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DEMOCRACY AND TECHNOLOGY

Richard E. Sclove

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PREFACE

This book promotes the reconstruction of technology along more democratic lines. Like many books, it germinated in response to personal questions and challenges. When I was 24, I landed a job as the research assistant to a major energy policy study. The job was a plum. The senior study team included a bevy of Harvard professors, a Nobel Prize winner, a director of the World Bank, and several celebrated scientists. I attended working dinners with congressmen and senators, and conferences in Aspen, Bermuda, and Paris.

For me, there was just one problem. I gradually grew convinced that conventional approaches to policy analysis obscure many important ways that energy and other technologies can transform people's lives. I was also troubled by a sense that even the most well-intentioned, elite study group can be deeply unaware of the extent to which its conclusions embody far-reaching value judgments. The problem was not at all in how our group applied economic analysis and its other analytic methods, for the study team was dazzlingly skilled. The problem lay somewhere in the methods themselves, as well as in the social processes through which they were implemented.

These are the distant personal origins of this volume—my own quest to discover whether there are better ways to make decisions about the technologies that seem almost daily to make, unmake, and remake our world. My basic argument is simple: Insofar as (1) citizens ought to be empowered to participate in shaping their society's basic circumstances and (2) technologies profoundly affect and partly constitute those circumstances, it follows that (3) technological design and practice should be democratized.

The resulting work combines knowledge from many disciplines. It is intended primarily for anyone interested in democracy and public policy, social justice and empowerment, political economy and business, or the social consequences of technology and architecture. The book may also prove methodologically helpful to social scientists, historians, and philosophers, including those who have not previously explored the complex role of technology within social systems.

I began this work more than a decade ago, during the early 1980s—a time when U.S. technology policymaking was dominated by the Reagan administration's Cold war military preoccupations. To envision democratizing technological decisions and design under those circumstances required something of a heroic leap of faith or, at the very least, an exceptionally evolved readiness to delay gratification.

In the meantime, the world has changed in ways that were then inconceivable. For a half-century the Cold war provided the overarching setting within which U.S. science and technology policies were formulated. Thus the cold war's sudden collapse has dissolved the dominant rationale undergirding many policies and institutions. This establishes a strategic opportunity to make technology decision making and design more responsive to democratically decided social needs. Under these circumstances the requisite leap of faith diminishes appreciably.

Likewise, elsewhere in the world—in the European Community, among former Warsaw Pact nations, and in the developing world—the turn to more open or internationally integrated trade regimes, laissez-faire capitalism, or shock capitalism is inevitably producing anxieties, disappointments, and in some places catastrophes of its own. This, together with new global movements toward democracy, may also signal new opportunities and needs for creative approaches to the interrelations of technology, society, and politics.

The book's argument unfolds in three stages. Part I synthesizes two disparate bodies of knowledge. One is a corpus of recent research into the social dimensions of technology. The other is that body of knowledge and practice known as democratic theory. These domains of knowledge have only rarely been related to one another, but their combination swiftly issues in the rudiments of a comprehensive democratic theory of technology.

Part II develops a provisional system of design criteria for distinguishing technologies that are compatible with democracy from those that are not. This undertaking is unusual, for there is little precedent for using political philosophy to develop prescriptions for technological design and choice.

Part III elaborates the concept of a democratic politics of technology. Challenging the foundations of modern economic thought, I argue that the democratic theory of technology qualifies as a coherent alternative to neoclassical welfare economics. Indeed, reinvigorated democratic politics should largely supersede conventional economic reasoning as a basis for technological decisions. I review case studies of participation by laypeople in technological research, development, and design. Finally, I explore political steps and strategies that can help us achieve citizenship in a future world of democratic technology. That world—so unlike today's and yet within our reach—would witness technological evolution becoming subordinate to democratic prerogatives. It would be a world made *by* people but also *for* people, acting under circumstances more favorable to fair and informed results.

Chapter 1

SPANISH WATERS, AMISH FARMING

Two Parables of Modernity?

> I wish to . . . persuade those who are concerned with maintaining democratic institutions to see that their constructive efforts must include technology itself.
>
> —*Lewis Mumford*[1]

During the early 1970s, running water was installed in the houses of Ibieca, a small village in northeast Spain. With pipes running directly to their homes, Ibiecans no longer had to fetch water from the village fountain. Families gradually purchased washing machines, and women stopped gathering to scrub laundry by hand at the village washbasin.

Arduous tasks were rendered technologically superfluous, but village social life unexpectedly changed. The public fountain and washbasin, once scenes of vigorous social interaction, became nearly deserted. Men began losing their sense of familiarity with the children and the donkeys that had once helped them to haul water. Women stopped congregating at the washbasin to intermix their scrubbing with politically empowering gossip about men and village life. In hindsight, the installation of running water helped break down the Ibiecans' strong bonds—with one another, with their animals, and with the land—that had knit them together as a community.[2]

Is this a parable for our time? Like Ibiecans, we acquiesce in seemingly innocuous technological changes.* Unlike many of the Ibie-

*"We" in this sentence is not a royal plural. Throughout the text "we" means, depending on the context, either me (the author) and you (the reader) or else contemporary citizens generally.

cans, however, we celebrate these changes: whiter teeth, lower cost or else greater convenience, abundance, safety, or amusement. The automobile, for example, embodies a distinctively American conception of freedom. People speed through city and countryside toward adventure and opportunity. But the negative results of our many individual decisions to purchase automobiles include gridlock, air pollution, suburban sprawl, the decline of downtown centers, and dependence on insecure sources of imported oil. Did we choose these results? Do they express people's freedom, or perhaps ironically limit it?

Of course, the automobile's adverse effects were never intended, any more than Ibiecans intended to dissolve their former way of life by introducing running water. Ibiecans did not foresee the extent to which earning money to own a washing machine would mean becoming enmeshed in the external cash economy. They did not plan to remake themselves into wage laborers and consumers, nor did they plan to gradually transform their town into the suburban appendage of an encroaching urban center. For many Ibiecans, the loss of their old way of life and the consequent pain proved profound. One farmer, compelled to sell his beloved but now useless donkey, withered into permanent silence. For Ibiecans, as for everyone else, the combined result of many individual technological choices is often not what anyone anticipated.

Modern industrial nations have, of course, outdone rural villages in evolving social processes for coping with technologies' unwanted effects. On the one hand, a modest scholarly industry, steeped in economic ideas, stumps for policies to accelerate technological innovation.[3] Their objective is to enhance national economic growth, productivity, and international competitiveness, based on the assumption that as long as an innovation sells profitably, it is a social blessing. But newspapers also grant front-page coverage to controversial technological developments—to industrial disasters or to unsettling advances in genetic engineering, automation, and weaponry. The United States has an Environmental Protection Agency to regulate technologies' impact on the environment. The Occupational Safety and Health Administration is responsible for worker safety, the Defense Department supports innovations in military hardware, many government agencies forecast technological trends, Congress provides oversight and legislative initiatives, the courts offer redress for grievances, and various private and nonprofit groups strive to advance their views of the public good.

But here, too, something is missing, something so vast that it is easy to overlook: virtually the entire range of technologies' psychological, cultural, and political effects.[4] For example, newspapers, public-interest

groups, corporate leaders and governmental bodies—when they consider a technology—normally address one or more of the following four questions: Is the technology at issue technically workable? What are its economic costs and benefits, and how are they distributed? What are the associated environmental, health, and safety risks? Are there implications for national security?

Undeniably, these are important questions. Yet as a group they are incomplete, for they fail to address technologies' profound role in altering the course of history and the texture of daily life. Consider the difference it would have made to us today had our forebears learned to pose these questions—and then act responsibly on the answers—throughout the first century and a half of industrialization. The world today would be cleaner and safer; thus, in certain significant respects, we would be better off. However, our societies would still have done nothing directly to comprehend, not to mention to guide or perhaps to alter or avert, such major, technologically influenced developments as establishing the home as a place where a woman labored alone, the birth of the nuclear family, changing sexual mores, suburbanization, the development of public schools and romanticized childhood, the withering of craftsmanship, the shift from an agrarian/cyclic experience of time to a linear one, the creation of hierarchically managed national and transnational corporations, or the evolution of modern political parties.[5]

In short, with attention confined strictly to these four questions, the momentous cultural developments associated with the Industrial Revolution would have come and gone without anyone noticing. Yet these questions, which are incapable even of distinguishing actions that perpetuate an agrarian social order from those that promote revolutionary political and cultural transformation, are the very questions now imagined adequate to guide us wisely into the next century.

This complicity in technological decisions that haphazardly uproot established ways of life is as perplexing as discovering a family that shared its home with a temperamental elephant, and yet never discussed—somehow did not even notice—the beast's pervasive influence on every facet of their lives. It is even as though everyone in a nation were to gather together nightly in their dreams—assemble solemnly in a glistening moonlit glade—and there debate and ratify a new constitution. Awakening afterward with no memory of what had passed, they nonetheless mysteriously comply with the nocturnally revolutionized document in its every word and letter. Such a world, in which unconscious collective actions govern waking reality, is the world that now exists.[6] It is the modern technological world that we have all helped create.

Could it be otherwise? Are the social effects of technology truly so complex that no one could possibly foresee them, much less act cogently to guide them? Not necessarily. To demonstrate this, one can contrast both Ibieca's and contemporary American society's style of technological politics with that of an alternative social order.

The Old Order Amish immigrated to the United States during the 18th and 19th centuries. With established communities in some 20 American states, their U.S. population is more than 100,000 and growing. To the outside society they are known as a religious subculture distinguished by old-fashioned clothing, horse-and-buggy transport, and an antiquated lifestyle that rejects modern technologies. The actual story is more complex and instructive.

The Amish are a pragmatic people who accept the reality of social change and do not reject all modern technology. Hence, theirs is not a primitive folk culture that lacks awareness of alternative possibilities. On the contrary, they represent a society that is conscious of the larger world in which it is immersed and that self-consciously guides its evolution.[7] The Amish have, for example, repeatedly adopted innovations in farming technology, sometimes sooner than their non-Amish neighbors. They will hitch a ride in a non-Amish car, charter a bus and driver, or perform sums using a battery-powered hand calculator. They are also skilled technological innovators who have been known, for instance, to devise a system in which a diesel tractor powers an air compressor that, in turn, pumps refined fuel to a set of indoor lamps. On the other hand, most Amish communities forbid personal ownership of automobiles, telephones, radios, and televisions; the use of tractors in the field; and electric hookups from power company grids to private homes and buildings.

To a casual observer, the resulting pattern of exclusions and adoptions seems capricious. However, the pattern is the result of a remarkably sophisticated style of technological politics. The exact decision-making process varies somewhat from one Amish community to the next and from one decision to the next. In essence, each local Amish community—acting collectively rather than as a set of discrete individuals—asks itself how the adoption of a technology would affect the community as a whole. Innovations that would tend, on balance, to preserve the community, its religion, and its harmonious relation with nature are permitted; those that appear to threaten the community and its values are rejected. In either case, the decision is reached through a process of public discussion and democratic ratification.[8]

What would be the impact on our desired form of society if individuals, or the community, were to adopt one set of technologies rather than another? The villagers of Ibieca had no tradition of asking

such questions or even an established forum for making the attempt. Nor do we. But isn't it striking that the Amish, who prohibit formal schooling past the eighth grade, have nevertheless managed for several centuries to make technological choices that shrewdly advance their chosen cultural and religious commitments? In this regard, their technological acumen surpasses that of the villagers of Ibieca as well as the combined capability of modern nations' scientific, commercial, and policymaking establishments.

Reconsider, then, our society's ineptness at guiding technological change. Might it have less to do with modern technological complexity than with a failure to evolve institutions through which we could begin to act upon appropriate questions? The potential list of neglected questions concerning technology is long. It could encompass the entire domain of technologies' social aspect: the political, cultural, sociological, psychological, and spiritual realms. Moreover, one might need to integrate such issues with others more familiar—matters of technical feasibility, economics, environment, health, and defense. Finally, it might be necessary to consider not only the social dimensions and impacts associated with single technologies, but also the combined effects that emerge from a complex of coexisting technologies.

Were we to do this, it might emerge that technologies, everyday tools and helpers, are implicated in a plethora of modern ills, including loneliness, narcissism, disempowerment, insecurity, stress, and alienation. Stated more concretely, technology appears to contribute indirectly to problems ranging from urban poverty to teenage pregnancy, child abuse, racism, the continued subordination of women, militarism, the marginalization of the elderly, high crime rates, and drug abuse. Ultimately, technology is implicated in perpetuating antidemocratic power relations and in eroding social contexts for developing and expressing citizenship.

Technology is not *the* cause of such ills, but it contributes to all of them. To continue to neglect technologies' broad social dimensions virtually guarantees that we will remain ineffectual in addressing our deepest social problems and sources of personal malaise. It will not do, moreover, to imagine that other kinds of social reforms—be they conservative or radical—must precede significant reform in the technological domain, such that we must "First transform society, then tackle technology." That refrain overlooks ways that existing technologies help constitute the present social order and so constrain social transformation. Until technological concerns are fully integrated into programs of social transformation, such programs will be stunted or abortive.

Several qualifications are in order. First, insofar as technology is not the sole contributor to social problems, one ought not to shift attention

to technology at the expense of other contributing factors. Concentrated economic power, poverty, racism, sexism, ethnic intolerance, and so on matter too; it is thus vital to explore the relationship between technology and these other factors.

Second, it is wrong to conclude that "technology is evil; let's get rid of it." We can no more eliminate technology than we can cease to be human. However, third, neither must we merely adapt compliantly to whatever technologies happen along. An adequate approach to technology must involve procedures for addressing a broader, more appropriate set of questions. But these must lead to the possibility of eliciting alternative technologies more compatible with the kind of society or communities in which people wish to live.

Among the panoply of questions concerning technology that escape attention, perhaps the most important one involves how technology bears on democracy. Democracy provides the precondition for being able to decide fairly and effectively what further questions to ask and what actions to take in light of the answers. Thus if technologies were more compatible with one or another vigorous variant of democracy, we might be better positioned to debate what other issues most urgently require attention. Conversely, it is vital to explore the extent to which the failure to come to terms with technologies' political ramifications represents an expression of antidemocratic social power formations, as embodied partly in current technologies themselves.

For a preliminary illustration of the importance of seeking compatibility between technology and democracy, let us turn again to the Amish. The Old Order Amish ask themselves how a particular set of technologies would affect their community. However, it happens that their communities already embody a relatively robust species of local, democratic self-governance.[9] Hence, implicit in the question of how to preserve their community is the crucial subsidiary concern that any permitted technologies must be compatible with preserving the Amish community's already-democratic nature.

The Amish have, for instance, prohibited private ownership of automobiles. This is done in part to inhibit a dispersed settlement pattern that would interfere with Amish-style extended families and neighborliness.[10] Such neighborliness is pleasurable and also necessary to promote economic mutuality and to perpetuate Amish culture. Furthermore, it contributes to the kind of mutual understanding, social commitment, and routine of gathering that, in turn, facilitate participatory and consensual decision making. Were the Amish to purchase automobiles, they would be jeopardizing their ability to continue governing themselves democratically with respect to technology and otherwise.

This does not mean that everyone should become Amish or impulsively discard their automobiles. Nor should one overlook features, such as smallness and cultural homogeneity, that distinguish Amish society from the U.S. mainstream. It is doubtless easier for the Amish to achieve consensual decisions than it would be for the citizens of a large, culturally diverse city. But for immediate purposes, the problem of achieving consensual answers is of much less concern than our failure even to begin debating crucial questions—in this case, concerning technologies' political and cultural dimensions.

In short, the "nuts and bolts of democracy"—ordinarily a metaphor denoting concern with the nitty-gritty of democratic politics—must grow to encompass a literal concern with nuts and bolts. Currently, there are few institutions through which citizens can become critically engaged with choosing or designing technologies. Should we commit ourselves to evolving such institutions and to adopting only those technologies that are compatible with democracy? Until we do, I shall argue, there can be no democracy worthy of the name.

Chapter 2

I'D HAMMER OUT FREEDOM

Technology as Politics and Culture

> Technological innovations are similar to legislative acts or political foundings that establish a framework for public order that will endure over many generations.
>
> —*Langdon Winner*[1]

What is technology? People ordinarily think of technology as machinery or gadgetry, as an economic factor of production, as know-how, as what engineers do, or as progress. Often they characterize technologies in terms of a single intended function. What is a hammer? It's what someone uses to pound nails into boards. What is a telephone? It's a device that enables people to converse at a distance. Some technologies, however, have more than one intended function. Hammers, for example, can pound nails into boards but can also extract them. This is the core of the contemporary view of technology. People understand technologies in terms of a primary function—or, occasionally, several functions—that each is intended to accomplish.

Beyond this, our society has in the past few decades come to acknowledge that technologies tend to produce at least two general kinds of "secondary" or "unintended" effects. First, they generate environmental consequences: pollution, resource depletion, and ecosystem modification. Each of these may, in turn, have direct or indirect effects on human life. Second, they promote unintended social consequences—consequences that are generally mediated by economic markets (e.g., the replacement of workers by machines or the emergence of boomtowns). Thus common knowledge has it that technologies perform one or perhaps a few intended functions, while also producing a limited range of unintended social and environmental consequences.

Although this view of technology is straightforward, it is also

incomplete and misleading. It diverts attention from many significant aspects of technology, including some of central concern to democracy. By synthesizing recent technological criticism, the alternative view of technology introduced here incorporates the accepted view's sound insights but situates these within a broader perspective that recognizes technologies as a species of social structure.

The phrase "social structure" refers to the background features that help define or regulate patterns of human interaction. Familiar examples include laws, dominant political and economic institutions, and systems of cultural belief. Technologies qualify as social structures because they function politically and culturally in a manner comparable to these other, more commonly recognized kinds of social structures. A series of illustrative examples will clarify this notion. (See Figure 2-1 for a summary of some of the terms used to discuss technology.)

TECHNOLOGIES AS SOCIAL STRUCTURES

Chapter 1 introduced Ibieca, the Spanish village that found that its indoor plumbing came at the expense of community integration. That is an instance of a technology helping to structure social relations. Upsetting a traditional pattern of water use compromised important means through which the village had previously perpetuated itself as a self-conscious community.[2] In the United States the automobile has played a somewhat similar role in disrupting prior patterns of community life.[3]

These are not isolated cases; technologies designed for such mundane tasks as commuting to work or cooking food also routinely help constitute social systems of cooperation, isolation, or domination.[4]

> Technology often embodies and expresses political value choices that, in their operations and effects, are binding on individuals and groups, whether such choices have been made in political forums or elsewhere. . . . Technological processes in contemporary society have become the equivalent of a form of law—that is, an authoritative or binding expression of social norms and values from which the individual or a group may have no immediate recourse.[5]

Coercive Compliance

Technologies help regulate social behavior in part because they are themselves governed by both physical and political laws. For example,

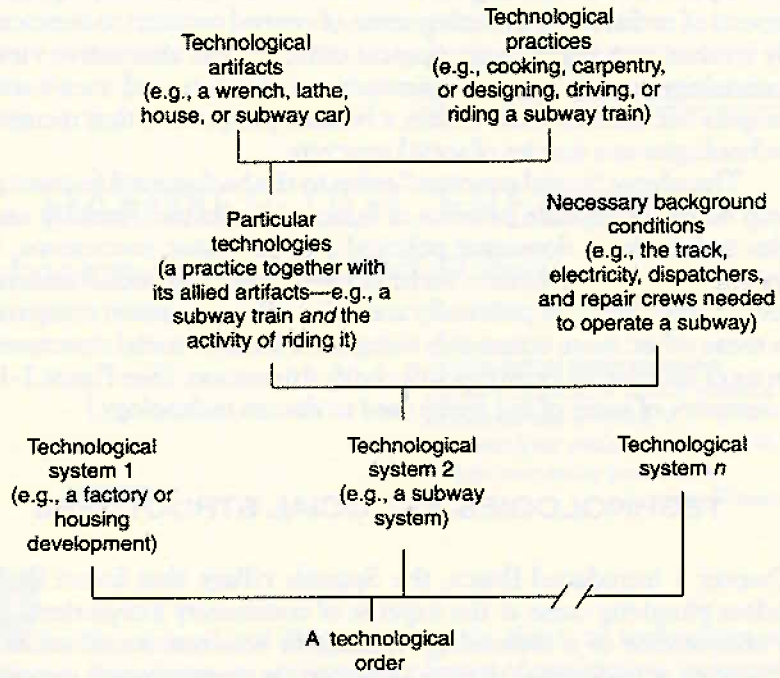


FIGURE 2-1. The hierarchic relationship among basic technological concepts. Additional definition: Technological style = Similarities in function, performance, necessary background conditions, or effects among diverse technologies. *n* = total number of technological systems within a given community or society.

the operation of many technologies—such as automobiles, medical X-ray machines, or guns—is legally regulated. Thus their misuse can entail a socially enforced penalty.

However, whether or not they are governed by legal regulations, technologies generally embody a variety of other kinds of coercive mandates. The penalty for resisting these mandates may range from an informal reprimand ("Don't lick the food off your knife!") to economic loss or systemic failure (e.g., the gears in a conveyor belt jam, or a worker's hand is injured). These latter results are akin to the consequences befalling those who ignore physical laws (e.g., when someone literally walks on thin ice). Thus physical constraints, or accompanying legal and social sanctions, are among the obvious means through which technologies help structure human behavior.

Subconscious Compliance

Sometimes technologies shape behavior and relationships less through brute compulsion than via subtle, psychological inducement. For example, social scientists have shown that the physical arrangement of chairs and tables strongly influences the kind of social interaction that occurs in schools, nursing homes, and hospitals. Yet the staff in those institutions had previously attributed behavior (including their own) entirely to the mix of personalities and psychological capabilities. They were surprised to learn that simply shifting the furniture could, for instance, help reanimate a seemingly moribund group of mentally impaired hospital inmates.[6]

Opportunities and Constraints

Social structures are also ambiguous in that while they can restrict opportunities in some respects, they can—when appropriately designed—enhance them in others.[7] For example, well-crafted laws help protect basic civil rights and, by providing a relatively stable and well-ordered social context, make it easier for people to realize their life plans.

Besides creating novel opportunities and constraints, technologies also reconfigure prior patterns. For instance, within some offices and factories the proliferation of personal computer networks has enhanced lower level workers' chances to contribute to production decisions while simultaneously challenging midlevel managers' former domains of authority and autonomy.[8] Once deployed, technologies can also aid or hinder the use of other technologies. For instance, telephone systems gradually displaced telegraph services but have more recently facilitated development of computer networks and long-distance data processing.

Background Conditions as Imperatives

In order to function, technologies require various environmental and organizational background conditions. A television set is only useful so long as viewers know how to operate it, it is protected from inclement weather, there is access to electricity, programs are being produced and distributed, and so on.

Frequently when individuals or groups acquire new technologies or technological facilities, they are at best only dimly conscious of the demands that effective operation will impose or require to be developed.

Several years ago a town near mine in western Massachusetts approved construction of an industrial research center, hoping thereby to realize tax benefits. But no one asked beforehand the eventual costs (financial, environmental, and emotional) that the town would one day bear in order to accommodate both new research activities and the concomitant growth in commuting, ancillary employment, and residential population. These costs could include hazards associated with toxic waste disposal, future loss of open space to new housing, and the burden of upgrading roads, sewer lines, snowplowing capabilities, schools, and school bus lines.

To the extent that a given technology plays only a small part in one's life, maintaining the conditions needed for its operation may be of no particular concern. But as a person or society grows dependent on a technology, the necessary conditions of its operation loom as practical imperatives. The need to support these conditions represents a way in which technologies exert a profound structural social influence.

Technology as Structural for Nonusers

Often technologies exert comparably significant effects on people who neither operate nor use the technology in question. One clear example involves phenomena that economists label "spillover effects" or "externalities."[9] Homeowners hear neighbors' radios, lawn mowers, or air conditioners; whole communities breathe noxious fumes from an industrial facility. Each person lives in an aesthetic landscape that reflects the aggregate technological choices made by other people or organizations. The psychological texture of our everyday life reflects the influence of countless technological choices and practices in which we did not participate.

Moreover, often such spillover effects exert a structural influence that is dynamic and transformative. For instance, someone might choose not to purchase a power lawn mower to avoid its noise. However, after a few neighbors have bought theirs, this person may reconsider, thinking, "Since I'm suffering from the noise anyway, why not buy my own power mower and at least benefit from the convenience?" In this way each mower purchased contributes to a cycle that gradually transforms a neighborhood of quiet into one rent by the sound of churning engines.

Next reconsider the background conditions necessary for a technology to operate. Many of those conditions have a tremendous impact on lives even if individuals do not own the technology or use the technological service that establishes their raison d'être. Suppose, to state the case

dramatically, that as a citizen of a modern nation a woman opts for a relatively self-sufficient mode of life: She refuses to own a car, uses solar collectors on the roof of her home, and plants a large vegetable garden in her yard. What has she accomplished? Something,[10] certainly, but the texture of her world still reflects the existence not only of cars and their immediate culture, but of roadways, automobile manufacturing and marketing systems, oil refineries, electric generating facilities, agribusiness, the private or public bureaucracies that manage these things, and their often tumultuous politics. That is part of what it means to say that technologies are social structures. The aggregate result of a society's many technological choices in one way or another affects every member.

Communicative and Cultural Systems

Apart from materially influencing social experience, technologies also exert symbolic and other cultural influences. This is true not only of technologies explicitly called communications devices (e.g., cellular phones, televisions, and radios), but of all technologies.

For example, modern sofas generally have two or three separate seat cushions. There is no compelling technical or economic rationale for this design (an affordable, seamless sofa is an easily conceived alternative—as seamless mattresses and Japanese futon sofa-beds attest). Rather, separate sofa cushions define distinct personal spaces and thus respect—but also help to perpetuate—modern Western culture's emphasis on individuality and privacy.[11]

Technologies even play transformative roles within psychological development. For example, earlier this century Swiss psychologist Jean Piaget determined that young children distinguish living from nonliving things according to whether or not the things move, and—as the children develop psychologically—then according to whether things move by themselves or are moved by an outside force. However, more recently, social psychologist Sherry Turkle found that children who play with computer toys that appear to "talk" and "think" develop different criteria for distinguishing "alive" from "not alive." Instead of relying on physical criteria (such as motion), they invent psychological criteria and hypotheses ("Computers are alive because they cheat" or "Computers are not alive because they don't have feelings"). Children's developmental trajectories, including their conceptions of self and moral reasoning, are transformed as a result of their interactions with these machines.[12]

The process that Turkle described with respect to computer toys is a specific instance of a much more general phenomenon. As they

reconfigure opportunities and constraints for action, and function simultaneously as symbols and latent communicative media, technologies also reconfigure opportunities and constraints for psychological development.[13]

Macropolitics: Technology *and* Society versus Technology *as* Society

Many scholars have described cases in which technologies exert a macrolevel influence on societies. Consider historians who focus on the social role of just one or two important technologies at a time. Large-scale dams and irrigation systems may have played a decisive role in the creation and maintenance of states in antiquity. Lynn White Jr. told a now-famous story of the role of the stirrup in the development of European feudalism: stirrups made possible mounted shock combat, which led in turn to heavy full-body armor, heraldry, chivalry, stronger horse breeds, more efficient plowing methods, and so forth.[14] In America, railroads helped establish national markets; promoted coal mining, steelmaking, and the widespread adoption of steam power; provided an influential model of geographically dispersed, hierarchically managed corporate organization; contributed to the adoption of standardized timekeeping; and served as a dominant metaphor with which Americans interpreted their entire civilization.[15]

More recently in the United States one role of new technologies has been to provide grounds for the growth of the federal government, through the proliferation of such agencies as the Federal Communications Commission for regulating telecommunications, the Federal Aviation Administration for regulating the airline industry, the Nuclear Regulatory Commission and the Department of Energy for administering aspects of national energy production and nuclear weapons development, and the like.

In each of these instances, technological innovation plays a role in establishing, transforming, or maintaining states or societies at the macrolevel. Langdon Winner has explored the further hypothesis that the entire ensemble of modern technological systems—including the background conditions required to keep them operating—tends to promote centrally coordinated, technocratic social administration.[16]

Hence there are numerous examples in which technologies affect societies or states in ways that have macrostructural implications. However, this formulation—while both true and dramatic—nonetheless misses the force of this chapter's earlier analysis. Technologies function politically and culturally as social structures by coercing physical compliance; prompting subconscious compliance; constituting systems of social relations; establishing opportunities and constraints for action and self-realization; promoting the evolution of background conditions; affecting nonusers; shaping communication, psychological development, and culture generally; and constituting much of the world within which lives unfold.

Considering all of the preceding functions and effects together, it would be fairer to say that technologies do not merely *affect* society or states, they also *constitute* a substantial portion of societies and states. That, too, is part of what it means to be a social structure. Recognizing the many respects in which technologies contribute to defining who people are, what they can and cannot do, and how they understand themselves and their world should dispel the common myth that technologies are morally or politically neutral.[17]

Influential, Not Determining

Technologies "structure" social elations in that they shape or help constitute—but do not fully determine—social experience.[18] Water pipes and washing machines did not, for example, literally force Ibiecans to stop gathering at their village's central fountain and washbasin, but instead altered the system of inducements and interdependencies that formerly made such gathering occur naturally.

Aside from the possibility of rejecting or retiring a particular technology, there is always a margin of flexibility in how existing technological artifacts may be used or operated, or in what activities may occur in conjunction with them. This margin is finite, and its extent varies from one technology to the next and over time, but it nevertheless exists. For example, while a conventional assembly line provides only highly restricted opportunities to vary work routines at each station, it does not materially prevent workers from rotating jobs among work stations.[19]

Context-Dependency

Developing a railroad network helped catapult the United States to global economic preeminence, but Britain developed railroads earlier and yet nonetheless gradually lost its world economic predominance. Thus railroads (or other technologies) are socially consequential, but how and why they matter depends on the precise technologies in question in each particular context of use.

Moreover, just as social context—including, among other things, a society's preexisting technological order—regulates each technology's material functions and effects, it also regulates a technology's communicative functions and cultural meanings. A few decades ago a belching smokestack symbolized progress. Today—in a different historical context—the same smokestack is more likely to evoke distress or even outrage.

Finally, one important influence on a technology's functions and effects is the minds and culture of people.[20] Nineteenth-century high-wheeler bicycles were perceived by athletic young men as virile, high-speed devices. But to some women and elderly men the same devices signified personal danger. Indeed, conflicting perceptions of the high-wheeler proved consequential to its subsequent technological development. Its perception as a "macho machine" prompted new bicycle designs with ever higher front wheels. The competing perception of the high-wheeler as an "unsafe machine" prompted designs with smaller front wheels, different seat placement, or higher rear wheels.[21] Thus to understand the social function, meaning, and evolution of the high-wheeler, it is essential to explore its psychological and cultural context.

Public controversies concerning technology offer another occasion for observing the role of culture and cognition in establishing a technology's context, and hence its social role. For example, during the 1970s nuclear engineers and electric utility executives generally viewed centralized production of electricity as a critical social need and essential to the concept of commercial nuclear power. To them an alternative to nuclear power needed to be another means of performing this critical function.[22] But other energy policy analysts saw the expanded production of electricity as so inessential that a perfectly viable alternative could be a panel of foam wall insulation that did not generate any electricity.[23]

In evidence here are fragments of a social process of contesting or negotiating what is or is not to count as an essential function of a technology and hence as an alternative.[24] Thus, when technological consequences or meanings become controversial, processes through which technologies are culturally constituted may emerge openly.

Contingent Social Products

There is residual variability in the structural effects associated with any deployed technology—*within* a particular social context and even more so *among* different contexts. However, a technology's greatest flexibility exists before its final deployment, when artifacts and their accompanying social organization are being conceived and designed.

Technologies do not just appear or happen; they are contingent social products. Thus it is possible, both before and after the fact, to imagine alternative designs. The process by which one set of designs rather than another comes to fruition is influenced by prevailing social structures and forces, including the preexisting technological order. However, this process also reflects explicit or tacit social choices, including political negotiations or struggles.[25]

For example, it is hard to imagine a modern home without an electric refrigerator, but had the accidents of competing corporate resources played out slightly differently, gas-powered refrigerators that would have run more reliably and quietly could have been the norm.[26] Other feasible alternatives in household technology harbored the potential for even more dramatic social effects.[27] Moreover, although today people think of the guiding impulses behind technological development as necessarily being profit, convenience, or military advantage, throughout history religious or aesthetic motivations have often been just as significant.[28]

Thus there are many potential, competing technological pathways, and each is socially developed. But the flexibility associated with a given technology, or with other social structures, tends to diminish with time. After a society has habituated itself to one technology, alternatives tend to become less accessible. Once designed and deployed, a technology, like a law or a political institution tends—if it is going to endure—gradually to become integrated into larger systems of functionally interdependent artifacts and organizations and then to influence the design of subsequent technologies, laws, and institutions such that the latter all tend to depend on the continued existence of the former. Thus, owing to the accompanying evolution of supporting custom, entrenched interest, and various sunk costs, it is often difficult to achieve radical design alterations once an initial decision has been implemented.[29] A further factor reducing the flexibility of technologies is that they exhibit some of the pure physical recalcitrance that comes with material embodiment. Hence, both technologies and other social structures, once they have come into existence, tend to endure. However, technologies exhibit a remaining characteristic that tends to distinguish them from other social structures and to increase their relative political salience: polypotency.

POLYPOTENCY

Technologies function as social structures, but often independently of their (nominally) intended purposes. This is one of the phenomena that the conventional view of technology obscures. The same obfuscation is

reflected in studies that profess a broad interest in the political effects of technology but that discuss only technologies designed explicitly to function politically (such as telecommunications, military and police technologies, voting machines, or computer databases).[30] Such technologies indeed function politically, but everyone knows that. That is these technologies' announced purpose. Harder to grasp is the truth that all technologies are associated with manifold latent social effects and meanings, and that it is largely in virtue of these that technologies come to function as social structures. In other words, technologies exhibit superfluous efficacy or "polypotency" in their functions, effects, and meanings. (The word *polypotency*, meaning "potent in many ways," is introduced here for want of a better existing term. The unfamiliarity wears off quickly if one contrasts it with *omnipotence*, meaning, literally, "potent in all ways.")

For example, when a man uses an ordinary hammer to pound nails, he also learns about the texture and structural properties of materials, he exercises and develops his muscles, he improves his hand–eye coordination, and he generates noise, all while stressing and wearing the hammer itself. As his competence at hammering grows, he feels his self-respect affirmed and approved. At another level, his activity resonates with half-conscious memories of primeval myths about Vulcan and Thor. He is also reminded of the blacksmith and the mythology of the American frontier. He thinks of a judge's gavel, the hammer as a symbol of justice, and a song popularized by the folksinging trio Peter, Paul, and Mary.

Where did the hammer come from? Somebody chopped down a tree and fashioned the handle. Others located and extracted iron ore. Some of that ore was refashioned into a hammer head. If a man touches his tongue to the hammer, with the taste of oxidized iron he senses fleetingly a former age when once-independent craftsmen and farmers first found themselves working under strict supervision in a factory. When he was a child, an uncle first taught him to use a hammer. Now when he hefts a hammer, he feels embedded in a historical relationship with this and other hammers and with the development of the concept of hammers and technology in general.

The hammer's immediate social context of use can vary. The man may work alone, on a project with others, or in a room where each person pursues a different project. He may or may not choose his task; he may or may not earn a wage. Depending on the precise social context of its use, the hammer means different things to him, he sees it differently, and it helps disclose the world to him in different ways. Likewise, his style of using the hammer discloses to others much about his character, competence, and mood.

The hammer differs from a partially automated assembly line in that the latter requires and helps coordinate the simultaneous efforts of many workers. But a hammer also establishes certain limiting possibilities on the social conditions of its use. Hammers have only one handle. They are not designed to permit the type of close collaboration that is possible through computer networks or necessary when using a long, two-handled saw.

The material result of the man's activity is likely to include some bent nails, scrap wood, a hearty appetite, maybe a bruised thumb, a few sore but marginally strengthened muscles, some excess exhalation of carbon dioxide, perspiration, and a product that becomes part of the humanly shaped world.

So, is the nail entering the board necessarily the most important feature of the activity called "hammering"? Hammers, like all technologies, are polypotent in their social functions, effects, and meanings.

Today's accepted view of technology takes a step toward acknowledging polypotency by speaking of technologies' unintended or secondary consequences. However, the term "polypotency" is helpful in not presuming that one knows automatically which of a technology's many functions or meanings are the most important or even which are intended. Many social historians of technology have, for example, argued that a latent but intended function of some innovations in manufacturing technology has been to substitute low-paid unskilled workers for higher-paid skilled workers, discipline the remaining workforce, and weaken unions.[31]

It is furthermore useful to introduce the term "focal function" to refer to a technology's (ostensibly) intended purpose. "Nonfocal" then denotes its accompanying complex of additional—but often recessive—functions, effects, and meanings. Thus, 19th-century New England schoolhouses' focal function was to provide a space for educational instruction, whereas one of their nonfocal functions was to help generate—in part via the symbolism of churchlike architecture—a relatively docile workforce.[32] (See Figure 2-2 for a summary of some of this chapter's principal concepts.)

Occasionally technologies function as social structures precisely by virtue of their focal purpose. For instance, weapons function coercively because they are designed to do just that. But more often and more subtly, it is technologies' latent polypotency that accounts for their structural performance. This is illustrated by many previous examples, ranging from sofa cushions (which help to latently reproduce our culture's sense of privacy) to computer toys (which unexpectedly alter children's psychological development). Even technologies focally designed to function structurally are apt to structure nonfocally as well.

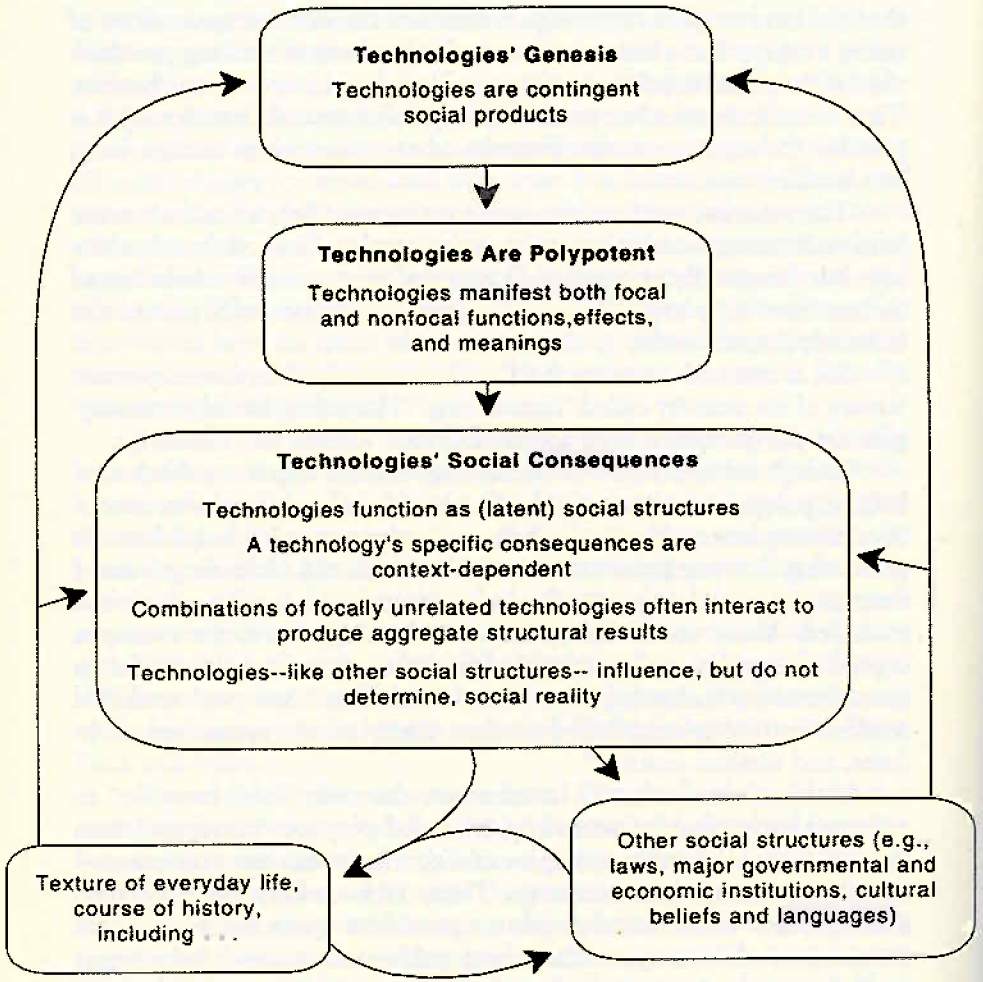


FIGURE 2-2. Technology as a social and political phenomenon.

For instance, nuclear weapons are designed focally to coerce, deter, or destroy other societies, but they contribute nonfocally to legitimating authoritarian government institutions within the societies that possess them.[33] Marshall McLuhan popularized this truth as it applies specifically to technologies focally designated as communications devices: "The medium *is* the message."[34] In other words, the technical means of

focally delivering a message can, owing to polypotency, matter more than the message itself.

Moreover, often groups of focally unrelated technologies interact latently to produce a structural effect that no one of them could accomplish alone. Distinct sofa cushions would not help establish cultural norms of privacy and individualism were they not part of a complex of artifacts and ritual behavior that contribute jointly toward that same result. (Other artifacts in the complex with sofa cushions include individual eating utensils, private bedrooms, telephone receivers designed to accommodate one person at a time, and so forth.[35]) In short, to achieve social insight and efficacy, it is essential to consider all the different artifacts and practices that comprise a society's technological order.

There are important functional equivalencies between technologies and nontechnological social structures (e.g., legal statutes, government agencies, and large corporations). All represent enduring social products that shape subsequent social experience. However, there are also differences, revolving around contrasting levels of social understanding with respect to each.

First, laws and political and economic institutions are contingent social products, and at some level everyone knows this truth. Societies evolve these things through formal political or juridical processes, and it is commonly understood that alternative choices are possible. In contrast, people are prone to misperceive a society's technologies as inevitable, that is, as naturally determined rather than socially shaped and chosen.

Second, laws and other formally evolved social structures are commonly understood to function as social structures. That is their explicit purpose. Certainly, they can also be implicated in the production of various unintended social consequences. Prohibition-era laws were enacted to stop alcohol production, not to drive it underground and contribute to the expansion of organized crime. However, people at least expect that legal statutes and institutions will—because that is their intent—in some way shape social interaction and history. In contrast, people ordinarily expect most technologies to prove structurally inconsequential, and—because focally most of them do—this expectation appears confirmed. But here is where appearances deceive, insofar as it is frequently a technology's nonfocal aspects alone that conspire to manifest profound structural consequences.

Hence, although technologies are as consequential as other social structures, people tend to be more blind both to the social origins of technologies and to their social effects. This dual blindness is partly due to certain myths or misconceptions, such as the myth that technologies

are autonomous self-contained phenomena and the myth that they are morally neutral.[36] It is also inculcated through modern technologies themselves, via both their style and their social process of design (see Chapter 6).

These dual misperceptions concerning technologies actually enhance their relative structural significance, because they enable technologies to exert their influence with only limited social awareness of how, or even that, they are doing so. This helps explain why people are prone to resign themselves to social circumstances established through technological artifice and practices that they might well reject if the same results were proposed through a formal political process.[37]

So long as their social origin, effects, and dynamics remain so badly misperceived, technologies will not suffer the same liability as would, say, functionally comparable laws or economic institutions, of being challenged on the grounds that they are politically or culturally unacceptable. Furthermore, societies will fail to develop the capacity to seek other technologies more consonant—both focally and nonfocally—with their members' ideals and aspirations.

Chapter 3

"IN EVERY SENSE THE EXPERTS"

Strong Democracy and Technology

> In West Central Minnesota, local farmers have been opposing an electrical transmission line for over four years. . . . The public relations man for the utility said . . . , "You should be proud to have the biggest powerline in the world in your country," but the farmers felt differently.
>
> To people who love and care for the land, a transmission line of this size is a desecration. People who once felt they lived in a democratic society feel they have been betrayed and no longer control their own lives.
>
> —*Minnesota farmer and protester Alice Tripp*[1]

How does the preceding chapter's key insight—that technologies represent a species of social structure—bear on the relationship between technology and democracy? The answer depends partly on one's concept of democracy. One common view is that, as a matter of justice, people should be able to influence the basic social circumstances of their lives. This view implies organizing society along relatively egalitarian and participatory lines, a vision that Benjamin Barber has labeled "strong democracy."[2]

Historic examples approaching this ideal include New England town meetings, the confederation of self-governing Swiss villages and

cantons, and the English and American tradition of trial by a jury of peers. Strong democracy is apparent also in the methods or aspirations of various social movements such as the late-19th-century American Farmers Alliance, the 1960s U.S. civil rights movement, and the 1980s Polish Solidarity movement.[3] In each of these cases ordinary people claimed the rights and responsibilities of active citizenship concerning basic social issues.

The strong democratic tradition contrasts with more passive or inegalitarian models of democracy that in practice tend to prevail today, so-called thin democracy.[4] Here the focus shifts from a core concern with substantive political equality and with citizens' active engagement in political discourse, or in seeking their common good, to a preoccupation with representative institutions, periodic elections, and competition among conflicting private interests, elites, and power blocs.[5] Within thin democracies power is less evenly distributed; citizens can vote for representatives but ordinarily have little direct influence on important public decisions.

The contest—both in theory and in practice—between the strong and thin democratic traditions is long-standing and unlikely to be resolved soon. Rather than stopping now to compare and contrast the two, I propose initially to suspend judgment and simply posit a specific, strong democratic model of how societies ought to be organized.

TECHNOLOGY AND DEMOCRACY

The strong democratic ideal envisions extensive opportunities for citizens to participate in important decisions that affect them. A decision qualifies as important particularly insofar as it bears on a society's basic organization or structure. The commitment to egalitarian participation does not preclude continued reliance on some representative institutions, but these should be designed to support and incorporate, rather than to replace, participatory processes.

Complementing this procedural standard of strong democracy is a substantive standard: in their political involvements citizens ought, whatever else they do, to grant precedence to respecting any important concerns or interests common to everyone. Above all, they should perpetuate their society's basic character as a strong democracy. Apart from this one substantive moral obligation, citizens are free to attend as they wish to their diverse and perhaps conflicting personal concerns.

This model of democracy, even in schematic form, is sufficient for deriving a prescriptive theory of democracy and technology: *If citizens ought to be empowered to participate in determining their society's basic structure, and technologies are an important species of social structure, it follows that technological design and practice should be democratized.* Strong democracy's complementary procedural and substantive components entail, furthermore, that technological democratization incorporate two corresponding elements. Procedurally, people from all walks of life require expanded opportunities to shape their evolving technological order. And substantively, the resulting technologies should be compatible with citizens' common interests and affinities—to whatever extent such exist—and particularly with their fundamental interest in strong democracy itself.

Democratic Evaluation, Choice, and Governance

The preceding argument suggests that processes of technological development that are today guided by market forces, economic self-interest, distant bureaucracies, or international rivalry should be subordinated to democratic prerogatives. Only in this way can technologies begin actively to support, rather than to coerce or constrict, people's chosen ways of life. For example, residents of many American cities have grown resigned to daily traffic jams, sprawling shopping malls, the stress associated with combining careers with parenthood, and the television as babysitter. This pattern of sociotechnological organization is largely haphazard.[6]

At other times, an existing technological order, or its process of transformation, reflects the direct intentions of powerful organizations or elites. For instance, this chapter's epigraph alludes to an electric utility consortium that proceeded, despite adamant local opposition, to construct a huge transmission line across prime Minnesota farmland. That outcome was not haphazard or unplanned, but neither did it reflect democratic preferences.

Technological evolution can thus encompass social processes ranging from the haphazard to the bitterly contested or blatantly coercive. None of these processes is strongly democratic. This is not to say that every particular technology must suddenly be subjected to formal political review. Each time one is moved to buy a fork or to sell a pencil sharpener, one should not have to defend the decision before a citizens' tribunal or a congressional committee. Not all technologies exert an equal structural influence. However, consider a modern society's treatment of another genus of social structure: various kinds of law. The rules that parents create for their children are subject to relatively little social oversight. But rule making by federal agencies is governed by extensive formal procedure, and even more stringent procedure is required to

amend a national constitution. Why should the treatment of technology be so different?

Whether a technology requires political scrutiny and, if so, where and how exhaustively, should correspond roughly to the degree to which it promises, fundamentally or enduringly, to affect social life. This implies the need for a graduated set of democratic procedures for reviewing existing technological arrangements, monitoring emerging ones, and ensuring that the technological order is compatible with informed democratic wishes.

Within such a system, citizens or polities that believe that a set of technologies may embody significant structural potency ought always to have the opportunity to make that case in an appropriate political forum. Beyond this, there should be a system of ongoing democratic oversight of the entire technological order, scanning for the unanticipated emergence of undemocratic technological consequences or dynamics, and prepared when necessary to intervene remedially in the interest of democratic norms.

This does not mean, however, that everyone has to participate in each technological decision that becomes politicized. Logistical nightmares aside, there is more to life than politics. But in contrast to the present state of affairs, there should be abundant opportunity for widespread and effective participation. Ideally, each citizen would at least occasionally exercise that opportunity, particularly on technological matters significant to him or her.[7]

For example, in the early 1970s the cry rang out that there was natural gas beneath the frigid and remote northwest corner of Canada. Eager to deliver the fuel to urban markets, energy companies began planning to build a high-pressure, chilled pipeline across thousands of miles of wilderness, the traditional home of the Inuit (Eskimos) and various Indian tribes. At that point, a Canadian government ministry, anticipating significant environmental and social repercussions, initiated a public inquiry under the supervision of a respected Supreme Court justice, Thomas R. Berger.

The MacKenzie Valley Pipeline Inquiry (also called the Berger Inquiry) began with preliminary hearings open to participation by any Canadian who felt remotely affected by the pipeline proposal. Responding to what they heard, Berger and his staff then developed a novel format to encourage a thorough, open, and accessible inquiry process. One component involved formal, quasi-judicial hearings comprising conventional expert testimony with cross-examination. But Berger also initiated a series of informal "community hearings." Travelling 17,000 miles to 35 remote villages, towns, and settlements, the Berger Inquiry

took testimony from nearly 1,000 native witnesses. The familiarity of a local setting and the company of family and neighbors encouraged witness spontaneity and frankness. One native commented: "It's the first time anybody bothered asking us how we felt."[8]

Disadvantaged groups received funding to support travel and other needs related to competent participation. The Canadian Broadcasting Company carried daily radio summaries of both the community and the formal hearings, in English as well as in six native languages. Thus each community was aware of evidence and concerns that had previously been expressed. Moreover, by interspersing formal hearings with travel to concurrent community hearings, Berger made clear his intention to weigh respectfully the testimony of both Ph.D. scientists and teenaged subsistence fishermen.

Berger's final report quoted generously from the full range of witnesses and became a national bestseller. Based on testimony concerning environmental, socioeconomic, cultural, and other issues, the judge recommended a 10-year delay in any decision to build a pipeline through the MacKenzie Valley, as well as a host of more specific steps (including a major new wilderness park and a whale sanctuary). Within months the original pipeline proposal was rejected, and the Canadian Parliament instead approved an alternate route paralleling the existing Alaska Highway.[9]

Some might fault the MacKenzie Valley Inquiry for depending so much on the democratic sensibilities and good faith of one man—Judge Berger—rather than empowering the affected native groups to play a role in formulating the inquiry's conclusions. Nevertheless, the process was vastly more open and egalitarian than is the norm in industrial societies. It contrasts sharply with the steps forced on those Minnesota farmers, mentioned earlier, who were loathe to see a transmission line strung across their fields:

> The farmers have tried to use every legitimate legal and political channel to make known to the utility company, the government and the public their determination to save the land and to maintain safety in their workplaces. The farmers and their urban supporters have been met with indifference and arrogance by both the utility and the government. Turned away at the state capitol, they have taken their case to the courts again and again, only to be rebuffed.[10]

The Berger Inquiry represents just one example of a more democratic means of technological decision making. (For other examples, see Chapter 12.)

Democratic Technologies

Besides fostering democratic procedures for technological decision making, we must seek technological outcomes that are substantively democratic. The purpose of democratic procedures is, most obviously, to help ensure that technologies structurally support popular aspirations, whatever they may be. The alternative is to continue watching aspirations tacitly conform themselves to haphazardly generated technological imperatives or to authoritarian decisions.

However, according to strong democratic theory, citizens and their representatives should grant precedence here to two kinds of aspirations. First and most importantly, technologies should—independent of their diverse focal purposes—structurally support the social and institutional conditions necessary to establish and maintain strong democracy itself. (These conditions are discussed later in this chapter.) Second, technologies should structurally respect any other important concerns common to all citizens.

This does not necessarily mean shifting social resources to the design of technologies that focally support democracy or other common goods. That is the instinct of many strong democrats,[11] and some such efforts may be appropriate. For example, there might be a constructive role within strong democracy for electronically mediated "town meetings."

However, a preoccupation with certain technologies' focal functions, if it excludes commensurate attention to their nonfocal functions and to those of other technologies, is apt to prove disappointing or counterproductive. It might, for example, do little good to televise more political debates without first inquiring whether a nonfocal consequence of watching television is to induce passivity rather than critical engagement.[12] And is it obviously more urgent to seek any new technologies that are focally democratic before contemplating the redesign of existing technologies that, nonfocally, are antidemocratic? How can one know that the adverse effect of the latter is not sufficient to override any beneficial effect intended by the former? For instance, it may be fruitless to try to foster civic engagement via interactive telecommunications unless communities are prepared at the same time to promote convivially designed town and city centers; neighborhood parks, greenhouses, workshops, and daycare centers; technologies compatible with democratically managed workplaces and flexible work schedules; more democratically governed urban technological infrastructures; and other steps toward constituting democratic communities.[13]

In other words, societies do not require a special subset of technologies that are focally democratic as a complement to the remaining majority of technologies that are inconsequential to politics, because the remaining technologies are not, in fact, inconsequential. The overall objective ought to be a technological order that structurally manifests a democratic design style. Considering the entirety of a society's disparate technologies—both their focal and nonfocal aspects—is the technological order strongly democratic? That is the first question.

Owing in part to modern societies' persistent neglect of their structural potency, technologies have never systematically been evaluated from the standpoint of their bearing on democracy. Therefore, upon scrutiny, many existing technologies may prove structurally undemocratic. Furthermore, from a dynamic perspective, they may erect obstacles to efforts intended to further democratization. For example, the declining interest in political participation observed within most industrial democracies might be partly attributable to latent subversion of democracy's necessary conditions by technologies. We can start testing such conjectures after formulating criteria for distinguishing structurally democratic technologies from their less democratic counterparts.

Contestable Democratic Design Criteria

If democratic theory can specify that technologies ought above all to be compatible with strong democracy, does that prescription preempt the most important questions that democratic procedures for technological decision making might otherwise address? No. In the first place, this leaves many important questions to the discretion of democratic judgment. These involve debating shared and personal concerns and then striving to ensure that technologies structurally support them. But even on the prior question of seeking a technological order that structurally supports strong democracy, there is a broad and critical role for democratic involvement.

The simple idea that technologies ought to be compatible with strong democracy is entirely abstract. To become effective, it must be expanded into a sequence of successively more specific guidelines for technological design, what I call democratic design criteria. But to specify such criteria with greater precision and content, and then to use them, one must adduce and interpret a progressively wider selection of evidence and exercise judgment (see Part II). Thus as democratic design

criteria become more specific and are applied, the grounds upon which they might reasonably be contested increase.

Moreover, even an expanded system of design criteria will always remain essentially incomplete. For instance, as social circumstances shift or as novel technologies are developed, new criteria will be needed and old ones will have to be reevaluated. In addition, no finite set of criteria can ever fully specify an adequate technological design. Democratic design is ultimately a matter of art and judgment.[14]

This guarantees an ongoing central role for democratic procedure. Democratic theory and its theorists—or anyone else—can help initiate the process of formulating and using design guidelines. However, self-selected actors have neither the knowledge nor the right to make determinative discretionary judgments on behalf of other citizens. Individuals cannot, for example, possibly know what their common interests and preferred democratic institutions are until after they have heard others express their hopes and concerns, and listened to comments on their own, and until everyone has had some chance to reflect on their initial desires and assumptions. Also, individuals cannot trust themselves, pollsters, or scientists to make objective judgments on behalf of others, because invariably each person's, professional's, or group's interests are at stake in the outcome, subtly influencing perception and reasoning. Only democratic forums can supply impartiality born of the balance among multiple perspectives, the opportunity for reflection, and the full range of social knowledge needed to reach legitimate determinations.[15]

Hence it makes sense to seek democratic procedures for formulating and applying rationally contestable design criteria for democratic technologies. These will be "contestable" because the process of generating and refining design criteria cannot be finalized. As technology, social knowledge, and societies and their norms change, one can expect shifts in these design criteria. However, the criteria will be "rationally" or democratically contestable because such shifts need not be arbitrary.[16] They should reflect citizens' current best assessment of the conditions required to realize strong democracy and other shared values. (See Figure 3-1 for the basic ingredients of a strong democratic politics of technology.)

Contrast

The theory of democracy and technology developed here contrasts with predecessor theories that emphasize either broadened participation in decision making or else evolving technologies that support democratic

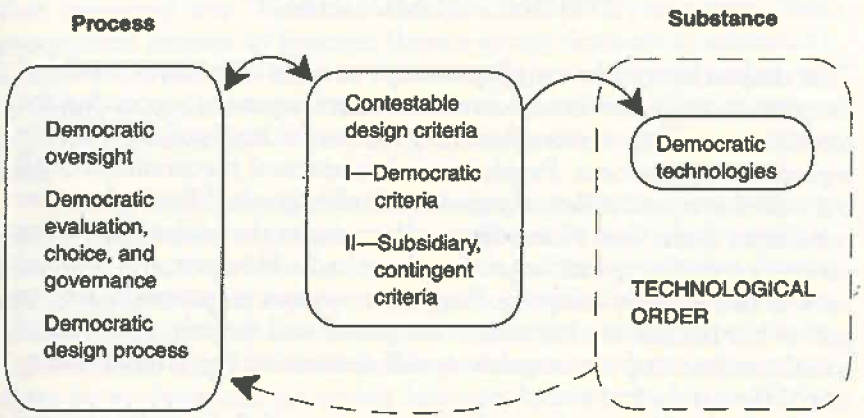


FIGURE 3-1. Democratic politics of technology. A technology is democratic if it has been designed and chosen with democratic participation or oversight and—considering its focal and nonfocal aspects—is structurally compatible with strong democracy and with citizens' other important common concerns. Within a democratic politics of technology, reflection on existing and proposed technologies plays a role in generating democratic design criteria. Use of these criteria then mediates between democratic procedures and the evolution of a substantively democratic technological order.

The figure distinguishes between two categories of design criteria: (I) priority goes to criteria that help ensure that technologies are compatible with democracy's necessary conditions; (II) subsidiary criteria can then reflect technologies' structural bearing on citizens' other concerns and interests. The dashed line indicates that the entire existing technological order exerts a structural influence on politics generally, including (in this instance) the possibility of a democratic politics of technology.

social relations, but that do not integrate these procedural and substantive concerns.[17]

The theory also contrasts with a prevalent view, one that arose during the 19th century, that American mass-production technology was democratic because it made consumer goods widely and cheaply available. Democracy thus became equated with a perceived tendency toward equality of opportunity in economic consumption.[18] This earlier view was insensitive to the structural social consequences associated with production technologies themselves and with the goods and services they produced. Furthermore, as a consequence of this blind spot, the theory foresaw no need to complement the market mechanism for making technological choices with any type of political oversight.

FREEDOM: THE MORAL BASIS OF STRONG DEMOCRACY

This chapter opened by simply positing a strongly democratic model of democracy; let us now briefly consider a moral argument supporting the model's desirability. Among human goods or values, freedom is widely regarded as preeminent. Freedom is a fundamental precondition of all our willful acts, and hence of pursuing all other goods.[19] But under what conditions is one free? Normally, people consider themselves free when no one is interfering with what they want to do. However, this familiar view is not entirely adequate. Suppose a woman is externally free to pursue her desires, but her desires are purely and directly a product of social conditioning or compulsively self-destructive (e.g., heroin addiction)? How truly free is she?

Such considerations suggest that actions are fully free when guided by something in addition to external incentive, social compulsion, or even a person's own instinctive psychological inclinations. That "something" Immanuel Kant identified as morality—specifically, compliance with moral principles that individuals prescribe to themselves. Morality expresses freedom in ways that cannot otherwise occur, even when one chooses among one's own competing psychological inclinations. With the freedom that morality secures, one acquires the dignity of being autonomously self-governing, an "end unto oneself."[20]

But what should the content of moral self-prescriptions be? Kant envisioned one overarching moral principle, what he called the "categorical imperative." One can think of it as a formal restatement of the Golden Rule: always treat others with the respect that you would wish them to accord you, including your fundamental interest in freedom. In Kant's words, "Act so that you treat humanity, whether in your own person or in that of another, always as an end and never as a means only."[21] Thus, in Kantian philosophy the concept of autonomy connotes moral community and readiness to act on behalf of the common good, rather than radical individualism.

However, suppose I behave morally, but nobody else reciprocates? There would be small freedom for me in that kind of society. Living in interdependent association with others (as people do and must) provides innumerable opportunities that could not otherwise exist, including the opportunity to develop moral autonomy. But it also subjects each person to the consequences of others' actions. Should these consequences seem arbitrary or contrary to their interests, people might well judge their freedom diminished.

As a solution, suppose each person's actions were governed by regulative structures, such as laws and government institutions, that

they participated in choosing (hence strong democratic procedure) and that respected any important common concerns, particularly their preeminent interest in freedom (hence strong democratic substance). In a society of this sort, laws and other social structures would each stand, in effect, as explicit expressions of mutual agreement to live in accord with Kant's categorical imperative (i.e., to respect oneself and others as ends).[22]

Strong democracy asks that citizens grant priority to commonalities not for their society's own sake, independent of its individual members, but because it is on balance best for each individual member. Strong democratic procedure expresses and develops individual moral freedom, while its structural results constitute conditions requisite to perpetuating maximum equal freedom. Insofar as it envisions democratic procedures for evolving and governing democratic structures, let us call this a model of "democratic structuration."* In other words, democratic structuration represents strong democracy's basic principle of collective self-organization.

Combine the preceding normative argument with the conventionally slighted insight that technologies function as an important species of social structure. It follows that evolving a democratic technological order is a moral responsibility of the highest order. A democratic politics of technology—one comprising democratic means for cultivating tech-

*The basic concept of structuration is that people's thoughts and behavior are invariably shaped by structures that—through ordinary activities (or sometimes extraordinary ones, such as revolution or constitutional convention)—they participate collectively and continuously in generating, reproducing, or transforming. A rough analogy from the natural world can help convey the idea. Consider a river as a process shaped and guided by a structure: its banks. As the river flows, it is continuously modifying its banks, here through erosion, there through deposition of sediment. Over time the river cuts deep gorges, meanders back and forth across broad floodplains, crafts oxbows and bypasses, and establishes at its mouth a complex deltaic formation. Hence the river is a vibrant example of structuration: a process conditioned by enduring structures that it nonetheless helps continuously to reconstitute.

In social life what we do and who we are (or may become) is similarly guided by our society's basic structures: its laws, major political and economic institutions, cultural beliefs, and so on. But our activities nevertheless produce cumulative material and psychological results, not fully determined by structure, that in turn are woven back into our society's evolving structural complex. Hence at every moment we contribute marginally—or, upon occasion, dramatically—to affirming or transforming our society's basic structures.

The word "structuration"—introduced by Giddens (1979, chap. 2)—is not aesthetically pleasing, but it has achieved wider currency than any synonym. I propose the term "democratic structuration" to embed this explanatory concept in a normative context, suggesting that the means and the ends of structuration should be guided by an overarching respect for moral freedom.

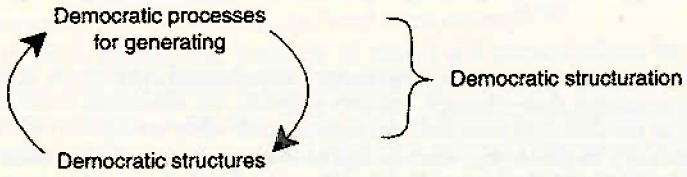
nologies that structurally support democracy—is needed to transform technology from an arbitrary, irrational, or undemocratic social force into a substantive constituent of human freedom (see Figure 3-2).

Of course, democracy is by no means the only issue that needs to be considered when making decisions about technology. Citizens might well wish to make technological decisions based partly on practical, economic, cultural, environmental, religious, or other grounds. But among these diverse considerations, priority should go to the question of technologies' bearing on democracy. This is because democracy is fundamental, establishing the necessary background circumstance for us to be able to decide fairly and effectively what other issues to take into account in both our technological and nontechnological decision

I. Philosophical Case for Strong Democracy:

A. Freedom is a highest order human value. Respecting other people's freedom is a moral duty, necessary for realizing one's own freedom. (Kantian moral theory)

B. Given the inalterable fact of real-world social interdependence, the opportunity to fully develop and express individual freedom can best be secured within a context of democratic structuration:



Under these circumstances both social processes and their structural results, by respecting people's freedom, embody Kantian morality. Here structures support rather than constrain people's highest order interest in freedom. (Neo-Rousseauian, or strong democratic, political theory)

II. Philosophical Case for a Democratic Politics of Technology:

Applying the preceding argument (i) to technology:

C. Technologies are a species of social structure. Therefore, it is morally vital that they, like other social structures, be generated and governed via democratic structuration. (The content of democratic structuration, as it applies to technology, is elaborated in Figure 3-1.)

FIGURE 3-2. Philosophical argument for strong democracy and for a democratic politics of technology.

making. (Granting priority to democracy within technological decisions would be somewhat analogous to ensuring compatibility with the U.S. Constitution when drafting or debating proposed laws or regulations.)

It would be presumptuous, however, to insist that the case supporting strong democracy is entirely conclusive. This implies that the contestability attributed earlier to democratic technological design criteria stretches logically back into the supporting theory's philosophical core.

DEMOCRATIC BACKGROUND CONDITIONS

Establishing democratic structuration depends on a number of background conditions. These need to be elaborated here in just enough detail to permit subsequent derivation of democratic design criteria for technologies. The requisite background conditions include: (1) some commonality of purpose, attachment, or outlook among citizens (at a minimum, general recognition of a preeminent interest in living in a strong democracy); (2) some general readiness on the part of citizens to accord higher political priority to advancing important common purposes than to narrower personal concerns; and (3) institutions that foster these circumstances. These background conditions, in turn, incorporate three organizing principles: democratic politics, democratic community, and democratic work (see Figure 3-3).

Democratic Politics

A strong democracy, by definition, affords citizens roughly equal, and maximally extensive, opportunities to guide their society's evolution. What kinds of political institutions does this imply?

Participation and Representation

Is there a middle ground between the present systems of representation, in which a few people participate in deciding most important issues, and obsessive participation, in which *all* people are expected to participate actively in *all* important issues. Barber characterizes the middle ground as a democracy

> in which all of the people govern themselves in at least some public matters at least some of the time. . . . Active citizens govern them-

Democratic politics, democratic community, and democratic work are three organizing principles that ought each, with varying individual intensity, to be present in every basic institutional setting or association within a democratic society:

DEMOCRATIC POLITICS

A. Complementary participatory and representative institutions, within a context of globally aware egalitarian political decentralization and federation (representative institutions designed to support and incorporate direct citizen participation).
B. Respect for essential civil rights and liberties.

To help establish equal respect, collective efficacy, and commonalities:

DEMOCRATIC COMMUNITY

A. Face-to-face human interaction on terms of equality as a means to nurture mutual respect, emotional bonds, and recognition of commonalities among citizens.
B. Intercommunity cultural pluralism.
C. Extensive opportunities for each citizen to hold multiple memberships across a diverse spectrum of communities.

To help develop citizens' moral autonomy, including their capacities to participate effectively in politics and the propensity to grant precedence to important common concerns and interests:

DEMOCRATIC WORK

A. Equal and extensive opportunities to participate in self-actualizing work experiences.
B. Diversified careers, flexible life scheduling, and citizen sabbaticals.

FIGURE 3-3. Some of strong democracy's principal necessary conditions.

> selves directly . . . , not necessarily . . . in every instance, but frequently enough and in particular when basic policies are being decided and when significant power is being deployed.[23]

Moreover, on issues in which individuals choose not to participate, they should know that generally others with a similar point of view are participating competently, in effect on their behalf. This may entail, among other things, institutional mechanisms to ensure that the views of socially disadvantaged groups are fully represented and that their needs and rights are respected.[24]

Broadened and equalized opportunities for participation are more than a matter of formal legal rights. They must be supported by relatively

equal access to the resources required for efficacy, including time and money.[25] Today, for example, politicians, government functionaries, soldiers, and jurors are paid to perform their civic duties. Why not, when necessary, pay citizens to perform theirs, as did the ancient Athenians? Fairness and equality may also be served by increasing the ratio of representatives chosen by lot to those chosen by vote.[26]

Political Decentralization and Federation

What can help prevent representation from gradually usurping the role of an active citizenry? A partial answer lies in some sort of devolution of centralized political institutions (in which the population's large size renders meaningful participation by all impossible) in favor of a plurality of more autonomous, local political units. By means of small-scale local politics, more voices can be heard and each can carry more weight than in a larger polity. Decisions can be more responsive to individuals, thereby increasing citizens' incentive to participate. There is also potential for small polities to be able to govern themselves somewhat more consensually than can the larger society.[27]

However, various considerations—such as the importance of protecting minorities from local repression—suggest the need to embed decentralization within a larger, federated democratic system.[28] The detailed form of federation must be decided contextually, but its thrust should be toward (1) subsidiarity (i.e., decisions should be made at the lowest political level competent to make them), (2) egalitarianism within and among polities, and (3) global awareness or nonparochialism (i.e., ideally, everyone manifests a measure of knowledge and concern with the entire federated whole—or even beyond it).[29]

In short, power should be relatively diffuse and equal. Political interaction and accountability should be multidirectional—flowing horizontally among local polities, vertically back and forth between local polities and more comprehensive political units, and cross-cut in less formal ways by nonterritorially based groups, voluntary associations, and social movements.[30]

Agenda Setting and Civil Rights

What if citizens are widely empowered to participate in societal choices, but the menu of choice is so restricted that they cannot express their true wishes? Numerous political theorists agree that decision-making *processes* are democratically inadequate, even spurious, unless they are combined with relatively equal and extensive opportunities for citizens, communities, and groups to help shape decision-making *agendas*.[31]

Various civil liberties and protections are also democratically essential either because they are intrinsic to respecting people as moral agents or because we require them in order to function as citizens.[32]

Democratic Community

A strong democracy requires local communities composed of free and equal members that are substantially self-governing. Such communities help constitute the foundation of a decentrally federated democratic polity, and hence of political participation, freedom, and efficacy. They do this in part by establishing a basis for individual empowerment within collectivities that, as such, are much more able than individual citizens to contest the emergence of democratically unaccountable power elsewhere in society (e.g., in neighboring communities, private corporations, nonterritorial interest groups, or higher echelons of federative government). Local communities also provide a key site for coming to know oneself and others fully and contextually as moral agents. The defining features of a democratic community include social structures and practices that nurture collective efficacy, mutual respect, and moral and political equality, and, if possible, help sustain a measure of communitywide commonality.[33]

Strong democratic theory does not envision a perfect societal harmony of interest, sentiment, or perspective. Rather, the central aims of strong democratic practice include seeking amid the fray for any existing areas of commonness; striving to invent creative solutions that, in a just manner, enhance the ratio of concordance to that of conflict; and balancing the search for common purpose against respect for enduring differences and against coercive pressures toward conformity.

Of course, countless forms of community and human association are not locally based. However, strong democracy places a special weight on local community as a foundation (but not a culmination) because of the distinctive and inescapable physical and moral interdependencies that arise at the local level; the territorial grounding of political jurisdictions; and the distinctive quality of mutual understanding, learning, and personal growth that can take place through sustained, contextually situated, face-to-face discourse and interaction.

Cultural Pluralism

If one next considers an entire society's overall pattern of kinds of communities and associations, one discovers that strong democracy does more than *permit* diversity among them: it *requires* diversity. Specifically, democracies should manifest a certain kind of institutional and cultural pluralism: equal respect and protection for all cultures, communities, traditions, and ways of life whose practices can reasonably be construed to affirm equal respect and freedom for all. (Cultures that fail to meet this standard may not warrant unqualified respect, but neither do they warrant determined intervention—unless, that is, they seriously threaten the viability of other, democratic cultures or oppress their own members involuntarily.[34])

There are two principal reasons for this requirement. First, equal respect for people entails respecting their cultural heritage. To undermine a culture corrodes the social bases of its members' sense of self and purpose.[35] Second, all people share an interest in living in a society and a world comprised of many cultures. Cultural pluralism supplies alternative viewpoints from which individuals can learn to see their own culture's strengths and limitations, thereby enriching their lives, understanding, and even survival prospects.[36] Moreover, it provides alternative kinds of communities to which people can travel or move if they become sufficiently dissatisfied with their own.

Democratic Macrocommunity

Democratic politics beyond the level of a single community or group requires generally accepted means of addressing disagreements, and ideally a measure of societywide mutual respect or commonality. The alternatives can include authoritarianism, civil violence, or even genocide—as modern history vividly demonstrates. How, then, can local or association-specific solidarity, together with translocal cultural pluralism, possibly be reconciled with the conditions needed for societywide democracy?

Cultures and groups invariably disagree on fundamental matters sometimes. Nonetheless, there is reason to believe that local democratic communities represent a promising foundation for cultivating societywide respect or commonality.[37] For one thing, ethnic hatred and violence are frequently associated with longstanding political–economic inequalities, not with extant approximations to strong democracy. Moreover, often it is probably harder to escape acknowledging and learning to accommodate differences when engaged in local democracy than in translocal association or politics, where there can be more leeway to evade, deny, or withdraw from differences.

The alternative notion of forging a macropolitical culture at the expense of local democratic communities risks coercion or a mass society, in which people relate abstractly rather than as concrete, multidimensional moral agents. Members of a mass society cannot feel

fully respected as whole selves, and furthermore, they are vulnerable to self-deception concerning other citizens' needs and to manipulation by those feigning privileged knowledge of the common good.[38]

One method of nurturing local nonparochialism is to pursue cooperative relations among communities that are distantly located and culturally distinct. There is a good model in those modern U.S. and European cities that have established collaborative relations with communities in other nations regarding matters of peace, international justice, environmental protection, or economic development.[39]

Another route to nonparochialism is to ensure that people have extensive opportunities to experience life in a variety of different kinds of communities. Generally, such opportunities should involve experience both in (1) a culturally diverse array of small face-to-face communities or groups and (2) socially comprehensive, nonterritorially based communities.* The former would encourage concrete understanding of the lives and outlooks of different kinds of people and communities; the latter would provide practical opportunities to generalize and apply what one has learned from these diverse experiences to the problems and well-being of society as a whole.[40]

Nonterritorial associations that are not socially comprehensive—such as ethnic associations, labor unions, churches, single-issue political organizations, and so on—can obviously function as one kind of rewarding community for their members. However, they seem less likely to provoke deep, multiculturally informed comprehension of an entire society.

Democratic Work

People often think of "work" as something they do primarily to earn a living. Here, however, work is interpreted as a lifelong process whose central functions include individual self-development as well as social maintenance (both biological and cultural). "Democratic work" thus denotes (1) work activity through which one can discover, develop, and express one's creative powers, strengthen one's character, and enhance one's self-esteem, efficacy, and moral growth (including readiness to act on behalf of common interests and concerns); (2) a work setting that

*The latter are communities or organizations that manifest a multifaceted concern with the well-being of a wide range of kinds of people, if not the entire society or world. Examples include broad-based political parties or movements; federation-level government agencies; and translocal, nongovernmental social service organizations.

permits one to help choose the product, intermediate activities, and social conditions of one's labor, thereby developing political competence within a context of democratic self-governance; and (3) the creation of material or other cultural products that are consistent with democracy's necessary conditions, that are useful or pleasing to oneself or to others, and that thus contribute to social maintenance and mutual and self-respect.[41]

Democratic work contributes richly to individual autonomy and democratic society. Hence, societies cannot be considered strongly democratic if there is involuntary unemployment or if, for example, many people are compelled to work in social environments that are tedious and hierarchically structured, while a few elite managers make important decisions that affect many other citizens.[42] To the extent that good jobs are scarce or societal maintenance requires a certain amount of drudgery or other unpleasant work, vigorous efforts should be made to ensure the sharing of both unpleasant and pleasurable activities.[43]

Diversified Careers and Citizen Sabbaticals

Numerous social thinkers have suggested that people should be able to work in a variety of different careers—either in linear sequence or, preferably, in fluidly alternating succession (sometimes called "flexible life scheduling").[44] However, one reason that is often overlooked concerns the cultivation of citizens' readiness to respect people everywhere as ends in themselves and to act on behalf of societywide interests.

To capture this benefit might require a societywide system, analogous to faculty sabbaticals or the U.S. Peace Corps, that would encourage each person to occasionally take a leave of absence from his or her home community, to live and work for perhaps a month each year or a year each decade in another community, culture, or region. This sabbatical system should include opportunities for the broadest possible number and range of people to take turns within translocal government and administration.

Citizens could then return to their home communities with a deeper appreciation of the diverse needs of other communities, a broader experiential basis from which to conceive of their society's general interest, and lingering emotional attachments to the other communities. (Note, for instance how increased contact between white and African-American soldiers in the U.S. armed services has generally reduced racial prejudice there, thus increasing receptivity to societywide racial integration and equality.[45]) Citizen sabbaticals would thus provide one concrete means of implementing the earlier proposal that citizens

have the opportunity for lived experience in a culturally diverse array of communities.

Guiding Principles

Do the three seemingly distinct social domains—formal politics, community, and work—mean that different kinds of basic institutions each contribute to democracy in an essentially different but complementary way? Suppose, instead, one conceives of democratic politics, community, and work as three guiding principles that should each to some extent be active within every basic institutional setting or association (recall Figure 3-3). An actual workplace, for example, may be conceived primarily as a locus of self-actualizing experience and production (work), but it should also ordinarily be governed democratically (politics) and help nurture mutual regard (community).

Failure to embody, within each of a society's many settings and associations, all three principles will tend to result in a whole society much less than the sum of its institutional parts. When, for example, each of a society's basic institutions is merely monoprincipled not only does each fall short of constituting a democratic microcosm, but each in addition tends to stress and overtax the capacities of the others.

Democratic Knowledge

Widespread political participation and the experience of diverse cultures and forms of work amount to an experientially based program of civic education. Living this way, one could hardly help but acquire extensive knowledge of one's world and society. This is not only positive; it is also democratically vital and a civil right. Competent citizenship, moral development, self-esteem, and cultural maintenance all depend on extensive opportunities, available to both individuals and cultural groups, to participate in producing, contesting, disseminating, and critically appropriating social knowledge, norms, and cultural meaning.[46]

Formal politics, in particular, must incorporate procedures that support collective self-education and deliberation. The means might include ensuring multiple independent sources of information with effective representation of minority perspectives; open and diverse means of participatory political communication and deliberation (including subsidies to disadvantaged groups that would otherwise be excluded); and extensive and convenient means of monitoring government performance.

OBJECTIONS AND REPLIES

Let us now consider objections that might immediately be raised against strong democracy.[47] The point is not to imply that the model of strong democracy is unassailable or that there are easy answers to every objection. (Certainly, the preceding background conditions are as subject to rational contestation as are subsequent technological design criteria.) Rather, it is to suggest that it would be a mistake to dismiss the model facilely, especially before seeing whether its further elaboration with respect to technology can help meet some of the objections.

Historically Irrelevant?

Perhaps the most obvious objection is that a vision of strong democracy is so at odds with today's realities as to be historically irrelevant, perhaps dangerously so. One of this objection's premises is quite true. For example, the United States harbors serious discrimination based on differences in race, ethnicity, age, gender, sexual orientation, class, and physical and mental capabilities. The political and economic system grants business corporations a structural political advantage over individuals, communities, and consumer, labor, and civic groups.[48] Bad in themselves, such ills seriously inhibit progress toward achieving greater democracy. For example, long experience of hierarchy in many walks of life establishes adverse psychological and social expectations. Those accustomed to giving orders come to cherish their power and seek more of it. Those used to obeying orders may have trouble conceiving of alternatives, themselves aspire to wielding hierarchic power, resent the powerful rather than oppose the structure of unequal power, or grow resigned to their fate and, with time, suffer impaired self-esteem.[49]

However, do these circumstances undermine a model of strong democracy? Perhaps they provide reason to espouse it more vigorously. Let's consider some potential uses of a strong democratic model under nonideal circumstances:

First, the model furnishes a moral standard or vision from which to evaluate existing societies, including their technological orders. Absent such vision, critique can miss its mark or be less complete. This is reflected in the historic failure to comprehend the breadth of ways technologies affect the democratic prospect. Such impaired awareness, by stymieing social resistance, may well have exacerbated technologies' capacities to structure antidemocratically.

Second, an ideal model can help motivate democratization. Armed with a convincing moral rationale, the weak can begin to bond and grow

stronger, while sometimes the strong begin to doubt their own purpose and resolve. So suggests Gandhi's challenge to the British Empire, as well as many hard-won successes by feminists, trade unionists, environmentalists, U.S. civil rights and antiwar activists, and rights' crusaders among the physically and mentally impaired. Morally fortified struggle does not always prevail. But moral vision and conviction are among the greatest resources potentially accessible to the disempowered, the oppressed, and strong democrats generally.[50]

One further objection to the historic relevancy of strong democracy explicitly invokes technology. How often are we told that the ideal of egalitarian participatory democracy has grown passé and that technology (or else the size or complexity of modern societies, which reflect the influence of technology) is centrally implicated in having effected this obsolescence?

> Congress has particular difficulty coming to grips with issues that involve significant input from science and technology. . . . I'm very much afraid it is no longer possible to muddle through. . . . Our democracy must grow up. . . . Jeffersonian democracy cannot work in the year 1980—the world has become too complex.[51]

> A model of the good society as composed of decentralized, economically self-sufficient face-to-face communities functioning as autonomous political entities . . . is wildly utopian. . . . A model of a transformed society must begin from the material structures that are given to us at this time in history, and in the United States those are large-scale industry and urban centers.[52]

Are such commentators correct in judging that modern technology and demographics decisively discredit the strong democratic ideal? Recall that for thinkers such as Rousseau and Jefferson, egalitarian and participatory democracy was a normative ideal—a goal toward which to strive. How, then, can any contingent fact about the world (such as technological complexity) now be understood to refute automatically an ideal vision of how the world ought to be?

Of course, if one discounts the appreciable opportunity that exists for politically informed choice within technological decision making, then facts can logically refute an ideal. That is, if we have no choice about our technologies and their political effects, and our technologies turn out to be incompatible with democratic ideals, then those ideals cannot conceivably be realized. However, once one recognizes that there is substantial social contingency in technological evolution, such conclusions seem less compelling. If a society's technologies are incompatible with an otherwise preferable system of social organization, why not contemplate strategies for acquiring different technologies?

Intrinsically Unworkable?

A second basic objection could be that a model of strong democracy is intrinsically utopian, in the pejorative sense of harboring fatal contradictions or naive fantasies about human nature and institutional competence. Strong democracy does harbor internal tensions. Representation must support and incorporate, but not supplant, participation. The virtues of democratic community must be integrated with a capacity for societywide governance. The search for commonality must not degenerate into enforced conformity, intolerance, or compromises that normalize injustice. Such tensions confirm the need for careful institutional design, vigilance, and ongoing social learning, as well as the necessity for steeling against life's inevitable disappointments and tragedies. But are these tensions more unmanageable than those infecting existing societies or competing models of social order?

How, too, is the strong democratic ideal psychologically or institutionally naive? It does not presuppose that everyone—or for that matter anyone—will become an altruist. Not all social conflict will dissipate. There is no presumption of a decentralized fantasy world in which there would be no administration or need for political coordination among communities, no role for economic markets, and no risk of international strife. In fact, nothing has been assumed about human nature or possible patterns of social interaction that has not already been observed historically.

Finally, the strong democratic model presented here is not overly detailed. Consistent with its commitment to freedom, strong democratic theory should remain relatively abstract, furnishing only a limited number of democratically contestable guidelines and constraints.

Strategically Infeasible?

Is this model of strong democracy too ahistoric, embodying no plausible strategic account to suggest the feasibility of getting from here to there? At this stage in my overall argument, providing such an account would be premature. However, Chapter 12 begins to engage in historically situated strategizing, based in part on the evidence of technology's structural bearing on politics developed in Part II.

Inefficient?

What of the concern that strong democracy could be grossly inefficient—wasteful of time and hazardous to prosperity? As with competing forms of social organization, there are such risks. But this concern may also involve misconstruing the meaning of efficiency and the nature of strong democracy.

An action is efficient if it accomplishes its end without the unnecessary expenditure of scarce resources. However, in a strong democracy social ends are not simply given. They must be formulated via a strong democratic process. Thus, rather than conceivably impairing economic efficiency, democracy is a precondition for legitimately specifying the ends with respect to which efficiency is defined.

But what if democratization would lead to truly severe or catastrophic economic hardship? Both brute survival and basic well-being are conditions of freedom, and thus it would certainly not contravene democratic ideals to retard the pace of democratization under such circumstances. Freedom and democracy can, as highest order social values, legitimately be traded off against economic considerations—but only when the latter both unequivocally and inescapably translate into offsetting threats to freedom and democracy.[53]

Democratic Competence?

The call for extending strong democratic politics into the technological domain immediately elicits further challenges. Aren't most citizens technological illiterates? Isn't it often impossible even for experts to anticipate technologies' social consequences?

The mere fact that citizens will sometimes render flawed judgments is not decisive here because, after all, experts make mistakes too. The normal way of posing the problem of competence is to look at the kinds of questions currently debated publicly about technology—matters of technical feasibility, cost, safety, environmental effects, and so on—and then to ask whether laypeople can be trusted to make reasonable decisions concerning such complicated matters.[54] The standard strong democratic response is yes, especially if people are provided with adequate resources for formulating their own informed opinions. This claim is then buttressed by discussing cases in which lay participants in technical disputes have reached reasonable conclusions.

For example, consider two reports on the acquired immunodeficiency syndrome (AIDS) disease crisis that were released in June 1988. The first, organized by the U.S. National Academy of Sciences, was

authored by a prestigious panel of Nobel Prize winners and other scientific experts. In contrast, the second was issued by a group, assembled by the White House to represent "ordinary Americans," that lacked prior expertise on the subject of AIDS. Observers were startled to find that, despite very different initial knowledge bases, the two panels reached similar conclusions across a broad spectrum of issues.[55]

Apart from merely grasping or replicating expert knowledge, laypeople sometimes contribute in their own right to producing new technical information. During Canada's Berger Inquiry, experts' testimony provided essential information concerning technical details of the pipeline proposal and its possible ecological impact. However, there were also crucial gaps in their scientific understanding, and sometimes they lacked the ability to interpret the significance of their own data. It was then that the value of citizens' knowledge garnered through the Bergen Inquiry's community hearings started coming into its own. According to one of the Inquiry's technical advisers,

> Input from nontechnical people played a key role in the Inquiry's deliberations over even the most highly technical and specialized scientific and engineering subjects. . . . [The final report] discusses the biological vulnerability of the Beaufort Sea based not only on the evidence of the highly trained biological experts who testified at the formal hearings but also on the views of the Inuit hunters who spoke at the community hearings. The same is true of seabed ice scour and of oil spills, both complex technical subjects the understanding of which was nonetheless greatly enriched by testimony from people who live in the region.[56]

Finally, those who argue against lay involvement in sociotechnological decision making often seem to be alluding to horrendous decisions and social consequences that they know will ensue.[57] Yet review of actual experience with lay participation does not yield a bumper crop of disastrous decisions.[58] After all, it was not panels of laypeople who designed the Three Mile Island and Chernobyl nuclear plants; who created the conditions culminating in tragedy at Union Carbide's Bhopal, India, pesticide factory; who bear responsibility for the explosion of the U.S. space shuttle *Challenger*; or who enabled the *Exxon Valdez* oil spill.

Thus the standard strong democratic argument—to the effect that laypeople are capable of participating in complex sociotechnical disputes—certainly casts doubt on any facile attempt to disparage the feasibility of a democratic politics of technology. However, it also misses a deeper and more telling point. The argument responds to the conten-

tion that the "lay public increasingly confronts a political agenda that . . . only the experts can understand."[59] But is that political agenda, setting aside its accessibility to lay comprehension, the one with which citizens should be most concerned?

The questions that today dominate the agenda of technological politics—the feasibility and cost of accomplishing promised focal results, assessment of ancillary environmental harms, and so forth—are a product of the conventional view of technology. While certainly significant, they overlook many of technologies' latent structural effects and the preeminent concern to ensure that technologies are compatible with democracy.

Naturally, it is reassuring to find instances suggesting that, given a fair chance, lay citizens can grasp complex technical information or contribute their own knowledge to contested technical deliberations. But that is not, in the first instance, what a democratic politics of technology is about. Rather, the first-order question is the structural bearing of technologies on democracy. Beyond that, it is up to democratic processes themselves to formulate further questions rather than to accept anyone's prepackaged agenda.

This turns the tables. If the first order of business concerns democracy and freedom, are technical experts especially qualified to offer answers? Probably not. After all, if today technological decisions are made undemocratically and with inadequate attention to their structural political significance, it is certainly not because scientists, engineers, economists, and other experts grasp the situation, are clamoring to inform the world, but are unable to get a fair hearing. To the contrary, business, government, and the press all routinely solicit the opinions of technical experts, but the latter typically remain oblivious to technologies' politically relevant aspects.

Technical experts are generally preoccupied with physical mechanisms, the principles that contribute to technological artifacts' performance of their focal functions, or the specifically biological or economic consequences of technological operation. But these are not normally the aspects of technology most salient to the possibility of democracy (see Part II). Moreover, as noted earlier, knowledge concerning technologies' democratic and other structural implications is ineradicably value-laden and specific to particular cultural contexts, and thus should never be a candidate for monopolized production by supposedly impartial experts.[60]

Finally, because technical experts enjoy a privileged position within today's inegalitarian political and economic structures, they tend to share with other elites an unstated, and usually quite unconscious, interest in suppressing general awareness of technologies' public, structural face. If that awareness were to surface publicly, the obvious structural salience and value-ladenness of technological decision making would tend to erode a principal basis on which experts have traditionally been accorded a measure of political deference. This interest in suppression arises despite the fact that many participating experts are behaving consciously with complete sincerity and the best of intentions.

The truth that technical experts are quite *inexpert* on the most important social questions concerning technology should effectively challenge restrictions on lay participation grounded in the claim that the experts know best. The point is not that experts ought never to occupy a distinctive niche within technological politics. However, if they do, that special niche should be decided by means of strong democratic procedure, with due sensitivity to experts' deep and abiding shortcomings on the specific subject of democracy and technology, and in a manner that ensures that, with respect to experts, lay citizens reclaim their rightful political sovereignty, formally and in practice.[61]

If experts are ill-equipped for perceiving the dimensions of technology that bear on the practicability of democracy, many nonexperts do not suffer the same liability, or at least not in the same way or to the same extent. First, everyday citizens have a greater objective interest than do privileged experts in advancing strong democracy. It is their own freedom, self-esteem, and well-being that are at stake (whereas, under strong democracy, some undeserved expert privileges might be at risk). Hence laypeople, once democratically assembled, are more likely to be democratically sensitized and to stand on the lookout for developments that could structurally affect their own empowerment.[62]

Second, nonexperts are apt to be aware from their everyday technological involvements of at least some of technologies' broader social conditions and effects, because the latter directly affect their own life experiences. Upon reflection people know, for example, which technologies require or enable them to work with other people and which have to be used in relative isolation; which are challenging or fun and which induce boredom or apathy; which increase local autonomy and which render localities dependent on faraway organizations. But such intuitions receive scant acknowledgment or affirmation and no interpretation of their structural political significance within the discourse that today dominates technological decision making.

Of course, experts are citizens too, and as such may share some of the experiences and sensibilities of nonexpert citizens. However, here structural distortions tend to interfere. Even if they are privately aware of some of a technology's broader social or political effects, technical experts have an interest in arguing that the most important questions

at issue are precisely those in which they themselves are expert. For instance, expert participants in public controversy concerning genetic engineering have tended to reduce the entire issue to a matter of assessing specific biological risks, whereas lay participants have drawn attention to accompanying ecological, social, and ethical concerns.[63]

In addition, experts' similar social backgrounds, self-selection in career choices, professional socialization, and tendency to acquire specialized competence at the expense of integrative knowledge and experience, render them statistically unrepresentative of the values and outlook of the larger citizenry.[64] Moreover, technical experts—especially the most influential, elite experts—tend to live experientially far removed from the everyday events and concerns of nonexpert, nonelite citizens. Elite experts are not asked to perform boring, repetitive tasks at work; few have to contend daily with inadequate mass transit systems, inferior housing, or poor medical care; they may even grow out of touch with the reality that, unlike themselves, other citizens do not have direct, easy access to the highest echelons of business and government decision making. Their world is (for them) accommodating, affluent, and already strongly democratic. For these reasons experts—even polarized, contending groups of experts—cannot be counted on to understand or communicate the everyday knowledge and judgment of other citizens.

Third, an important component of any democratic politics of technology involves identifying commonalities among citizens and the impact of technologies on them. Here there can be no question of bypassing broad citizen involvement. To establish their differences and commonalities, citizens must communicate with one another. To discover a technology's social functions, effects, and meanings, one must consider the technology in its context of deployment. But affected citizens are part of that context and know things about it that no one else can. Once again, the experience of the Berger Inquiry is pertinent:

> When discussion turned to . . . complex socioeconomic issues of social and cultural impact, [native] land claims, and local business involvement—it became apparent that the people who live their lives with the issues are in every sense the experts. . . . [At] the community hearings, people spoke spontaneously and at length of their traditional and current use of the land and its resources. Their testimony was often detailed and personal, illustrated with tragic and humorous anecdotes.
>
> To the experts' discussion of problems and solutions, local residents were able to add comprehensive and vivid descriptions of the meaning of an issue in their daily lives. Their perceptions provided precisely the kind of information necessary to make an impact assessment.[65]

Where expert testimony tended, moreover, to treat the proposed MacKenzie Valley pipeline as an isolated occurrence, natives and other nonexpert citizens insisted on treating it as a probable trigger for subsequent industrial development. Thus, they, rather than the experts, better articulated the phenomenon of systematicity—the tendency for technologies to elicit the emergence of necessary background conditions and other cascading effects.[66]

It is ironic. Today leaders among our technical elite, such as former Massachusetts Institute of Technology president Paul Gray, argue that scientific and technological illiteracy have reached epidemic proportions, threatening national economic well-being and democracy itself.[67] According to the Clinton administration, "The lifelong responsibilities of citizenship increasingly rely on scientific and technological literacy for informed choices."[68] However, if the most important knowledge about a technology involves not its internal principles of operation but its structural bearing on democracy, then presumably the latter kind of knowledge should constitute the very core of technological literacy. Yet experts, even the elite, typically know little about this first-order issue—not even that it *is* an issue. Must one not reluctantly include among the technologically illiterate—in that term's socially most meaningful sense—the majority of technical experts?

A democratic politics of technology will make demands on individuals' knowledge and judgment. It requires institutions through which people can educate themselves and learn to deliberate together. The Berger Inquiry, for instance, devised community hearings and provided funding to disadvantaged participants. Thus reason and evidence alike suggest that lay citizens can rise to the occasion.[69]

Unpredictable Consequences?

One sometimes encounters the further objection that no one—neither laypeople nor experts—can foresee technologies' social consequences, and hence the ambition to develop democratic technologies and decision making is naively impractical. One part of this concern—namely, that it can be difficult to make predictions—is well founded.[70] Predicting accurately is rarely easy and sometimes impossible. But the consequences of this fact for a democratic politics of technology are not so obvious.

First, even if prediction were utterly impossible, this would not be a telling argument against technological democratization specifically. Those objecting usually assume that in expressing their misgivings, they are defending the status quo against the dangers of misguided democratic idealism. But if one cannot anticipate technologies' social consequences, then why be complacent either about existing, relatively nondemocratic, decision-making processes or about permitting technological innovation at all? Thus, if the doubters' concern stood as a serious challenge to the vision of technological democratization, it would equally challenge the status quo.

Second, sociotechnological predictions are often unreliable, but not invariably so. Some reasonable predictions were, for example, made at an early stage concerning the telephone, the airplane, and atomic energy.[71] Those who completely discount the feasibility of prediction often seem to be making several dubious assumptions. One is to suppose that experts and decision makers have for decades been struggling to anticipate technologies' democratic consequences but have found the task infeasible. That assumption is false. Relatively few experts and decision makers are even sensitive to technologies' structural dimensions, and no one anywhere has ever made a systematic effort to anticipate alternative technologies' structural bearing on democracy.[72] It may prove virtually impossible to foresee technologies' democratic consequences, but that is not yet known, because no one has made the attempt.

Also, skeptics often seem to be reasoning by analogy with contemporary experience in predicting conventionally highlighted technological impacts, such as risks to the environment or human health. In such areas one typically confronts the need to estimate the probability of extremely rare occurrences, to assess the biological consequences of exposure to minute levels of potential toxins, or to understand the behavior of extremely complex ecosystems. Information and consensus are notoriously elusive.[73]

Decision making concerning technologies' democratic implications may sometimes involve questions of comparable complexity, but often it will not. Thus if it is difficult to anticipate the toxicity of a new chemical or the environmental effects of carbon dioxide buildup in the atmosphere, it is not necessarily so hard to predict whether a new work process will involve drudgery or whether or not a new economic activity will contribute to local self-reliance. Yet the latter kinds of questions are not only potentially more tractable, but they also better typify the first-order agenda for a democratic politics of technology (see the design criteria developed in Part II).

Furthermore, it is at least conceivable that our ability to predict will gradually be enhanced, although never perfected, through better understanding of technologies' social dimensions.[74] It may also improve simply by our learning to ask better questions. Publicly debating democratic design criteria offers a promising means for learning collectively to perceive technologies' nonfocal aspects and to formulate democratically essential questions.

Third, and most importantly, it is a mistake to assume that a successful democratic politics of technology depends heavily on long-range prediction. After several centuries of rapid technological innovation, our world has become technology-saturated, but it has not been carefully assessed or governed using democratic norms and structural criteria. Thus one of society's deepest needs is not to predict future consequences, but instead to observe and evaluate the technologies we already have. This might lead to promoting, reforming, or replacing certain existing technologies and systems rather than simply integrating new technologies into a taken-for-granted, preexisting technological order.

The world, moreover, is not culturally or technologically homogeneous; indeed, one can learn much about technologies' social consequences not by prediction, but by studying and comparing technologies as they exist, or formerly existed, in diverse sociocultural settings.[75] The concept of nonfocal structural consequences highlights the potential utility of such comparisons, for it suggests that—relative to headline-grabbing "cutting-edge" technologies—more prevalent, mundane technologies are not so socially inconsequential as we have come to suppose. In other words, the coming wave of biotechnologies, nanotechnologies, cryogenics, and information superhighways matters, but so do more familiar technologies such as pipes, washing machines, air conditioners, jackhammers, and electricity distribution networks.

To the extent that it does, however, become important to understand a particular new technology's social implications, one option would be to run voluntary social experiments. By observing technologies on a trial basis in selected communities, it should be possible to discover social consequences that would otherwise be hard to anticipate. There are already partial precedents for such experiments. For instance, many businesses test-market new products and systems prior to full-scale deployment, and pharmaceutical companies must run rigorous clinical trials before marketing new drugs. Democratic trials would be analogous but would also differ in some respects. They would require a more egalitarian design and evaluation process, and their purpose would be to evaluate technologies' democratic and other broad social consequences, rather than only economic marketability or medical efficacy and safety. (Trials are promising for detecting some social consequences but not those that are scale-specific. For instance, local

trial of a prototype invention will not disclose impacts that might later arise from creating large production facilities, supporting technological infrastructures, or a new government bureaucracy to regulate use of the proliferating devices.)

One rough indication of the practicability of acting on information garnered from sociotechnological trials involves historical instances in which elites or powerful organizations stifled innovations that experience showed to be inimical to their interests. For instance, Japan's 17th-century warrior aristocracy suppressed the use and manufacture of guns. Among other things, sword-bearing samurai objected to being shot by peasants.[76] Thus potent actors seem able, when self-interest so dictates, to discriminate actively among competing technologies. A more democratic society would differ in striving to empower all members and groups to participate in such technological discernment.

Finally, one democratic design criterion developed in Part II seeks technological flexibility, so that if future technologies should manifest unexpectedly adverse structural effects, they can be modified or replaced without undue hardship.

CONCLUSION

The basic practicability of a democratic politics of technology seems well demonstrated by the accomplishments of the Old Order Amish. As Chapter 1 explained, the Amish have for centuries guided their social and technological development with unusual self-awareness, while retaining their communities' self-governing, democratic character.

Their success suggests that the Amish have learned better than many other societies to perceive technologies' nonfocal, structural dimensions. For instance, their reasons for favoring horses over tractors include recognition that horses reproduce themselves; produce manure fertilizer; compact the soil less; do not mire down in mud (permitting earlier springtime plowing); and help avert dependence on petroleum products, parts suppliers, and outside mechanics. Also, using tractors would lower farm employment (which the Amish wish to maximize) and reduce the overall need for horses, thereby increasing the chance that cars would gradually replace horses for nonfarm transportation.[77]

The Amish style of technological decision making exemplifies a number of the strategies proposed above for coping with the difficulty of prediction. For instance, the Amish observe the social effects of technological innovations in surrounding non-Amish communities and then use those observations as one basis for making their own decisions.

Generally, community members are permitted to adopt a new technology unless that innovation has already specifically been prohibited. However, sometimes the Amish put new technologies "on probation," allowing only tentative adoption so that the social results can be discovered. For example, in various Amish communities once-probationary private telephones, electric generators, and computers were eventually forbidden. On the other hand, Amish communities in east central Illinois ran a one-year trial with diesel-powered bulk milk tanks before deciding not to prohibit them.[78]

If nonexperts are incompetent to participate in technological decision making, if it is impossible to learn to perceive technologies' nonfocal aspects, and if the difficulty of prediction poses an insurmountable barrier to the practicability of a democratic politics of technology, then somebody had better go tell the Old Order Amish.