



Disruptive technologies: the pitfalls and opportunities

Panel: Disruptive Technologies

Organized by Ryerson University

CSPC 2015: November 26, 2016

Panelists: **Wendy Cukier**, Vice-President Research and Innovation, Ryerson University; **Dr. Michelle Chrétien**, Program Manager, Strategic Research, Xerox Research Centre of Canada; **Mohamed Elmi**, PhD Student/Research Associate, Information Systems, University of Cape Town/Ted Rogers School of Management's Diversity Institute; **Martin Lavoie**, Director, Innovation, Canadian Manufacturers & Exporters; **Colin McKay**, Head, Public Policy and Government Relations, Google Canada

Takeaways and recommendations

- ✓ Disruptive technologies disrupt existing business models
- ✓ Universities need new incentives to deliver the skills industry needs
- ✓ Increase digital literacy and STEM education, from kindergarten to post-secondary
- ✓ Encourage greater ICT adoption by companies
- ✓ Disruption can be minimized through open science and science communication
- ✓ Social sciences and humanities can help policymakers better prepare for these changes
- ✓ Modernize regulations to support disruptive technologies

The policy issue: Disruptive technologies create entirely new industries (think Google) and destroy or transform entire industries (think Uber). Canada leads the world in consumer use of mobile technologies but corporate adoption information and communications technologies (ICT) has lagged. A recent study by the government of Ontario showed small- and medium-sized enterprises were generally laggards in the use of ecommerce. The transition to electronic health records has been promising to transform health care since the 1980's but the impediments to use are systemic.

The options: Technologies are not inherently disruptive, explained Lavoie, it's how you use them. "The disruptive effect of innovation has to be closely linked to the notion of markets. An innovation will disrupt existing markets or a business model."

That paradigm shift is a challenge for governments, industries and academic institutions. For example, Lavoie predicts the whole model of mass production will be disrupted by innovations in artificial intelligence and 3D printing.

"We can't define manufacturing as we did 50 years ago. It is shifting value from the product to its functionalities or design. It no longer matters where you manufacture it," said Lavoie, noting that the service associated with a product can often be more profitable than the product itself.

He added that 3D printing or additive manufacturing has the potential to reshape Canadian production by creating highly skilled designers who can use these new technologies to make products and parts locally. **"This gets away from the race to the cheapest jurisdiction. This could be a niche for Canada,"** said Lavoie.

Cukier said current approaches to education and skills development are misguided because they assume certain occupations and skillsets cannot be automated. Yet she pointed to companies like Associated Press which has begun using web 'robots' to churn out short articles on company corporate earnings—far faster and in greater volume than any human journalist can produce.

"Universities, for the most part, are medieval institutions," that are financially rewarded for the number of "bums in seats"," said Cukier. **"If you want to do a new curriculum which is just-in time or blended learning, something that is other than three hours a week for 13 weeks, it's much more challenging because of the structures."**

For universities to change, Cukier said governments need to intervene with policies and processes that incent innovation and relevant skills training. **"Governments say they want innovation but if you look at the way they fund universities, there's absolutely no incentive to do anything differently."**

Disruptive technologies will have a significant impact on social change and government priorities, said McKay. Self-driving vehicles, for example, respond to the high risks and costs we accept as part of a driving culture—some 30,000 people die annually from vehicle collisions in the U.S.

"There are incredible social costs with in the way that we drive, the decisions we make about investing in infrastructure, and the way that we force municipalities and provinces and the federal government to make decisions about financing hundreds of millions of dollars of concrete infrastructure in our country," said McKay.

Similarly, advances in materials science will impact everything from healthcare to manufacturing through the development of new sensor technologies enabled by printable electronics and new approaches to energy capture and storage, said Chrétien. Some of the biggest changes are predicted for the energy sector.

"The future world of energy and the environment will look much different," she said. Advances in new materials will improve the efficiency and economics of renewable energy like solar power. **"It will result in changes in how we distribute, store and manage energy,"** said Chrétien.

As part of his Ph.D. studies, Elmi is looking at how mobile technologies and other ICT are changing Africa. In just a decade, mobile phones have gone from being out of reach to nearly ubiquitous and ICT is one of the most productive sectors of the economy. **"Companies like Google are now tripping over themselves in the rush to gain market share and access to the more than one billion Africans."**

Where does that leave a country like Canada? Despite having one of the world's most education populations, Elmi said Canada is not responding quickly enough to disruptive technologies, which puts it at a competitive disadvantage on the global market.

"There are a set of interlocking responses that are required to avoid being left behind" he said, including changes in university structures and government policies that overcome barriers to ICT adoption, and support a responsive workforce that is increasingly globally distributed. **"Those one billion Africans are going to need jobs as well and they're going to be competing with 35 million Canadians for those jobs."**

Lavoie said many universities are still stuck in a silo mentality, despite the fact that industries like manufacturing require employees with experience working across disciplines. **"Companies like Siemens created their own school for youth (the Seimens Mechatronics Academy) because universities and colleges don't produce the skilled people they need. That's a challenge for these institutions."**