Modernity, Technology and the Forms of Rationality

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The following paper is a contribution to the conference "Lyon-Shanghai: Knowledge and Society Today." It summarizes the concluding chapters of Between Reason and Experience which will appear with MIT Press in 2010.

We are accustomed to thinking of rationality as a feature of modern societies. Modernity has been accompanied by an unprecedented growth of science and the breakdown of many taboos. We are able, as our ancestors were not, to question everything, choose our leaders, and build on reliable knowledge accumulated over the past few hundred years. This is why modernity appears to us as a value that must be preserved.

But progress in rationality has not only freed the pursuit of knowledge. More and more of social life and technical activity is structured by what I call "social rationality." This form of rationality bears a certain resemblance to the rational procedures we associate with mathematics and science. For example, markets are organized around a principle of mathematical equivalence: money purchases an equal value in goods. Similarly, bureaucracies operate through systematic classification and the application of universal rules. In this they resemble a science that applies laws to objects according to their type. Finally, business and engineering seek optimum efficiency in the relation between means and ends. This requires precise quantitative measurement of the sort characteristic of science as well.

This whole complex of systems and procedures was called "reification" by Georg Lukács in his famous Marxist analysis of modern forms of rationality. Reification crystallizes the fluid process of human relations in the form of "thinghood," that is, as independent objects such as institutions and commodities. Individual features of human situations are effaced in the application of general concepts. Time and space are rendered uniform and measurable. Reification thus separates the rational form of social objects from their human contents. The social world is conceptualized as a "second nature," a realm of facts and laws similar to the first nature studied by natural science and like it controlled by technology. But unlike in the case of natural science, reification actually shapes the relations and objects it conceptualizes. Reification is not merely a theory, but also a systematic practical relationship to the world which constructs that world in the form of a collection of law-governed objects.

Reification depends on a peculiar attitude toward social processes that is unique to modern societies. The subject of action in reified institutions limits its understanding and behaviour to technical manipulation. The buyer on the market abstracts from the human relation to the seller. The bureaucrat and businessman too relate to the human objects of their activity in a peculiarly objective manner. Habermas calls this an "objectivating attitude" toward the social world. In the case of technology something similar goes on: the meaningful dimension of technical artifacts is reduced as much as possible to make room for a stripped down functional approach.

Meaning in this context is the significance of objects within the way of life to which they belong. For example, food is not merely calories--its functional aspect--but is the occasion for the pleasures of the table, good taste and social contacts. It is edible according to culturally established rules and is eaten in a specific order with some types of items beginning the meal and others ending it, accompanied by appropriate drinks, and so on. All these complex cultural

associations with food are as much a part of its experienced reality as its caloric content. Much of the richness of this cultural dimension is lost in the functional abstractions of dietary manuals and the barren setting of fast food restaurants. This example could be matched by others from every area of social life. In each case cultural interpretation reveals the complexity of the world from which functions are abstracted.

Nevertheless, the loss of richness is essential to social rationality. It has made possible tremendous progress in the power and effectiveness of institutions and technologies. The result is the emergence of large scale social organization and enterprise. The building of nation states and cities depends on the generalization of social rationality. Without technologies, markets and bureaucracies there can be no modern societies. The progress of knowledge and the emergence of the modern form of rational individuality depends on the transformation of daily life through ease of movement in space and transmission of intellectual resources on an ever widening scale. Better education and relatively greater security of life erode religious traditions and customs inherited from the past and open individuals onto the future to an unprecedented extent. These are the foundations of modern life.

But the results of all this progress in rationality are mixed. Every advance in the power of our reason seems to have been accompanied by devastating setbacks. The 20th century, which should have been a triumphant justification of reason, saw both triumph and disaster. Wars, concentration camps, and environmental crisis are a part of its heritage, along with greatly increased wealth, medical advances, and decolonization.

There are two very different interpretations of these mixed results. Many, perhaps most, people conceive of reason as in itself innocent, neutral, employed for ends either good or bad depending on human will. This is the obvious answer to the question of the failures of modernity.

But philosophers have proposed a different answer in the context of a critique of technology, understood as the signal achievement of modernity. Jacques Ellul, Martin Heidegger, the thinkers of the Frankfurt School, and many others argue that there is a fundamental flaw in rationality as we in the modern world understand it. They do not claim that irrationality would be an improvement. They reject the old romantic opposition of reason and emotion that would lead to such a conclusion. The argument is more subtle and focuses on historically specific distinctions between our way of being rational and that of earlier societies.

Those earlier societies relied on what we think of as "common sense" rather than a reified or formalized mode of thought such as we associate with scientific and technical disciplines. This everyday or "informal" rationality is less systematic but richer in content than our formal rationality. It takes into account meanings and valuative dimensions of objects from which formal rationality abstracts in identifying objects with their functions and affordances. It plays with timing and ambiguity in ways excluded by systematic thinking. It opens up the psychic space of self-reflection and critique. Humanistic disciplines, like most other non-technical thinking, build their reflections on the basis of everyday modes of thought rather than on the reified abstractions and quantifications of the technical disciplines.

Although informal rationality structured premodern societies and still has its place today in all sorts of everyday contexts, it cannot and does not structure modern societies based on socially rational systems and procedures. The hope of the critics, insofar as they have any hope, is not that we get rid of technical rationality but rather that we learn from the past what we are missing and on that basis reconstruct our modern society in a less dangerous pattern.

Ellul explains that modern societies are ruled by efficiency. This purely instrumental value replaces all others and guides the "autonomous" development of technology. He does not

mean that technology is self-generating but rather that any modern decision maker faced with a problem would arrive at a similar technical solution under the rule of efficiency. This has implications for how the world is understood and experienced by modern human beings.

Heidegger argues, for example, that the world is seen as a sum of resources, raw materials and system components. Nothing any longer has its own inner principle of movement, its own essential core of being, but rather everything is exposed to transformation to serve a role in the technical system. Objects are ripped from their contexts and reduced to their useful properties. These decontextualizations and reductions are inherently one-sided and violent. In this respect modern technology differs from craft work in which a pre-existing essential form embracing a wide range of values and meanings is realized by the craftsperson in materials conceived as predestined for the work. Instead, modern societies impose plans on passive materials.

The Frankfurt School holds similar views, distinguishing premodern "substantive" rationality, encompassing both means and ends, from the purely instrumental rationality of modern technological society. The incorporation of human beings into the technical system as deskilled producers and passive consumers of media and commodities suppresses resistance to social injustice and so perpetuates a competitive and destructive social pattern. Common sense itself is corrupted as adjustment to the facts of life becomes conformity to the system which establishes those facts. The reified system prevails not only in the objective organization of society but is lived by the individuals as the necessary form of their own experience.

Underlying all these diagnoses of the ills of modernity is nostalgia for a world in which the essence of things is secured by a stable culture. All premodern societies have some equivalent of the notion of essence, understood as an internal principle of form and development. Essence limits human technical activity to means that favour the unfolding of potentialities slumbering in nature which nature unaided cannot realize. Only modern societies free instrumental activity from all concern with the essential and conceive a total technical system that embraces human beings as well as things in accordance with arbitrary plans. This is the condition for rapid technical advance but it also has disastrous consequences since so many aspects of reality are ignored in the race for more power and wealth.

Since it is impossible to return to the closed cultural worlds of premodernity, we must innovate unprecedented solutions. At best premodern forms of technical practice hint at possibilities foreclosed by modern development. Some critics of technological rationality take refuge in spiritual transformation. This is a solution that is no solution. It leaves the realm of technology unchanged while holding out hope that a better attitude can somehow address the problems technology causes.

Unsatisfactory as is this approach, it seems preferable to the suggestion that we regress from industry to craft. One imagines with difficulty the preservation of the achievements of modernity such as individual freedom in a society that has gone back to the Middle Ages technically. Even more unsatisfactory is the solution Heidegger sometimes proposed in which the challenge of technology is met through some sort of unspecified collective heroism vaguely associated with Nazism.

The Frankfurt School philosopher Herbert Marcuse offered the most complex and interesting alternative. He argued that our lived experience of nature gives access to "existential truths" that reflect the intrinsic potentialities of things. Experience reveals norms of peace, harmony, and flourishing that have been preserved and developed by philosophy and art throughout the history of class society, even as the repressive structure of that society prevented

their realization in fact. According to Marcuse, modern technology can at last be transformed to realize the potentialities revealed in experience. But only a socialist society that democratically administers technology will be able to break the "continuity of domination" and initiate a new era.

This solution depends on the notion that there are truths to be found in our everyday experience of the world. But unless "truth" in this sense has a better claim to rational universality than any particular cultural prejudice the word is simply misused. Marcuse took it for granted that certain normative assumptions are built into human experience as such. The Western cultural tradition articulates these assumptions in works and concepts that have validity beyond the vagaries of personal opinion. For example, categories such as beauty and health have equivalents in all cultures even if their referents are somewhat different.

The differences surface as disagreements in large scale modern societies. They may never be resolved in a singular universal but that is unnecessary in the context of a democratic system such as Marcuse imagined. Public debate can give an operative content to normative categories and that content can guide the transformation of technology in accordance with a renewed notion of essential potentialities. The point is that design and development would no longer be guided by the pursuit of profit and power but would respond to a vision of the good. Modern technological rationality would incorporate values once again but in a modern way rather than through regression to craft.

Marcuse's solution addresses the problems identified in the critique of technology while avoiding the determinism that vitiates other approaches. He also avoids the vacuity of an appeal to a mere change in attitude, which leaves technology as it is, as well as the regressive notion of a return to premodern conditions. Both positions imply that technology cannot be changed, only approached in a different spirit or abandoned. Marcuse's position is unique among critics of modernity in that he recognizes the flexibility of technology, its potential for reconfiguration under different social conditions. His position is also original in posing the problem at the level of the form of rationality and its relation to experience. As we will see, this opens a possible connection to recent technology studies. But this connection has been ignored, overshadowed by the very radical political argument within which Marcuse locates his contribution to understanding technology.

The key insight of technology studies is the role of social actors in the design of technologies and technical systems. The notion of "actors" dereifies technical practice by restoring the role of human action in the technical sphere. Where previously it was generally assumed that technological design responded to purely technical considerations, more recent research shows that many underdetermined decisions are made in response to ideologies, visions of life and interests. Technology studies shows this concretely through research on particular cases of all sorts, from missile accuracy to the history of bicycles, refrigerators, plastics, and vaccines. The old technological determinism that so influenced modern sociology and philosophy is effectively refuted.

According to technology studies, technology is a hybrid of knowledge about nature, conserved in the technical disciplines, and the many concerns of non-technical actors who intervene in design decisions in a variety of ways. Several concepts have been introduced to signify the hybrid character of technology and the technical disciplines that create it. Wiebe Bijker proposes the concept of "technological frame," a kind of paradigm or model that guides the actions and interactions of the many individuals and groups who cluster around the process of development. The similar notion of the "technological regime" has been developed by Arie

Rip in a constructivist approach to technology assessment. I have suggested the term "technical code" to refer to the translation of social demands into technical specifications. Technical choices that depend on a social criterion of some sort bear a social content in technical form.

As can be seen from this brief description, technology studies arrives at conclusions similar in important respects to Marcuse's from a completely different starting point. Technology studies validates Marcuse's hypothesis that technological design is responsive to non-technical interventions and embodies a way of life, although it abstains from political references and philosophical reflection on the nature of modernity.

This partial confirmation suggests a strategy for reconstructing Marcuse's theory in a politically modest but still normatively interesting form. Instead of linking the transformation of technology to a future socialist revolution, it can be conceived as an ongoing process that is gathering strength as technology is implicated in more and more domains of social life and causes a wide variety of problems to which solutions must be found in the present. And in fact solutions are being pursued actively around issues in environmental, medical, and information technology today. Technology studies explains why and how these public interventions into technology are not simply ignorant meddling but potentially significant for the future direction of progress.

Marcuse only observed the beginning of this active public process of technological change toward the end of his life. He believed that the environmental movement confirmed his own theory. It opposed the rights of the living to the destructive dynamic of capitalist development. A value based on the evidence of experience—the affirmation of life—was invoked as a guide to the reform of technology.

Whether this process will eventually prove incompatible with capitalism as Marcuse claimed need not be decided in advance. Marcuse drew on a larger conception of the destructiveness of capitalism confirmed by a long history of oppression in concluding that the system was fundamentally challenged. He related environmental politics simultaneously to the overarching structure of modern rationality and the particulars of technological design. That is the important connection that is so far missing from technology studies.

A new picture of technical politics can be drawn on the basis of Marcuse's philosophy of technology and research in technology studies. The dominant technological rationality is based on a simplified understanding of its objects. Reduced to raw materials and disconnected from their natural background, the materials incorporated into technical system have unanticipated side effects that become fatally significant as the system expands. Eventually these side effects cause such destruction and disease that ordinary people are affected and protest. The protests feed back into technological design and result in modifications that reflect a more realistic understanding of the objects. This overall dynamic leads to awareness of the hybrid character of technology and a weakening of technocratic and determinist ideology. Predictably, technical politics will become part of mainstream political debate as this process unfolds.

In other domains such as information technology a related dynamic is at work. There technologies introduced in the context of military and business enterprise have been colonized by users in pursuit of personal fulfilment. The communicative opportunities opened by the technologies have a role parallel to that of side effects in environmentalism, revealing complex potentials of the systems unsuspected by their original designers. These potentials are benign rather than threatening and deserving of independent development. They enable new forms of sociability and multiply creative possibilities for ordinary people. The democratic implications of

these technologies are also emerging clearly as resistance grows to commercial exploitation and political suppression.

What are the values that preside over these processes of technological change and what are their relation to the technical disciplines involved in the redesign of technology? In each particular case of environmental protest the arguments are different but it is possible to generalize to a notion of respect for nature within limits set by human flourishing. The reconciliation of these requirements is usually possible and even economically viable in the long run if not in the short run time spans of capitalist investment decisions. Similarly, the value of human flourishing underlies the transformations of information technology. These are precisely the values Marcuse celebrates in his reflections on the lived experience of nature and the "existential truths" we can learn from it.

The technical disciplines respond to these public interventions by gradually incorporating a broader range of considerations in their concept of the object and their practices. The increased complexity of the disciplines corresponds with the real complexity of the world on which they operate. Values do not appear within the disciplines directly and immediately, but indirectly through mediations that address side effects and opportunities identified in protest, hacking and innovation. The results are improved technical disciplines and technologies as judged from both a technical and a normative standpoint.

The dynamic interaction of technical disciplines and public interventions is a consequence of the differentiations that make modernity possible. Until technology achieved a certain independence from society it was constrained by craft traditions and religious, ethical and aesthetic conceptions. Modernity unleashes technology by creating the conditions for the development of formalistic rational systems. Reification is thus a productive feature of modern societies despite the problems it brings in its wake. But the rapid development of modern technology has reached the point where it can no longer conserve its autonomy.

The ultimate reality test for technology is public acceptance since the public must deal not only with each particular technology in its ideal setting but all of them together in the chaotic world of daily life. The informal common sense thinking arising from everyday experience can evolve to become adequate to making judgements about this world. It is not simply inferior to technical thinking but encounters the world differently. Rather than abstracting toward a limited explanatory register consisting of causes and functions, informal rationality connects ideas by association. It operates on the surface of the phenomena where values and meanings circulate freely. This may lead to confusion and error but it also opens thought to the unforeseeable complexity of the world. That openness can be essential where the narrow scope of the values and connections built into technology leads to disaster or blocks progress.

Feedback from "reality" as it is experienced by ordinary people under these conditions is thus not extraneous to technology but essential to its successful development. In a differentiated society that feedback takes place through a sometimes conflictual circulation of information and products between the technical disciplines and society at large. In sum, neither technical nor everyday rationality are complete in themselves; they form halves of a fragmented whole.

Reification cannot be abolished once and for all by joining the heterogeneous fragments but its effects can be mitigated by their interaction. Struggles in which formal and informal modes of thought encounter each other bring the human basis of the society to the surface. Concrete issues involving technology and other rationalized institutions are the occasions for these struggles. Anything that promotes the interaction of these divergent ways of understanding the world is progressive and should be supported. Obstacles should be removed as quickly and as

effectively as possible. That is the new task of the democratic process that has been unfolding in the modern world since the 18th century.