The Impact of Technology on Society

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It was not much more than a century ago that the Industrial Revolution broke upon us, amid much concern and some violence over its feared negative consequences to people and to the society. We survived the Luddites, and prospered under the Industrial Revolution--indeed bringing us in the late 1930s and 40s to a culture of Technological Utopianism, where it was believed science and engineering would solve all the problems that face mankind.

Once again today, there is concern and some violence and vandalism aimed at the processes and products of science and technology. The mood of Technological Utopianism has been replaced by a rampant techno-phobia--a fear that technology creates more problems than it solves.

We live in a system whose standard of living and whose creature comforts are the direct result of technological advance in a free market system. By contrast, we have seen in Eastern Europe the grim consequences of creativity and productivity stifled by politics--consequences that were not fully understood until the wave of democratization revealed a system increasingly unable to provide for its people and that has damaged its environment almost beyond belief.

One might conclude that the stark comparison would reaffirm to the people and policymakers of the West that their system is the right one. Yet many beneficiaries of the free-market system seem ever more inclined to reject it and its advances. Far from concluding that a system that works should be perpetuated, we hear more and more expressions that it should be slowed down, or in some cases stopped completely. "Zero risk" is the banner that now flies above our comfortable and relatively self-satisfied societies. Energetic and often extreme effort is being devoted in many quarters to influence the public, the opinion leaders and the policymakers either to delay the arrival of new technologies or to abandon them altogether. Even as Eastern Europe abandons socialism for capitalism, we seem to want to abandon that which those beleaguered nations want to adopt.

Affluent nations and peoples understandably want to preserve what they have. But we cannot preserve our present standards of living by standing still, and we cannot deal with the problems that still beset us by fossilizing the status quo. Yet the debate over perfectly valid issues of safety, quality, and environmental protection, pressed with great vigor by spirited advocates, unquestionably is leading to public confusion, distrust, and to delay. Every advance in our ability to test a product for safety seems to lead to more stories and rumors about dangers, not to more public reassurance that it is being well protected by the regulatory system. In a competitive industrialized world, and in the underdeveloped world where human needs are largely unmet, the consequences of shackling the progress of technology can be damaging and even tragic.

For their own sake, Western nations cannot afford to adopt the philosophy that they have it all and can now rest on their technological laurels, and in global terms, industrialized nations cannot adopt the motto "You can haul up the ladder, bos'un, I'm on board." It would be both arrogant and dangerously counterproductive were industrialized nations to conclude that global circumstances do not impinge on their own economic health, or to ignore the plight of others out of a lack of simple humanity.

Only an affluent and well-fed society could consider that the paramount issue about food is safety, when the issue for the overwhelming majority is still finding enough food just to stay alive. We should not fall into the trap of believing, for example, that the decline of world grain supplies to a 61 day reserve is not an issue for our nations as well as for the Third World. Inflation is a major disease of industrialized nations, and nothing can drive inflation up faster than a shortfall in food supplies.

Those nations that will continue to prosper

will be those that continue to move, to adapt, to change. And those that recognize the value of an expanding global economy and an improved human condition will also work to transfer progress to those in need. In large part, this progress will be knowledge-driven. New ideas leading to new products and processes are today the major economic tool advanced nations possess to maintain their leadership, and the primary tool for progress on a global scale.

But there is also no question that the role of technology in our societies of the future has to be approached in a different way. Our approach to growth must be more broadly based than past philosophies of growth. Whether you trust the phrases to be real or not, we do hear this sentiment expressed more frequently these days. Phrases such as sustainable development and corporate environmentalism carry with them not only economic considerations, but social and moral ones as well. They recognize the continued need for growth, but also the need to monitor the consequences of growth. They suggest an effort to combine private interest with the public interest, which in turn requires a new relationship between the public and private sectors.

Much of that burden falls upon government, and governments working together, to do a better job of integrating technological change with policy. But it also requires that industry do a better job of participating in the process. It is not enough for industry simply to develop a product, manufacture it, and put it on the market. Those who develop the technologies and the new products must take a hand in helping governments accommodate new technologies successfully. I am not talking about lobbying or special pleading in the halls of Congress or the corridors of the Executive Branch, but about substantive, objective, publicly visible input.

The historical relationship between industry and government offers little encouragement that a new sort of relationship can be forged. At best, the relationship is an arm's length one, and usually is more accurately described as adversary. Industry cherishes its independence, and government does not want to be viewed as the handmaiden of Big Business.

Nevertheless, a more cooperative relationship is easily possible without compromising the agenda, the integrity and the mission of either side. In fact, I think we need to hope quite fervently that such a change can be achieved.

Writing in the Spring issue of Foreign Affairs, Admiral B. R. Inman, together with Daniel Burton of the Council on Competitiveness, writes: "Recent technological developments have...generated a lively policy debate, pitting traditional notions about the proper role of government against the need for prompt, pragmatic policy responses." And again: "Another issue on which there is widespread agreement is the need to improve the U.S. policymaking machinery for technology. Because public policy has not addressed the issue of the commercial application of technology, government policies often tend to impede rather than assist industrial efforts to bring new technology rapidly to the world's markets."

The fact is, industry has knowledge that the policymakers need to meet these challenges. This is a complex world. President Bush's science advisor, D. Allan Bromley, stated before he took office that technology is routinely ignored in the formulation of policy, and expressed his hope to change that. The president himself seems set on a goal of being both pro-environment and pro-growth. Innovative thinking for the benefit of the economy, executed with the nations's overall agenda in mind, is the obvious best path to a secure future.

Biotechnology is a perfect case study. If ever there were an example of new knowledge and innovative thinking leading to dramatic new human benefits, biotechnology is it. Most of the attention is focused on the medical applications of biotechnology, but it is very likely that its role in agriculture and industrial processes will affect more people and even save more lives.

Without reciting a litany of benefits already known to you, I would like to make a couple of points about this technology that don't get the proper attention. First, it is the most equitable, accessible, and transferrable technology to reach agriculture since the Industrial Revolution. The arrival of mechanization on the farm, and then the advent of the chemical era, led to dramatic improvements. In the United States, for example, agricultural productivity has tripled since the end of World War I. The economics were wonderful. But the price of admission was high; the level of skill required to utilize these expensive inputs rose steadily. Many prospered, but many were left out. Three hundred million people are chronically malnourished in the Third World today, a fact that needs no elaboration. And improvements in agricultural productivity based on existing technology are leveling off.

The offerings of biotechnology do not carry the baggage past technologies did. They do not require capital investment, or any special skill, or even much of a mechanism to deliver them to those who can use them. In most cases, the technology is contained in the seed. It makes life easier and more productive for a small farmer in Wisconsin or a subsistence farmer in the African Sahel because it reduces the need for chemicals and other inputs that require a degree of technical skill to apply properly and effectively.

The economic and environmental effect will be profound. Currently, 40 percent of insecticides used in the United States are used on cotton. Biotechnology can reduce that enormous usage to a minimum. Globally, one quarter of our crops are lost to insects, diseases, and other stressors, according to the World Bank. Biotechnology can reduce that materially, and by natural means. The single greatest loss of topsoil is excess tillage. Through new means of weed control that reduce the need to till, we can cut into that loss significantly.

The second point is that, despite the loudly expressed concerns about this technology, I cannot think of another technical advance that has been subject to so much scrutiny before it ever reached the marketplace. The degree of regulation, or self-policing in the form of guidelines, the level of public discussion, exceeds anything we have ever seen. The result of all that scrutiny will unquestionably mean that biotechnology will reach the marketplace with a uniquely low level of unanticipated or negative consequences. Even the best science under the closest scrutiny cannot deal with the wilder assertions of the tomato-that-ate-North Carolina sort, but every technical or environmental concern worth thinking about has been thought about--exhaustively.

There remains, however, a larger question: How do we fold these new benefits into the social and economic fabric of a nation -- of all nations -- with maximum efficiency and minimum dislocation? Obviously, by planning for the change. And here is where we are falling short.

In the past, absorption of a technology by society, except in terms of marketing, was not considered to be the job of industry. No one really expected business to think about those things -- it wasn't industry's job. We all view this issue differently now. Social responsibility is now increasingly recognized as a central element of good business planning, as well as good citizenship.

But even the responsibility to be good citizens doesn't fully capture the task before us in assuring that the benefits of biotechnology arrive in a timely fashion. We are offering up to the world a very innovative and different way of doing things in the world's largest industry, agriculture. Its goals are familiar, but its methods of reaching those goals are based on new knowledge, and our systems are not always ready for them. This is where industry comes in, and I can best illustrate my point by example.

As you know, biotechnology has the power to introduce new characteristics into food crops of great benefit to the grower and the consumer. But this ability does not fit comfortably within the regulatory system in many nations. Food per se is not regulated. Food additives are, food purity is, food labeling is. But this is different. Should biotechnology altered food itself be regulated? And if so, how? Does an extra gene to increase the protein content of potatoes require full regulatory review? Is it still a potato, or something new?

Recognizing the problem, 30 U.S. food-processing and biotechnology companies formed the International Food Biotechnology Council. Their goal was to fill the vacuum of knowledge with solid and useful data for the benefit of the regulatory agencies. The IFBC had no intention of telling the Food and Drug Administration how to regulate new products, but only to lay out the scientific basis for a rational system.

These were not lobbyists and PR men who gathered for the IFBC meetings. They were technical people. And the companies, Monsanto included, sent top scientific people. The report has just been issued, publicly. It is a detailed, peer-reviewed examination of the science involved in biotechnology-altered foods -- a solid foundation from which our regulators can proceed.

It seems only logical that the source of this sort of scholarship should be industry, where the knowledge resides. We cannot expect governments to possess the kind of knowledge industry has, or to spend tax dollars acquiring it. So industry should offer it, out in the open, honestly. And governments should accept that kind of help.

A generation ago, this sort of dynamic would not have taken place. Industry would have done its thing, put its products on the marketplace or up for approval. If problems later arose, an endless and wearying succession of private contacts, lobbying, and jockeying would take place, ending in, at best, some uneasy compromise. Through activities such as the IFBC, industry is now saying: Why wait for

issues to arise before addressing them? Anticipate them, and resolve them as best as possible.

This is more than a good idea. I view it as an obligation on industry to do some forward thinking and show some forward motion, and an obligation on government to be receptive to it. Government doesn't have to agree with everything industry offers, but it should be open to this new kind of knowledge-based input. I know it is the inclination of some to keep industry and the regulators apart, on the theory that the regulators will somehow be co-opted. But the players in this most important of events absolutely must be in the same room.

This sort of approach also works on the international level. Monsanto is currently engaged with two dozen other American companies and 10 Japanese firms in building a common scientific understanding of all the ins and outs of biotechnology as it applies to foods, agriculture and pharmaceuticals. The Bilateral Forum on Biotechnology, under the auspices of the Japan-U.S. Business Council, is close to completing its work. Its goal, again, is not to write the regulations but to provide a common basis for regulations so that our two countries can avoid the frictions and trade wars that have afflicted other technologies. It is a joint effort to create a level playing field. If the forum succeeds, the amount of time, money and trouble that will be saved is worth all the effort and expense put into it.

Evidence that this is a good idea is the decision of the Senior Advisory Group on Biotechnology, composed of six European companies and Monsanto, to join in the forum's work. Imagine a scientific compact covering three continents. Is this not precisely the kind of input policymakers need? The signals we get from our governments are very positive. We don't want governments to fly blind into a new era, and governments don't want to, either.

It must be recognized, however, that democracies have a difficult time planning for the future. The pressures of constituent politics inevitable tilt elected officials toward the task of protecting present-day interests and policies. The future doesn't have many votes. But I think we all would also agree that it should not be the goal of agricultural policy formulation to perpetuate the present; present agricultural policies are something less than deserving of perpetuation.

Yet we do see that happening. The pressure to create a fourth criterion for productivity-enhancers in Europe must be interpreted as an attempt to buy time, to stop the clock by changing the rules of the game. We watched with great interest an attempt to do the same in Wisconsin. An attempt to ban productivity enhancers in dairy farming failed. The legislation that did pass has no practical meaning but is loaded with signals indicating a desire to fossilize the status quo. These sorts of events reflect a moratorium mentality based on the mistaken belief that the best way to plan for the future is to delay its arrival.

But of course that is futile. This technology we are talking about today, along with most modern technologies, is global in its pursuit and its application. Movement can be delayed in a state or a region, but it cannot be stopped. Somebody, somewhere will develop these new benefits, and those that delay will find themselves in a technological backwater with negative consequences for their economies and for the majority of their people. Change is not to be denied -- it is to be accommodated, threaded into the fabric of economic and social life by well informed policymakers. Moratoriums are not decisions. This reality is beginning to be more clearly perceived through the smoke generated by critics. Despite a massive campaigning, the Vermont legislature recently voted down a ban on BST, and a half dozen other states have rejected the idea in committee.

History is clear-- and history has recently spoken out on this subject in Eastern Europe -- the only competent judge of what is useful to the marketplace is the marketplace itself. It will accept what works, and discard what doesn't. To impose barriers to the marketplace, even in the name of desirable goals, is to deny ourselves the very tools to achieve those goals.

A stultified, no-growth global economy will not yield a cleaner environment. Only growth will generate the money and the technology to do the job. And job creation, not job preservation, is the answer to human needs.

Perhaps most important, the most rapid progress consistent with good and cautious science is vital to the transfer of this technology to areas most in need. In the United States, we have focused this technology on productivity, not production, because we were perhaps too mindful of the mountains of agricultural surplus of food is certainly not the planet's problem. Food production will grow by one percent a year, according to the Worldwatch Institute. World population is growing by 1.6 percent a year,

and most of the growth is where food supplies are chronically short. This technology is easy to transfer to help change that equation. But making that happen, creating another Green Revolution accessible to all, will require a level of cooperation among industry, governments and international organization and cooperation that does not now exist.

One illustration: Monsanto is currently working with Washington University of St. Louis on the development of a virus-resistant strain of cassava, a food that provides 40 percent of the calories for the people of the sub-Sahara. That research will succeed, and Monsanto will accept no fees or royalties. But will that alone get it into the ground where it is needed?

Tough questions. Not enough answers. No one can offer a prescription for a sure cure. But one can describe a process, and there is evidence that it can work and indeed is working with the industry groupings I have cited. Certainly all the pieces are there to put us on a steady course of sustainable development. But they have to be put together.

It has been said, most recently by Admiral Inman in his Foreign Affairs article, that a new public policy framework is emerging that focuses on industrial competitiveness and technology. This evolution inevitably means changing roles for industry and government in their influence on and management of the economy. Yet the federal government is still bogged down on decisions about the scope of regulations, leaving a policy vacuum that makes corporate research planning difficult, and encourages Congress and the states to write the rules their own way. In Germany, the absence of rules and spirited opposition from the Greens led one company, BASF, to move its research arm to friendlier climates -- to Cambridge, Massachusetts, perhaps the most liberal town in the most liberal state in the Union. The message sent by that action should be heeded by all those struggling to balance public policy issues with the undeniable need to keep moving forward in order to avoid falling behind.