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# Managing Technology by Performance

Virtually everyone now agrees that if Earth is to become and then remain a suitable habitat for mankind, living in harmony with nature, the management of technology to this end is required. There is much less unanimity on how to do it.

Many people are inclined to put their faith in the legal adversary process as a means for selecting among candidate technologies. This process results in the legal sanctification of one technology and condemnation of another, often confusing the severity of the restraint with effectiveness in solving the problem.

The consequence can be frustration of hopes for a viable environment with safe and healthful air, water, vehicles, products, food, homes, and workplaces for people. A popular conviction that science necessarily ill serves mankind might also follow.

Standards intended to ensure the achievement of specific social goals should, wherever possible, be based on performance criteria and not on design specifications. They should specify the problems to be solved and not the detailed prescription for solving them. But they must include valid quantitative means for determining whether the required performance has been achieved. The virtues of the performance approach are two.

1) By specifying the performance criteria in functional terms, the social purpose of the standard is clear, as is the level of performance required to achieve it. Everyone has an opportunity to evaluate the wisdom of the choices made and the value judgments implicit in them.

2) The scientist and engineer who are trying to meet the goal can search, with minimum restraint, for innovative solutions. The restraints on technology are limited to those that are actually relevant to social ends. Performance standards are also less likely to serve as obstacles to a fair, competitive marketplace, since they are less likely to protect established technologies against potentially more productive new ones.

Broad participation by all affected parties is essential in the selection of the strategy for solving a given problem and the choice of the level of performance to be required, for it is here that value judgments enter. But achieving a fair and effective regulatory process based on performance requires progress in a research task whose difficulty and importance are usually underestimated. While compliance with design requirements can be verified by inspection, compliance with performance-based standards can only be evaluated with very sophisticated tools.

It is frequently very difficult to devise test methods which exclude technologies that will not achieve the specified social need, yet which are free of prejudice and do not favor one technical solution over another. It is difficult to prescribe test methods than can withstand challenge by sophisticated lawyer-expert teams in court. Thus research in the field of physical measurement takes on a new dimension as an essential element of the rational systems approach to the management of technology by society.

The performance approach need not rest on the skills of physical scientists and engineers alone. The ideal would be to specify the performance goal in terms of social and biological effects. Psychophysics and other branches of biometry, applied in conjunction with physical science and engineering, deserve a very exciting period of development. If the research community insists on the performance approach as an essential basis for rational regulation and provides sufficient research help to make it practical, science can be used to manage technology responsibly.—LEWIS M. BRANSCOMB, director, National Bureau of Standards, Washington, D.C. 20234