Innovation Policy in an Era of Disruption

Kevin Lynch

As so many authoritative economic sources, surveys and corporate titans have told us recently, the nature of work is about to change drastically. Automation will replace many existing jobs and governments are scrambling to adjust their innovation policies accordingly. Kevin Lynch, one of our regular contributors who is uniquely positioned to assess the evolution of thinking on adaptation to the Fourth Industrial Revolution, outlines the opportunities and pitfalls of policy making in an age of disruption.

We are in the midst of an era of disruption, driven by the extraordinary scale, scope and speed of technological change, and spawning transformative innovations throughout economies and societies. These new technologies, from big data to machine learning to artificial intelligence to quantum computing to the internet of things, to much more, are intersecting and intertwining in unimaginable ways—a virtual revolution (Figure 1).

But few revolutions transpire without upheaval, uncertainty, and swaths of winners and losers, and technological revolutions are no different. This one not only has the potential to fundamentally transform what we produce and how we produce it, but its impacts are being felt well beyond the production economy—how we communicate, interact, date, learn, get news, and govern.

People are totally transfixed by technologies that have created self-driving cars and trucks but blissfully ignorant of the job-displacement potential of such automated vehicles.

Uber sent a shipment of beer 200 miles along an interstate in a self-driving truck. Elon Musk likes to be photographed arriving at meetings in San Francisco in a self-driving Tesla. Amazon is experimenting with drone delivery of packages in selected neighbourhoods. Cool technology, disruptive innovations and new business models. A productivity and growth gain from technological change, to be sure, but also a looming social pressure and policy quandary.

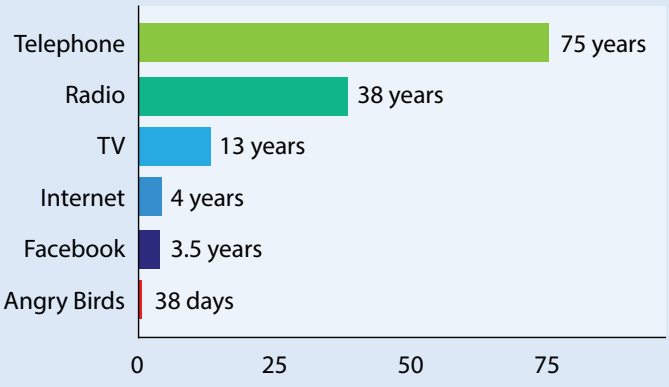
Widespread deployment of autonomous trucks in the United States would put the jobs of upwards of 3 million truckers at risk of technologi-

Figure 1(a): Technology is disrupting things, again

- Artificial intelligence (AI) and advanced robots
- New computing technologies (quantum, neural, …)
- Blockchain, distributed ledgers
- Internet of things (linked sensors)
- Big data, cloud computing
- Virtual and augmented realities
- 3D printing
- Neurotechnologies, geo-engineering
- Nano materials
- Energy storage

Source: McKinsey

Figure 1(b): The "PACE" of disruption (time to reach 50 million users)



Source: Citi GPS: Global Perspectives & Solutions

cal displacement. In Tom Friedman's words, this is the hollowing out of middle-income paying jobs requiring middling education. More generally, McKinsey & Company estimates that, through a combination of machine learning, big data, massive computing power and artificial intelligence, some 40 per cent or more of current jobs in North America could be automated in the foreseeable future.

This highlights the duality of the policy challenge facing governments, business and society. On the one hand, we have a significant long-term growth problem, caused by slowing productivity performance and shrinking labour forces due to aging. The main driver for rebuilding potential growth is innovation, which increases productivity, improves competitiveness, expands product choice for customers and moves firms up the value-added curve. And Canada has a considerable way to go in rebuilding growth through improvements in our innovation performance as even a cursory examination of global rankings makes strikingly clear (Figure 2).

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Here, the 2017 federal budget provided encouraging signals. First, we have to set ambitious targets and assign accountabilities. Building world-class innovation superclusters has driven innovation and growth in other countries, ranging from the United States to Israel, Singapore and the Netherlands, and the government has signalled its intention to work with business, universities, technology centres, risk capital and the entrepreneurial start-up community to do so here on a competitive basis. We should aim to have at least one innovation ecosystem in the global top 10 by 2020; half-measures will not succeed.

Second, we have to become a global talent hub, and align policies to achieve this. Extraordinary talent drives brilliant research, solves intractable problems and creates new ways of looking at old things. What sets successful innovation ecosystems apart is that they are magnets for such talent. Recognizing that talent pools are global, not national or local, the government's new Global Talent Visa and other measures to attract researchers and innovators should build on one of our greatest strengths—our diversity.

Third, we have to modernize our policy toolkit to support innova-

Figure 2: A global scorecard on innovation

Despite pockets of excellence, strength in start-ups and some best-in-class university research strengths, Canada is pretty mediocre in business R&D and innovation, particularly in established firms. We have to go from "reasonably good" to "globally great", and rapidly, to rebuild Canadian competitiveness.

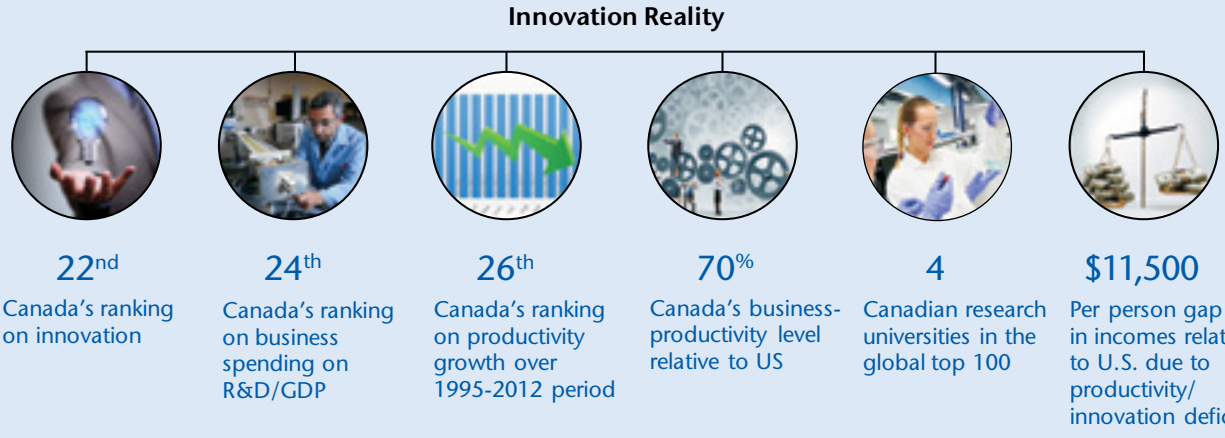
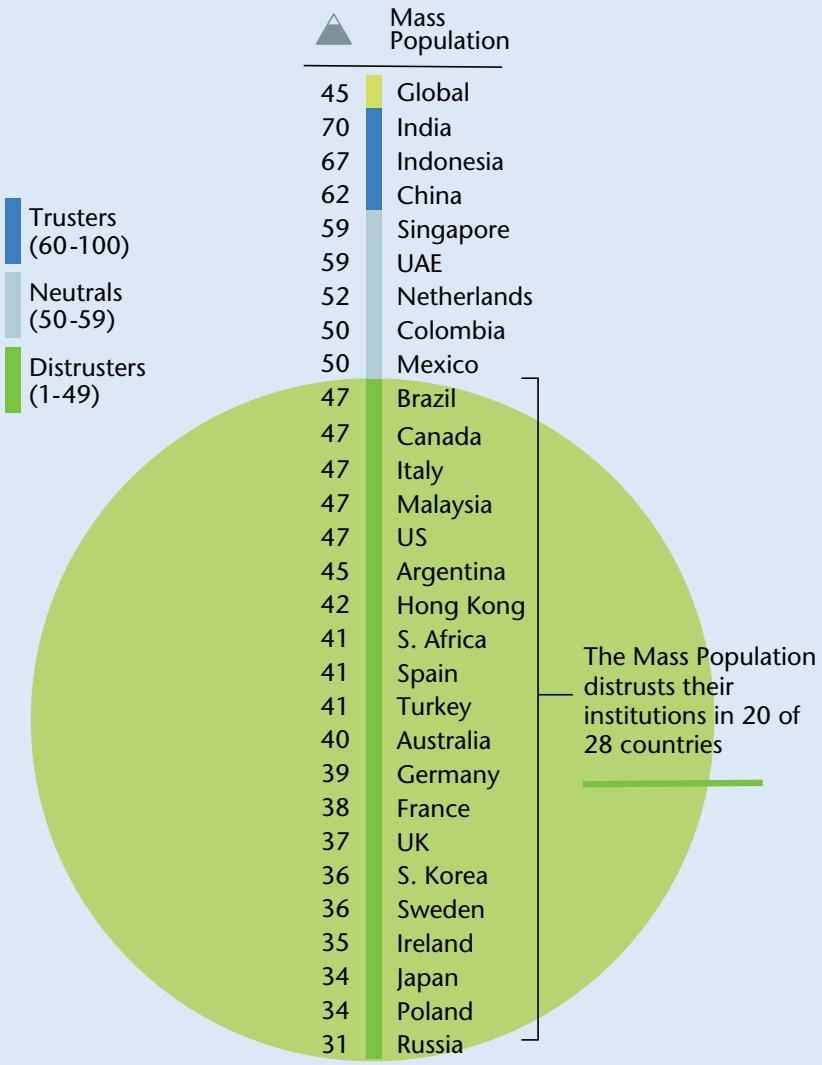


Figure 3: A world of distrust (2017)

Trust affects governing, managing and innovating, and, distrust is growing: in 20 of the 28 countries the Edelman Trust Barometer surveys, less than 50% of the general population expresses trust in the core institutions of government, business, media and NGOs. Trade displacing jobs, technology displacing jobs, short-termism displacing long term investing, lower long term growth, inequality displacing opportunity—are all elements of the loss in trust.



(Dis)trust factoids

59% of the general population in Western countries trusts a search engine more than traditional media

Trust in government globally has fallen to 41%

Only 37% of the general population globally trusts corporate CEOs

"Trust inequality" between informed public and general population is over 20 percentage points in the US, UK and France

Source: 2017 Edelman Trust Barometer, Global Report

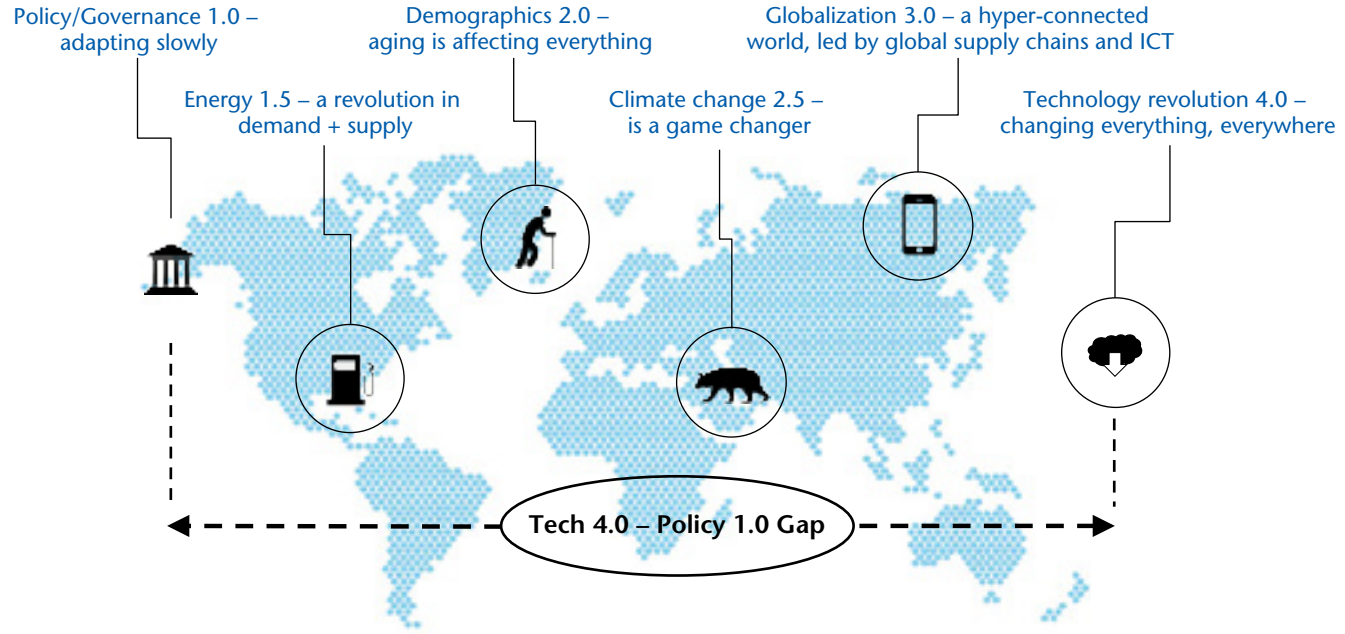
tion. Recognizing the importance of early customers to start-ups, the budget opened up federal procurement to innovative SMEs, and hopefully the provinces will quickly follow suit. Expanding access to risk capital through BDC's "VCAP 2.0" and the financial institutions-led "business growth fund" will help respond to the substantial scaling up challenge that Canadian start-ups face, as does promised assistance to access global markets and supply chains. But we still rely too much on tax-based assistance to innovation, something future budgets should tackle, and the absence of a "Canadian DARPA" (Defence Advanced Research Agency), which has been so successful in the US and elsewhere in developing dual-use advanced technologies that the private sector can commercialize.

And fourth, the importance of a culture of innovation to economic success cannot be underestimated. We need to encourage curiosity in our education systems; conformity seldom stimulates innovation. We need to emphasize cross-discipline interactions; the sharing and diffusing of diverse ideas cultivate innovation. We need to incent collaboration; innovation is a team sport not a solitary endeavour. We need to celebrate successful innovators; recognition by peers and community is both a powerful reward and an effective incentive to others to follow suit—something the Governor General, the Right Honourable David Johnston, has long been a leader in advocating and doing.

But the other side of the innovation coin is the inevitable technological job replacement and displacement. New jobs emerge, old jobs disappear. The nature of work and jobs change. This is not new; it is the history and future of disruptive innovations—from the steam engine, electricity, automobile, and computers to digitization, telecommunications and the internet more recently and to future innovations not yet clear. The policy, economic and social problem is to

Figure 4: Disruptive trends are creating policy gaps

Disruptive global trends are reshaping our world. One consequence: the status quo is not a strategy for future success, anywhere. A second consequence: a large capacity gap has emerged between a world of "Technology 4.0" and "Policy 1.0".



match educational training with future job requirements and to meet the reskilling and retraining needs of workers and firms as technological shifts occur. This challenge, while always present, is greatly magnified in eras of disruption.

The duality of the political challenge is very real. The slowdown in growth has broadly and deeply impacted most Western economies and societies in the last fifteen years, exacerbated by the global financial crisis, limiting real wage gains and constraining the capacity of government finances to provide public goods.

At the same time, workers made redundant by robots and global supply chains are embracing populist tenets ranging from nationalism to protectionism to distrust of "others" and anti-establishment resentment. As history teaches us, bouts of fervent populism seldom end well, so we have to get ahead of the disruption curve in our policy thinking about both restoring growth and responding to technological job displacement.

Importantly, the capacity to act depends on trust, the soft infrastructure that supports both governing and managing. Here, the reality is not good. According to the Edelman Global Trust Barometer (Figure 3), in 20 of the 28 countries they monitor, a minority of the general population now expresses trust in the core institutions of government, business and the media. Overall, trust in government has fallen to 41 per cent and trust in mainstream media is about the same—about 60 per cent of the general population in western countries have more confidence in a search engine than traditional media for news. Disconcertingly, we appear to have entered a "post-truth world" and this can only hamper efforts to deal simultaneously with growth and displacement.

In all this, any real precision on the scope of the possible impacts and the feasibility set of policy responses is still largely unknown (Figure 4). But selective opting in and out of these technological changes and disruptive innovations is not a choice; they are global trends.

Going forward, a smart growth strategy should deal with both rebuilding growth and reducing exclusion. What will be the nature of the new jobs that technological change will create and the skills required for them? How do economies and societies handle disruption on this massive scale? What are the possible models to reskill and retrain this magnitude of the workforce—will countries need a repeat of the GI Bill—an AI (Artificial Intelligence) Bill for the 21st century to facilitate such a reskilling? How are the costs of adjustment and the benefits of this technological change going to be shared? These questions are indicative of the risks and unknowns inherent today, and form the basis for developing an inclusive growth strategy. P

Contributing writer Kevin Lynch is Vice Chair of the Bank of Montreal and former Clerk of the Privy Council and Secretary to the Cabinet.