

TECHNOLOGY ASSESSMENT AND PUBLIC POLICY

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2/ The accelerating rate of technological change and development in the  
twentieth century has raised serious questions concerning the ability of  
democratic systems to control and direct technological development in ways  
compatible with both the protection of present and future public interest  
and the survival of individual freedom. In highly industrialized societies  
scientific invention, technological innovations, and public policy alterna-  
tives are inextricably intermeshed. Consequently much of political theory  
in the twentieth century has focused on the problem of democratic decision-  
making. Political philosophers have asked: Will the highly complex decisions  
which determine the quality of men's lives, the conditions of their labor,  
and the shape of their physical environment, necessarily be made by an elite  
class of specialists and technocrats? Will such decisions be made within an  
anonymous and non-responsible corporate structure? Can we escape this fate  
only at the cost of a highly controlled, totalitarian State? Or will the  
technocratic elite, the corporate structure, and the governing process in-  
exorably merge, while the mass of men, unable to participate meaningfully

*the title  
determines  
that decisions  
are general*

a decisionmaking, lapse into apathy or alienation?

Professor Stafford Beer, Professor of Cybernetics at Great Britain's Manchester University, testifying before a congressional committee in 1970, said:

"...(Technology now seems to be leading humanity by the nose. We appear to have no sense of priorities where our problems are concerned; we do what is technologically easy -- and we do it regardless of cost."

Professor Beer was concerned with the apparent failure of democratic societies to develop systems of management and control which are adequate to the complexities of their internal and external environments. The alternative which he offered was to "design a stable society," recognizing that this will involve "the deployment of a political science to new ends" by treating our "complexity-control capability...as offering a nervous system for the body politic."

Today, technology and public policy are inextricably intermeshed. It could not be otherwise in these days of government subsidy of R&D, large-scale public projects, direct federal aid to cities, and all the rest of the welter of federal-state-and-local programs, regulation, and incentives.

We live in a highly interdependent society and interdependent world, where technology permeates our daily lives. John Eberhardt has noted that the cities in which we live, or work, today are the product of six inventions which occurred in the eleven years between 1877 and 1888 -- the electric trolley, the automobile, steel-beam construction, elevators, electric lights, and telephones. Just as surely, the technology of today will determine the quality of our lives in the next few decades. Modern technology has given us a degree of power, well-being, and equality that was undreamed of before the last two centuries.

We should not forget this, even when, as at present, we are increasingly aware of the social costs and hazards associated with that progress. Technology also determines who shall work, where they will live, the conditions of their labor, and the quality of their physical environment. Advances in farming technology sent great migrations of people off of the land and into cities which were woefully unprepared to receive them. Biomedical technology may soon affect the very nature of man himself. The point here is that technology is a basic causative agent - if not the basic causative agent - in social change, not just in the U.S. but throughout the world. It helps to shape not just our environment, but our behavior, our institutions, and our values.

21 Unfortunately we have only the most rudimentary understanding of social change. We can design systems to produce a desired output far easier than we can predict the unplanned, unexpected consequences that will follow, that may ripple outward as our complex society makes both deliberate and unconscious adaptations and adjustments. This raises the problem of the ability of pluralist, democratic societies to guide and control and encourage technological development in such a way that we can reap the full benefits of our advances in knowledge, safeguard the larger public interest, and at the same time preserve individual liberties and options.

When we talk about technology assessment we are offering it as a beginning, a first step in improving and broadening and rationalizing the way in which decisions are made in our present democratic institutions - those in the public sector and those in the private sector. Inept and inefficient and sometimes corrupt though those institutions are, I submit that from the standpoint of the ordinary citizen, they are probably the best that history has yet evolved.

It is, I suppose, incumbent on everyone who talks about technology assessment to offer a definition. TA is the systematic and disciplined attempt to forecast, identify, and evaluate all of the potential impacts of new technology -- or a significant change in the application and utilization of old technology -- all of the impacts, whether beneficial, detrimental, or uncertain, on economic, environmental, behavioral, cultural, and institutional systems and processes. If TA can provide a neutral, objective, informational input into decisionmaking, we can begin to make rational trade-offs so as to maximize potential societal benefits and avoid or minimize or control the potential social costs. TA should be used in two ways -- it should be integrated into day-to-day decisionmaking both in government and the private sector; but also if widely disseminated, it can provide a test, check, by the public on those decisions. The first duty of a citizen in a democracy I submit, is to have a healthy suspicion of all authoritative decisionmaking.

I want to mention briefly some of the factors and pressures which seem to me to be pushing the development and acceptance of technology assessment, to describe some of the more recent developments, and to comment on the constraints which seem to limit its future development.

J. M. Bury, in his book The Idea of Progress shows that in the West, from the time of the industrial revolution and for a century afterward, the belief in Progress had its touchstone an almost unlimited faith in technology. Through most of human history, natural resources seemed unlimited and the social costs of their exploitation were almost unnoticed, because those social costs - such as inhuman conditions of labor, loss of common lands, and spoiling of local environments, were largely passed on to social classes who not only lacked political power but lacked even the intellectual means

of aggregating and voicing their grievances. That day is past. Recent enlargement of the scale of technology has brought with it over-population, concentration of people into congested metropolises, world-wide economic interdependence, accumulation of pollution and hazardous side-effects, and invasion of human privacy. Moreover, modern technology with its astronomical costs of research and development and capital investment has meant that public institutions are heavily involved in technological development. A rising standard of living and a demand for more equitable distribution of material goods gave rise to ever higher expectations which in turn led to and now sometimes conflicts with, demands for a better physical environment. In the 1960's which were in the U.S. a decade of polarization and politicization, public controversies erupted over a great many projects such as urban renewal, highways, and airports. Though these projects were well designed, to meet real needs, they also usurped recreation space and aesthetic vistas, dislocated homes and businesses, disrupted established neighborhoods, and brought intrusions of noise, pollution, and congestion into homes and communities. Citizen protests in the form of direct action and lawsuits caused expensive delays and changes in many projects. This, in turn, generated political pressures on local and state governments and finally on Congress, which has, therefore, become increasingly suspicious and resentful of the programs, but more specifically of the information, which it gets from executive agencies. Congress has, therefore, increasingly laid new demands on agencies for improving their planning and evaluation techniques ... for example, consider the National Environmental Policy Act of 1969 (perhaps the largest single stimulus to the development of technology assessment) and the four highway acts of 1958-1970 which mandated successively more comprehensive planning and interagency consultation.

*problems  
of the day*

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As you may know, Congress has initiated and passed, and the President as signed, the bill creating an Office of Technology Assessment to provide Congress with an independent source of assessments.

Executive agencies are slowly responding to these pressures by improving and broadening their assessment practices, an improvement which I concluded in a recent study has been significant over the last 5 years but still has a long way to go. Out of 86 Federal offices which I studied, I judged that roughly 63% are now carrying out some assessments, 31% regard technology assessment as the major function of the office, and about 24% concern themselves strictly with performance criteria and give no significant attention to any secondary or higher-order impacts. A few agencies have responded to the new OTA bill by signalling their consideration of creating new T.A. groups within the agency. Others are now struggling to create interdisciplinary evaluation teams and to incorporate social science and ecological data into their cost/benefit studies. The fact remains that the institutional survival and strength of an agency are judged by the agencies' success in promoting and selling its programs and projects to Congress and to the public. There is obviously built-in resistance to assessment practices which may cast doubt on the long-range benefits of those projects, which may impose on the agency new and onerous responsibilities or which may offend or threaten their special constituencies in the name of a nebulous public. Agency officials are well aware, also, that some time in the future they will be expected to have met increasing demands for energy, for transportation, and for other services and that if those demands are not met, the fickle public may forget who it was that objected to new power plant sites, airports, or water resource projects. Finally, agencies do not have adequate resources either of money or interdisciplinary teams for comprehensive assessments,

and the Executive Office, especially OMB, has supplied neither the resources nor the demand for comprehensive assessment.

In the business sector, I think that T.A. has made little progress although in some companies there is much talk of it. At the moment, the corporate image requires a show of social responsibility, environmental concern, and a role in the community. And corporation managers - usually not having the cut-throat drive of old-style entrepreneurs, and frequently being men of social conscience, are often sincere in this intention. And there is also the realization that something like technology assessment is desirable to foresee and avoid future government regulation or investment in products which produce ecological disasters or health hazards and hence painful losses to the company. But on closer look industry T.A. usually turns out to be quality control or market studies under a different name. The business of business is still to make a profit, after all, and business -- unlike government -- has no broad charter which says it's chief responsibility is to promote the overall public interest. In terms of corporate accounting, social benefits are very slow to mature, and are even more difficult to internalize than social costs.

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Methodology is sometimes a sore point for technology assessors. T.A. is an eclectic and basically judgmental activity. There are no magic formulas. Such innovative techniques as are being experimented with, such as Delphi, cross-impact matrices, etc., are adapted from futurist research, management techniques, and resource allocation studies. T.A. methodologies are really no more than a structured approach to analytical thinking, just as T.A. is in one sense a broadening of systems analysis. In this area quite possibly, systems engineers may make contributions to the development of methodology, but I do not think that further practice of T.A. should wait for development

of elegant refined techniques.

Technology assessment teams are, or should be, first of all interdisciplinary. They should include ecologists, physical scientists, economists, demographers, urban planners, and most importantly, social scientists.

In the 86 Federal offices which I studied and the nearly one hundred assessments I looked at, the disciplines most commonly used were engineering and economics. There are several points to be made here. First, all scientists must be trained to do interdisciplinary research. Not simply as part of a project that also employs other disciplines, but to exchange meaningful information across disciplinary lines, to absorb insights from other disciplines, and to integrate and synthesize information of many kinds. Secondly, the physical scientists must learn to deal with a high degree of uncertainty. There are few general theories or laws in social science. Physical scientists and engineers appear to be uncomfortable in dealing with the low-probability predictions which social scientists must use, and, therefore, they complain that social scientists cannot tell them what they want to know. Yet social scientists might for example, have warned highway engineers about the anomie and alienation which might result from dislocating a settled functioning ethnic neighborhood.

The manager of an assessment team has the responsibility of recruiting and organizing the interdisciplinary team. Social scientists, and the pseudo-sciences such as urban planning, aesthetics, etc., are still at the stage of constructing their disciplines; the reward structure is such that they are more likely to be involved in building theoretical constructs and accumulating data than to be involved in practical problems. Hence the technologist must perhaps play a tutorial role, instructing other disciplines in the practical needs of society and the real-world constraints on meeting and managing those needs.



But the fact remains that most technology assessments today are not performed by interdisciplinary teams. They are perforce carried out by one person or a small group. Each person, then, should be interdisciplinary, must become sensitized to the intricate relationships and uncertainties of environmental, ecological, political, and social systems. They must inquire into the process of social change, and must be encouraged to ask not only how? but Why? and What then?

Finally, all scientists must be involved to a much greater extent not only with the problems of industry and the government, but with the problems and activities of the community and the society. If the mass of citizens is to be able to understand and participate in the issues and decisions which shape their lives, rather than lapsing into obstructionism or apathy; if we are to avoid the excesses of neo-Ludditism on the one hand and technocratic elitism on the other, here too scientists must play a tutorial role. They must find ways of sharing their expertise and their understanding of the physical world with the public, who after all must remain the final check on decisionmakers.

- 1) Survey of trends demanding technology assessment
- 2) discussion of the meaning of T.A. - Evaluation of <sup>the</sup> direct and indirect impacts of new ~~or~~ revised technologies as they are applied to a society
- 3) speaks as something of an advocate, calling on citizens to fulfill their democratic responsibilities
- 4) T.A. must become much <sup>more</sup> widespread and the techniques better developed.

She has a clear insight, as well as some deep concern about the world ~~and~~ situation

