawing on many of the epistemological and methodological debates of SSK, there quickly developed an uneasy consensus around a broadly social constructivist idea that technological artefacts, in both their form and their meaning, are socially shaped, as opposed to being the clearly defined products of particular inventors or innovators. As two of the key figures in the development of the field have put it:

Technologies do not have a momentum of their own at the outset that allows them ... to pass through a neutral social medium. Rather, they are subject to contingency as they pass from figurative hand to hand, and so are shaped and reshaped. Sometimes they disappear altogether: no-one felt moved, or was obliged, to pass them on. At other times they take novel forms, or are subverted by users to be employed in ways quite different from those for which they were originally intended.

[Bijker and Law 1992:8]

As this quote suggests, most of the work in this field is not about technology in the abstract, but about the complex relationships between technologies and the social and interactional circumstances in which they exist and through which they attain their meaning. This is in stark contrast to more traditional sociological concerns with technology which focused on the development of factories, the introduction of machines and the increasing automation of work. The explicit aim was to develop a critical, and political, account of the effects of these processes in terms of class division and the nature of the labour process (for classic studies, see Blauner 1964; Braverman 1974). Work in this latter tradition is often cited as a prime example of technological determinism: the view that forms of technology actively cause new forms of social relations to come about.¹

Whether in a strong or a diluted form, this view courses through much of the populist discourse about the social 'impacts' of new information and communication technologies. Toffler (1981), one of the most well-known 'sociologists of the future', has argued that the invention of computers heralded a 'Third Wave' in Western culture, following the First Wave of agriculturalism and the Second Wave of industrialism, in which just as profound a set of social and cultural changes will be caused as came in the wake of the preceding waves. It also influences many of the more sociological accounts that have been produced in recent years. Poster (1995), for instance, takes a similar, if theoretically more sophisticated, line to Toffler when he argues that the current 'era of electronic exchange' is the third in a series of communication eras that have characterised human societies (the others are the era of 'oralism', prior to the development of writing systems, and the era of 'written exchange' which allowed rationalism and science, with their objective representations of the world, to flourish). What is being brought about by the era of electronic mediation, for Poster, is a fragmentation of the self and a resulting crisis of identity in which there is an increasing separation between the things that we can be or have done to us in the world, and our physical presence in any given social space.

But this discourse of 'social impacts' of technological change has been brought into question by social constructivist developments in science and technology studies. In this perspective, the very commonsense dichotomies between the technical and the social need to be fundamentally challenged. Sociologists need to see that social processes and the 'properties' of technological artefacts are inter-related and intertwined, and need to analyse the ways in which they are. While there are a range of (often fiercely competitive) theoretical perspectives involved in this consensus, they all begin from the viewpoint that precisely what the characteristics of technologies are, as well as their relationship with social structures, are both socially constructed: the outcome of a whole range of social factors and processes.

Taking this anti-determinist move to its logical conclusion, Grint and Woolgar (1997) have reconfigured the question as one not of anti-determinism but of anti-essentialism: a principled opposition to the view that technological artefacts have

any inherent properties outside the interpretive work which humans engage in to establish what those artefacts 'actually are'. Rather, what counts as 'the technology' is just as much the outcome of interpretive accounts – some more persuasive than others – as is what counts as the technology's 'uses' or 'effects'.

On one level, this is an aspect of the long-standing debate within the sociology of science and technology between realism (the view that worldly objects have inherent properties that act as constraints on observational accounts) and constructivism (the view that the very 'reality' of objects is itself an outcome of discursive practices in relation to the object).² Grint and Woolgar's (1997) contribution is especially interesting because, apart from being the most comprehensive and sustained attack on the realist position, it also argues that many of the more significant *constructivist* studies unintentionally fall into unwelcome realist assumptions. They do this, in Grint and Woolgar's view, because they are not sufficiently thoroughgoing in examining the logic of their own position.

For instance, those in the school of socio-technical interactionism represented by the influential Mackenzie and Wajcman (1984) collection want to say that the specific functions, and hence the social 'effects', of a given technology are bound to social factors such as the ideologies informing its design or the division of labour within which it is deployed. However, they still maintain that there are particular properties of technologies which do have some kind of social effect. For Grint and Woolgar, this means that these writers end up 'struggling with a dualism between "technology" and "the social". Does technology ... determine, or is it determined by, the social?' (1997:21).

A position much closer to their own is that of actor-network theory (Callon and Latour 1981), a standpoint associated with a systematic scepticism about the characteristics of technologies and an unwillingness to accord any necessary, objective characteristics to technical artefacts. Yet Grint and Woolgar are equally critical of actor-network theory, asserting that it too is susceptible to 'technicism', or the idea that technologies ultimately have features specific to themselves. They discuss one of the foundational studies in the actor-network approach, Callon's (1986) analysis of the attempts by a French company (EDF) to develop an electric car (the VEL) in competition with another company (Renault).

According to Callon, the actor-network within which the VEL was developed, promoted and ultimately withdrawn from production involved a range of actants including batteries, zinc, potential users, city streets, the Renault motor company, engineers, catalysts, platinum and so forth. The two companies, EDF and Renault, sought to build different actor-networks out of these constituents in order for their own technology to become the accepted one. The key point which Grint and Woolgar pick up on is the moment at which, in Callon's account, one element 'deserted' the network prepared by EDF, thereby playing into the hands of Renault. This element was the motor parts called catalysts: 'the catalysts refused to play their

part in the scenario prepared by EDF: although cheap (unlike platinum), the catalysts had the unfortunate tendency of quickly becoming contaminated, rendering the fuel cell unusable' (Callon 1986:90, cited in Grint and Woolgar 1997:31).

As Grint and Woolgar point out, this description implies that the catalysts had specific, 'actual properties' – such as the tendency to become contaminated – which were not affected by their socially constructed role within the network. In other words, we find a retreat to a form of realism. Grint and Woolgar's proposal (1997:31) is that:

the 'actual property' of catalysts [should] be treated as a construction (or accomplishment) and hence as part of the situation to be explained. Who says catalysts had this unfortunate tendency, how and why did they say so, and why does this particular version prevail? A... rendering... in line with the initial scepticism about essential capacities of technical entities, might proceed by suggesting that what was initially construed (by EDF) as the attractive property of a solid ally, later became recast (by Renault) as the deficient weakness of a deserter.

While Grint and Woolgar thus seek to take anti-realism to its logical conclusion in their anti-essentialist standpoint, I want to propose an approach to the study of technologies and social life which offers a reconciliation between the opposing poles of constructivism and realism. This involves seeing technologies neither in terms of their 'interpretive textual' properties nor of their 'essential technical' properties, but in terms of their *affordances* (Gibson 1979). I will argue that affordances are functional and relational aspects which frame, while not determining, the possibilities for agentic action in relation to an object. In this way, technologies can be understood as artefacts which may be both shaped by and shaping of the practices humans use in interaction with, around and through them. This 'third way' between the (constructivist) emphasis on the shaping power of human agency and the (realist) emphasis on the constraining power of technical capacities opens the way for new analyses of how technological artefacts become important elements in the patterns of ordinary human conduct.

This does not mean that I want to propose a return to the more unilateral discourse of 'effects' – a discourse that is all too apparent in current journalistic accounts of 'technological revolution', 'depersonalised communication' and 'information overload' that in themselves simply echo, under a new guise, technophobic and technophilic concerns that have been with us since the beginnings of industrial capitalism (Webster 1995). But I do want to argue that a new empirical perspective is possible on the nature of the relationship between technological artefacts and human practices. That perspective needs to be grounded in a conception of the constraining, as well as enabling, materiality of the technology as a worldly object.

'Materiality' here need not be thought of only in physical terms. We may, for instance, think of the telephone as having a materiality affecting the distribution of

interactional space, through the promotion of what can be called conversational 'intimacy at a distance'. Likewise we can conceive of the interfaces of expert systems or internet conferencing software as having a materiality affecting navigation through a technically bounded interactional space, as people attempt to orient themselves in the sequential order of a particular interaction (Hutchby 2000).

In the present article I will not present a detailed empirical application of this perspective,³ focusing instead on the theoretical case for the kind of shift in empirical footing that I am proposing for the sociology of technology. However, in the final section, I will offer some indication of the pay-offs to be gained from a focus on the affordances of artefacts by briefly reconsidering one of the cases that have been given a constructivist treatment in the literature.

Technologies as texts?

Grint and Woolgar (1997) suggest the intriguing notion that technologies should be treated as 'texts' which are 'written' (i.e. configured) in certain ways by their developers, producers and marketers, and have to be 'read' (i.e. interpreted) by their users or consumers. The writers of these technology-texts may seek to impose particular meanings on the artefact, and to constrain the range of possible interpretations open to users. Users, by contrast, may seek to produce readings of the technology-text which best suit the purposes they have in mind for the artefact. It is in the dynamic between these processes that sociologists can begin to locate the meaningful social reality of technologies.

Neither the writing nor the reading of technology-texts is determinate: both are open, negotiated processes. Although there may be ways that technology-texts have 'preferred' readings built into them, it is always open to the user to find a way around this attempt at interpretive closure. A good example is the telephone. As Frissen (1995) points out, one of the early ways that the telephone was marketed to a mass audience ('written', in Grint and Woolgar's terms) was as an instrumental tool useful for business negotiations (for men) and the management of household services (for women). However, women in particular began to 'read' this technology in quite a different way – as a tool for sociability, for chatting – and after a while the manufacturers, sensitive to this new reading, began to market what was to all intents a 'different' technology to the one they had begun with.

Technology as text metaphor is a powerful one, and it opens up a range of possibilities for understanding the key role that human agency plays in the moulding of what, in commonsense terms, may seem like 'natural' functions of artefacts. Nevertheless, some significant problems arise when we consider the metaphor a little more closely. In maintaining that technological artefacts cannot be said to have any intrinsic properties, and that what they 'are' is always a matter for negotiation and persuasive rhetoric, the logic of Grint and Woolgar's position is that technologies

must be 'open' forms. Although nowhere explicitly stated, it seems they must assume that artefacts are *tabulae rasa*, since the only thing that constrains their social construction is the persuasiveness of the account that is offered.⁴ But how far is this the case? For one thing, how far are a fruit machine and a telephone (for example) open to the same set of *possible* interpretations? While both have many common aspects (for instance, both may routinely be found in pubs, both might need money putting into them to get them going, both may make bleeping noises), it seems clear that at some level their very capacities differ. A telephone enables vocal signals to be transmitted along wires; a fruit machine does not. A fruit machine enables money to be won at specific moments of alignment of three barrels with pictures painted on them; a telephone does not.

Such assertions may be seen as rather crude, and Grint and Woolgar might argue that they rely on a whole array of other constructions, both technological and cultural (for instance, 'transmission', 'winning', and so on), which are in turn the prior outcomes of persuasive negotiations. Indeed, they spend a good deal of time arguing against a similar objection by Kling (1992) that their position fails to acknowledge the fact that a bullet fired from a gun has effects on flesh and bone that are intrinsic to the gun and bullet, and cannot be altered by social constructions. Yet while they demonstrate again and again that there are manifold social factors involved in producing the outcome of whether someone gets shot dead or not (or even what it means to be 'dead'), they ultimately fail to dismiss Kling's basic point about the material properties of gun-fired bullets in interaction with those of flesh and bone:

Without a gun, it's hard to tear so much flesh and splinter so much bone so rapidly and readily and with such focus while standing ten feet away from the intended victim . . . physical objects like guns and roses have some capabilities which are not only arbitrarily derived from the talk about them. It's much harder to kill a platoon of soldiers with a dozen roses than with well placed high speed bullets.

[Kling 1992: 362, cited in Grint and Woolgar 1997: 154]

How are we to deal with these capabilities that go beyond discourse, either theoretically or in terms of empirical research into technology and social action? A complicating factor is that, at various places in their argument, Grint and Woolgar (1997) claim that 'the social constructivist argument does not deny that material artefacts have constraining influences upon actors' (p. 23), that the point is 'not to suggest that machines do not have effects' (p. 33) and that the technology as text metaphor 'does not mean that any interpretation is as good as any other' (p. 32). However, this metaphor leads them to focus almost entirely on the question of *representations* of technologies. A general strategy is to observe that a given technological form (for instance, a bridge) can be represented in at least two competing ways (for example, as a means of carrying people over a road or as an instrument for the perpetuation of racial inequality – see Winner (1984)), and then to show that

both these representations are based on some conception of ‘inherent’ characteristics whereas the more appropriate procedure is to analyse the discursive practices through which one interpretation wins out over another.⁵

There is a fundamental problem with maintaining this emphasis. Certainly, juxtaposing different readings of a bridge, or of a computer, or of an aeroplane, shows that humans are capable of interpreting the capacities of technologies in varying ways. Constructivist methods, by focusing on such variability, have usefully brought to the fore the recognition that social processes are involved in all aspects of technology, and not simply in its effects upon society. But the question that still looms is: does the aeroplane lend itself to the *same set of possible interpretations* as the bridge; and if not, why not?

The affordances of things

I suggest that the answer to this question is no. The reason is that different technologies possess different affordances, and these affordances *constrain the ways that they can possibly be ‘written’ or ‘read’*. The affordances of aeroplane and bridge render available different (though sometimes overlapping) ranges of uses, and subject those possible uses to different ranges of effects and constraints. As noted, even Grint and Woolgar (1997) admit to the possibility of such effects and constraints; but ultimately it is not clear where, in their view, these phenomena emerge from. Interpretations and representations are by definition defeasible, open to contestation. To what degree could these lead to ‘constraining influences’ and ‘effects’, terms which seem to imply the existence of precisely those objective features of technologies which they are so concerned to question? Ignoring the different affordances which constrain both the possible meanings and the possible uses of technologies denies us the opportunity of empirically analysing precisely what the ‘effects’ and ‘constraints’ associated with technological forms are.

The concept of affordances is associated with the work of Gibson (1979) in the psychology of perception.⁶ For Gibson, humans, along with animals, insects, birds, and fishes, orient to objects in their world (rocks, trees, rivers, etc.) in terms of what he called their affordances: the possibilities that they offer for action. For example, a rock may have the affordance, for a reptile, of being a shelter from the heat of the sun; or, for an insect, of concealment from a hunter. A river may have the affordance, for a buffalo, of providing a place to drink; or, for a hippopotamus, of being a place to wallow. Affordances may thus differ from species to species and from context to context. However, they cannot be seen as freely variable. While a tree offers an enormous range of affordances for a vast variety of species, there are things a river can afford which the tree cannot, and vice versa.

Gibson’s theory was designed principally as a critique of two influential forms of cognitivist theorising in the study of perception. First, the view of gestalt

psychologists such as Koffka (1935) for whom 'the value [i.e. meaning or utility] of something is assumed to change as the need of the observer changed' (Gibson 1982:409). By contrast, for Gibson, 'the *affordance* of something is assumed *not* to change as the need of the observer changes. The edibility of a substance for an animal does not depend on the hunger of the animal. The walk-on-ability of a surface exists whether or not the animal walks on it' (ibid.). Secondly, the view developed within cognitive psychology that the brain must play an intermediary role in perception by interpreting the images transmitted via light sources to the retina. Against this view, Gibson (1979) argued that the *affordances* of objects could be 'directly perceived': for instance, it may be that a fleeing lizard perceives the shape in front of it directly in terms of its affordance as a 'place to hide' (while an observing human may equally characterise it as 'a rock').⁷

To discuss the significance of affordances in the context of the psychology of perception would take us beyond the concerns of the present article.⁸ However, in arguing for the utility of the concept in terms of the sociology of technology, I want to bring out four emphases which are sometimes lost in the Gibsonian account of affordances.⁹ First, while Gibson's work stressed the affordances of natural objects and the ecology of perceptual space, there are of course many types of affordances: affordances of the natural environment; affordances of artefacts; affordances of other species within the environment; or of other members of our own species; and so on. These different sources may be interrelated or compounded on any given occasion of action.

Secondly, it is important to see that affordances are not just functional but also relational aspects of an object's material presence in the world. Affordances are *functional* in the sense that they are enabling, as well as constraining, factors in a given organism's attempt to engage in some activity: for instance, walking, or hiding, photocopying a document, and so on. Certain objects, environments or artefacts have affordances which enable the particular activity while others do not. But at the same time the affordances can shape the conditions of possibility associated with an action: it may be possible to do it one way, but not another. The *relational* aspect, by contrast, draws our attention to the way that the affordances of an object may be different for one species than for another. Water surfaces do not have the affordance of walk-on-ability for a lion or a crocodile, but they do for an insect waterboatman. Gibson's interest in the possibility of direct perception of affordances thus does not mean that the *range* of affordances of any object are fully and immediately available to perception. To Gibson's (1982:409) remark: 'the walk-on-ability of a surface exists whether or not the animal walks on it', we can add: the surface's affordance of walk-on-ability becomes manifest *when* the animal walks on it.

Thirdly, especially when it comes to the world as experienced by humans, objects and their values can also be tied in with complex sets of concepts and conventional rules governing their use, so there is an important sense in which we can, and indeed

must, *learn* about some of the affordances that certain things offer. Again, in this sense, affordances can be laminated or compounded. For example, a young child may become interested in a camera found around the house. The camera may be found to have a catch, which affords undoing, and a hinged door, which affords opening. Yet carrying out these actions will lead to problems if the camera contains a roll of film, which is a material affording the development of still photographic images but only if exposed to light under highly restricted conditions. The child may thus learn that there are both social and technological rules delimiting the affordances of the camera's door: namely, that you do not open it while a film is inside unless you want to destroy the film (and incur the wrath of the adult camera-owners).

Finally, the latter point also suggests the importance of recognising that the affordances of *artefacts* (i.e., manufactured objects) do not necessarily derive from natural features of the artefact's materiality (as, for instance, the fact that a drumstick is made of a hard material, wood, plays a part in its affordance as both 'stick for drumming' and 'weapon for poking'). Affordances can also be designed into the artefact. Norman (1990) has argued that 'good' designers of objects such as door handles, light switches, coffee machines and so on, are those who are most concerned to shape the artefact so that its possible uses, its affordances, may be readily perceivable by its proposed users.¹⁰

The notion of affordances, used as an analytic tool, enables us to transcend some of the unresolved difficulties in the technology as text metaphor. As a first illustration, let us consider the following quote about the telephone, characteristic of Grint and Woolgar's (1997:21) position:

For example, telephone technology was used originally to broadcast concert music. It was not axiomatic to its design that the telephone system would ultimately be restricted primarily to two-way personal communication, nor serve as a communication channel for students undertaking distance education, nor carry faxes, nor act as an electronic surfboard for the internet. The original use of telephone technology, and indeed its use now, was and is the result of interpretations and negotiations, not determinations.

All this is, on one level, true. However, the question that is posed by the final sentence is: what is it that these interpretations are interpretations of? While it may be the case that the telephone was not originally marketed as a means of two-party interpersonal communication, the point is that it affords that form of interaction (along with the other forms mentioned and, no doubt, others yet to be found). The interpretations and negotiations referred to are interpretations of the affordances of the artefact: the possibilities for action that it offers.

We might bring into play here a notion from conversation analysis (see Hutchby and Wooffitt 1998). In work on conventionally paired actions such as greetings, questions and answers, invitations and responses, and so on, conversation analysts often talk of the relevant 'slots' that delimit the possibilities for actions in a particular

conversational sequence. In ordinary conversation, an action hearable as an 'invitation' is something that delimits the range of possible rational actions to be produced 'next' by a co-participant in the sequence of talk. Put slightly differently, an invitation *affords* the production of a turn that is recognisable as, or can legitimately be interpreted as, an acceptance or declinature (or as a turn which attempts to evade giving an acceptance or declinature). Thus, the invitation already provides the structural possibilities for the next move in a conversation: you may choose to respond or not, but whatever you do can be heard as an action in response to the affordances offered by the prior action.¹¹

In the technology as text approach, this relationship is inverted. There, the aim is to view technologies in terms of the interpretations that are made of them by social actors of various sorts (whether designers or users); but the technologies themselves are seen as essentially empty, formless 'first moves' in the sequence.¹² It is the interpretation which makes of the technology what it is, rather than there being elements of the technology which constrain the possible range of interpretive moves that can be made in 'second' position. It is this idea of technology as a *tabula rasa*, which is only given meaning and structure through actors' interpretations and negotiations, that the concept of affordances allows us to challenge.

To focus on affordances in this way is to accept the realist position that there are features of artefacts that are not constructed through, or retrievable only by means of, accounts. In my view, it is these features which provide the very conditions of possibility for competing accounts to be sensibly made. However, this is not to fall back into a form of reductionism or determinism, because it is not to claim that human actors are necessarily caused to react in given ways to technological forms. Rather, it is to stress that the range of possibilities for interpretation and action is nowhere near as open for either 'writers' or 'readers' as the technology as text metaphor implies.

What I am proposing is a shift in analytic focus for the sociology of technology: a change in empirical footing. Rather than restricting the analytic gaze to the construction of accounts and representations of the technology, we need to pay more attention to the material substratum which underpins the very possibility of different courses of action in relation to an artefact; and which frames the practices through which technologies come to be involved in the weave of ordinary conduct. At this level, a quite different range of issues becomes relevant. When people interact through, around or with technologies, it is necessary for them to find ways of managing the constraints on their possibilities for action that emerge from those artefacts' affordances. As a way of illustrating the point, I will conclude by briefly reconsidering a case study from the literature on technologies as texts. This will show how a focus on affordances raises a different set of empirical questions to those encouraged by an anti-essentialist focus on interpretive negotiations.

Technologies and users: A case study revisited

One of the most significant notions in the anti-essentialist sociology of technology has been that of ‘configuring the user’ (Woolgar 1991b; Grint and Woolgar 1997:65–94). This is a particularly clear example of the treatment of technological forms as *tabulae rasa*. Based on the development and marketing of a new computer model designed to cater for the education sector, this case study looked at the range of processes through which the computer-as-text is ‘written’ in such a way that an ideal model of its proposed users is ‘enshrined in the artefact’ (Grint and Woolgar 1997:91). Such a process involves the manufacturing company inscribing boundaries around the artefact as a worldly presence and attempting thereby to configure the user such that s/he can only meaningfully encounter the technology on the company’s terms.

A crucial place where this boundary work is tested is in so-called usability trials, in which companies recruit panels of potential users, set them various ‘real world’ tasks and then observe and measure the ease, or otherwise, with which the prescribed task was carried out. Grint and Woolgar (1997:87–92) focus on a particular episode in which one trial user, Ruth, is asked to connect a printer to the newly designed computer (the rationale being that this would be something that ‘real world’ users would inevitably seek to do at some point). After consulting the manual for some time, moving the booklets from the front to the back of the machine, and scrutinising the devices she is confronted with, Ruth eventually gives up and asks the observer (Nina, a company employee) for help:

R: (this point) oh gosh [4-second pause] hmmm [7-second pause] I must be extremely thick I I can’t see where this plug goes (plugs in), at all. I’m going to ask for help Nina ha on this one hahahahahuhh

[Grint and Woolgar 1997: 89]

The subsequent interaction reveals that the designers have mistakenly asked Ruth to connect a printer to the new computer using a lead designed for use with a previous model: hence it is not possible for her to carry out the task as required. For Grint and Woolgar this is a particularly clear example of the ‘machine being treated as a text which Ruth is asked to interpret’ (1997:89): ‘An adequate interpretation will make the instructions, the printer and Ruth all part of the (larger) machine’ (1997:90).

How might a focus on affordances lead towards a different understanding of what is going on in this scene? Grint and Woolgar (1997:91) argue that:

It would be easy to misunderstand what is at stake by way of a crude summary that . . . the ‘actual’ character of the socket/lead ‘determined’ the [participants’] actions . . . however, the transcript emphasises that participants did not have access to this transcendental, objective socket/lead. Instead they were preoccupied with assessing what the socket/lead was. Its character is the upshot of interaction involving complex considerations of identity and authority: who speaks for the machine and when?

What is missed in this interpretation is precisely the sense in which Ruth's interaction with the machine is underpinned by a material substratum in which she encounters, not a text, but an array of affordances. For example, one of the affordances of the socket at the back of the computer is that a lead with a similarly shaped connector can be inserted into it; similarly, the connector at the end of the lead has as one of its affordances that it may be inserted into a similarly shaped socket. These affordances may be reinforced by illustrations in the manual (though it is not clear whether the manual is, in fact, illustrated: reference is made to what Ruth 'reads' in the manual and what she 'sees' on the machine (Grint and Woolgar 1997:89)). But undoubtedly they are also available as a result of Ruth's everyday experiences of 'plugging devices in'. Ruth's ultimate failure to accomplish the task as set is, indeed, due to the fact that connector and socket are technically incompatible. She is not, it seems, able to identify an observably appropriate socket/lead match among the available choices. We are not told whether she actually attempts any connection or is simply baffled by the unavailability of a socket that 'looks right'. Nevertheless, among the array of affordances that the artefact confronting Ruth possesses, these particular ones *are* observably available to her and she *can* attempt to carry out actions within the framework that they make available.

Thus, I argue that Ruth did indeed have access to (at least some of) the 'actual' properties of the socket and lead – though that does not mean that those properties necessarily determined her actions and behaviour. Rather, those properties (the affordances) framed her actions in relation to the machine. While Grint and Woolgar's textual metaphor leads them to focus on issues of identity and authority in claims to speak 'for' the machine – in other words, to prioritise representations over practices – an emphasis on the interface between ordinary action and the affordances of artefacts leads to a different set of empirical concerns. In this case, the issue would be to observe in close detail, using the video evidence,¹³ the ways in which Ruth brings to bear her ordinary competencies in attempting to accomplish the activity of plugging the printer in. In contrast with Grint and Woolgar's assertion that the participants are engaged in trying to find out what the technologies 'are', I would favour an orientation which stresses that Ruth is engaged in discovering how the technologies' available affordances for 'plugging in'/'being plugged into' can be brought into operation in order to carry out the task as set. Where her problem arises is not in the (wrongly) configured relationship between herself and the computer, but in the mismatch between the affordances and the task.

To focus on such a mismatch in terms of whether the 'entities can be said to stand in an adequately configured relation to the machine' (Grint and Woolgar 1997:90) is to distract from the ordinariness of the actions revealed in the scenario. By that, I do not mean to downgrade Ruth's actions, but rather to emphasise that a vital aspect of *what* it is that she is doing is obscured under the sociological gloss of the text metaphor. How exactly might her actions in this case of 'plugging a device in' differ

from, or be similar to, her actions in other everyday situations in which she plugs in a technological device? How does she actually engage in *finding* that the lead does not plug into the socket? Looking at it from this angle tells us something about how the relationship between user and technology is bounded not so much by a politics of speakership and representation, but by ordinary practices interfaced with material enablements and constraints.

Conclusion

My aim has been to argue for an acceptance that our interpretations and uses of technological artefacts, while important, contingent and variable, are constrained in analysable ways by the ranges of affordances that particular artefacts possess. The social constructivist consensus has usefully brought to the forefront the recognition that social processes are involved in all aspects of technology, and not simply in its effects upon society. But we can become too fixated on the social shaping of technology at the expense of an equally pressing, though differently framed, concern with the technological shaping of social action.

The position I have taken up may seem redolent of some of the more 'common-sensical' notions of objectivism, or what Edwards, Asmore and Potter (1995) refer to as 'bottom line' arguments against relativism. It may also seem perilously close to a return to technological determinism: to a view that the reality of artefacts is something that imposes itself on the passive human user.

In fact it is none of these things. By introducing the concept of affordances, I have been able both to avoid the arbitrariness of the radical constructivist position, with its single-minded view that the discourses surrounding technologies are the only phenomena with any possible sociological (and social) relevance; and to evade the equally unilateral epistemology associated with technological determinism. The affordances of an artefact are not things which impose themselves upon humans' actions with, around, or via that artefact. But they do set limits on what it is *possible* to do with, around, or via the artefact. By the same token, there is not one but a variety of ways of responding to the range of affordances for action and interaction that a technology presents. We can analyse the development of those responses empirically, but in order to do so we have to accept that technological artefacts do not amount simply to what their users make of them; what is made of them is accomplished in the interface between human aims and the artefact's affordances.

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NOTES

1. It has to be recognised that there is a certain element of mythologising in social constructivist attempts to identify 'technological determinists'. From Marx onwards, it is not clear that any of the writers who tend to be situated in this category explicitly made the claim that technological change *determines* social change. Even those sociologists most often cited as true technological determinists turn out, on closer examination, not to be the crude reductionists they are caricatured as.
2. For introductions to the key terms of this debate, see Hollis and Lukes (1982), Pickering (1992), and Lynch (1993).
3. A series of case studies is discussed in Hutchby (2000).
4. The authors come close to stating such a policy in their remark that: 'In disassociating the upshot of reading and interpretation from any notion of the inherent quality of the text . . . we do not mean to suggest that any reading is possible (let alone that all readings are equally possible), although in principle this is the case' (Grint and Woolgar 1997:72–3).
5. In an earlier article, Woolgar (1983) was critical of this very tendency in social constructivist sociology of science. However, beyond suggesting that embracing playful irony might offer a useful strategy for dealing with the persistent methodological problem of a gap between sociologists' accounts of reality and the reality they are meant to account for, that article was self-consciously 'negative in the sense that while expressing deep reservations about the constructivist perspective . . . it [did] not advance an alternative' (p. 263). In the more recent work discussed in the present article, the playful irony is indeed present (in the form of what the authors now call 'analytical scepticism'), but the grounds on which the irony is built, more often than not, involve that same juxtaposition of competing representations.
6. In fact, as Gibson himself points out at one stage, the very word 'affordance' is an invention of his, and not to be found in any standard English dictionary.
7. This does not mean, however, that affordances are always, or necessarily, directly perceived. See the discussion below.
8. For a critical discussion of Gibson's thinking along these lines, see Sharrock and Coulter (1998).
9. That is, I am not suggesting these are lacunae in Gibson's account. Rather, in his concern to pursue his position in terms of debates within the psychology of perception, Gibson was led to focus on issues of 'direct perception', 'ecological specification of information' and other technical issues at the expense of other possibilities that the concept itself affords.
10. Chabaud-Rychter (1995) attempts to conjoin an approach deriving from the technology as text metaphor with a recognition of the significance of affordances. However, her concern is still with the configuring practices of designers and manufacturers and not, as I am arguing for here, with the material practices of users.
11. Within the strict terms of conversation analysis it is more accurate to say that the first and second moves in such paired action sequences are reflexively related: in responding with 'Sure' you thereby help in the constitution of your interlocutor's utterance, 'You wanna come over?' as an invitation, since there is apparently nothing in the syntax of that sentence that makes it an 'invitation'. Yet it seems clear that this could not simply be a retrospective relationship. There *is* something about the phrase 'You wanna come over?' that makes it more readily hearable as an invitation, making an acceptance or declination relevant in next turn, than as a greeting, for example. Hence, one would not ordinarily respond to it with, 'Not too bad, and you?'

12. I am grateful to Michael Lynch for suggesting this way of putting the comparison.
13. I should note that I do not have the video data available to me.

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