Information Infrastructure: No Easy Road to Sustainable Development

John S. Niles

Mr. John S. Niles is president of Global Telematics, a policy research and management consulting firm based in Seattle, Washington. He works with entrepreneurial businesses and government innovators on regional telecommunications strategy, public transportation revitalization, and economic development planning. Mr. Niles has led projects that linked telecommunications development to public policy in Idaho, Washington, Oregon, Montana, Minnesota, and Kentucky, as well as in the U.S. government. He is the principal author of a study for the U.S. Department of Energy, *Beyond Telecommuting: A New Paradigm for the Effect of Telecommunications on Travel*.

Mr. Niles is a member of the Telecommunications and Travel Behavior Committee of the Transportation Research Board. He earned his bachelor degree in mathematics at Massachusetts Institute of Technology, and a Master of science in industrial administration at Carnegie Mellon University.

Most readers of this journal would probably agree that information infrastructure is an important source of revolutionary transformation.[1] The marriage of communications and computers—called information infrastructure or telematics—is now the dominant force in reengineering, downsizing, productivity improvement, and entrepreneurship. In fact, earlier versions of information infrastructure (going back to network broadcast television) have had a lot to do with major world changes such as the U.S. civil rights movement, the ending of the Vietnam War, the breakup of the Soviet Union, the reunification of Germany, the economic rise of the Pacific Rim countries, and the fall of apartheid in South Africa.

Although the future of cyberspace and networking is uncertain, it is worth pondering the long-term intrinsic nature of the changes this technology is bringing. Focusing on the United States, what is the relationship between telematics and social outcomes like income inequality, a faster pace of life, people getting less sleep, suburbanization, rising traffic congestion, and a level of general happiness that surveys reveal is declining? There are positive trends, too, that mark the current societal milieu, such as expanding choices and opportunity, growing economic productivity, moderate inflation, cleaner air, and an environment so attractive that most of the world's people would live here if they could.

In considering these trends, note that we in the United States and other leading-edge societies are arguably quite far along into the Information Age—not just beginning. The worldwide direct-dial voice telephone system, broadcast TV and radio, video recorders for downloading movies, personal computing, nationwide newspapers, telephone shopping, and remote database access have been with us, albeit improving in functionality and cost-effectiveness, for at least a decade. We are in the middle of the Information Age, if not in the last quarter.

Past revolutions in the technologies of connectivity—railroads, telegraphs, telephones, electric power distribution, automobiles, radio and TV, and commercial air travel—provide some clues to the probable accuracy of present thinking about the ongoing upgrading of global telematics. Extreme optimism about the future, far exceeding the reality, has been the historical pattern of contemporary reports from inside the revolution. This record should challenge us to look askance at wishful claims made for the effects of the information infrastructure.[2]

Much of what might be good about the future is captured in the concept of *sustainable development*. As defined by the United Nations, this is economic and social development that meets the basic needs of all people without compromising the ability of future

generations to meet their own needs. There are three core elements to sustainable development:

- Consideration of the natural environment as a part of economic policy-making.
- Commitment to social equity between geographic regions, and between generations.
- Focus on the qualitative aspects of development, not just the quantitative.

As one might expect, conventional wisdom establishes a strong, positive relationship between sustainable development and information infrastructure. For example, U.S. Vice President Al Gore writes in the *Financial Times*, "President Bill Clinton and I believe that the creation of a network of networks, transmitting messages and images at the speed of light across every continent, is essential to sustainable development for all the human family.... It will bring economic progress, strong democracies, better environmental management, improved health care and a greater sense of shared stewardship of our small planet."[3]

The optimism of Gore undoubtedly goes beyond the simple observation that there are many fine network applications that promote sustainable development. Such applications include the Center for Civic Networking's Sustainable Development Information Network, and the World Wide Web site of the International Institute for Sustainable Development in Winnipeg, Manitoba. Improving social equity is also being addressed by community center networking projects in poor urban neighborhoods:

- The Playing To Win Harlem Community Computing Center in New York City.
- The Plugged In project of East Palo Alto, California.
- The Blue Line Televillage community center in Los Angeles.

One might take these examples to illustrate that information infrastructure is a neutral technology that can be applied for—or against—sustainable development. However, in this discussion, we need to go deeper and focus on some of the intrinsic characteristics of information infrastructure evolving in the present era. We should explore whether or not it tends to promote sustainable development in all of the ways it is being applied.

Solutions

Fortunately, there appear to be many characteristics of information infrastructure that are positive to sustainable development.

(1) Information infrastructure supports increased human knowledge and understanding on any and all topics, including domains of knowledge that are important to sustainable development. One important aspect of this knowledge growth is awareness of what we do *not* know. For example, information infrastructure has improved the ability to track global climate changes and to model the effects of human development on them. This ability will undoubtedly improve as the information highway reaches into all corners of the globe.

(2) Telematics as a people-to-people communications medium promotes the human interaction and teamwork necessary for sustainable development. As June Holley of the Appalachian Center for Economic Networks writes, "Without a sufficient number of personal relationships spanning the invisible walls and fences found in our communities,...attempts to solve problems are piecemeal, and have limited long-term impact." She notes that, for sustainability to be achieved, a community needs to "develop the capacity to link people who seldom or never interact, so that effective, sufficiently-complex solutions are generated."[4]

(3) Telematics promotes a wider geographic scope of concern. This is necessary for sustainable development in a world of global trade in goods and services, and in a world of international tourists, immigrants, and refugees. Internet Web sites around the world are reached through the same kind of mouse click that gets you to an electronic bulletin board in your own community. As Robert Gilman of the Context Institute points out, "each country and culture approaches sustainability issues from a slightly different angle—with different assumptions, taboos, and senses of what's possible. Added together, the global creativity is astonishing."[5]

(4) Information infrastructure provides the opportunity for major improvements in how production and social support processes of all types operate. This is demonstrated through the invention of new service delivery systems and the reengineering of

old ones. Specifically, with respect to unsustainable patterns in some burgeoning, less-developed cities, carefully designed and targeted telematics could provide efficient mass public education, or offer electronic access to some services as a way around our vehicle-clogged roadways. In California, official state government policy includes the movement of information via telecommunications in the definition of transportation. The California Department of Transportation is studying the potential for telecommunications to preserve and enhance the state's economic competitiveness by changing the mix of physical and electronic access in the operation of the state economy.

Problems

The foregoing are all very positive aspects of telematics that tend to support its general promotion as a force for sustainable development. However, there are other characteristics of information infrastructure that tend to work against sustainable development:

(1) Information infrastructure promotes the consumption of goods and services along traditional lines of economic growth. One need only observe how businesses of all types and sizes are scrambling to capitalize on the exponential growth of the World Wide Web of the Internet. *Internet World* has just offered tongue-in-cheek proof that "absolutely everyone" is on the net by noting the Web location of the Polyurethane Foam Association.[6]

(2) Telematics still promotes energy-consuming physical travel on all geographic scales, even while providing a powerful mechanism for saving travel. It does this by facilitating the expansion of the number and geographic scope of economic and social relationships in which people and organizations engage. As a simple example, telecommunications makes people aware of additional general audience events and opportunities that are reached through travel, such as political rallies, professional conferences, entertainment events, and shopping opportunities. Similarly, telecommunications makes more and more businesses aware of—and able to interact directly with—a worldwide span of customers and suppliers. These electronic relationships usually spin-off into an additional increment of "real" travel.[7]

(3) Information infrastructure facilitates sprawling, low-density, energy-wasting, transportation-consuming land use patterns. To many activists, sustainable development implies the restriction of human activity in spatial terms, primarily for the purpose of ecological quality. Land should be set aside to protect other species, as well as for its purely aesthetic value. New development should be more compact and less separated to minimize impacts on areas that should remain natural. We have traditionally concentrated land development because there are economies of scale associated with many of the amenities we enjoy—cultural associations, museums, concerts, and sporting events. As the information infrastructure develops further, more people will be able to satisfy their need for a secure and quality existence without close contact with others. A growing army of the network-enabled workforce now seeks rural acreage around their houses and offices. This will create a centrifugal pull on development and a wider distribution of human development and its attendant impacts.[8]

(4) As a further blow to sustainable development, information infrastructure exacerbates existing patterns of inequality. Like all pools of capital and tools that make workers powerful, information infrastructure provides the highest benefit to those who are already rich and powerful. The rich tend to get richer, and the poor stay the same or become worse off. This analysis is often discounted by the frequent assertion that small companies and individuals can use microcomputers and the Internet to do anything that big companies can do. The fact remains that the ramp up of the Information Age over the past decade has been accompanied by a growing gap between rich and poor. Automation and reduced employment in obsolete job categories, complexity and the growing skill requirements of new jobs, and globalization and foreign competition all have logical threads of connection to expanding information technology, even if public policies that affect equity come from political institutions.

(5) The multi-tasking and multiple channels that characterize telecommunications compound the fragmentation of human attention. According to the *Wall Street Journal*, psychiatrists are seeing many more stressed out multi-taskers who think that their work techniques are a solution and not

the problem.[9] We should worry about the effect of information overload on our ability to prioritize and focus on complex critical problems like sustainability.

Questions

On top of this formidable list of concerns about the effect of information infrastructure on sustainable development are a number of issues that are ambiguous in their effects. One's opinion as to the positive or negative impact of these issues is likely to determine how one assesses the net balance of the positive and negative effects raised above:

• Does interactive communications over high-capacity information infrastructure in some way contain the seeds of a process that will intrinsically transform existing patterns of power and influence toward a more sustainable path of development?
• Does information infrastructure foster a societal process that lets people converge toward awareness and implementation of workable solutions to sustainability? Or does the flood of information, an expanding network of contacts, and the availability of more choices all the time—characteristics exemplified by the World Wide Web—tend toward promoting "analysis-paralysis" and deadlock?
• Does better information infrastructure promote a longer time horizon of planning and action in societal institutions?

An even larger question suggested by these considerations is how to focus attention on making the development of telematics better support sustainable development of the global society and economy. One obvious alternative is to directly modify the path of development. Making sure that network access and applications development tools are placed in the hands of people who are focusing on understanding and confronting sustainability issues is one way.

A more subtle, yet powerful focus may lie in making complementary changes to societal resource allocations outside the traditional boundaries of information networks. In other words, if transportation creates pollution, land use conflicts, and other problems of non-sustainability, then one option is to constrain budgets for transportation. Declining transportation capacity would eventually motivate a market or political reaction to free up more resources for interactive communications. Returning to the

example of California's Transportation Department, over $5.5 million has been committed to information infrastructure and applications in the past several years—money that is not being spent on highways and trains.

While government-initiated reprogramming of funds is one resource, another opportunity lies in leveraging voter mandates that put limits on the expansion of transportation systems. Populist efforts in Seattle to stop the development of rail mass transit and a new airport runway are examples of actions that hold the promise of forcing sustainable changes in the trade-off between transportation and telecommunications. Land use controls and budget limits on capital facilities construction (new college campuses, for example) are other examples that may indirectly but powerfully cause telematics to foster sustainable development.

This article raises the prospect that environmental renewal, social equity, and other aspects of sustainable development do not come naturally with information infrastructure development. A very non-sustainable global economy and social pattern can arise in parallel with better telematics. More fiber optics and better computers are neither necessary nor sufficient for a better world. Technology deployment is happening in any event. Sustainability in the world that is now unfolding must be the subject of explicit, targeted add-on actions by activists who care about changing the direction that development is taking. ntq

[1] This article is based on a speech presented at "Ties That Bind Converging Communities," a conference sponsored by Apple Computer, Inc. and the Morino Institute (May 5, 1995, Cupertino, California).
[2] T. Lappin, "Deja Vu All Over Again," *Wired* (May 1995):175-177, reviews the early forecasts for commercial radio. D. E. Nye, *Electrifying America: Social Meanings of a New Technology* (Cambridge, MA: MIT Press, 1990), reviews the early optimism about electrification.
[3] Gore's writing is quoted by M. Schrage in "The Data Highway May be a Route for Exporting U.S. White-Collar Jobs," *Washington Post* (September 23, 1994).
[4] J. Holley, "Growing Sustainable Communities," a working paper from the Appalachian Center for Economic Networks (1994).
[5] R. Gilman, "We Really Are Interconnected," *Context Institute Sustainer Newsletter*, Issue 10 (Spring 1995):1.
[6] "Foam Home," *Internet World* (November 1995):19.
[7] J. Niles, "Telecommunications Won't Eliminate Traffic Congestion," *New Telecom Quarterly*, Vol. 1, No. 4 (November 1993):19-23.
[8] D. Greising, "The Boonies are Booming," *Business Week* (September 9, 1995):104-112.
[9] S. McCartney, "The Multitasking Man: Type A Meets Technology," *Wall Street Journal* (April 19, 1995):B1.