

## **Between Reason and Experience: Preface to the Chinese Translation**

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### **Introduction**

The explanation of the original title of this book is helpful for understanding its basic theme. “Reason” in the title refers to rational technical disciplines, while experience means the lifeworld of everyday preferences, beliefs, and tastes. These are two seemingly alien dimensions of every technical design. The question of the book is: how do reason and experience combine and communicate in the technological realm?

The answer to this question is found in the methods of constructivist science and technology studies. According to constructivism, purely rational considerations do not determine “one best way” to make a device. Technical disciplines yield multiple alternatives and social criteria select among them the one that is actually realized. Many of the important choices are made by those with official authority over the design process, for example, the regulators, managers and owners of businesses.

But the public also has input into the selection. In this case communication is established between the apparently alien realms. We are of course familiar with market inputs by which consumers express their preferences individually, but there are also collective demands for new functions and changes in design. The technical environment has been transformed by protests, boycotts, demonstrations, public hearings, and the popular uptake of the results of hacking. These public inputs have a democratic character because they represent the values of the population at large and not merely the interests of business or the experts.

My book concerns the nature of these democratic inputs and how they relate to the technical disciplines. Hence the title, *Between Reason and Experience*, which situates technology in its ambiguous place in the social system. I address the question of technology so formulated with many concrete examples such as the history of steam boilers, Japanese modernization, the French Minitel system, and information technology. I evaluate and borrow from many different theories including constructivist technology studies, cost-benefit analysis, Kuhn, Habermas, Heidegger, and Marcuse. The question of the democratization of technology is thus approached from many angles, three of which I will discuss in this preface. These are the relation of technocracy to public agency; critical methods for the study of technology; and finally philosophical aspects of the relation of technology to the lifeworld.

### **Technocracy and Democracy**

The background to discussions of democratization of technology is its opposite, the technocratic project of modern societies. The idea of technocracy dates back to Saint-Simon in the early 19th century but it only becomes influential after World War II. Then it was widely believed that expert rule would

replace politics in advanced societies. The aspiring technocrats assumed implausibly that everything debated in the public sphere is ultimately a technical problem. They also assumed that all technical problems can be solved by a context free, neutral, instrumental rationality. This was truly the end of ideology, the reduction of values to facts.

The “reason” of the title is of course not the only form of rationality but it is the one specifically idealized by the technocrats. In modern societies it takes the form of technical disciplines, broadly defined. These disciplines are not to be confused with actual sciences although they use scientific results and methods. But technical disciplines combine these scientific borrowings with many other elements drawn from social, legal, and traditional sources. For example, dietetics draws on the science of physiology but also bows to traditional food preferences. Architecture employs engineering methods and concepts combined with an aesthetic. And so on.

I call such quasi-scientific disciplines or institutions “socially rational.” By social rationality I mean a formal procedure or institution that resembles science and mathematics but is not *essentially* scientific or mathematical. There are three types of social rationality. The exchange of equivalents resembles mathematical equations. It characterizes the market where money is traded for goods, and is employed in all technical disciplines in the form of quantification and calculation. The classification and application of rules resembles the scientific identification of phenomena and the application of scientific laws. Bureaucracies are characterized by this simulacrum of scientific rationality. Again, technical disciplines apply such an approach to their objects. Finally, optimization is a procedure which involves calculation and control of resources and devices. Business is constantly engaged in attempts to optimize its activities.

In all these cases of social rationality reality, ideology and values penetrate technical disciplines and designs. The technical sphere is not context free or neutral but is underdetermined by purely technical considerations. Value controversies cannot be reduced to technical problems because technology is already a valuative enterprise. Consider for example the role of aesthetics in the design of automobiles and the ethical debates in medicine about abortion and patient rights. Every field of technology reveals similar admixtures of values and facts in the design of devices and systems.

It is thus not surprising that the rise of the technocratic idea was soon accompanied by a new politics of technology. Both respond to the generalization of technical mediation throughout all the institutions of the society. Technical mediation creates the terrain on which the technocrats feel at home, but it also creates new types of social groups which react to the technologies that link together users, workers or victims of side effects.

Some of these technically based groups are latent, while others are immediately visible. For example, workers in a factory, brought together by a production technology, are perfectly aware that they form a group. Groups such as these have been active through the labor movement and other organizations for centuries. By contrast patients suffering from a given disease are an example of a latent group brought into being by the technical system of the medical

institution that treats them all. That system forms an unconscious technical link between them which might exceptionally become the basis for conscious group formation. Today, the failures of the technocracy such as pollution and medical abuses result in such exceptions becoming commonplace.

This is partly due to information technology, which enables people to communicate easily across distances and social barriers. Increasingly, the experience of users and victims of technology is brought to bear on the design process. They can now protest more effectively against the harms of technology. And hackers can actualize ignored potentials of technology that were not understood by the experts who originally participated in the design process. The introduction of communication on computer networks, beginning with the Minitel in France, is the most important example of the latter effect.

These considerations on the limits of social rationality explain why experience figures in the original title of the book. Experience, in this sense, refers to the everyday world. Today that world is technological. Technologies are not merely tools; they create our environment, encompassing us and shaping our lives. As a result we have extensive experience with technologies. This experience is the basis of a specific form of technical knowledge available to ordinary people. This is an empirical knowledge based on direct contact with the technical environment rather than a formalized knowledge such as experts possess. It shows up in many contexts, for example in complaints about pollution, but also in useful ideas about how to improve computer interfaces.

This knowledge provides the basis for opinions and interventions in the world of technology. In recent years opinion formation and intervention has become a commonplace. Technology has entered the public sphere as protests over environmental and medical issues have multiplied, and hacking has transformed the computer into a medium of communication. The generalization of such interventions raises the possibility of a more democratic organization of technological society in which the interaction between technical disciplines and lifeworld experience would be routine rather than appearing exceptional as it still does today.

### **Questions of Method**

The critical theory of technology is based on a combination of ideas drawn from constructivist technology studies, phenomenology, and Frankfurt school critical theory. Why this combination? I first studied Heidegger but found his writings on technology too abstract and apolitical to serve as an adequate theory. In Marcuse's version of Frankfurt school critical theory we get a little closer to reality. He envisages the possibility of technological alternatives, of different designs of the technological world, but he has no analysis of the technologies themselves. Constructivism provides the analytic tools for studying technologies, but it developed as a specialized, apolitical academic discipline, without a larger view of the social system within which technology functions. Attempts have been made to overcome this heritage but the results so far are rather limited.

To establish a coherent combination of my various sources, I focus on the relation of technical disciplines to the lifeworld. This relation brings out the

inherent complexity of technology reflected in these different sources. Technical disciplines work with causality while the various theoretical traditions that I draw on are primarily concerned with meaning. And in fact technical devices and systems have both causal properties and meanings determined by their place in society. Combining and coordinating the two in practice yields specific designs. It ought therefore to be possible to combine and coordinate them theoretically in the analysis of technology.

The term I have introduced to signify the intersection of causality and meaning is “technical code.” A technical code is a technical specification that corresponds to a social meaning. Here is an example. The technical specification governing the size of refrigerators is specified by the manufacturer in accordance with the family size and urban structure of the market in which the refrigerators will be sold. Large families with freeways connecting homes to supermarkets need big refrigerators. Whereas a city like Paris, where families are small and people walk to stores, needs much smaller refrigerators. The technical specification of size therefore encompasses a whole urban and family sociology.

Here is a more complex example that shows the role of cultural tradition in technological design. Fax machines were originally designed in the United States as office equipment. The early machines were very large and expensive. The Japanese got hold of the idea and, inspired by a traditional interest in miniaturization, transformed the fax machine into a small and affordable consumer product. The new technical specification of the fax machine followed an alien cultural impulse and reached new markets.

These examples point to an important methodological principle. Technologies are not organic wholes like animals and plants. They are concatenations of functional elements that correspond to the various social influences on design. The functions they serve depend on social influences, meanings. These functions appear as layers in the constitution of the technological assemblage.

The implications of this approach to the study of technology were explored in depth by the philosopher of technology Gilbert Simondon. Simondon argued that technology has an inherent tendency to combine functions in a reduced number of structures. The initial designs of a technology are “abstract” in the sense that each function is assigned a separate structure. But as the technology evolves, clever combinations of functions in fewer structures simplify the device and improve its efficiency. Simondon calls this “concretization.” The layers can still be distinguished but only analytically once they have been effectively concretized in a single structure. Simondon gives the example of the air cooled engine which combines cooling and containment of the cylinders in the engine case, designed both to protect the engine and to dissipate heat.

Simondon's examples tend to be like this one, purely technical, but we can easily substitute examples that have a wider social significance. Often when cost-benefit analysis is applied to proposed environmental reforms, the assumption is made that compliance with new environmental standards will require the introduction of new structures, increasing costs and reducing efficiency. The combination of layers may indeed complicate a technology in a

way that reduces its efficiency, but it is also possible to combine layers through innovation to create a more streamlined and efficient device.

I formulate the basis of this methodological approach in what I call the “instrumentalization theory.” The “primary instrumentalization” operates at the causal level. It decontextualizes phenomena for incorporation into a device. In Heideggerian terms we could say that it “de-worlds” aspects of nature by separating them from their natural surroundings to reconstitute them functionally. At the same time, the primary instrumentalization situates the subject in a technical relation to the world.

The “secondary instrumentalization” operates at the level of meaning. It re-worlds the elements of nature extracted by the primary instrumentalization, integrating them to the social world. Simultaneously it orients the technical subject toward the social meanings realized by the technology. Because these are meanings, they are apprehended in a hermeneutic relation which allows differences of interpretation, awareness and criticism. The secondary instrumentalization enables initiatives beyond the intended use of the technology. The two instrumentalizations are distinguishable analytically in the design of technical devices and systems. At each stage primary instrumentalizations are involved in the causal processes of construction and secondary instrumentalizations control and channel the application of causal powers in a specific direction.

### **Technology and Lifeworld**

Here is a story which illustrates the difference between technical practice and the practice involved in the politics of technology. Suzuki tells of two sword-makers in medieval Japan. Muramasa is the disciple of the great master, Masamune. Both are famous for the sharpness of their swords. A samurai compared their swords to determine which was superior. He plunged the Muramasa sword into a rushing stream. As leaves drifted toward the sword they were sliced in two at contact with the blade. He then plunged Masamune's sword into the same stream. The leaves parted around the blade. The samurai concluded that Masamune's sword was superior because it went beyond the mere application of technical power, changing the nature of the sword from a murderous instrument into a peacemaker. On my terms, this story is a mythic representation of the idea of a practice that alters the meanings of technologies rather than simply applying them technically

This distinction can be clarified by a more detailed consideration of the relation of technology and lifeworld. The concept of lifeworld is derived from phenomenology where it was developed by Husserl and Heidegger. It describes the system of meanings within which subjects move in their daily lives. Husserl argued that the lifeworld is the foundation and source of scientific concepts. Heidegger used the simple term “world” for something similar. Heidegger's world has to do with the practice of enacted meanings, especially the meanings that guide and are embodied in everyday coping with reality.

Technical disciplines and experience with technologies can be understood in terms of these concepts of world. Technical disciplines are founded on

lifeworld sources as Husserl would argue, and experience with technology reflects practices that enact meanings as Heidegger would claim. The concept of lifeworld is thus useful for the study of technology.

However in modern societies the lifeworld is not the whole world. Modern societies are differentiated in the sense that various functions have been split off from the lifeworld. They appear as specializations based on competences or systems such as the market. Technical disciplines are an obvious example of differentiation. They achieve a partial independence of the flux of lifeworldly opinion and action through the application of socially rational procedures. But they synthesize quasi-scientific and lifeworld inputs in a coherent formally consistent whole and so are still deeply embedded in the lifeworld. Invention is the product of such syntheses.

The lifeworld too is differentiated in modern societies in the sense that it no longer includes much of the technical knowledge required by the devices in daily use. Albert Borgmann's notion of the "device paradigm" explains this disburdening of the lifeworld of many technical tasks. Nevertheless, the differentiation of the lifeworld is only partial. Experience with technologies is a source of a unique technical knowledge from below. Every user knows things about his computer that he wishes the designer had known when he designed it.

Technologies are thus the objects of two forms of knowledge, neither of which is complete. The incompleteness shows up in the following ways. On the one hand technical disciplines have a historical heritage of social inputs which is largely forgotten as experts reformulate them as technical specifications in technical codes. That heritage may blind the experts to effects of their activities on victims who were silenced in an earlier era. On the other hand the lifeworld lacks formal technical knowledge but has knowledge of side effects, contexts, and potentials that may have been ignored by the experts. Together these two forms of knowledge complement each other although in practice they are often seen as conflicting.

These considerations set up the modern contrast that corresponds to the swords of the disciple Murasaki and the master Masamune. Technical devices are meant to be used technically for a purpose inscribed in their design. Like the swords of Murasaki, they are valued if they do their job well. But in the process of invention by technical experts and in the course of reinvention by users, victims and hackers, the very purposes are transformed. Technologies are themselves the objects of a higher order practice which is not itself technical. Like the swords of Masamune, this is an action that addresses meanings, not things. It is the specific form of creative practice belonging to the secondary instrumentalization as it is lived in the everyday lifeworld.

The last chapter of my book develops these themes through the contrast between Heidegger's late philosophy of technology and Marcuse's critical theory. Heidegger argues that the lifeworld is completely overwhelmed by technology. Creative practice is no longer possible. Everything has become an object of technique which, in a modern context, means a raw material or component in a technical system that "challenges" nature to deliver over its powers for human purposes. Human beings too are incorporated into the system and no longer

recognize themselves as the locus of recognition of meaning. Heidegger sees no way out of this situation. He rather hopelessly calls for a “free relation” to technology but this is not a reform program. It seems to mean nothing more than living with the existing technology in a different, presumably more philosophical, spirit.

Marcuse was an early Heidegger student, but soon broke with Heidegger and joined the Frankfurt School of Critical Theory. In the 1960s Marcuse’s radical philosophy of technology shows Heidegger’s influence. Marcuse too sees the complete destruction of the lifeworld by a technological “apriori” that treats everything as manipulable and fungible material for production and consumption. The inherent potentialities of people and things are ignored as they are integrated to the machinery of capitalism. Unlike Heidegger, Marcuse holds out the possibility of a transformation of technology. It is at least possible in principle for human beings to introduce new valuative considerations into the design of technologies, bending them to benign purposes and creating a life-affirming environment.

Marcuse witnessed the beginnings of the environmental movement and saw in it a confirmation of his critique, with its promise of possible transformation. Indeed struggles over technology have multiplied in advanced societies and now appear daily on the front page of the newspapers. This development broadly confirms both the idea of invasive technification explored by Heidegger and Marcuse, and the hoped for resistance Marcuse anticipated. Experience with these struggles and advances in the study of technology make possible a much more precise and detailed analysis of the politics of technology than either of these philosophers achieved.

The key advance is the hermeneutic perspective on the full range of meanings of technical devices. Struggles over technology are struggles over these meanings. For example, is air pollution part of the meaning of the automobile? So long as it can be ignored, nothing need be done to reduce it. The design of the automobile remains an impenetrable “black box,” indifferent to pollution. But once the public reacts and demands cleaner air, the black box is opened. It becomes clear that the design of the automobile is contingent on social and political forces. The relational dimension of what appeared as a quasi-natural thing becomes visible.

The critical theory of technology affirms the growing significance of democratic interventions in the reshaping of technologies and technical disciplines. This is a historical turning point. The industrial system evolved under an extraordinarily undemocratic system of private ownership and control of technical innovation. The few actors with influence over design dedicated technology unreservedly to the pursuit of profit. Those harmed by the side-effects of this frenetic pursuit were silenced. Only now are the silenced actors finding a voice. The consequence will be the radical transformation of industrial societies.

### **Philosophy of Technology for China**

Many Western ideas about technology and development have been applied successfully in China. But Westerners have long been critical of the

problems in their own system. Those criticisms have been effective in bringing about labor regulation and environmental protection in the West. In China this corrective aspect of Western development has been under-estimated until recently.

Industrialization in the West was pursued for a century in almost complete indifference to the welfare of workers and the natural environment. The harms suffered by the victims of progress were recognized late in the process. In China intensive industrialization has been similarly indifferent to its human and natural victims. Only now are attempts being made to right the wrongs of the industrialization process. These attempts address abuses such as contaminated food, air and water pollution, and dangerous and exploitative working conditions.

The theme of this book, the democratization of technology, is relevant to China despite the difference between its political system and the systems prevalent in the West. No government can ignore public opinion indefinitely regardless of the degree of formal democracy. The Chinese government responds to a public opinion increasingly intolerant of the bad side-effects of rapid economic development. Thus the argument for the democratization of technology presented here applies in China as in the West.

An outmoded deterministic philosophy of technology encouraged planners and business leaders to ignore the problems caused by industrialization. They routinely dismissed complaints as “unrealistic,” “utopian.” That phase of Chinese development is now ending as a new and more mature approach to the economy takes hold. A new philosophy of technology is required to understand this transition. The ideas presented in this book are proposed to a Chinese readership in the hope of contributing to that goal.