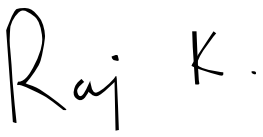
On Technology: Let's Make It Simpler and a Little Less Open

It all sounds eerily familiar and much like the scenes unfolding in a horror movie: Whole swaths of the country go dark without electricity… The airline, railroad, and motor traffic systems grind to a halt… Disturbingly enough, these scenes are real. Further, our computers are increasingly incapacitated by viruses, worms, and bugs of various sorts, and the Internet is clogged with spam. Complex high tech systems appear to be becoming more vulnerable to calamities. Are they getting too massive for us to manage? Recent events and the increasing concern with homeland security raise important issues related to the weaknesses of a *centralized* and *standardized* technology system. We have a centralized electricity distribution (grid) system. The operating system that we all use for our personal computers is standard. These systems evolved because of the need for efficiency and ease of communication while rendering them increasingly prone to massive failure. Yet centralization and standardization run largely counter to the twin tenets that this country was based on, namely, democracy and free enterprise. Perhaps the time has come for us to rethink this technological paradigm. Consider the simple Christmas tree light model in this regard. Recall that the lights are wired in parallel so that any defective single light bulb does not incapacitate the entire network. Nature even has a biological counterpart in the "lizard and tail" example. Such *decentralized* systems will be flexible enough so that the major, critical parts (think lizard) will continue to operate even when a portion (think tail) malfunctions or breaks down completely. As an added and important bonus, these systems will also be much less vulnerable to economic and terrorist threats.

A related aspect of our technological system is its openness and accessibility, features that would be crucial in a communications scenario. Thus the complex web underpinning the Internet was designed for seamless flow of data across the globe. However it is this very feature that also makes it most prone to intrusion by the spammers and hackers. An analogy in everyday living is the evolution of the urban neighborhood. The advent of increased crime and security concerns heralded the arrival of gated communities in once-open neighborhoods. While a wide-open Internet would have been desirable in an ideal world, perhaps it is time for us to envision instead, a network of segmented chunks of the Net where access is restricted by digital security guards at the entrance. Of course, such sub-networks ("intranets") already exist in the corporate arena. Break-up of the open Internet architecture, however, will have the undesirable effect of slowing down communications.

Jeremy Rifkin in his book, "*The Hydrogen Economy,*" talks about a decentralized energy distribution system — a hydrogen energy web based on a loose network of distributed-generation associations. This paradigm transforms dispersed fuel cell operations into vast extended power plants, in which individual energy producers tap into the existing power grid and sell unused power back to the utilities. There are also discussions on directly coupling renewable energy sources (*e.g.,* wind and sun) with the electric grid system although the engineering and optimization challenges involved here are non-trivial. And so we are back to square one with a complex technological system! Engineering, but with an electrochemical bent, is also the theme of this issue of *Interface*, which focuses on the Industrial Electrolysis and Electrochemical Engineering (IE&EE) Division. I want to thank Peter Foller, John Weidner, and John Van Zee for their coordinating efforts, and the feature article authors for their contributions. Stay tuned.



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