Kim Vicente, P.Eng. Taking tech to the people

by Dwight Hamilton

Born in Lisbon, Portugal, Kim Vicente, PhD, P.Eng., was raised in Canada and received a BASc in mechanical engineering from the University of Toronto in 1985. After completing his masters' at Virginia Polytechnic Institute and State University, he went to work for Jens Rasmussen in Denmark for a year. The Danish engineering professor was working on the dividing line between man and machine, coined the "ecological interface"–long regarded as the weakest link in industrial design.

Vicente obtained his doctorate from the University of Illinois and taught briefly at the Georgia Institute of Technology before returning to U of T in 1992. He is currently a professor of mechanical and industrial engineering there and is cross-appointed to the university's Institute of Biomaterials and Biomedical Engineering. In addition, Vicente is an adjunct professor of psychology at Miami University. He founded U of T's Cognitive Engineering Laboratory in 1992, which focuses on the discipline his and Rasmussen's work has helped define throughout the world.

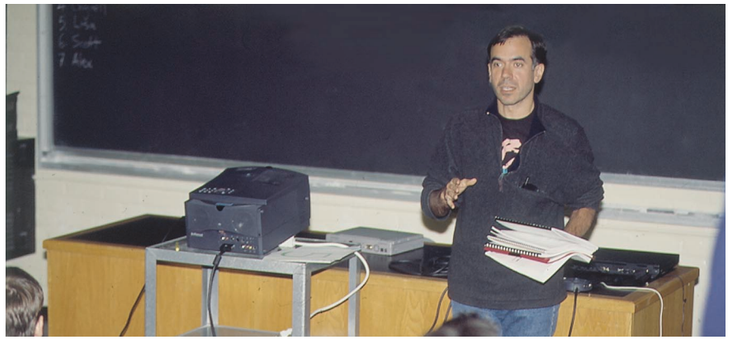
In 1999, Vicente published a book that is regarded by many as a milestone in how humans and machines interact. Due to his innovative research, *Time* magazine selected him as one of Canada's young leaders of the 21st century the same year.

ED: *What is the emerging discipline of "cognitive" engineering and how does it differ from ergonomics?*

Vicente: Cognitive engineering, or human factors, integrates knowledge from the human and technical sciences to design complex social and technical systems to make them safer, more productive and healthier for people to work with. Usage around the world differs, but ergonomics usually refers to physical and physiological concerns with design, not psychological ones like decision making and problem solving. My research is concerned with how people use their brains.

ED: *What inspired you to apply the principles of human psychology to technological design?*

Vicente: When we build technology it is for people, so maybe we should actually know something about people when we build things, so that after we build products people could actually use them. Sounds obvious–the problem is it never happens.



People first: Vicente lectures U of T engineering students on the principles of design.

ED: *Your book,* Cognitive Work Analysis: Toward Safe, Productive and Healthy Computer-based Work*, has been described as a "landmark" by Penelope Sanderson, director of the Swinburne Computer-Human Interaction Laboratory in Australia. A senior scientist at the Honeywell Technology Center in the U.S. called it the clearest articulation of cognitive engineering that he had ever seen. Had this work ever been publicized before?*

Vicente: No. The work done by Rassmussen and myself was scattered all over and no one had pulled it together. No one had presented it pedagogically with examples and rationales that make it easy to understand. People knew Rassmussen was up to some neat stuff, but no one really understood it. I did because I worked with him for a year and we talked on a day-to-day basis. I thought it was important to communicate what I knew in a form people could pick up because they couldn't with the existing sources.

Some came up after and remarked that they thought there was a lot of new material. There's not really that much, but I am making it clearer than it was before, which is a really good thing because now people are doing research based on those ideas. It has been used as a textbook by about a dozen universities in various countries.

ED: *Describe some of the projects where your research has been applied.*

Vicente: Toshiba found out what Rasmussen and I were doing and they felt the research matched the practical problems they were working on. They wound up using the theoretical framework that we developed and they also used specific displays that I had designed for my PhD work and implemented them in a prototype of a nuclear power plant's control room. Various dials and gauges were funneled into an integrated graphical display so you can look at it at a glance and tell if you have a leak or if everything's stable. Before, you'd have to look in 20 different places and keep it all in your head.

It actually was like the real thing because it was hooked up to a full scope simulator and behind everything were a bunch of computers for mimicking plant behaviour. When I went to Tokyo and walked in the facility with all the computer wall displays it looked like the bridge from *Star Trek*.

In another case, the US Air Force used my research to design information systems for what they call "distributed decision making," in military operations. It was basic research and not connected to designs used in the field. The military as everyone knows is by the book, but now they've found they can't work that way anymore. Planning and coordination have to be much more fluid and dynamic now because the world's a much different place. They can't use protocols and rules of engagement that are inflexible. But to use flexibility wisely you need feedback, you need to know what state the world is in. If you don't, you are in big trouble because you're operating in the dark.

ED: *What should engineers keep in mind when designing things in a world where technology is evolving at an exponential rate?*

Vicente: The old ways of thinking aren't so useful anymore. The traditional idea about engineering, that you've got to worry about just the nuts and bolts, may have been true at some point, but today it's not enough. Of course, you can't give up on the technical excellence–otherwise planes don't get off the ground and buildings fall down. But you have to work in new ways. From the old perspective it sounds kind of wacky what we're doing, but now we realize that it's about common sense.

The world is a rich place. When you look at it without being bogged down with preconceptions, there are all sorts of interesting things that fall through the cracks of our disciplines. Look at engineering. It's been about technology, but we've never seen technology without people–it doesn't exist. The world is a good teacher in that respect.