

Beyond Innovation: Education and Ethos in an Era of Ceaseless Change

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The arrival of the year 2000, the symbolic start of a new millennium, was an especially good time to celebrate it. Newspapers, magazines and television programs worked overtime preparing lavish feature stories filled with inflated rhetoric and colorful imagery that proclaimed its overwhelming significance. Scientists, engineers, businessmen, and social visionaries offered their views of it in solemn tones. The general public looked on in stunned amazement as depictions of its glory unfolded.

Here was our future in clear outline. What kind of future would it be? Would it be a future in which human beings came together in renewed commitment to peace, justice and freedom? No, not exactly. Would it be a future in which the environmental crisis would be solved by firm resolve and ingenious solutions. No, not exactly. Would it be a future in which the suffering of a large portion of the world's children would finally be declared unacceptable? No, not exactly.

Well, then, what kind of future was being envisioned and promoted? What was its main focus?

The answer was perfectly clear — a future of ceaseless change, a future in which the absolute centrali-

ty of technology is unquestioned. Thus, part of the build-up for the year 2000, especially in northern, industrialized countries was great agony about the possibility of an inadvertent computer bug that might bring digital systems around the world crashing to a halt. That this did not happen, that disruptions were fairly minimal, was greeted with a sigh of relief. What was little commented upon, however, was how thoroughly the supposed bug had become the main focus of attention.

Here we were approaching what could have been seen as a momentous turning point, a time for reaffirmation of the best purposes of humankind. Instead people focused on how the computers so central to our ways of living might fail us.

But the threat of a millennium bug was not the only way in which the centrality of technology was proclaimed. More often than not, stories that predicted what the future would be, focused on technological change almost exclusively. In other words, the future was not going to flow from anything creative in our culture, in our social life, in our personalities, in human needs, in a political grasp of major challenges that lie ahead. Not at all.

In the prevailing view, the future would be created by a stream of technological innovations that pour from the laboratories and corporate marketing campaigns. Society changes as it adapts to this onrushing flood of devices and systems.

Typical of this way of thinking were issues of *Time* magazine and *The New York Times Magazine* surveying prospects for humanity's future. According to the experts, here are the developments scheduled for the decades ahead.

Automobiles will drive themselves as we watch television or read the newspaper on the highway.

Exotic varieties of computerized "virtual reality" will lure us into video games that are "better than real life."

The world's people, especially the poor, will eat a diet composed of genetically modified foods.

Genetically engineered grass will grow to a constant height of four centimeters, thus eliminating the need to mow the lawn.

Our intelligence will greatly expand as boundary between humans and smart machines disappears and people plug computer chips directly into their brains.

Digital computing and wireless communications will be embedded in our clothing and household appliances, anticipating our every need.

Equipment in our bathrooms will not only keep us clean, but also offer medical diagnoses of our health, including a daily brain scan.

Children's toys will be filled with artificial intelligence and robotics, making them better playmates for our children than the kids down the block.

Newspapers, magazines and books printed on paper will become obsolete, replaced by hand held electronic displays that hold thousands of pages.

Looking for a date will become easier as beeper sized devices broadcast information about you and

your preferences to strangers in bars and restaurants.

Of course, this may not be all that important because the new equipment of cybersex will make sex with a real living person seem uninteresting by comparison.

Yes, there is much to look forward to.

This is the human prospect that captures the public imagination at the beginning of the twenty-first century — a situation in which an inevitable wave of change sweeps through the world eliminating the boundaries between artificial things and natural things, leaving nothing untouched. Unfortunately, this vision of technology is also one that prevails in education in our time. Teachers and parents tell students that that world is propelled by rapidly moving developments in a variety of technical fields and that their role is simply to adapt.

Let us call this:

Situation I: The world is technologically driven.

Most remarkable in such descriptions of Situation I is how strenuously its proponents labor to convince us that all possibilities for choice have been foreclosed. The very scope and dynamism of present and future technological change seem to present us with a world in which other ways of thinking about the human condition have been rendered impotent.

From the standpoint of a scholar in science and technology studies, this climate of opinion is especially ironic. During the past twenty-five years our historians, sociologists, political scientists, and philosophers have been busily at work producing detailed, systematic studies of the ways in which new techniques, technical devices, systems, and material infrastructures enter the human world. An important result of this research is to show that along any path of technological development there are always contingencies, always options, choices to be made. Thus, there was the choice between light

rail urban transit and the saturation of the city by automobiles, the choice between refrigerators powered by natural gas as compared to those powered by electricity, a choice to develop nuclear energy or solar. In our time, the marriage of computing and telecommunications could take an almost countless variety of forms, some of which will eventually be realized in hardware, software and social practice, while others will not.

Choices about the shape and use of new technologies often involve intense competition among social groups. The belief that technological and social change presents us with contingencies, options and consequential choices, be described as:

Situation II: People choose and shape technologies they live with.

One might think that the vision given in Situation II is a message educators would prefer. One might expect they would want to interest students in the possibility that their lives, careers and social futures are matters they could reflect upon and eventually choose. But much of contemporary education does not stress this approach. A far more popular belief is the one given in Situation I – the idea that the world is technologically driven. This is a vision that disempowers young people from the outset, a vision that makes their lives, their futures, their very sense of who they are a matter of adapting to changes over which they have little if any influence.

I regret to say that despite the concerted efforts of historians, philosophers and social scientists, the idea that the world is technologically driven is probably stronger now than it has ever been. In the literature of a wide variety of technical fields, especially digital information technology, the language of momentum, trajectory, technical imperatives, and determined outcomes is the coin of the realm. The perception that one is being swept along by a law-driven process of technological change is widely embraced among those who work in fields of computers and telecommunications. One of the founders of Intel, Gordon Moore, formulated Moore's law which states that the computing power available on a microchip doubles roughly

every eighteen months. Writers on computing and society have seized upon this as the basis of the common perception that social change in our time is driven by necessities that emerge from the development of new electronic technology and from nowhere else. This is Situation I thinking with a vengeance.

In a similar vein, the writing on global technology and the global economy is filled with visions of technologies whose development proceeds so rapidly that the best anyone can do is to anticipate their likely trajectories and arrive in time to seize the advantage. In Lester Thurow's book *The Future of Capitalism*, for example, we learn that technological change is one of the tectonic forces shaping our times. We can no more influence the thrust of technological change than we can alter the motion of the earth's tectonic plates.

For those who believe we are in Situation I, there is an ethos, a basic disposition and understanding of what is desirable and legitimate. I will call this *Ethos I*. Carried to its ultimate extent, its basic moral disposition is: "Hell, why not?"

If a technical feat is possible, if it can be justified according to some narrowly defined purpose (and there is always some imaginable purpose), by all means do it. Thus, one need not consider history, context or consequences. Just get busy innovating, for if you do not come up with the result soon, someone else will.

Saturate the home and all other personal and social spaces with digital electronics? Hell, why not?

Fill the world with wireless contraptions of every description? Hell, why not?

Alter the genomes of hundreds of species, possibly even our own? Hell, why not?

Move on to hack the human genome to create a race of post-humans? Hell, why not?

At a time in which people feel the world is technologically driven, the attitude "Hell, why not?" is the one that increasingly prevails. Unless some-

thing astonishing occurs, this will be the dominant ethos, the default moral setting, the actual spirit of technology likely to inspire people in the century ahead.

Clearly, this ethos is one thoroughly severed from any concern with questions about fundamental ends, questions about basic human purposes and needs. If one can identify a thinly articulated reason for taking action to achieve some imagined benefit, that is enough to justify going ahead. Faced with powerful new techniques in particular fields of technical development, the immediate impulse is to try them out.

Has someone devised a robotic nurse for use in elder care? No. Well, that's a big market, so let's get on it.

Has anyone applied techniques of nanotechnology to veterinary medicine or gourmet cooking? No. Well, dear student, there's a career for you. Opportunity knocks. Teachers and professors give advice like this all the time.

In contrast, for those who believe they stand in Situation II — the situation in which people choose the technologies they live with — the prospects and challenges may suggest an approach of a different kind. It is certainly true that engineers and technical professionals often understand what they do as narrowly defined problem-solving. Businessmen in high tech fields often understand what they do as narrowly defined product development and marketing. But whether they own up to it or not, all those involved in technological change are involved in a much broader project — the project of “world-making.”

Whether one is designing a bridge, developing new software, improving techniques for treating industrial wastes, or doing some other technical work, the overall contribution is to put in place the parts and pieces that constitute a world in which people and other species must somehow live. By virtue of their training and positions of employment, engineers and technical professionals have a distinct advantage in comprehending and taking part in the process of world-making. Especially within their

areas of expertise, they receive an early view of prospects for change. They are in a position to ask: “What are the possibilities here?” Which ones are worth realizing and which ought to be avoided? Which possibilities ought we to choose?

The advantage engineers have in this respect would seem to offer a philosophical moment, an occasion for people who are at once technically knowledgeable and who also have a vision of a desirable future to announce publicly which options and choices could produce a better world for our living. But, in fact, society at large seldom hears reflections of that kind. Technical professionals often find themselves in circumstances that limit their ability to think broadly or to speak out in public life. The organizations that employ them set forth their assigned roles and tasks beyond which they stray at their peril. People in business, even those who pride themselves on strength of character and high ethical standards, typically run into definitions of profitability and responsibility to corporate shareholders that limit their choices.

Prospects for a broader citizenship in which the technically able might explore the world-making prospects in their own fields with people outside their organizations or disciplines are not usually encouraged. Reinforcing this tendency are personality traits — a passion for order, a talent for quantitative thinking, a fascination with building things — that bring people to the technical professions in the first place. But these traits make it less likely that they will seek roles and voices in the public realm. Unfortunately, engineering education as it has developed during the past century strongly reinforces these traits. It offers what is called “instruction” in one-directional, implicitly authoritarian classrooms. Students often leave our best engineering schools prepared to accept challenges and take orders from their employers, but not at all prepared to think about themselves as citizens of a democratic society.

Nevertheless, it is still possible for technical professionals who understand we are in Situation II to recognize a special responsibility associated with their roles as world-makers.

An ethos strongly suggested by an awareness of Situation II in which people choose the technologies they live with is fairly clear. It is the resolve to build an agreeable world in which humans and other creatures might flourish.

Of course, engineers cannot exercise this resolve alone. They must reach out to others in the community at large, to listen, to build relationships, to work to define common issues across the social boundaries that divide us.

In that light, I would suggest *Ethos II*, whose maxim is: Together we must build a better world.

I certainly do not want to suggest that everybody is in one of the two positions I have described. There are many ways in which people orient themselves with respect to freedom and necessity, choice and destiny in our technological era. Neither do I conclude that it is an easy matter to decide what a better world would be or how it could be achieved. Quite the contrary; these are difficult and divisive questions. What I want to suggest is that today a great many people feel empowered thinking they are impelled by inevitable trends. In contrast, others find this disposition untenable and try to find or create choices wherever they can. My description of the two situations and two varieties of ethos is meant to highlight these fairly common points of view.

Today understandings of what is possible or necessary are especially evident in discussions about developments in microelectronics and creation of the Internet. The power of digital technology and networked computing make it possible to transform a great many of the activities in production, communication, education, health, care, shopping, leisure, and others by realizing in digital format and putting them on line. This seems to me a vast experiment in world-making through the creation, design and deployment of technologies of various kinds. The sociotechnical fabric of social life is being rewoven. In its most basic potential, this *could* be something worth celebrating. God knows, many of our existing practices and social forms are desperately in need of change.

The differences between the two Situations and the contrast between Ethos I and Ethos II can be revealed by using them to ponder specific issues that often confront us. Take, for example, the question of *need*. What are the needs and need-related problems that inform the design of electronic devices and systems and the shaping of the social relations around them?

Several years ago IBM announced the arrival of its new SA-27E microchip, one advertised as a way to bring information processing and storage into much closer connection, providing greater speed in a smaller package. What would be done with this fabulous power? An article about this development in the *New York Times* suggested that there could now be a range of much more compact, more efficient and more versatile products, including an improved version of the Palm Pilot. Citing the views of several engineers and corporate planners, the writer of the story concluded, "the dawn of the talking toaster appears to draw closer."

The talking toaster! How wonderful! Such are the powers of imagination that inspire much of contemporary information technology. Accomplishments of this kind are often held out to young engineers as worthy goals. Wouldn't that be neat? You could be one of the people to create this marvelous product.

Unfortunately, much of market driven technology innovation these days is aimed at upscale, comfortable consumers, trying to interest them in satisfying an even broader range of superfluous desires. I'm often astonished to find that when I try to talk with my colleagues and students in engineering about social aspects of technological design, they quickly begin to imagine new devices and systems that seem destined to appear in *The Sharper Image Catalog*. Thus, a recent issue of the catalog features a truth detector telephone, a device that analyzes the voice of caller to estimate whether they are telling the truth. And from a certain point of view one can always say: Hell, why not?

But what is the *need*?

As he surveyed the technological changes of his time, the 19th century American writer Henry David Thoreau concluded that civilization was developing “improved means to unimproved ends.” In a great many developments in information technology these days, one could easily reach the same conclusion.

It turns out, however, that there is a larger world out there with a great many pressing needs — not the least of which is the fact that roughly a third of the world’s six billion people are poorly housed, poorly nourished, and poorly educated. In fact, half the population of planet Earth live on two dollars a day or less, not a great market for talking toasters and truth detecting telephones.

If one is not aware of these matters, the Human Development report issued by the United Nations each year provides an update. The report for 1999 was especially interesting because it issued a direct challenge to the technology developers of the North. Why can’t we develop tools and systems that speak more directly to the needs of those who still live in dire poverty? Recent reports in this series have come very close to suggesting that it is a basic human right to have access to good technology, technology that acknowledges one’s presence, one’s identity and one’s fundamental needs.

As technical professionals go about their work, a great many are guided by a purely instrumental way of thinking. This leads them to initiate their projects in ways that can be summarized by the phrase “in order to.”

In order to make the cell phone receive Web pages, we’ll apply the same promising solutions. In order to make the antimissile hit the nose cone, we’ll try the latest techniques. In order to produce a lighter laptop, we’ll use the newest digital electronic components.

The development of most patterns in material culture and social practice during the past two centuries have been guided by this instrumentalist way of thinking, a way of connecting narrowly conceived ends to technically effective means. Most of what goes under the name of “innovation” these

days is guided by this narrow, short-term, thinly rational way of thinking.

There is, however, another way of understanding human action that people have known for many generations and often still employ. In this approach, there are still ends and means, but the relationship between them is situated in much broader contexts and connected to deeper human concerns. Actions of this kind are sometimes initiated with the phrase: “for the sake of.”

For the sake of my God, I will do things in a particular way. For the sake of my family and friends, I will take the following steps. For the sake of my community, I will proceed in a particular way. For the sake of the planet as a whole, I will embrace the following policies.

Many of those in Europe and America who had gone through the upheavals of the Depression and World War II were strongly motivated in the mode “for the sake of . . .” The experience of the economic hard times and war inclined them in that direction. My parents were people of this sort. For the sake of the well-being of the family, especially their children, and for the good of the community, they pursued plans and policies that seem irrational from today’s market oriented perspective.

People who act “for the sake of” are inclined to make sacrifices rather than to maximize their personal, rational self-interest. But their actions make a great deal of sense in terms of a world they hoped to build and maintain.

Between those who act “in order to” and those who act “for the sake of” there is now a enormous gap. It should be clear why I believe we need more engineering and institution building in the mode “for the sake of,” more technology creation that asks: what kind of world are we building here? Are there good examples of technical professionals who have encountered the contrast between “in order to” and “for the sake of” and made wise choices. Surely, there are a great number of them, although they are not the people celebrated in *Business Week* and *Fortune*.

Bill Joy, chief scientist at Sun Microsystems and leading developer of computer systems for several decades, someone who's devoted his life to instrumental projects in information technology, has recently taken a stand against supposedly progressive developments in several high tech fields, arguing that developments in robotics, genetic engineering and nanotechnology now threaten the extinction of the human species.

I will not summarize the particulars of Joy's message. Suffice it to say that he believes that the trajectory of normal, ongoing, problem-solving work in major areas of science and technology will produce major disasters. "My continuing professional work," he writes, "is on improving the reliability of software. Software is a tool, and as a tool-builder I must struggle with the uses to which the tools I make are put. I have always believed that making software more reliable will make the world a safer and better place; if I were to come to believe the opposite, then I would be morally obligated to stop this work."

Joy's own reflections on the problem put him in a category with Thomas Hobbes and Thomas Malthus. Since we are confronted with the prospect of death, let's depart from what we doing and attend to the menacing possibilities ahead. The story has gotten worldwide coverage for much the same reason that Hollywood sci-fi disaster films draw large crowds, people actually enjoy the chills that move through the body when the prospect of death from technology out of control is depicted.

In my view, Bill Joy is a person who has been propelled from Situation I into an awareness of Situation II. After having operated in the world in which Ethos I has long prevailed, he's now trying to interest his colleagues in Ethos II. To his credit, at the end of his jeremiad, Joy takes note of a book written from another modality than the one he is used to, a recent statement of how one might view action, "for the sake of." The book is *Ethics for the New Millennium* by the Dalai Lama, a book that, quite surprisingly, offers an extended commentary on technology. The Dalai Lama

argues that our primary concern ought to be the suffering of others. In this light he argues that "we have to ensure that compassion inspires all our actions." He offers an ethic of universal responsibility, one that implies drastic change in how people in the north regard their prosperity. "The fact that the population of the rest of the world has an equal right to improve their standard of living is in some ways more important than the affluent being able to continue their lifestyle. If this is to be fulfilled without causing irredeemable violence to the natural world . . . the richer countries must set an example."

It is invigorating to imagine a technological world based on compassion and responsibility for one's fellow creatures rather than on acquisitiveness, competition and the "Hell, why not" approach to innovation. Obviously, it would require an enormous shift in attitudes and understandings to move in that direction.

Some thirty years ago in response to a growing awareness of the harmful effects of industrial civilization on the biosphere, people around the world came together to organize Earth Day and from there a new social movement — the Environmental movement. As the movement matured, one of its points of emphasis was the need to preserve the habitats of species that dwell on this planet with us. It is, in other words, not enough to clean up pollution, air and water and to guarantee for ourselves a clean, healthy supply of food. In addition, we must protect biodiversity which means that we protect habitats that would otherwise have been seen as mere economic resources.

I believe there is a need for a different kind of social movement, one directly and actively concerned with the qualities of human involvements, not so much with natural things but with the qualities of technological systems, the social, political and cultural qualities that place them in harmony or conflict with our preferred ways of living. A movement of this kind would attend to the quality of habitats in which we live, in this case the artificial habitats that house our activities.

Among the questions such a movement might raise are these:

What kinds of technology are compatible with meaningful, satisfying work?

What features of technological systems contribute to the building of satisfying forms of family and community life?

Which varieties of technology recognize, affirm and support the rich diversity of groups and persons that coexist on the planet?

Which sociotechnical patterns are appropriate for a social order in which people feel secure and trusting?

Which technological patterns might narrow rather than expand the social inequalities that afflict our societies and the global economic order?

What kinds of technological creativity, combined with democratic political will, could move us closer toward an ecologically sustainable economy?

What means can be found to include people now usually excluded from making choices about new technology and excluded from their benefit?

These are entirely positive questions that we can approach in hopeful, peaceful, cooperative mood. To raise even one of them in our time, however, is occasion for being branded "anti-technology," for such questions suggest that there may be something wrong in the current drift of development, a possibility that today's ardent technology boosters would prefer to ignore.

The movement that would address these matters I would call simply the movement for responsible technology. In the same way that the environmental movement expresses care for humanity's relationship to the natural realm, a movement for responsible technology would strive to improve the human involvements with things artificial.

I believe it is time we stop asking a thoroughly ignorant question: Where is the global technologi-

cal order headed (as if it were headed somewhere of its own accord)? Instead, we must ask: What kind of technological order is truly worth creating? The movement for responsible technology is one whose arrival is long overdue. My generation had numerous opportunities to initiate and nurture it, but in the end we failed to take its tasks seriously. It is time for the educators and students of a new generation to seize the challenge.

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