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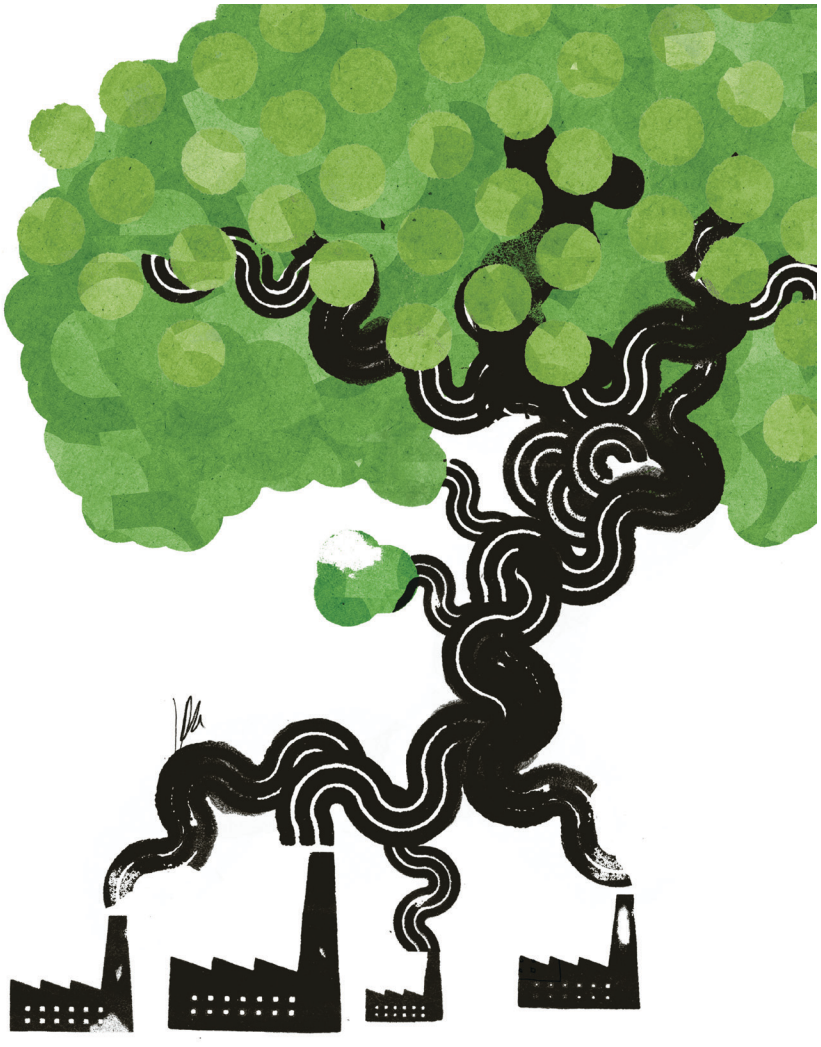
R.T. Watson, J. Corbett, M.C. Boudreau, and J. Webster

Computing Ethics

An Information Strategy for Environmental Sustainability

Seeking solutions to a problem of change.



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THROUGH THREE CENTURIES of industrialization, humans have changed the chemical composition of the air, land, rivers, and oceans. The essentials of life for the majority of the Earth's flora and fauna have experienced profound alterations, and these species-threatening transformations show signs of accelerating unless we take action to change direction. Many of the proposed solutions, such as carbon sequestering, have an engineering orientation and are based on current technologies.[7] Often the suggested remedies do not adequately recognize the potential of information systems to greatly increase energy efficiency[12] or to influence individual and organizational behaviors. This is a critical oversight. Computer-based information systems have been the driving force for productivity improvements[10] in the last five decades. We contend that, in a similar way, information systems can be a driving force for sustainability improvements. Our quest for environmental sustainability needs an information strategy to parallel and complement engineering solutions: ACM members could and should play a critical role in creating and implementing an information strategy.

Computing professionals and academics have many of the key skills needed to help solve the complex problems surrounding sustainability. This community is highly innovative, focused on efficiency gains and the customer experience, and has extensive knowledge of the design and implementation of systems. In this column, we want to stimulate the computing profession to address environmental sustainability collectively through action and research focusing on several imperatives at the heart of an information strategy. These imperatives arise from two views about human behavior—rational and social—

that influence how we make decisions about sustainability and many other aspects of life. The rational view, as typically espoused in economics, takes two perspectives: humans are entirely motivated by narrow self-interest and the pursuit of utility maximization[6]; and firms should focus exclusively on maximizing shareholder wealth.[1] Individual rationality, however, does not always lead to collective rationality. The tragedy of the commons[4] and the paradox of thrift[8] illustrate how individual self-interest can lead to the depletion of a community resource and how individual austerity in times of recession exacerbates the problem, respectively. Social forces, such as the desire to build long-term relationships, dampen self-interest.[5] Social constraints and interventions, such as culture, laws, and ethical codes, can rein in naked self-interest to create outcomes that are more attuned to the collective interest.

The Role of Information in Rational and Social Behavior

The economic organization of current society predominantly reflects the operation of self-interest. By the late 20th century, most countries had decided that the allocation of many scarce resources, a fundamental economic problem, should be assigned to prices, markets, and free enterprise. The global economy largely operates through prices, particularly for commodities (such as coal and iron), which are major factors in the price of nearly all consumer products and services. From a sustainability and societal perspective, prices are not always an effective signal because of the presence of externalities, which represent costs absorbed by society rather than the producer. For example, the costs of CO_2 emissions of coal-fired power stations are borne by everyone, irrespective of how much electricity they consume. When society allows this externalization of such costs, markets and self-interest work against sustainability,[3] which is why some advocate internalization of externalities.[9] Thus, the economic system would better serve the greater social good if prices were aligned with sustainability goals.

At present, we do not have in place data streams and associated information systems that economists and legislators could use for setting fees and establishing regulations and social interventions to ensure that prices reflect externalities. One solution is extensive sensor networks for recording the location and characteristics of pollution. Then we would have the raw material for accurate pricing. Thus, a first imperative for the profession is to: *Create information systems and networks that provide the capacity to incorporate significant environmental costs into prices*.

Many people want to maintain a sustainable lifestyle, but they do not know how.

This pricing perspective favors one view of how to transition to an environmentally sustainable society. Treating people and organizations as autonomous maximizing utilitarians, however, fails to recognize that our innate social nature and non-economic priorities greatly influence our decisions, needs, and behaviors, and that we are strongly influenced by others. Behavioral economics addresses some of the shortcomings of traditional individual self-interest oriented economic analysis. Solutions to sustainability, particularly information-driven strategies, need to also consider our social side. Our environment is the result of what we consume now and in the future. Hence, societal transition ultimately hinges on consumers—as individuals and organizations—changing their consumption patterns for the greater good of the environment and not just because of a product's price. Many organizations and individuals have a positive attitude toward the environment and seek to make sustainable choices, yet it is often difficult for them to follow these beliefs because they lack information about the environmental consequences of those decisions. Information, which helps to form perceptions, is critical to the functioning of our social as well as rational side. Three streams of information can influence perceptions about sustainability: organizational sustainability reporting, product information, and feedback on individual environmental impact.

If consumers and enterprises want to favor environmentally responsible organizations, where can they find objective and reliable information to identify such organizations? Investors can turn to audited financial reports, but what if people and organizations want to invest in the future of the Earth by favoring environmentally conscious suppliers and firms, and ecologically sound products? Regulations for sustainability reporting are emergent. At the global level, there are now about a dozen standards, most of which are voluntary and not necessarily audited, with the Global Reporting Initiative (GRI)[2] the most widely used. Voluntary reporting can work against the attainment of sustainability by hampering the implementation of other mechanisms that could be more effective, such as stricter regulations. Consequently, in 2010, GRI issued a declaration calling on governments to require companies to report on environmental and social factors. Compulsory reporting will set the stage for our profession to enter the fray because we excel at the exploration, collection, presentation, and dissemination of the information contained in organizational sustainability reports that can influence behavior. The profession has already contributed extensively to the development of organizational financial reporting systems to make markets more efficient. Another imperative before us is to: *Design corporate sustainability reporting systems that achieve the goal of a more sustainable society*.

If consumers want to purchase products that advance sustainability, where can they find reliable information? Governments require labeling information to provide data on the nutritional value of food and the chemicals in drugs. This practice could be extended to sustainability. Information has far more value when it can be

digitally processed, and what is needed is a product database containing the environmental calculations for the vast majority of commonly consumed items so consumers can readily undertake green comparisons of products. Computing professionals can play a key role in defining the data standards for consumer environmental calculations and then designing systems for making this data publicly and conveniently accessible. We can help consumers choose greener products and understand the environmental consequences of their purchasing decisions. Consequently, another imperative for the profession is to: *Implement efficient approaches for collecting and persuasive means of presenting product sustainability information to promote green purchasing decisions*.

Many people want to maintain a sustainable lifestyle, but they do not know how. For example, the householder who wants to do the laundry with electricity primarily from renewable sources typically lacks relevant information. Furthermore, even when some information is available, it is often aggregated so that individual action is hidden in collective behavior. For most, the monthly electricity bill omits the necessary details to promote change. Consumers would be better informed if each action were accompanied by information about its environmental effects. Therefore, as a profession, we need to: *Develop information systems that provide individuals with accurate, meaningful, and actionable information about the environmental impact of personal decisions*.

In summary, accurate pricing and well-informed perceptions among all members of society—individual, organizational, governmental—are the foundations of an information strategy for environmental sustainability. Such an information strategy requires processing and storing more information (along with studying its reception by consumers). Sensor networks and product sustainability information will add new streams of data that we need to manage securely and sustainably in a world already experiencing a data deluge. We certainly do not want a situation where the energy required for storing and processing this data results in a net increase in harmful emissions.

What matters now is that we stimulate debate within the profession about its role in creating a sustainable society.

Thus, in designing and developing an information strategy for sustainability, we must take into account the full life cycle impact of these solutions and their own intrinsic demands on the environment for materials and energy consumption. Critically, we need to: *Develop professional standards for data processing and storage that minimize their environmental consequences, while simultaneously helping to create a sustainable society*.

A Call for Action

Large-scale endeavors, such as reducing the effects of global climate change, require the incremental and cumulative action of many working toward a common outcome. Like those in other fields,[11] we believe it is our ethical imperative to address environmental sustainability issues. Collectively, we can start on this path by first tackling current tractable issues, such as designing and building local sensor networks, and then scaling up as we learn how to create a global network of linked sensor networks, using the Internet as both a platform and a model. Similarly, the behavioral scientists in our community can begin exploring the relationship between information, perceptions, and environmental consequences, and scale as they learn.

What matters now is that we stimulate debate within the profession about its role in creating a sustainable society. Despite differences between ACM members, there is ongoing work on which we can build—see the work on computational sustainability of the Computing Community Consortium as well as the work of the Association for Information Systems special interest group on green information systems. It matters that we take action, and as we learn, we will refine our notions of an effective information strategy and sound tactical solutions. John Holdren, President of the American Association for the Advancement of Science and advisor to U.S. President Barack Obama for Science and Technology, called on his colleagues to tithe 10% of their time to working on the globe's significant problems; it might well be appropriate for ACM to make a similar appeal to its membership. In summary, *ACM members, both collectively and individually, must apply their computing knowledge to contribute to the creation and implementation of an information strategy for a sustainable society*. C

References

1. Friedman, M. *The Social Responsibility of Business is to Increase its Profits*. Springer Berlin Heidelberg, 2007.
2. Global Reporting Initiative. *Sustainability Reporting Guidelines: Version 3.0*. 2006.
3. Grunert, K.G. and Thøgersen, J. *Consumers, Policy and the Environment: A Tribute to Folke Ölander*. Springer, 2005.
4. Hardin, G. The tragedy of the commons. *Science 162*, 3859 (1968), 1243–1248.
5. Lawrence, P.R. Being human: A Darwinian theory of human behavior. Unpublished draft, 2007; http://prlawrence.com/beinghumandownload.html%3E.
6. Milgrom, P.R. and Roberts, J. *Economics, Organization, and Management*. Prentice-Hall, Englewood Cliffs, N.J., 1992.
7. Pacala, S. and Socolow, R. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science 305* (2004), 968–972.
8. Samuelson, P.A. and Nordhaus, W.D. *Economics*. McGraw-Hill Irwin, Boston, 2010.
9. Stern, N. *The Economics of Climate Change: The Stern Review*. Cambridge University Press, 2007.
10. Stiroh, K.J. Information technology and the U.S. productivity revival: What do the industry data say? *American Economic Review 92*, 5 (2002), 1559–1576.
11. Swim, J. K. et al. Psychology's contributions to understanding and addressing global climate change. *American Psychologist 66*, 4 (2011), 241.
12. Watson, R.T., Boudreau, M.-C., and Chen, A.J.W. Information systems and environmentally sustainable development: Energy informatics and new directions for the IS community. *MIS Quarterly 34*, 1 (2010), 23–38.

Richard T. Watson (rwatson@terry.uga.edu) is the J. Rex Fuqua Distinguished Chair for Internet Strategy in the Department of MIS at the Terry College of Business at the University of Georgia, Athens, GA.

Jacqueline Corbett (jacqueline.corbett@fsa.ulaval.ca) is an assistant professor in the Department of Management Information Systems in the School of Business Administration at Laval University in Quebec City, Canada.

Marie-Claude Boudreau (mcboudre@terry.uga.edu) is an associate professor in the Department of MIS at the Terry College of Business at the University of Georgia, Athens, GA.

Jane Webster (jwebster@business.queensu.ca) is the E. Marie Shantz Professor of Management Information Systems at Queen's University in Kingston, Ontario, Canada.