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Studies in Sociotechnical Change

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Abraham &
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edited by Wiebe E. Bijker and John Law

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Contents

Preface ix

General Introduction 1
Wiebe E. Bijker and John Law

I
DO TECHNOLOGIES HAVE TRAJECTORIES?
Introduction 17

1
The Life and Death of an Aircraft: A Network Analysis of Technical Change 21
John Law and Michel Callon

2
What's in a Patent? 53
Geof Bowker

3
The Social Construction of Fluorescent Lighting, or How an Artifact Was Invented in Its Diffusion Stage 75
Wiebe E. Bijker

humans (yes, you sociologists, there are also relations among things, and *social* relations at that).

24. For the study of user's manual, see Norman 1988 and Boullier, Akrich, and Le Goaziou 1990.

25. Re-inscription is the same thing as inscription or translation or delegation, but seen in its movement. The aim of sociotechnical study is thus to follow the *dynamic* of re-inscription transforming a silent artifact into a *polemical* process. A lovely example of efforts at re-inscription of what was badly pre-inscribed outside of the setting is provided by Orson Welles in *Citizen Kane*, where the hero not only bought a theater for his singing wife to be applauded in, but also bought the journals that were to do the reviews, bought off the art critics themselves, and paid the audience to show up—all to no avail, because the wife eventually quit. Humans and non-humans are very undisciplined no matter what you do and how many predeterminations you are able to control inside the setting.

For a complete study of this dynamic on a large technical system, see Law (this volume and in preparation) and Latour (forthcoming).

26. The study of scientific text is now a whole industry: see Callon, Law, and Rip 1986 for a technical presentation and Latour 1987 for an introduction.

27. The linguistic meaning of a paradigm is unrelated to the Kuhnian usage of the word. For a complete description of these diagrams, see Latour, Mauguin, and Teil (1992).

28. I am grateful to Berward Joerges for letting me interview his key and his key holder. It alone was worth the trip to Berlin.

29. Keys, locks, and codes are of course a source of marvelous fieldwork for analysts. You may for instance replace the key (excorporation) by a memorized code (incorporation). You may lose both, however, since memory is not necessarily more durable than steel.

A Summary of a Convenient Vocabulary for the Semiotics of Human and Nonhuman Assemblies

Madeleine Akrich and Bruno Latour

Semiotics: The study of how meaning is built, but the word “meaning” is taken in its original nontextual and nonlinguistic interpretation; how one privileged trajectory is built, out of an indefinite number of possibilities; in that sense, semiotics is the study of order building or path building and may be applied to settings, machines, bodies, and programming languages as well as texts; the word socio-semiotics is a pleonasm once it is clear that semiotics is not limited to signs; the key aspect of the semiotics of machines is its ability to move from signs to things and back.

Setting: A machine can no more be studied than a human, because what the analyst is faced with are assemblies of humans and nonhuman actants where the competences and performances are distributed; the object of analysis is called a setting or a setup (in French a “dispositif”).

Actant: Whatever acts or shifts actions, action itself being defined by a list of performances through trials; from these performances are deduced a set of competences with which the actant is endowed; the fusion point of a metal is a trial through which the strength of an alloy is defined; the bankruptcy of a company is a trial through which the faithfulness of an ally may be defined; an actor is an actant endowed with a character (usually anthropomorphic).

Script, description, inscription, or transcription: The aim of the academic written analysis of a setting is to put on paper the text of what the various actors in the settings are doing to one another; the de-scription, usually by the analyst, is the opposite movement of the in-scription by the engineer, inventor, manufacturer, or designer (or scribe, or scripter to use Barthes's neologism); for instance, the heavy keys of hotels are de-scribed by the following text DO NOT FORGET TO BRING THE KEYS BACK TO THE FRONT DESK, the in-scription being: TRANSLATE the message above by HEAVY WEIGHTS ATTACHED TO KEYS TO FORCE

CLIENTS TO BE REMINDED TO BRING BACK THE KEYS TO THE FRONT DESK. The de-scription is possible only if some extraordinary event—a crisis—modifies the direction of the translation from things back to words and allows the analyst to trace the movement from words to things. These events are usually the following: the exotic or the pedagogic position (we are faced with a new or foreign setup); the breakdown situation (there is a failure that reveals the inner working of the setup); the historical situation (either reconstructed by the analyst through archives, observed in real time by the sociologist, or imagined through a thought experiment by the philosopher); and finally the deliberate experimental breaching (either at the individual or the collective level). No description of a setting is possible or even thinkable without the mediation of a trial; without a trial and a crisis we cannot even decide if there is a setting or not and still less how many parts it contains.

Shifting out, shifting in: Any displacement to another frame of reference that allows an actant to leave the ego. hic. nunc—shifting out—or to come back to the departure point—shifting in. For narratives there are three shiftings: actorial (from “I” to another actor and back), spatial (from here to there and back), temporal (from now to then and back); in the study of settings one has to add a fourth type of shifting, the material shifting through which the matter of the expression is modified (from a sign FASTEN YOUR SEAT BELT, for instance, to an alarm), or from an alarm to an electric link between the buckle and the engine switch, or, conversely, from an electric current to a routinized habit of well-behaved drivers; the first direction is called shifting down (from signs to things) and the other shifting up (from things to signs).

Program of actions: This term is a generalization of the narrative program used to describe texts, but with this crucial difference that any part of the action may be shifted to different matters; if I write in a text that Marguerite tells Faust, “Go to hell,” I am shifting to another frame of reference inside the narrative world itself without ever leaving it; if I tell the reader, “go to page 768,” I am shifting already away from the narration, laterally so to speak, since I now wait for the reader-in-the-flesh to do the action; if I then write the instruction, “go to line 768,” not to a reader but to my computer, I am shifting the matter of the expression still more (machine language, series of 0 and 1, then voltages through chips); I do not count on humans at all to fulfill the action. The aim of the description of a setting is to write down the program of actions and the complete list

of substitutions it entails and not only the narrative program that would transform a machine in a text.

Antiprograms: All the programs of actions of actants that are in conflict with the programs chosen as the point of departure of the analysis; what is a program and what is an antiprogram is relative to the chosen observer.

Prescription; proscription; affordances, allowances: What a device allows or forbids from the actors—humans and nonhuman—that it anticipates; it is the morality of a setting both negative (what it prescribes) and positive (what it permits).

Subscription or the opposite, de-inscription: The reaction of the anticipated actants—human and nonhumans—to what is prescribed or proscribed to them; according to their own antiprograms they either underwrite it or try to extract themselves out of it or adjust their behavior or the setting through some negotiations. The gap between the prescriptions and the subscriptions defines the presence or absence of a crisis allowing the setting to be described; if everything runs smoothly, even the very distinction between prescription and what the actor subscribes to is invisible because there is no gap, hence no crisis and no possible description.

Pre-inscription: The competences that can be expected from actors before arriving at the setting that are necessary for the resolution of the crisis between prescription and subscription.

Circumscription: The limits that the setting inscribes in itself between what it can cope with—the arena of the setting—and what it gives up, leaving it to the preinscription. The glass walls of a bar circumscribe the setting; the word “end” at the end of a novel circumscribes the text; the rigid photovoltaic cell kit circumscribes itself and keeps away “idiots” with whom it cannot cope.

Conscription: It is never clear where the “real” limits of a setting are even though it has inscribed precise walls to itself—a book does not end with the word “end” no more than a bar stops at its glass wall; conscription is the series of actors that have to be aligned for a setting to be kept in existence or that have to be aligned to prevent others from invading the setting and interrupting its existence; it is what makes the pre-inscription more favorable for a setting; it is the network effect of any setting, its tendency to proliferate (the book needs librarians, publishers, critics, and paper, and the bar needs whiskey manufacturers, advertising, a heat spell, socializing buddies, etc.)

Interface or plugs: The many gaps between preinscription, circumscription, and conscription are tentatively limited by plugs, sieves,

“decompression chambers,” or more generally interfaces; when a setting is largely made of materialized interfaces, it looks like a network in the technological meaning of the word: electricity, telephones, water distribution, and sewage systems are peculiar settings that have a network shape.

Re-inscription: The same thing as inscription but seen as a movement, as a feedback mechanism; it is the redistribution of all the other variables in order for a setting to cope with the contradictory demands of many antiprograms; it usually means a complication—a folding—or a sophistication of the setting; or else it means that the complication, the sophistication is shifted away into the pre-inscription; the choices made for the re-inscription defines the drama, the suspense, the emplotment of a setting.

Redistributing competences and performances of actors in a setting: The new point of departure for observation instead of the divide between humans and nonhumans; the directions of this redistribution are many: extrasomatic, intrasomatic; soft-wire, hard-wire; figurative, nonfigurative; linguistic, pragmatic; the designer may shift the competence IS AUTHORIZED TO OPEN THE DOOR either inside a key (excorporation) or inside a memorized code (incorporation); the code itself may be soft-wired or hard-wired (tied to a nursery rhyme, for instance); the task of opening the door may be either shifted to humans or to nonhumans (through the figurative attribution of electronic eyes); the basic competence for opening the door may either be written down through instructions, (linguistic level) as for airplanes, or shifted to the pragmatic level (emergency one-way exit doors that open when pressed upon by a panicked crowd).

A setting is thus a chain of H(umans) and N(onhumans), each endowed with a new competence or delegating its competence to another: in the chain one may recognize aggregates that look like those of traditional social theory: social groups, machines, interface, impact.

Ascription: The attribution process through which the origin of the activity of the setting is finally decided in the setting itself; it is not a primary mechanism like all the others but a secondary one; for instance, the movement of the setting may be ascribed to the autonomous thrust of a machine, to the Stakhanovist courage of workers, to the clever calculations of engineers, to physics, to art, to capitalism, to corporate bodies, to chance, etc.

Scribe, enscriber, scripter, designer, or author: Who or what is the designer of a setting is the result of a process of ascription

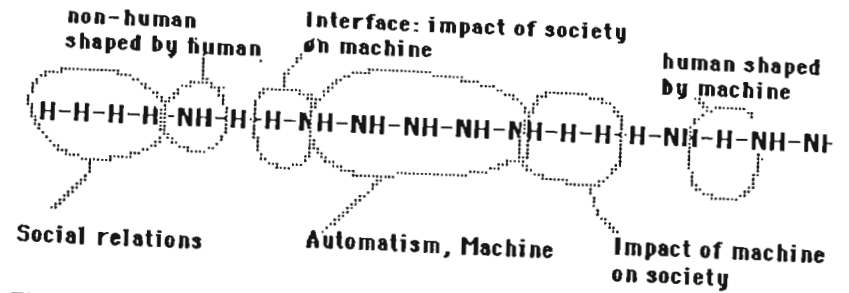


Figure 9.1

The usual categories that sharply divide humans and nonhumans correspond to an artificial cutting point along association chains. When those are drawn, it is still possible to recognize the former categories as so many restricted chains. If we replace H and NH by the name of specific actants, we obtain a syntagm. If we substitute a specific name for another, we obtain the shifting paradigms.

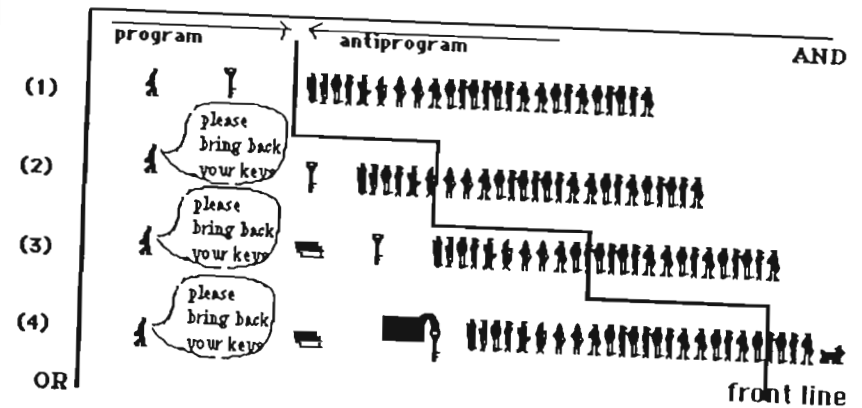


Figure 9.2

The hotel manager successively adds keys, oral notices, written notices, and finally metal weights; each time he thus modified the attitude of some part of the “hotel customers” group while he extends the syntagmatic assemblage of elements.

or attribution; but this origin may be inscribed under many guises in the setting itself—trademarks, signatures, legal requirements, proofs that standards are fulfilled, or more generally what the industry calls “traceability”; the blackest of black boxes are illuminated with such inscriptions.

AND (syntagmatic, association, alliances); OR (paradigmatic, substitution, translation): The two fundamental dimensions for following the reinscription of a setting, hence its dynamic or history; the oral or written message BRING YOUR KEY BACK TO THE FRONT DESK is not necessarily obeyed—antiprogram; the shift from keys to weights ties the clients to the front desk because they have a heavy load in their pockets; other antiprograms will appear that will have to be defeated; the front line between programs and antiprograms maps out the plot of a script and keeps track of its history.

Technology, Testing, Text: Clinical Budgeting in the U.K. National Health Service

Trevor Pinch, Malcolm Ashmore, and Michael Mulkey

Defining Technology

Technology, unlike science, is everywhere. We use it—to obtain crisp five-pound notes from the automated bank teller; we talk about it—praising the quality of our latest compact disc recording; we write about it—in an attempt to build our careers in the sociology of technology; we construct fantasies around it—such as when one of the editors of this collection drops us at the station in his 1938 Citroen and surprised Dutch people look up to see which movie stars have arrived in town; we may live by it—the dialysis machine; and, we may die by it—the ballistic nuclear missile. As Langdon Winner (1977) remarks, “technology is a word whose time has come.”

Providing a definition of something that is so much a part of the fabric of our everyday lives is to offer a hostage to fortune. The editors of *The Social Construction of Technological Systems* (Bijker, Hughes, and Pinch 1987, 3–4) deftly dealt with this problem by refusing to offer an explicit definition. Instead they gave us a series of paradigmatic cases intuitively taken to be technologies. Certainly the artifacts described in that volume—such as bicycles, nuclear missiles, and cooking stoves—would figure on most people’s lists as examples of technologies. But we should be careful. Technology like all other terms is indexical—it takes its meaning from its use. Items are classed as technologies for particular purposes. A pertinent example comes from work on gender and technology. Ethnographic studies of technology in the home show that if women are asked to classify which items they consider to be technologies, the home computer will almost certainly be included whereas the cooking stove almost certainly will not.¹ What counts as a technology can itself be contested.

The appeal to intuition works even less well for the object of