McGill students outside the Redpath Museum on the university's historic Montreal campus. *McGill University photo*

The Innovative University: Open, Connected and Purposeful

Suzanne Fortier

One of the indelible elements of the Silicon Valley origin story is the role Stanford University played in both generating entrepreneurial renegades and providing the academic infrastructure to feed a permanent culture of innovation. That model of the university as a supercluster anchor now pertains from Cambridge to Waterloo. McGill Principal Suzanne Fortier deftly lays out the components of that dynamic, from the university's point of view.

Over the past three decades, our universities have changed. The ivory towers of the past have become open, connected and purposeful institutions that play a central role in Canada's innovation ecosystem. The ongoing Fourth Industrial Revolution —the integration of the digital, biological and physical realms—will require even more profound transformations. This article sketches some of the new developments at universities that are aimed to strengthen how we educate, conduct research and collaborate with

other actors in the ecosystem—and offers some suggestions for ways to move forward.

Students today are driven to innovate: they want their ideas to make a real difference in the world. According to Professor Karl Moore of McGill's Desautels Faculty of Management, millennials "are constantly seeking purpose in what they do for a living and at the same time want to know how their job is helping them get to the top. They're constantly questioning where they are going next and why."

Nearly half of post-secondary students in Canada say they want to start their own businesses after graduation. In response, universities have broadened their offerings to include entrepreneurship programs and work-integrated learning. The University of Waterloo was a pioneer in this area and is now an acknowledged world leader. Now nearly all universities in Canada have entrepreneurship centres, offering courses and services such as mentoring, seed funding, and boot camps. For example, Université de Sherbrooke's entrepreneurship hub helps connect researchers and students with potential business partners. The entrepreneurship@UBC venture accelerator offers workshops, mentorship, start-up space and programs for market validation and business model development. Beginning in 2018, Dalhousie University's ideaHUB will support students as they bring their technology-based ideas to market. These are some of the many examples one finds throughout the Canadian universities landscape.

In addition to general training, students, faculty and young alumni can often access specialized training in social enterprises and technological start-ups—in fields as diverse as IT, health, green tech and the arts. The University of Toronto, for example, has nine different accelerator programs, each with its own niche. Ryerson has 10 entrepreneurship-focused "zones," including the DMZ, which focuses on the digital sector. The Dobson Centre for Entrepreneurship at McGill's Desautels Faculty now partners with five other faculties to offer specialty minors in entrepreneurship, from social ventures to agribusiness.

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The Business-Higher Education Roundtable, a group of leaders from top companies and post-secondary institutions, has set a goal: that 100 per cent of Canadian post-secondary students engage in "some form of meaningful work-integrated learning (WIL) before graduation." Students have certainly shown a hunger for such experiences; demand for internships and high-quality summer jobs outstrips availability. Programs such as IBM's Extreme Blue and Microsoft's Garage Internship use work-integrated learning not only to identify future employees, but also to build their culture of innovation by recognizing young talent as a source of disruptive ideas.

Universities and businesses are collaborating to create more and better opportunities. The Consortium for Research and Innovation in Aerospace in Québec (CRIAQ), for example, aims to increase the aerospace industry's competitiveness through more industry-university collaboration, including initiatives that encourage and support student engagement in research.

Obviously, not every business has the means to create work-integrated learning opportunities with the feel of a start-up incubator. All business leaders, however, are shifting their viewpoint to recognize young interns and employees as innovation assets, rather than simply trainees.

In 2017, innovation depends on connecting people of different backgrounds and experiences so that they can share knowledge and expertise. An early model of university-industry connection was the science park: a dedicated location where a mix of academics, government and private-sector researchers worked and collaborated. Stanford Research Park, established in 1951, is the exemplar. It was part of the creation of Silicon Valley, the world's flagship supercluster.

Science and technology parks were usually situated off-campus and often in isolated locations. Today many such parks have moved into university campuses and the urban heartland. Universities and cities worldwide are experimenting with innovation districts, which integrate innovation activities more holistically within their urban communities. The Brookings Institution describes these neighbourhoods as "the ultimate mash-up of entrepreneurs and educational institutions, start-ups and schools, mixed-used development and medical innovations, bike-sharing and bankable investments—all connected by transit, powered by clean energy, wired for digital technology, and fueled by caffeine."

Generally concentrated within a small geographical area, these districts are notable for their density and their diversity of people and organizations. The MaRs Discovery District, located next to the University of Toronto in downtown Toronto, works with more than 1,000 young firms to help them find funding, provide mentoring, and assist them in scaling up. Their firms have raised $2.6 billion in capital thus far. In 2013, the École de technologie supérieure and McGill launched the Quartier de l'innovation in Montre-

al's Griffintown neighbourhood; the QI now has 20 private sector partners, and has grown to include Concordia and Université du Québec à Montréal. The district supports 12 incubators and accelerators in areas such as social innovation and technology, as well as partnerships with schools. Some districts, such as 22@Barcelona's landmark project, have a mandate to revitalize marginalized neighbourhoods and build skills among the population. One of the latest experiments in innovation districts, Cornell Tech, will move to new quarters on New York's Roosevelt Island in the summer of 2017.

Global connections are as important as these local networks. Companies that export tend to be more innovative: participation in global trade brings increased competition, and businesses have to up their game to succeed. Canada's international university alumni networks, such as McGill's global community of 250,000 alumni, can help grow trade and foster innovative business partnerships. University of Waterloo has drawn upon its alumni connections in Silicon Valley as a source of mentorship and capital to strengthen the Toronto-Waterloo Innovation Corridor, and other universities are beginning to do the same.

Australia, already a leader in international student recruitment, is experimenting with a global alumni engagement strategy, launched in 2016. Through it, the government aims to connect Australian businesses and the diplomatic network to international alumni, as well as foster best practices in international alumni engagement across educational institutions. While the effort is still in its infancy, it is worth watching. In Canada, the new superclusters that the federal government recently announced could be used to leverage powerful alumni networks through coordination among universities and businesses participating in the cluster. While we are not starting from scratch, there is much more we could be doing.

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Commentators on Canada's innovation track record have noted repeatedly that not enough academic knowledge makes its way into the marketplace. While there are some signs of strong university-industry interaction—businesses fund a greater percentage of higher education research in Canada than in the US or on average in OECD countries, for example—there is room to improve.

Each sector must play to its strengths. While university researchers have launched some successful spinoffs, and a few licenses have generated significant revenue, the reality is that the university's greatest innovation strength is to generate fundamental and pre-competitive research—and to share it.

Many Canadian universities are now placing more emphasis on building long-term, strategic relationships with key partners. It takes time, though, to establish the trust needed to communicate well, to share business problems and burgeoning discoveries, and to exchange game-changing information.

Another approach that is gaining traction is the move toward more open sharing of information—particularly knowledge created with public funding. At the Montreal Neurological Institute and Hospital (MNI), McGill has launched what Nature calls "a radical experiment in open science." For five years, not only will the Institute make all of its data, Biobank samples and results freely available, it will also strongly encourage all of its partners to do the same. The MNI will not file for patents on any of its discoveries during this time.

The complexity of the brain has made developing effective treatments for neurological conditions frustratingly slow. The Director of the MNI, Guy Rouleau, believes that "by sharing data quickly, we'll be able to accelerate the discovery of mechanisms and eventually new medicines."

The venture has sparked considerable interest. The Lawrence and Judith Tanenbaum Family Foundation provided $20 million to support the initiative, now named the Tanenbaum Open Science Institute. In March, the MNI announced a collaboration with the Centre for Drug Research and Development (CDRD) and Merck to create a platform for modeling neurological disease. Other private-sector partnerships are in the works, and major international foundations plan to participate in the definition of evaluation metrics and the analysis of the data.

The real impact of the MNI's experiment will only be known once the five years are completed and the metrics evaluated. But what it and all the initiatives described here show is a willingness to try new ways of working and collaborating to build innovation in Canada.

In recent years, I have seen not only Canadian universities, but also businesses, government and social organizations becoming more open, connected and purposeful. New federal and provincial initiatives—such as the superclusters, the speedy investment in artificial intelligence, support for entrepreneurship and work-integrated learning, and a new organization to support skills development—will build on this momentum. P

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