



The Journey of an Innovation Nation

Recommendations from Canadian Innovators

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The Public Policy Forum works with all levels of government and the public service, the private sector, labour, post-secondary institutions, NGOs and Indigenous groups to improve policy outcomes for Canadians. As a non-partisan, member-based organization, we work from “inclusion to conclusion,” by convening discussions on fundamental policy issues and by identifying new options and paths forward. For 30 years, the Public Policy Forum has broken down barriers among sectors, contributing to meaningful change that builds a better Canada.

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INTRODUCTION

Seven extraordinarily imaginative Canadians were recognized at Rideau Hall last May as the first-ever recipients of the Governor General’s Innovation Awards.

These Canadians have created such things as wearable technology so people with diabetes can use a smartwatch to detect what they can’t feel in their feet. They’re extending the lifespan of the lithium ion batteries that power electric cars, attracting the attention of Tesla’s Elon Musk and drawing a dream team of graduate students to Dalhousie University. They’re marrying traditional Indigenous knowledge with cutting-edge applied arts and design, using technology and art for social justice and change.

They’re using nanotechnology to create a breakthrough dressing for burn survivors that simultaneously kills bacteria and decreases inflammation. They’ve developed a minimally invasive procedure to treat brain tumors using laser probes guided by MRIs. They’ve invented a robotic arm that allows people with physical disabilities to manipulate objects.

In a town hall the morning following the awards ceremony, six of the seven shared what it took to become successful innovators and the obstacles they had to overcome along the way. The encouraging news: they’ve created a series of promising Canadian companies, motivated by social good and with a potential to create jobs and contribute to Canada’s exports. The discouraging news: public policy weighed them down as much as it lifted them up.

For policy makers, these are cautionary tales. Cautionary tales of the perversity of government procurement programs, the dizzying alphabet soup of support programs, the impossible tangles of red tape, their mixed experiences with the popular incubator-and-accelerator movement and the benefits to be accrued from reforming post-secondary educational structures that are tied to rigid outcomes. The abridged profiles of the Governor General’s Innovation Award recipients within this document exemplify the immense perseverance and dedication required by Canadian innovators and, as recipient Mark Torchia stated, “There were times of extreme frustration followed by extraordinary elation. It wasn’t a straight line.”

Economic growth does not come easily. It must be earned through the imagination and resolve of entrepreneurs and enterprises and the smart application of public policy. Innovation is not quite a partnership, but it does take a coalition of private and public players each doing their part in order to break out.



While there are times of extreme frustration for an inventor, there are great things happening in the Canadian innovation landscape that should be continued and built upon, including dedicated spaces for experimentation, trial and learning through doing. There is also a growing recognition that innovation comes in many forms, with a drive fueled by caring, passion and the determination to find a solution lead to incredible results that are improving the lives of people, communities and the environment while also realizing economic benefits.



Key takeaways contained within this report and shared by the Governor General’s Innovation Award recipients include:

- 1) Do no harm** – No one wants to spend their discovery time filling out forms. There is a need to simplify the layers of process, the magnitude of forms and the diverse array of sources to find information and supports for moving a concept to development and implementation.
- 2) Make procurement work** – There is great potential to rethink procurement processes at all levels of government in Canada to leverage the buying power, volume and access of goods and services to create market opportunities for Canadian innovation, particularly from new and emerging companies.
- 3) Rethinking education and talent** – Most Governor General’s Innovation Award recipients report that a non-linear path has led to innovation. There are opportunities to be more imaginative and inclusive in approaches to education and in the development and identification of talent in Canada.

The Public Policy Forum and Deloitte are pleased to present the lessons learned from the Governor General’s Innovation Award recipients and recommend they be taken aboard as Canada moves forward with its innovation agenda on the road to becoming an Innovation Nation.

Sincerely,

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Photo Credit:
Nick Pearce, Dalhousie University



Jeff Dahn
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THE POWER OF RISK

*“Universities provide buildings, heat and electricity; they’re stretched just to deliver an undergraduate education...”
With stable industry funding, “you can go into an area you know little about and take risks.”*

— Dr. Jeff Dahn

The days are long in [Dr. Jeff Dahn’s laboratory](#) at Dalhousie University in Halifax. Dahn, a professor of physics and chemistry, and his group of 25 graduate, undergraduate and postdoctoral researchers comprise one of the world’s most renowned hubs of expertise in lithium-ion battery technology.

One key focus is longevity. The typical batteries in phones and laptops die after perhaps three years, Dahn explains. He would like to see an electric car’s battery last as long as the car does. And the batteries that store renewable energy should remain in use for at least 30 years, as long as the warranty on a solar panel, he says. “Lifetime is critical.” A new five-year research partnership with Tesla Motors began in June, the first-ever such collaboration for the electric car and energy-storage company.

Dahn says this kind of support is critical to innovation. “Universities provide buildings, heat and electricity; they’re stretched just to deliver an undergraduate education,” he says, noting that with stable industry funding, “you can go into an area you know little about and take risks.”

He advises researchers to “bite the bullet, invest the time and maybe do something useful,” which especially means “you can’t be afraid to take risks.” One barrier Dahn faces is in his own capacity, so he maintains a limit of 25 physics, chemistry and materials engineering students in his lab. “If I had more space and money I would turn it down,” he remarks. “In research you have to be able to look at the results and you have to be able to think about them and you have to think about what to do next.”



Photo Credit:
Colin Way



Breanne Everett Calgary, Alberta

“As front-line health-care providers, we see the issues and deficiencies. Who better to identify where innovation needs to exist? But we haven’t been the people to carry the ball forward.”

— Dr. Breanne Everett

THE IMPORTANCE OF TAKING THE WHEEL

Most medical residents can barely keep up with the constant demands and long hours spent in specialist training, hospital rounds and patient care. Dr. **Breanne Everett** added to these pressures during her residency in plastic and reconstructive surgery at the University of Calgary by inventing a new medical technology, starting a company and getting an MBA.

Stemming from her research and treatment of wounds, she developed a special insert for shoes that provides feedback to help wearers with reduced sensation in their feet from neuropathic illnesses avoid ulcers and other pressure injuries. The patient responds to cues and alerts that come via a smartwatch - for example if a shoe is too tight or there’s a foreign body that’s going to cause a sore.

“This is a major issue,” says Everett. Of the eight per cent of patients with diabetes, one-quarter will develop foot ulcers; one in five will lead to amputations.

She was determined to combine diabetic foot care and neuroplasticity to address the problem, taking a leave of absence from the residency in 2011 to pursue her MBA and co-found and become CEO of her company, called **Orpyx**. The name is an anagram of “proxy”, because its product, called the SurroSense Rx, serves as a proxy for the sensation that’s been lost, explains Everett.

She says there’s resistance to change in the medical community, with little culture of innovation and entrepreneurship. “As front-line health-care providers, we see the issues and deficiencies. Who better to identify where innovation needs to exist?” she says. “But we haven’t been the people to carry the ball forward.”

The company today has 12 employees. Clinical trial results of the SurroSense Rx “have really exceeded our expectations,” she says, with a reduced rate of re-ulceration, for example. The product is already on the market, and Everett would like to get it “on the feet of everyone who could potentially benefit,” covered by insurance and government plans. “There are tremendous cost-savings that can be made.”



Photo Credit:
Katie Chalmers-Brooks

Mark G. Torchia and Richard Tyc Winnipeg, Manitoba

“If the end goal is for Canada to be an innovation nation, we need to determine the outcomes we want, what will be the measures of our success, and then design programs, processes and policies that align.”

— Dr. Mark Torchia



FROM THE LUNCH TABLE TO THE OPERATING TABLE

Mark Torchia, a professor of surgery at the University of Manitoba and **Richard Tyc**, a mechanical engineer, are co-founders of the [NeuroBlate System](#). The device is a laser probe, inserted into the brain and guided by an MRI, that kills tumour cells in a minimally invasive procedure. Their invention faced challenges, from a lack of funding and regulatory hurdles, to a lag in the development of new technology and resistance by the medical profession to adopt it.

As the product advanced, the pair “had to be innovative about getting funding,” Torchia says, because granting agencies typically support basic science and discovery rather than application research. “They also tend to be success-driven,” rather than backing projects that often have negative results along the way, he says. Success rates for some grant competitions are below 30 per cent, which can be a disaster for innovation projects that require continuous and increasing funding.

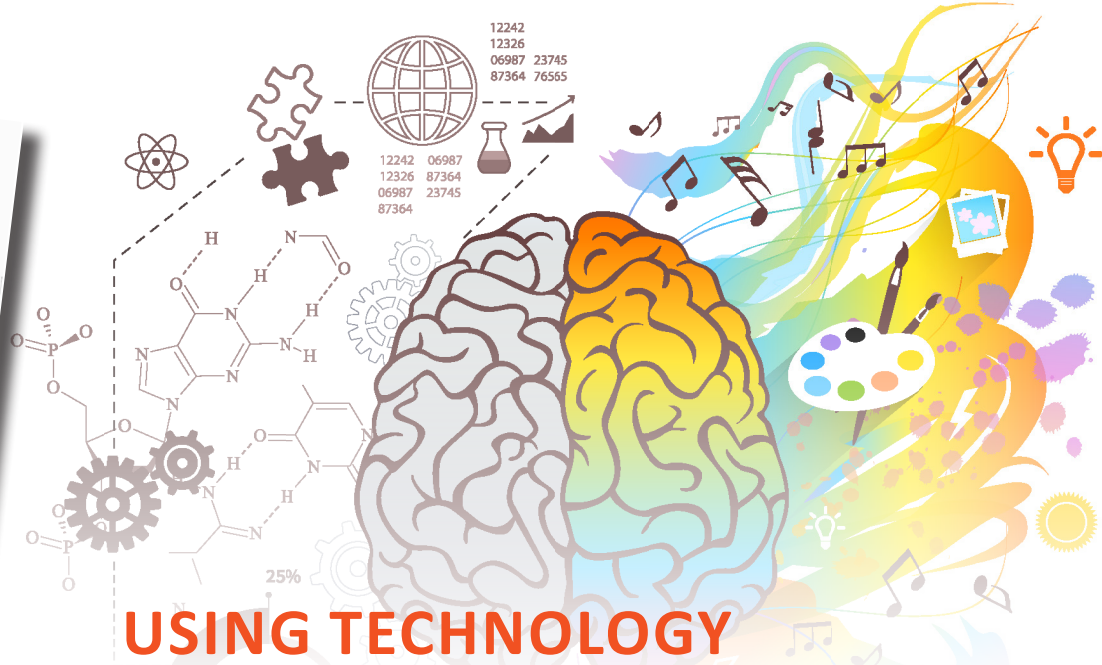
“We found lots of creative ways to get money,” Torchia says, beginning with a local fundraising campaign at St. Boniface General Hospital in Winnipeg that paid for the original NeuroBlate prototype. That led to further venture capital backing its development.

“I honestly think it would not have happened if we had to rely on traditional science funding sources,” Torchia says. “If the end goal is for Canada to be an innovation nation, we need to determine the outcomes we want, what will be the measures of our success, and then design programs, processes and policies that align.”

One of the major roadblocks in this country is the slow adoption of new technology. To date NeuroBlate has been installed in more than 35 hospitals in the U.S., many of them top-ranked, but just one here, Vancouver General Hospital. One issue in Canada is the need for more evidence of cost recovery, Tyc says, noting that minimally invasive techniques can be less expensive than traditional surgery—not to mention improving the ability of patients to recover quickly.



Christi Belcourt
Espanola, Ontario



USING TECHNOLOGY FOR POSITIVE CHANGE

“Artists can be innovators... I have seen how the arts and artists are creating positive change in their communities.”

— Christi Belcourt

Innovation comes in many forms. [Christi Belcourt](#) is an internationally recognized Métis visual artist and author whose work is deeply engaged with the natural world, its beauty and its practical value. More recently her work has resulted in innovative creative partnerships that marry traditional knowledge with cutting-edge applied arts and design, using technology and art for social justice and change.

“Artists can be innovators,” says Belcourt, a member of a prominent Métis family of accomplished artists. An advocate and community organizer, her work crosses many media and has touched innumerable lives. “I have seen how the arts and artists are creating positive change in their communities.”

Belcourt says she is honoured to be named among the other innovators, although she is often reluctant to accept awards. “Because while we rightly celebrate the achievements and compassionate work of my fellow recipients, for me, I do not feel my work is separate from the work of the hundreds of thousands of Indigenous Peoples and Nations who are doing work that brings health, healing or light to their communities and yet goes unheralded.”

Her signal achievement is the travelling commemorative installation *Walking With Our Sisters*, a project to honour the lives of murdered Indigenous women and girls in Canada and the United States. It has grown into an astounding international seven-year touring memorial involving more than 1,500 artists and thousands of volunteers.

The project includes a visionary use of social media, bringing together the artists to advance public awareness of the value of the lives of missing and murdered Indigenous women and to create momentum toward transformative societal change. *Walking With Our Sisters* is to travel to dozens of communities across North America during its run. Belcourt is pleased that hundreds of thousands of visitors from all cultural backgrounds will have an opportunity to understand and experience this tribute “and to become engaged with the movement for social change on behalf of Indigenous women everywhere.”

Photo Credit:
Ernest C. Manning Awards Foundation



Robert E. Burrell
Edmonton, Alberta

“Pasteur said that ‘In the fields of observation, change favours only the prepared mind.’ I think I was prepared for discovery by the breadth of my training.”

— Dr. Robert Burrell



VALUING SERENDIPITY – AND FAILURE

Robert Burrell, a professor of chemical and materials engineering at the [University of Alberta](#) and one of the world’s leading experts in advanced metallic films with healing properties, describes his career as “tumultuous.” His boyhood dream was to become a veterinarian, but after studying zoology for two years he moved into philosophy and then plant biology. There was a Masters in soil microbiology, a PhD in ecotoxicology and a postdoctoral fellowship in chemical engineering, after which his pursuit for an academic appointment proved fruitless.

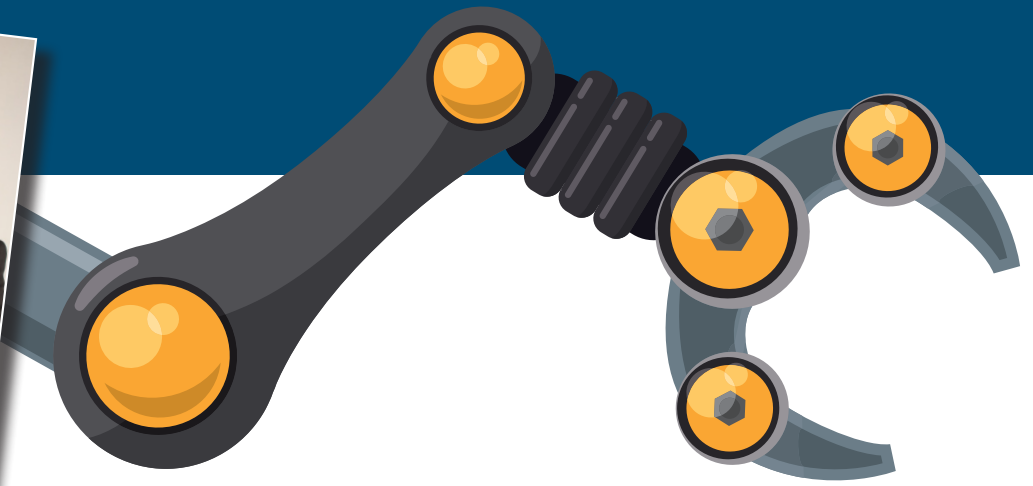
He identified burn dressings as a “high-need area” and over time produced Acticoat, the first dressing to simultaneously kill bacteria and decrease inflammation. It was the world’s first commercial therapeutic application of nanotechnology. In 2009, Smith & Nephew PLC, one of the world’s largest wound-care companies, acquired Acticoat; since inception the product line has global sales of \$1-billion in some 50 countries.

Acticoat is one of more than 300 patents and patent applications that Burrell holds worldwide. Its impact is “quite gratifying,” he remarks. “It’s really quite amazing to be able to heal people and change their lives because of the technology.”

The goal of research such as his is to “pick problems to solve that have an impact on people.” Government funding and granting agencies have been helpful to his research, albeit at times “there were incredibly high expectations for us to deliver.”

He says that applied research is important to fund, although “if there’s no business case you shouldn’t continue to pour money into it.” It’s important to follow a “gated process,” with a reduction in risk for each step in order to proceed. “Governments and granting agencies have a different view,” he says, worrying about “sunk costs” and often continuing to invest in research in an effort to preserve an investment, even though a technology is unlikely to have clinical or commercial success.

“We need to stop trying to pick winners and losers – no one does that well,” he adds. “Let markets and users decide who the winners and losers are. Do not spend good money to avoid losing sunk dollars, you just lose a lot more.”



Charles Deguire Boisbriand, Quebec

“If you want technology to save us, we have to make room for it. They need to lower the roadblocks... I tell the politicians they should stop giving me grants and instead give me orders.”

— Charles Deguire

REACHING FOR INSPIRATION

Growing up with three great-uncles living with muscular dystrophy who depended on wheelchairs, **Charles Deguire** learned what ingenuity could produce. Uncle Jacques (Jaco) was the family inventor. With no more than a Grade 5 education, Jaco fashioned a robotic arm he called the “manipulo” from items he found around the house and at the local hardware store.

“I said, ‘We’re sending robots to space, we’re replacing people with robots in factories, but we’re not using robots to help people,’ “ says Deguire. “It kept me up at night.” The two called the invention Jaco and started a company called [Kinova Robotics](#), which today has 65 employees in Boisbriand, north of Montreal. There are plans to double the team and open a new facility by 2017.

Along with the Jaco there is the Mico, a smaller version for reaching items on the wheelchair tray, for instance. Both are easily manipulated using the wheelchair’s controls. In addition to such assistive robotics, Kinova works with organizations like NASA and Google in the area of service robotics, for example doing bomb disposal or managing toxic waste. It is especially focused on surgical robotics, a vast, lucrative and untouched market.

Deguire has done well with support from the government, angel investors and product sales, and plans to go after a first round of venture-capital financing. “You have to make a compelling case,” he says. One major frustration, given the aging population, is that Canada has “no clear pathway to integrate innovation in the health-care system,” he comments. “If we want technology to save us, we have to make room for it. They need to lower the roadblocks.”

“I tell the politicians they should stop giving me grants and instead give me orders,” he says. “If you want to have an innovation nation, your biggest buyer has to be innovative.”

To pursue a venture such as his “you need to be a bit naïve,” he says. “If you knew everything that had to be achieved to be successful, it would scare off many people.” Indeed Deguire and his business partner watched as fellow graduates landed hot jobs straight out of university, while “we worked 90 hours a week in a basement,” says Deguire. He’d like to see innovators get credit even when they fail, so perhaps they are recognized by potential employers. “The lessons you learn are more valuable than any diploma you can get.”

CHALLENGES, OPPORTUNITIES AND THE FUTURE OF INNOVATION IN CANADA

Informed by the challenges Canadian innovators have faced, the following recommended actions for government focus on opportunities to leverage talent, reduce burdens and make structures more nimble in order to create a more conducive environment for innovation in Canada.

- **Standardize the definition of ‘innovation’** – In order to help our innovation economy, we need to arrive at a standard definition of innovation that is understood by all citizens. This will help to simplify such tasks as applying for funds or grants.
- **Make education and learning environments more innovation inclusive** – There needs to be collaboration and communication between the federal and provincial bodies who often fund the various education programs at the high school and university levels to ensure that they are delivering a consistent curriculum across all levels of education. Investing in our young people will be instrumental in bringing about change and innovation.

Encourage education institutions to embrace new models of teaching and to reduce the barriers for cross-stream learning and applied learning, development and creation of spaces outside of traditional education structures.

- **Look at the policies surrounding immigration** and work to reduce the burden of process to allow for talented individuals with the right skill sets to come to the country.
- **Explore alternative procurement models** – Have dedicated resources to help innovators navigate the sometimes complicated procurement processes. The federal and provincial governments should coordinate their programs and processes to make it seamless for the end user so they do not need to dedicate a lot of time trying to navigate various systems, but rather spend their time innovating and in turn help drive economic growth.

Innovators would rather have the government leverage their procurement vehicle to buy their products than to provide funding that is limited and usually comes attached with conditions. Government issued Request For Proposals (RFPs) should encourage and/or incentivize organizations (financially or economically) to partner with small and medium enterprises.

- **Taking risks and changing the culture starts from the top** – If we want our citizens to be risk tolerant, it has to start from the top. Our elected politicians should be willing to take risks on new and sometimes undefined innovative programs (e.g., Digital Government Transformation) that could benefit citizens and not be swayed by political pressures if the results do not pan out as planned.

Mandate letters to the ministers should instruct them to take calculated risks on their programs and to include innovative tools and methodologies when delivering on their mandate.



- **Take a more strategic approach to incubators, clusters and hubs** – Government should ensure incubators, clusters and hubs are additive to each other and not simply fragmenting the marketplace and creating a diffusion of mentoring and programming rather than concentrating it to increase quality levels. Having more incubators in every town should not be the strategy. Rather, the incubators, clusters and hubs that are targeted, focused and can scale is what will be the key.
- **Funding models need to be nimble enough so that the innovators can get access to funds faster** – The government can help innovators access funds faster by either streamlining the funding application process and/or by creating a navigation wizard to find the right programs to apply to for funding.

The government should make strategic investments in projects and programs. The government needs to put a stop to some programs (e.g., WED, AITF, Voucher programs etc.) that are not flexible, impose strict conditions and are bureaucratic, especially when the projects needs to change mid-stream and does not follow the original plans that were put forward when requesting the funds. Overall, this means allowing more time for identifying and devising ways to address problems, and recognizing the value of experimentation and taking some risks to develop and revise solutions along the way.

There are alternative programs for innovators and start-ups to fund their projects such as equity crowd funding. Governments should not interfere with such programs. The government should focus on funding the job creator/end-user rather than programs that may be stifling innovation in Canada.

These recommendations will help to create a more conducive environment for innovation in Canada. It must be made clear and reinforced that failure is healthy and can lead to great success but innovators must also have a business case in order to receive and to be supported by funding.



