

A Collision Course with Ourselves

... An Interview with James Canton, President of the Institute for Global Futures



Technology Group's **David Kelsey** spoke with futurist **James Canton** who offers his definition of technology and his notions of what technological innovation will mean to the way we do our jobs and live our lives.

David Kelsey: First, I would like to understand what you interpret the term "Futurist" to mean and how that would be contrasted with what other people know as forecasting.

James Canton: Well, there are many different kinds of futures so what does this indicate? Being a futurist is being somebody who identifies trends, does research. The kind of futurist I am particularly is a technology futurist. And my specific interest area is to look out over the horizon and identify those technologies that create changes impacting on market economies, customers and industries. That's my particular focus. And I do trend analysis, I do primary research, focus groups. And we have developed a proprietary forecasting methodology which enables us to stay close to what emerging technologies are coming into the marketplace and what the potential scenarios are for their impact on customers. That's our particular interest. We're much more enterprise futurists than we are academic futurists. There's a real difference there. So I'm much more interested in the impact of technologies on both economics, business, customers, than I am just on society and culture.

Kelsey: What in your background led to this career for you?

Canton: In the early years I was a trained social scientist, I got my primary training in the early years in academia, but the real lessons were in working in the marketplace. Formerly before entering the private sector I was a domestic policy advisor of the Carter administration, where I was tasked with identifying specific trends that were related to business and government and then healthcare, healthcare policy. I had a former think tank called the Health Policy Council where I advised policy makers both in trying to create bridges between government and business regarding progressive healthcare policy and its impact particularly in business. And then I migrated out of there and worked on my doctoral work, which was on systems, and ended up at Apple Computer in 1979, where I joined the Macintosh marketing and development team at Corporate, where I became one of the first strategic planners in high technology companies looking out over the horizon over what was coming next.

At that time, in 1979, we were working on next generation personal computers. I already had my eye on things such as artificial intelligence and digital agents and next generation networks. Of course it was the early stages of network deployment, satellite communications and of course, artificial intelligence. After that, I went through seven or eight years of starting companies in the high tech area involving artificial intelligence, telecommunications, computer peripherals, and then investment banking. And then migrated out of that into advising companies - investment companies, technology companies, virtual intelligence companies on what were the top technologies that were going to shape opportunity in the marketplace.

Then I developed my own institute [in] 1990, to be able to pursue this full-time, working with companies, speaking, doing studies, providing expertise. There was really one set of folks that were calling themselves futurists, most of those folks were mostly of academic orientation, there were some folks who were involved in strategic planning, but there were not a lot of folks who

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understood technology, who were involved in forecasting. That became my specific focus of expertise.

Kelsey: So, would it be safe to say that you have one foot planted in the real world because of your business experience?

Canton: That's right.

Kelsey: The word 'technology' -- we all read about that but no one ever seems to come up with a definition of what it is. Could you define what we generally mean by that term, and also whether you think the rate of technological innovation is fairly constant or whether it occurs in sporadic flurries of activity?

Canton: My definition of technology is technology at its most simplest and also perhaps most profound way of looking at it is the technology of tools. What distinguishes human beings from other animals certainly is our ability to use tools to make tools. So this whole notion of tool-making is really integral to the evolution of civilization and the evolution of survivability of humankind. So this notion of tools is how I look at technology. Now the next generation of tools are new tools that I refer to as the power tools of the 21st century, things such as biotechnology, networks of computers, or even neurotechnology, these are for me the sort of key power tools that will shape the 21st century. The ability to be able to manage and restore these is the challenge before us. But that's how I would describe technology.

How we use these tools is designed to be able to make a more productive, a more efficient, a more pleasurable, even, world. So we're still at this battle of being able to harness the powers of nature through the use of tools. Of course, 500 years ago, it certainly may have been harvesting the elements of nature, the resources of nature. Today, we have another set of tools we're deploying but it's the same species, if you will, of challenges.

Kelsey: Do you think that the rate of innovation over whatever time span you want to look at, whether it's 1,000 or 50 years or 500 years, tends to be fairly constant or do you think we're actually living in a special time now in terms of breakthroughs or new technologies becoming available?

Canton: Well, I think we've reached a series of megapoints. In other words, this new generation of power tools is causing an acceleration of new developments. For instance, 20 years ago, we did not have the computational power to be able to produce the fast changes in evolution in industries that we have today. Think about it -- let's just take one small but certainly profound development, the human genome, we're done mapping the first part of the human genome, which is basically the book of life. Well, the untold story behind the mapping of the human genome is the computational power and networking power that was needed to be able to create this breakthrough. So instead of taking ten years to sequence a gene now it might take 15 seconds. Again, it is because of the evolution of these tools that has brought this ability for us to create these kinds of innovations.

Now, all you have to do is turn back the clock less than 15 years and if somebody had made that forecast that you were going to have small to medium-sized business drive the economy, that the GDP was going to be accelerated by information technology, and that women were going to be the captains of the greatest locomotive of the economy, people would have laughed at you. But that's what has evolved.

Now, going back to your question, my forecast is that we're looking at a special time from the point of view that -- yes, there is a greater proliferation of power tools than ever before that are changing paradigms, business models, economies and ultimately industries and markets; yes without a doubt. But I think that given this new wealth of technology, the smarter, more connected, more real-time technology -- is all really extension-coming back to this notion of a tool. If you think of what a tool is, it's really an extension of our own capabilities, whether it's a hammer or whether it's a computer. I think what's happening now is that the ability to be able to have more powerful, more cost-effective, more intelligent extensions, tools to extend our creative capabilities, is creating much faster change than ever before. I think this a unique time we're living in.

By the way, I believe time is speeding up. I believe our very notion of time, based on these technology drivers, is speeding up the evolution of change. So, for instance, some people might say, "Well, we're living in a very special time but it's very chaotic." I think the notion of planned, predictable change, whether it's a social system, an economy, or a marketplace, is just disappearing because of this rate of innovation, we're actually folding time and accelerating time with new technologies. Again, we're just scratching the surface. You don't need to be a futurist to realize that you are doubling the power of the microchip in the same time you're reducing the cost by 50% over a year, where that bandwidth is certainly doubling. It will increase this year about 300%. So again, if you run this out by three or four years, what you'll end up having is a whole different melding and merging of lifestyles, of culture, of technology. In fact, technology will just disappear because it's imbedded. It will just transform every lifestyle and work style on the planet, within the next decade. Whereas, 20 or 30 years ago I wouldn't say that, because we didn't have access to fast networks and large distributing computational power.

Kelsey: How do you think the application of technology will be influenced by the number of different cultures in the world, and also by the so-called haves and have-nots? Do you think it's going to result in increasing gaps between the haves and the have-nots? And also do you think that the adoption of the innovation will vary greatly across cultures and can contribute either to the bringing together of those groups or to the further spreading apart of them?

Canton: As a futurist who's studied this matter and has discussed it with other folks worldwide, I'm a firm believer that technology is the great leveler. I do believe that it will bridge many of the gaps between the haves and the have-nots. When I look at the evolution of computers and certainly the Internet over the past not even 25 years, what I find is that it has completely transformed economies by putting into the hands of mostly entrepreneurs, capabilities they could never have had access to. Those capabilities have spawned entirely new businesses. To look at the real driver of growth, there certainly are two interesting measures. One is that information technology is responsible for about a third of the real gross domestic product here in the United States, and that's somewhat predictive of what's going on in terms of global GDP. Meaning that IT is a key driver to GDP.

The other interesting piece is that as the real growth in economies, 90% of the real growth in the US economy -- to a certain extent Asia and Europe -- is with small-to-medium sized business. When you combine this data, IT is the key driver of GDP, and real growth is occurring in small to medium-sized business. It portends a new view of civilization where information technology is going to fall into the hands of the have-nots and has already, I might add, put in the hands of the have-nots tools, capabilities, entirely new businesses that would never have existed before.

Coming back to that data regarding the US domestic economy, not only are small to medium-sized businesses responsible for 90% of the real growth in the economy, but over half of those small to medium-sized businesses are owned and operated by women. Now, all you have to do is turn back the clock less than 15 years and if somebody had made that forecast that you were going to have small to medium-sized business drive the economy, that the GDP was going to be accelerated by information technology, and that women were going to be the captains of the greatest locomotive of the economy, people would have laughed at you. But that's what has evolved.

In terms of haves and have-nots, transglobally, I'm very optimistic about the next generation of telecommunications build out, particularly types that will make the Internet available and wireless technologies that will make the Internet, as a marketplace, available to many folks who would not have access any other way. I think there's no doubt in the third world and the second world that cellular technology, tied to computer databases and tied to Internet infrastructures, will provide a major new marketplace for buyers and sellers whether they're in Senegal, Chile, New York or London.

As we evolve towards a global net economy where the Internet becomes a marketplace that knows no boundaries of distance or nationality, that is instantly available via a variety of different kinds of inexpensive devices, I think that we're going to be not just bridging this gap but providing a lot more economic sustainability than ever before to peoples that have a very difficult time escaping the boundaries of poverty and perhaps even war and lack of opportunity. So I'm very hopeful that this is already beginning to show some evidence that technology is a great leveler.

Kelsey: So the spread of something like the Internet then will be primarily for economic reasons, you think, rather than communication reasons?

Canton: I think it becomes all part of one conversation. I think that you can't separate communications and commerce and culture. We're in effect transforming the global civilization. With the fall of communism and the end of the cold war, the containment of rogue nations and ultimately the reduction in warfare and the opening of free markets, you need a robust economy. So the electronic market would be the most efficient way to be able to share buyers and sellers communicating worldwide.

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And again, look at the economics alone in terms of making a telephone call over an existing POT (plain old telephone) system. The economics, the internal expense, is approximately four to five cents versus an Internet platform where it's less 1/100th of one penny. So we're talking about efficiencies here, but we're also talking about putting in the hands of people who never have had the ability to be able to communicate with other nations technology that will now be cost effective, that will enable them to sell products, to share ideas, and for us to learn about other cultures.

I received an e-mail the other day from a Web developer in India that found me on the Internet and is now offering her services at a price point significantly lower than anyone here in Silicon Valley. I know that there are now collectives of communities in India. Because of the Internet they can find entirely new markets for their products than ever before.

Chinese farmers who would like to market their garlic, other than being

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able to sell their garlic to folks days away or hours away now have a marketplace over the Internet. I think we're just scratching the surface of the future here. And when I look out over 2005, we will have a billion and a half to 2 billion people on the Internet generating close to \$5 trillion worth of business. I think this is the evolution of human civilization, I think technology can help make a more productive, more sustainable life for people on the planet. I think that's what's going on.

Kelsey: That would be great, but do you think governments are going to get in the way of that?

Canton: Well, I think government already gets in the way of it. I think that you're talking about a clash of paradigms, a clash of private interest and government interest. Governments are in the business of self-perpetuation, if you will. They have a role to play in all of this. We have dodged the Internet taxation issue, but there are going to be bigger issues. Will government be the fly in the ointment of this grand vision of globalizing the Internet and transforming economies in an era of free enterprise and digital entrepreneurship? Without a doubt.

And again, this will cause a redefinition of the role of governments. This will cause a conflict between the private sector and governments. We already see that happening today. We already see a digital brain drain occurring in certain nations worldwide where entrepreneurs, digital entrepreneurs, are leaving where they can follow an easier path for venture capital or they can find other talent or they can pursue their business. I think governments are going to have to reconsider their role in this brave new electronic marketplace. They're going to have to rethink. Even the notion of law and taxation will need to be adjusted to give wide berth to all the very innovative if not competitively rich 21st century.

Kelsey: In your book "**Technofutures**" you talk about the blurring of the real and virtual worlds. You use a term "the megaverse" as the dominant marketplace and media backbone. Do you think these worlds that we have created are in some sense on a collision course, in terms of some people rejecting virtual worlds as alienating?

Canton: Oh, without a doubt. I talk about this emerging, blending reality which is really the indistinguishable nature of the 3D physical world with the on-line world. And really the indistinguishable characteristics are going to be when virtual reality becomes sensory, meaning you can actually touch and feel objects and experience even emotional cognition in virtual realities. Certainly the streaming of sensory information will really confuse some people, but some people will actually prefer the sensory virtual universes to physical reality.

Again, it's not hard to envision this. Try to talk to a four-year old who's watching TV and try to get them to break their concentration for more than five minutes and you'll see the rug rats rule and parents drool as my daughter has reminded me on occasion. But my point of all this is to suggest that yes, you're going to go through a series of phases of this evolution. Right now it's pretty tame stuff. You've got pretty low bandwidth, you've not got a lot of interactive involvements. In other words, right now this is a little like the Middle Ages, we've got very primitive information, let's say, information and virtual layer.

But as this environment becomes fast and enabled by fast bandwidth it becomes sensory. It becomes telepresent, where you can actually walk through environments, you can actually touch and feel objects and have objects touch and feel you. It's going to be a very different experience because as we learn to digitize everything from smell to touch to hearing and we then stream it into an environment, the limitations on innovations, the limitations on experience, the limitations on taboos will disappear and what of course may be illegal or undesirable or even repulsive in the physical world made up of day-to-day reality may become entertainment in the virtual world.

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So I think without a doubt, we're going to be creating the next level of seductive on-line sensory reality that will come to rival physical reality.

Now, will there be some folks -- and I would forecast that there will be many folks who will reject this technology, reject the seductiveness of it, reject wanting their children or families or even their workers to engage with it. Then will this sensory, virtual reality streamed over the net become an opiate of the masses?

I think that we'll have to consider this, probably or certainly in our society we will have to consider this. Now, will there be hopes that we'll legitimately reject this technology as not being worthy of time spent? Will there be restrictions placed -- much the way we put restrictions on violent media -- of who we want to attend movies that are R or X rated, versus who we don't? I think that all of that will evolve. I don't think that people realize how seductive and how powerful the electronic emergent sensory universes could be.

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Because they are going to be designed based on the visions and the dreams of individuals who will have at their hands - again, moving back to our earlier conversation here - they'll have access to power tools that quite frankly would have been unimaginable 20 years ago. Look at the next generation of video game machines that are coming out right now - - Sony's new next generation Playstation will have the graphics capability of a supercomputer that used to cost \$25,000 not that long ago. The chip in it will have more power than what Intel could put on the desktop today. It will have an artificial intelligent operating system called the Emotion Engine that will be intuitive. It will have a built-in DVD and will be Internet ready. And the bill will be under \$400.

What are the implications for this technology when the Internet becomes wireless? We don't need complicated devices to be able to jack into these ultimate realities.

Well, you're going to have some people who will eat it up, other people will reject it, and other people who can't get enough of it. The good, bad and the ugly.

The interesting phenomenon about technology and its impact on society is that we kind of get what we always had, right? You could make good, bad and ugly scenarios out of the telegraph versus the TV versus the Internet of the 21st Century. It's only going to be exacerbate what human nature is already. Perhaps portray it in ways where more people understand more choices, but there's no way of avoiding all of this because the more you make it illegal or put taboos on it or try to restrict it from populations, the more people are going to want access to it.

Kelsey: So we're on a collision course with ourselves in effect?

Canton: Yes, and again I wouldn't quite say that we're on a collision course as much as you can't achieve gain without some pain. We are a young civilization that's learning to deploy vastly more powerful technology tools than we are perhaps socially ready to integrate into our society. I mean there's still whole-scale poverty on the planet, there are large disparities between the rich and the poor, there is large disparity between education, health care availability, at any given time you've got approximately 20 wars going on, we haven't learned how to leave the planet yet, we haven't learned how to be able to use technology to provide free energy or free food, we're still a fairly primitive civilization. What these new technologies are going to do over the next 100 years is give us as a civilization an opportunity to be able to apply these power tools to be able to better manage our own civilization and provide more of the basics, to more people, but also to be able to bring a level of prosperity and creativity and productivity where there has not been as much.

Kelsey: Do you think that as computers get smarter and smarter that we'll at some point have to redefine words like intelligence and life?

Canton: Great question. I think that along the lines of redefining economic guidelines and industries, and markets, without a doubt that we're on the edge of redefining what life is itself. And I think this is going to be a very philosophical long-term experience here.

One of the seminal points in history certainly was when Deep Blue beat Kasparov at the chess table. I think this was a shot across the bow because at that point Kasparov leaned over and said he had a sense that Deep Blue was feeling the moves.

The media didn't really understand that, but that was the beginning of a new chapter. I believe within certainly 25 years and perhaps less we will have artificial intelligence or artificial life that will come to mimic human functionalities, human capabilities and we will begin to question what the

nature of intelligence is, what the nature of perception is, even what the nature of humanity itself is. I think it's going to be a very interesting existential moment in human history over the next couple of decades here when computational power not just creates intelligence, artificial intelligence that can mimic or even be superior to human beings, but when we create entities, free-standing, mobile autonomous entities that we perceive as having human qualities.

In other words, it's the ability to mimic human capabilities more than human intelligence that will challenge our notion of what it is that life is. When you start to -- in a very physical form - when we start to deploy nanotechnology, the manipulation of matter at the atomic level, when we start to build machines that are made from organic components such as proteins and DNA, when we start to use chemicals and organic components to build free-standing androids or even computational devices that are now organically based, how long before those devices or those structures or those potential artificial entities start to wake up? And I think the critical thing is when they wake up and they become self-reflective and they have the ability to communicate not just with us but with each other, what will those conversations teach us about ourselves?

Going back again to your earlier conversation about technology: what is technology? Technology is the extension of ourselves. I mean it's interesting, we're building a satellite global network.

What is that? Well it's an extension, a projection of our nervous system. What is the Internet?

Well, it's really an extension of the collective unconscious, that which links all human beings, all human life on the planet. What are computers? Well, really it's an extension of the human brain that will now all be voice enabled.

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Technology is the extension of human beings. It's really part of the process that we go through to learn who we are and will we have entities that no doubt are, let's say, superior in intelligence to us, superior to us in terms of dexterity, speed, memory? Yes. But I think perhaps the more interesting question is: what will be the convergence and the merging of human and machine intelligence, human and machine perception, human and machine dexterity and performance? How this will change human evolution is perhaps really the critical question. Human evolution will be transformed by the integration of technology that will at first adjust, heal and substitute those functions that are dysfunctional with humans, such as artificial retinas to enable us to see, artificial ear drums to enable us to hear, certainly synthetic organs. But when you get to the next generation you start to really consider that one out of seven men who will reach the age of above 75 will suffer from Alzheimer's, what are the implications in terms of being able to give somebody a memory? What are the implications of being able to enhance someone's intelligence by being able to download certain capabilities? You'd like to learn how to fly a 747, or perhaps speak Mandarin Chinese in an afternoon?

The ability to train the brain in many regards is the way we've treated computers as part of a node, part of a network. The ability to upload and download information for learning, experience, communication, opportunity; this is going to change human evolution, and it will change it in our

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lifetime. We'll start to see these kinds of capabilities - embedded neural systems, which really are on-board computers - start to phase in over the next three years. There's an on-board computer that's smaller than a nail that's been approved for assisting epileptics. How we evolved technology in our society is we learn how to fix things, and then we learn how to enhance things. Human enhancement will be the largest market opportunity for the 21st Century. Human enhancement. How we define that -- if it's longevity or performance or intelligence or however people choose to use these tools to augment and enhance themselves - will be a very large set of ethical issues, a large set of social issues and there will be many, many commercial opportunities that never even existed before as we move towards the mid-range of the 21st Century.

Kelsey: I'd like to know who's going to staff all the help desks for all these computers.

Canton: It won't be humans!

Kelsey: If in fact we get to the point where we can alter our evolution and/or redesign the human species and even invent new life forms, who is going to make the decisions that those things are okay? Is it going to be scientists, is it going to be politicians? Who's going to make those decisions?

Canton: We already have people in the first world certainly who have opportunities to take cholesterol reducing drugs, who have the opportunities to have their eyes treated by laser surgery to improve their vision, improve their performance, to be able to get an artificial hip if they need that.

What I'm pointing out is that we already have many enhancements that are dictated certainly by cost and availability and geography if not a certain degree of financial resources.

Part of the answer is going to be that we are going to have to rethink the role of government and private sector in making certain very tough ethical decisions in terms of who gets to live longer. Who gets to have access to some of these drugs? We're going through these issues right now in terms of AIDS. If AIDS is not reduced in Africa it will decimate much of Africa, and certainly a quarter to a half of the population over the next, I will forecast, not even 75 years will be completely eliminated. And they cannot afford the pharmaceuticals that we can afford in the first world.

How do we deal with this? How do we deal with the differences in the economic disparity between continents, cultures and peoples? I think that part of the great challenge of the 21st Century is how to be able to make more resources available to more people given a certain degree of economic, or lack of economic parity.

But coming back to this issue of who gets to decide, right now it looks like there are economic drivers that make determinations of who gets access to certain kinds of enhancements, whether they're drugs or whether they're certain kinds of procedures. And again, I don't see that changing. I think that there will be some nations that will be more socialistic certainly, such as Scandinavian countries.

But if you're willing to give up 90% of every dollar, you certainly would be entitled to have that neural enhancement put in your memory because you paid out over the 50 years to be able to have a right to that kidney or that new eye or whatever. And I think there will be economic models that will be sustainable that people pay in and have their chance to be able to then redeem, if you will, the organ of their choice upon need.

There will be other economies in the future not unlike what we have today that will be cost driven. You can have the best laser surgeon in the world work on you, or the best heart available to you, or the best transgenic gene available to you, or maybe the farm animal of your choice will be available on demand with the kidney specifically targeted for your particular genetic acceptability. So again, I think that the way it looks today we've got a mix of political systems and therefore healthcare opportunities are somewhat varied and diverse. It's not going to look that much different in the future. You're just going to have more to see.

Kelsey: So if smart drugs become available, and that might happen because there was some consumer trend behind it, then I could certainly take them I suppose...

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Canton: There are a couple of different vectors that work together here. Think about today. The cost of contact lenses today, or the cost of glasses today is dramatically lower than let's say certainly 50 years ago. As these technological tools -- computers, biotech, nanotech, networks -- as they proliferate basically what they do is they provide more value for less money. So for instance, my contact lenses -- my soft lenses -- the technology is better but they're also about a third of a cost of what they were if not less than that of contact lenses I was wearing 20 years ago. And they're a lot safer with better performance. So there are many technologies that are going to be available to people for a price point that would be very affordable, and there will therefore be opportunities for people to have access to more. Productivity or more efficiency or more, let's say, overall prosperity will be greater as technology again is used in the manufacturing process, and the distribution process will be able to provide more efficiencies.

As more and more sophisticated technology particularly migrates to these wireless networks, where more and more people can access it with less and less expensive costly devices, what you're going to end up having is a lot more freer markets, more enterprise and more sustainability overall.

I think that's part and parcel with mass marketing. Few people realize less than 3/4 of the world have made its first phone call, but less than 3/4 of the world is tied into the global marketplace. What happens when they're all tied in? Well, the price of not just commodities goes down, but also manufactured goods go down and services goes down dramatically because you've got a much larger aggregate population that has access to all these innovations.

I tell my story about the rich engineer that I encountered in the flea market in Hong Kong. He had taken a Nintendo chip, Nintendo game, and reprogrammed it. He found memory on it that was dead space -- it had not been programmed. And he put on there 150 games. The same cartridge that you buy in the store with one game on it he reprogrammed it. He had less than a 3rd grade education. I asked him where he got the information, a friend of his got it for him off the Internet and he was using an old 286 computer. So worldwide I see technology creating opportunity. And I see technology creating prosperity. As more and more sophisticated technology particularly migrates to these wireless networks, where more and more people can access it with less and less expensive costly devices, what you're going to end up having is a lot more freer markets, more enterprise and more sustainability overall.

Kelsey: A couple of questions that businesses have to confront. You use the phrase, "Survival of the smartest." Customers are becoming

increasingly demanding. Customer service is a critical requirement and businesses end up, out of necessity really, knowing more and more about their customers. How can lasting customer relationships be built in cyberspace when employee turnover rates are increasing and brand loyalty and product name recognition are declining in importance?

Canton: Well, I disagree that brand recognition is going away. I think there will be a resurgence in brand identity and brand value. One of the bad things about the Internet is that it makes everything a commodity. And it creates what I call price elasticity. This notion of fixed pricing starts to disappear in the era of fluid markets. When you've got fluid markets, price elasticity and you've got commoditization of every product and service, what really springs to the surface for the customer? It's brand. And I think that brand equity is going to be very important in the future, moving forward in the future. Protecting your brand equity and how you make your brand equity available in an electronic marketplace is going to be very important. And how you build valued brand equity. Well, what does that mean to build valued brand equity? Well, a lot of it may have to do with the people who are allowed to market products that are associated with your brand, or what kind of service is associated with your brand, your response rate, how you deal with breakdowns are critical to how you manage your brand.

Coming back to this issue of customer relationship management in a virtual marketplace, this is going to be a key competitive differentiator. I think that companies are going to have to redefine their relationships with who their sales people are. We're going to have video e-mails soon. We will have interactive multi-media e-mails. The next generation of the Internet will be wireless, sensitive. It will be device independent. It will be open. It will be digitally cashless, integrated. It's going to be very important to be able to not lose the human touch, but there are a lot of functions in terms of sales and customer service and technical support that could be better mediated by

smart machines, meaning artificial intelligence or interactive voice response. And I think more and more as we move forward we're going to find that.

Kelsey: Let's talk about shrinking product development cycle times. I think you make a reference to that undermining existing product sets. Do you think that's generally applicable across a number of industries or confined to just a few?

Canton: Cycle times are going to shrink and go negative. What do I mean by that? We're going

to see entirely new paradigms. Let me give you an example. Let's say now the year's 2002, 2003 and you've got a better part of, let's call it a billion people online. And let's say now that we have the ability to identify customer segments. Before I build a product I want to identify a customer segment that would be interested in buying and committed to buy the product customized for their particular interest. Now I turn around and I actually poll them, contract with them, commit to them as a manufacturer or the agent for the manufacturer. And then I turn around a build a product only after I've gone ahead and gotten the commitment from my customers that this is a product they're willing to buy. Now, I think that we're heading into an entirely new era, which I call knowledge value engineering, where my ability to be able to respond in real time, I call that real-time agility - how fast can you respond in terms of your production time, how deeply personalized and customized can it be? Your ability to be able to deploy, deliver and support as much as much as possible in real time-this is going to be part of the new era of next generation manufacturing. And more and more the people will be doing this, whether the manufacturing or the technology stays or the healthcare stays or whatever, there's a whole new level of intermediaries that are going to be coming between them and customers, providing a real bona fide service to be able to enable faster cycle times, access to resources, better logistics.

Kelsey: So is this a question of businesses finding intermediaries that can understand their customers better than they can?

Canton: Well, not necessarily. I think this is an era of being able to think more as a network-based organization, where you have certain core competencies. You outsource other competencies and also you listen to other voices of people who are close to the customer as opposed to trying to own all those relationships.

Let's say I'm interested in selling computers to a set of customers that I know really well because I already sell them other consumer manufactured products that they resell, being able to leverage through intermediaries, when they know they've discovered customer segments that may be served better with them in the mix, I think is going to be more and more in an up-trend as we move into the 21st century because of the unique niche specialization of markets.

It used to be that in the computer market, when I first started 25 years ago in Apple, we talked about how there was a consumer market and there was a business market. And the whole notion that the segmentation and verticalization of markets, even niche markets within markets, the better that we know the customer, the better we know his or her needs the faster we're going to be able to get closer and more intimate and be able to be successful in our sales and marketing efforts. And we may need intermediaries to be able to help us do that, that's correct.

Kelsey: But with the rate of change in modern society, do you think customers really have a very good idea of what their requirements are?

Canton: I think the answer to the question is that you have to understand the difference between what customers want and what customers dream about but don't express. What I mean by that is that few companies spend as much time understanding the future needs of customer's dreams -- what they would really like, what they would ideally want, what would really make the big difference in terms of their lifestyle or workstyle. Particularly in the technology sector, we're much too technology-centric as opposed to being customer-centric. And we're much too today-centered instead of being future-centered. Being able to help our customers understand the future, how to move into the future, how their businesses may be different in the future, how they'll evolve and

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change -- this territory is unexplored. And I think the opportunities certainly are going to be extensive as we move forward. Being able to rethink how we do planning in terms of product development, how we listen to a customer. I think in an electronic universe you could do things you can't do in a physical universe just being able to access a larger segment of your customer population. Ultimately, how well you know the customer's needs, not just today, but what their needs may be, how they are evolving and changing. How best you could personalize a customer as your grand aim, your marketing, your product development cycle to be able to be in step with their future needs. This is, I think, the path towards future opportunity.

Kelsey: But do you think you can do that without face-to-face discussions? Do it through cyberspace or telephone calls or some other medium? IBM and other big companies have smaller sales forces than they had five years ago, which means they now have to find other ways to understand customer requirements.

Canton: I'm not suggesting that face-to-face communication is going to disappear. I'm not suggesting that you shouldn't have customer meetings. I am suggesting that a natural evolution of focus groups, customer meetings, site visits, face-to-face, telephone interactions are what you do in the in-between space certainly to be able to reach a larger number of folks. We have not tapped really the full potential of interactive multi-media environments where we can demo virtual products, where we could have interactive conferences and engagements. I'm really saying that we're just on the verge now with fast bandwidth, with redefining the paradigm of computers. We're just on the verge of being able to go ahead and re-look at all of this given the transformation of the customer experience that will be moved forward by this convergence of particularly fast networks and a higher level of computational intelligence.

Kelsey: It looks as though people in general are going to have to deal with more and more information, they're going to be forced to adapt to ever faster rates of change and increasing complexity. Two questions: One, do you think we're very well equipped to do this, and two -- as a final question -- what professional and/or personal advice would you give our readers to prepare for their futures?

Canton: Well, I would say that one of the great things about working for a technology company is that you constantly are around innovation. But often we're stuck in the trees and don't see the woods. What I mean by that is that if you're involved in financial services, go spend some time with people in healthcare. If you're involved in hardware, spend some time with people in software. If you're involved in entertainment, go spend some time with people in manufacturing. So I think the best advice I can give is if you want to think outside the box, spend some time outside the box looking at other domains that you may not have any expertise in. The different lessons you may learn may be very helpful if you can bring back best of breed examples and strategies to your specific area of expertise. I tell people who are involved in designing next-generation applications or chips or software that they should spend time in nature or go on an anthropological dig to get a different frame of reference about what they're attempting to do. So one of the things I would suggest people do is use the resources within the company to be able to investigate other models, other practices, other industries, other approaches that really would be foreign or alien to them as a way of stimulating their innovation. That's number one.

The other is, attend conferences, look out into the future of your own particular pursuits, spend some time with customers trying to understand what's next for them. How are their industries, their customers, their markets changing? Try to speculate with them. Put the hat on of a futurist. What we try to do is think about where things are going and how life will be different when we get there, and then try to work back from those scenarios. And it wouldn't be a bad idea to be able to integrate some of that scenario planning, some of that forecasting, some of that blue sky thinking about how life is going to be different in 2005, 2010, 2015. Because a lot of the strategies that you plan today, projects you plan today will be able to deploy that.

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