The impact of disruptive technology: A conversation with Eric Schmidt

From computational biology to 3-D printing, Google's executive chairman provides a look into the future of technologies that will change business models and lives.

In this video, Google executive chairman Eric Schmidt explores the phenomenon of technological disruption and selects those technologies likely to have the greatest impact on economies, business models, and people. This interview was conducted by James Manyika, a director in McKinsey's San Francisco office, in February 2013. What follows is an edited transcript of Eric Schmidt's remarks.

Biology goes digital

The screen that you want to apply about technology is not what technologies are interesting, because there are so many that are interesting. You want to look at which ones have a chance of having a volume impact on many, many people, or large segments of the society.

We're going, in a single lifetime, from a small elite having access to information to essentially everyone in the world having access to all of the world's information. That has huge implications for privacy, communications, security, the way people behave, the way information is spread, censorship, how governments behave, and so forth.

That's the primary narrative, I think, today. It changes education. It changes the way intellectual property works, it changes the way businesses work, it changes the way the media works, on and on and on. We're in the middle of that right now.

The one that comes next is undoubtedly biology. The same tools and techniques for combinatorial calculations, the kind of analytical computer use that we do today, when applied to biological systems, has an even greater impact. As we begin to say, "We're going to take the analog world of biology—how genes work, how diseases work—put them in a digital framework, calculate for a while, do some machine learning on how things happen," we'll be able to not only help you become

a better human being, but predict what's going to happen to you physically in terms of your health, and so forth.

Everything that we can do to build a model of how biology works, and in particular how the human brain works, how DNA works, how protein folding works, these sorts of things, is a serious step change for humanity. So, all of the grand challenges, like the sequencing of the human genome, for example. There are now firms and foundations building databases of DNA to use, to move to a model of individual diagnosis of disease, where you literally just press a button, the sequences occur, and it tells you what's wrong. So the use of analytical tools in a historically analog world is a very big change.

Materials and manufacturing

What's happened in technology is that a new set of ultrapowerful, ultralight, ultraconductive materials can now be manufactured at scale. And there's a revolution, largely driven by a set of universities, around new kinds of these manufacturing services that will change everything.

So that revolution, plus the arrival of three-dimensional printing, where you can essentially build your own thing, means that—during the rest of our lifetimes, anyway—it'll be possible to build very interesting things from very interesting, new materials, which have all sorts of new properties.

We already know that there's a whole hobbyist area around buying these 3-D printers for plastic. Well, if you can get these new materials, you could put them in the printers, and then over time those printers will become capable of machining, mining, and producing these materials.

My computer, my friend

It's certainly true that much of what we call innovation today is essentially routine, or evolutionary innovation. Cloud computing has been around for a long time, right? And it's getting better, and better, and better. After all, cloud computing is just mainframe computing in a different way, which is how I learned how to compute when I was a young boy. So the fact of the matter is these ideas have been around for a long time. Is that going to change the world? It certainly makes it better, but it's another step in the evolution of computer architecture.

There's a new generation of user-interface theory that says there should not be a user interface; the information should just be around you. We have a product called Google Now, which is available on Android,[1] which actually attempts (by watching what you're doing, and with your permission, and so forth) to make some suggestions.

So it's now figured out roughly where I live, and roughly where I work. And it tells me how long it takes me to get back and forth to work. Sort of useful. I didn't ask it to do that. It figured out

[1] Since the date of this interview, Google Now has become available on iOS devices through the Google Search app.

that I was going back and forth every day, and it said, “Oh, there’s a traffic jam,” and so forth. Now what are the limits of that technology? That’s an artificial-intelligence question. But it’s highly useful for it to have made a suggestion that would be good.

So I think we’re going to go from the sort of command-and-control interfaces where you tell the computer, like a dog, “Bark,” to a situation where the computer becomes much more of a friend. And, a friend in the sense that the computer says, “Well, we kind of know what you care about.” And again, you’ve given it permission to do this. And it says, “Well, maybe you should do this,” or, “Maybe you should do that.”

And the ultimate model is that the computer does what it does well, which is these complicated, analytical needle-in-a-haystack problems, and has perfect memory. And humans do what we do well, which is judgment, and having fun, and thinking about things. The relationship is symbiotic. The computer is making suggestions that are pretty good, they’re pretty helpful, but you’re ultimately in charge.

Man vs. machine

The race that’s not being followed in the media is the race between humans and automation. And this race is run every day, and it’s a very tough race. So when I go to the local convenience store, they’ve replaced a low-wage worker with a machine to do my checkout. And that machine costs a great deal of money. And I’m sure it was a good business decision for them.

So what happened to that low-wage worker? Well, their low wages probably did not go up. They might have even gone down. Maybe they’re on part of government assistance. So what’s the solution for that low-wage worker? Better education. So in the race against automation, which is the race we’re winning, and which politicians never articulate, the answer is better education.

Now there are some other answers as well. For example, immigration of high-skilled workers; rather, we don’t have to educate everybody in America. We can also get a few educated people from other countries, and they’ll help us out, because they’ll hire all these other people here in America. And again, people are slowly beginning to understand that, in any particular country, you want an unfair share of highly educated people—in all industries, by the way—because in the race, they’re the winners. ▢

Eric Schmidt is the executive chairman of Google. This interview was conducted by **James Manyika,** a director in McKinsey’s San Francisco office.