

Canada's Polytechnics Offer Solutions to Pressing National Economic Challenges

Nobina Robinson & Daniel Komesch

Polytechnics Canada

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As we come over the horizon of what many have dubbed the Fourth Industrial Revolution, Canada's future looks bright. Canada is well positioned to harness new technologies, to adopt new production processes, and to leverage increasingly globalized value chains, to the benefit of all citizens.

However, as bright as the prospective future looks, there are wide-ranging challenges our economy faces. The challenges I am referring to are the likes of innovation lag, a slow-growth macroeconomic environment, rapid technological change, and a looming demographic shift that will see a wave of individuals exit the labour market over a relatively short time period. In order to best position ourselves to reap the full benefits and opportunities presented by the Fourth Industrial Revolution, identifying effective solutions to these pressing challenges is essential.

Since their emergence, polytechnics have consistently contributed solutions to the challenges posed to the Canadian economy, demonstrating a high degree of adaptability, nimbleness, and responsiveness—when the economy changes, polytechnics change too. So, as the Fourth Industrial Revolution shapes the economy of tomorrow, polytechnics will necessarily shape the workforce solutions that this new economy demands.

However, to date, our federal government has not done enough to effectively utilize Canada's polytechnic institutions and

the solutions they provide to the challenges our economy faces. Properly harnessing post-secondary institutions is complex at the federal level, as section ninety two of the Constitution devolves the mandate of education to the jurisdiction of the provinces (Constitution Act, 1867). Yet, when polytechnics are understood not just as education actors, but as *economic actors and innovation intermediaries*, the federal role becomes more obvious and urgent.

In my role as the CEO of Polytechnics Canada, a national association of Canada's largest, research-intensive polytechnics, federal advocacy is my mission and mandate. I am constantly working to ensure that the federal government is re-thinking, updating, and modernizing its policy tool kit, in a way that can best harness Canada's polytechnics to create growth, improve productivity, and stimulate innovation.

In the following, I will highlight how polytechnic education and institutions strengthen Canada's economy by providing solutions to the pressing challenges noted above. Further, I will demonstrate that these institutions are currently underutilized in their innovation capacities, and underleveraged in their ability to contribute to economic growth. Finally, I will spotlight opportunities for federal investment that can have significant positive impacts on the Canadian economy broadly, by better harnessing the talent, equipment, knowledge, and know-how that exist within polytechnics across the nation.

Canada's Current Challenges

In order to reap all of the potential gains a new economy could make available, Canada needs to ensure that we can effectively address all of the pressing challenges currently sitting in front of us. The challenges that hamstring Canada's economy-wide growth and productivity most are laid out below:

Innovation lag. On innovation, R&D spending as a share of GDP has been on the decline since 2001 (Sulzenko, 2016) (see Figure 1). Effectively investing in all facets of the economy from which innovation is drawn, and in all stages of the innovation cycle, is critical to producing strong innovation-led economic

Author Note

Nobina Robinson has served as CEO of Polytechnics Canada since 2009. She regularly writes commentary on Canada's innovation and skills challenges.

Daniel Komesch is a senior policy analyst at Polytechnics Canada.

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growth. At present, a significant imbalance exists in the federal share of R&D funding between basic and applied research.

Weak productivity of labour. Labour productivity, the amount of goods or services one hour of labour produces, has also declined over time in Canada (Drummond, 2015). Weak labour productivity numbers are demonstrative of lagging innovation, but also of human capital that is inefficiently allocated (Guironnet & Peypoch, 2007). That is, there exists a situation in our labour market where the skills that individuals possess, and have garnered through education and training, are not necessarily well aligned with the jobs they hold (see Figure 2).

The demographic deficit. The share of Canada's population at ages 59 to 65 (or those at or nearing retirement) is greater than the share of those 30-49, and also the share under 15—those that will fill positions when these individuals retire (Index Mundi, 2017). This demographic deficit is putting severe pressure on the labour market, in particular on sectors and occupations that are already facing labour shortages, such as Canada's construction and information and communications technology sectors (BuildForce Canada, 2017; Information and Communications Technology Council, 2016) (see Figure 3).

Slow growth. Canada's macroeconomic environment has largely been one of slow growth in recent decades (Trading Economics, 2017). Slow growth is the result of a confluence of factors, but has, to a degree, been impacted by the combination of innovation lag, weak productivity, and demographic imbalance (see Figure 4).

Polytechnics as Innovation Intermediaries

The contribution polytechnics make to innovation is not often widely recognized. This could, in part, be attributed to the common tendency to conflate innovation with invention. Polytechnics operate at the near-to-market end of the innovation continuum, where they assist their industry partners with experimental development, business validation, technology adoption and access, and last-mile pre-market product and process testing (Polytechnics Canada, 2017d). Polytechnics further make available physical equipment, such as 3D printers, water laser-jet cutters, and CNC machines, to assist firms in the capital-intensive components of the product development process. The innovation gains at this end of the innovation spectrum are often less apparent, and therefore less celebrated, but nonetheless contribute significantly to innovation-led growth in Canada.

In recent months, much discussion has surrounded the release of Canada's "Review of Fundamental Science". The Review recommends that Canada increase basic research funding to

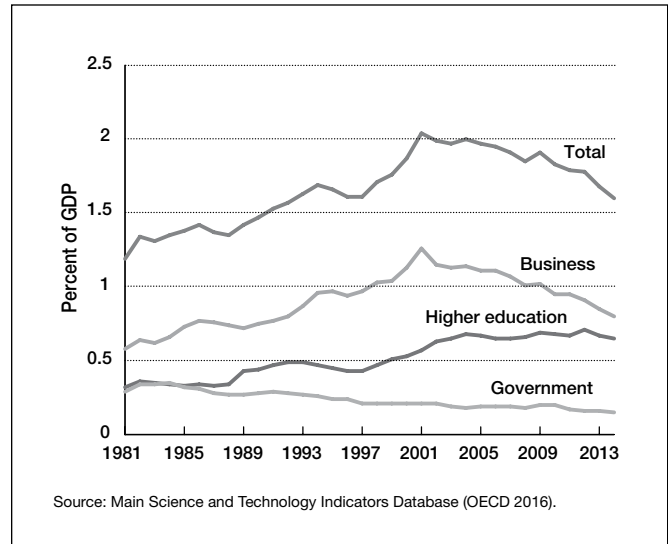


Figure 1. Graph of Canada's R&D spending as a percent of GDP, 1981 – 2013. Reprinted from *Canada's Innovation Conundrum: Five Years after the Jenkins Report*, by Andrei Sulzenko, June 2016, retrieved from (<http://irpp.org/wp-content/uploads/2016/06/report-2016-06-09.pdf>).



Figure 2. Graph of Canada's productivity as a proportion of United States' productivity from 1970 – 2014. Reprinted from *Canada's Innovation Conundrum: Five Years after the Jenkins Report*, by Andrei Sulzenko, 2016 (<http://irpp.org/wp-content/uploads/2016/06/report-2016-06-09.pdf>).

\$4.8 billion from its current \$3.5 billion (Naylor et al., 2017). Policymakers largely view funding increases as a mutually exclusive choice—they can either fund basic or applied research, but funding one has always been at the expense of funding the other.

This has created the conditions for an emerging tendency to pit the spheres of applied and basic research against one

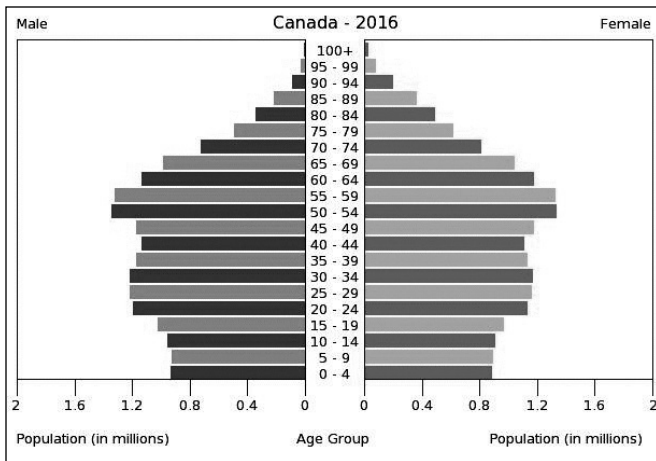


Figure 3. Graph of Canada's population pyramid. Reprinted from *Canada Age structure*, by Index Mundi, 2017, retrieved from http://www.indexmundi.com/canada/age_structure.html

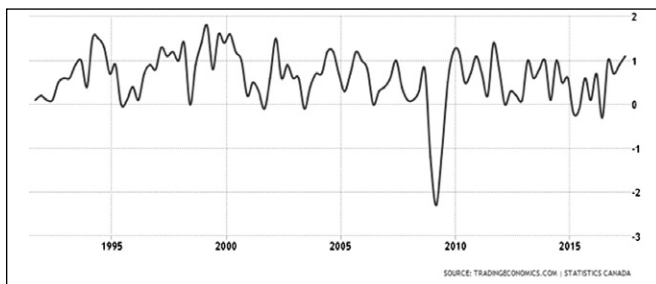


Figure 4. Graph of Canada's GDP growth rate from 1990 – 2020. Reprinted from *Canada Age structure*, by Index Mundi, 2017, retrieved from (http://www.indexmundi.com/canada/age_structure.html)

another, and by extension, higher education institutions and sectors against one another. This is clear insofar as government support goes for higher education R&D (HERD): Polytechnics are eligible for only 1.7 percent of the federal government's over \$3 billion in HERD funding, and are ineligible for the Research Support Fund, which assists post-secondary institutions with the overhead costs of doing research (Statistics Canada, 2017a).

The choice between basic and applied research is, however, a false dichotomy; a flourishing economy is the result of a healthy ecosystem, where each actor can most efficiently leverage their respective comparative advantages. As such, the differentiated roles post-secondary institutions play in this ecosystem, and in the economy more broadly, need to be encouraged and funded by government decision-makers across the country.

Near-to-market innovation that serves to bridge the commercialization gap—moving products from the lab or shop floor to the hands of customers—is an area on the innovation spectrum in which polytechnics hold a comparative advantage. This advantage is particularly important for innovation-led growth

when considering the varying firm sizes in Canada.

Almost 98 percent of all employer businesses in Canada are Small and Medium-sized Enterprises (SMEs), with an average of 6 to 7 employees and annual revenues of under \$50 million (ISED, 2017). These businesses employ over 70 percent of the private sector labour force, and thus, targeting the innovation potential of SMEs can yield significant economic benefits to Canada (ISED, 2017).

Though Canada's polytechnics contribute solutions to and partner with firms of all sizes, speaking to the contribution they make to SME productivity is particularly germane. Most firms of this size do not have in-house laboratories or equipment, often have not invested in R&D performing staff, and find the innovation process too risky and too costly (Jenkins et al., 2011). Polytechnics fill these gaps by acting both as innovation intermediaries and direct talent pipelines, in a way that is cost-effective and financially beneficial to the firms with which polytechnics partner.

In contrast to universities, polytechnics are not trying to generate revenue through licensing intellectual property—they are not motivated by patents, publications or citations. Rather, the motivation is that applied research projects solve business-identified problems using the polytechnics' faculty, students, facilities and capabilities in innovative ways (Polytechnics Canada, 2017). These are not simply off-the-shelf solutions or services for industry. There must be a novel and innovative solution applied to the industry identified problem or the polytechnic will not accept the project.

Innovation collaboration benefits polytechnics by deepening their business partnerships while improving the learning experience for both faculty and students. Students receive opportunities to participate in real world business projects and build innovation skills. Companies are not in the "research collaboration game" for fun: they actually have a real problem that needs an innovative solution. And that solution involves not simply the "R" of research, but the "D" of development and the "C" of commercialization as well. As innovation intermediaries, polytechnics are able to mitigate the risk associated with innovation and generate new revenue sources for partner firms.

Since 2008, Polytechnics Canada's member colleges and institutes have:

- Serviced **13,000** Canadian **companies**, 75% of which are SMEs
- Conducted **12,900** applied research **projects** solving industry-identified problems

- Engaged **11,500** college **staff and faculty** in applied research activity
- Involved **80,300** college **students** in hands-on applied research projects
- Developed **5,100 prototypes** for their industry research partners

(Source: Polytechnics Canada, 2017a)

How the Federal Government Can Better Leverage the Polytechnic Contribution to Innovation

Canada's innovation performance is sub-optimal, due to the lack of policies and programs that strongly support applied research and the industry-demand for near-to-market innovation. Conflating innovation with invention, or presenting innovation as an end itself, (instead of a means to an end: economic growth and prosperity) ignores the complementary roles played by all the actors in the innovation ecosystem and weakens the collaboration that should occur.

Over several decades, Canada has concentrated primarily on the input of ideas as the spark for innovation, instead of fostering an innovation economy that responds to demand for ideas, demand for solutions, and consumer or market demand for new products or services.

Recognizing that Canada needs to do more to create a competitive and innovative business climate, including opportunities for firms to scale up, it is vital that we revamp and modernize the set of programs and policies that stimulate business innovation.

The first solution to consider is consolidating all key business innovation and industry-academic collaboration programs into one federal agency. This would improve both the efficiency and the impact of public funds targeted for this purpose, by making it easier for business to access services in a "one-stop shop" (Polytechnics Canada, 2017b).

The federal government can further improve Canada's innovation performance by meeting the demonstrated demand from industry for polytechnic innovation. To this end, the federal government should significantly grow its funding to polytechnic applied research by doubling current commitments.

At present, there is only one federal program that supports polytechnic applied research—the Community and College Innovation Program (CCIP). The program currently receives a funding envelope of \$53 million, and is available to over 110 post-secondary institutions across Canada (Bains, 2016). In 2017, the program faced a \$13 million shortfall as a result of being oversubscribed (NSERC, 2017).

There is a clear demand for polytechnic-industry innovation that is demonstrated by the 2,815 unique firms supported by polytechnics and colleges in the last year alone; current funding levels cannot effectively meet this demand. To break the innovation lag that is holding back growth at the national level, the federal government needs to fully support industry demand for polytechnic innovation by making it easier to access polytechnic innovation services, and by significantly increasing funding to the only program that supports industry-polytechnic innovation.

Matching skills to jobs: the polytechnic advantage.

Canada faces major skills obstacles that further complicate our innovation, productivity, and growth challenges. Skills mismatches persist across regions and industries: young people are working in jobs poorly aligned with their educational experience (Statistics Canada, 2016), and workers are being displaced as once dominant industries decline. The result is high regional unemployment, poor employee and employer satisfaction, and a youth underemployment rate estimated to be nearly 30% (Waye, 2015).

At the same time, as much of the baby-boomer population reaches the age of retirement, the Canadian labour market—and certain occupations in particular—will face significant pressure from this "greying out." One example of a sector facing critical shortages at present is Canada's construction sector, where some estimates state that within ten years, Canada will face a shortage of 250,000 individuals in the construction trades (Ontario College of Trades, 2016).

Shortages in the construction sector are of particular worry because, while many trades face demographic pressure, the federal government is simultaneously committing significant investments to updating infrastructure—nearly \$190 billion and a further \$35 billion invested by the newly created Canadian Infrastructure Bank (Office of the Parliamentary Budget Officer, 2017). These investments will, of course, drive up demand in the very professions that are already facing serious shortages.

With Canada facing these skills challenges and demographic pressures, an increased focus on how we develop the talent that feeds the labour market is critically important to our collective future prosperity. Polytechnics directly address human capital productivity through the myriad of outcome-based and industry-aligned education and training activities that feed the supply side of the labour market. In the search for stronger productivity and enhanced growth, better harnessing the talent that is produced through Canada's polytechnics is a promising path forward.

Developing a future-forward workforce. Canada's polytechnics train multidisciplinary talent for the labour market of tomorrow by offering technical, industry-aligned, and hands-on education across all credentials—from four-year bachelor's degrees, to diplomas and advanced diplomas, to apprenticeships in the skilled trades.

At present the 13 members of Polytechnics Canada offer:

- 183 stand-alone Bachelor's degrees
- 952 Diplomas
- 593 Certificates
- 283 Graduate Certificates
- 274 Apprenticeships

(Source: Polytechnics Canada, 2017c)

(Note: BCIT offers two Masters degrees as well, in applied construction disciplines).

The polytechnic model of education ensures that talent is distributed widely across the economy – both through the knowledge economy and the know-how economy. These are important and positive contributions to labour productivity. Polytechnics and colleges offer opportunities for lifelong learning to all learners and workers, effectively graduating students into jobs, but also instilling resilience in those who learn and train at the institutions. Polytechnics are building a cadre of workers who are less susceptible to the effects of job displacement.

Of particular note is Canada's polytechnics' enduring focus on the skilled trades. The knowledge economy and the know-how economy enable each other, and as we move to an increasingly automated future, it is critical we view our skilled tradespeople as automation enablers. Canada's polytechnics have always maintained a strong commitment to developing Canada's skilled trades workforce. In 2015/16, the members of Polytechnics Canada were actively training 48,100 apprentices, across 52 Red Seal trades professions, and prepared another 12,300 last-level completers to challenge for their certifications (Polytechnics Canada, 2017c).

Polytechnic education additionally offers the differentiated advantage of being outcome-based, and industry-aligned. That is, in contrast to universities, the ultimate goal of polytechnic education is employment, and therefore there are numerous built-in levers to ensure strong employment outcomes.

One such lever is the program advisory committee (PAC). PACs are comprised of industry leaders and academic staff. The intent of the PAC is to identify the industry-relevant skills a program should deliver, and assist in the curriculum design to ensure that those skills are delivered in a way that they can be leveraged in an actual workplace environment. Committee

members also assist in identifying industry resources, including guest speakers, work-integrated learning (WIL) opportunities for students, and placements for graduate employment. The overarching goal of a PAC is to smooth labour market transitions for students by creating an efficient institution-to-industry pipeline. Smooth labour transitions are critical to productivity as they ensure that human capital is activated as quickly as possible and never sitting idle.

A second lever that contributes to strong outcomes in polytechnic education is work-integrated learning (WIL). WIL is embedded in the DNA of polytechnic education, and always has been. The applied nature of polytechnic education necessitates that students spend time in the environments in which they will eventually work. Critically, polytechnic education takes a broad perspective of WIL, providing wide-ranging opportunities such as field experience and internships—experiences that extend far beyond the co-op model that is traditionally offered by universities. Polytechnic education also makes WIL available across a broad spectrum of disciplines and credentials, making sure that no matter what field students are pursuing, there are opportunities to garner hands-on experience. Like the PAC, WIL enhances productivity in Canada's labour market by smoothing transitions and ensuring that when students graduate from a polytechnic, they are work-ready.

Thirdly, polytechnic education offers the opportunity to participate in applied research projects. Applied research projects equip students with in-demand innovation skills and innovation literacy, as students collaborate with industry and community partners to solve real-world challenges. Innovation literacy is the ability to think creatively, evaluate opportunities and apply problem-solving skills to diverse business and community challenges. It cannot be taught in the classroom alone; it requires the practical hands-on experience students at polytechnics gain as intermediaries in helping their private or social sector research partners. Polytechnic graduates who gain innovation literacy along with practical skills are ready to make a meaningful contribution to their future employers and the Canadian economy.

Building a resilient workforce. Canada's polytechnics offer education and training options to individuals at all stages of their career—to those looking to enter the labour market for the first time, those looking to upgrade skills at mid-career, and those seeking to re-enter the labour market after being displaced (see Figure 5).

Not only does polytechnic education build resilience by providing in-demand, transferable, and future-forward skill sets,

it also offers a multitude of flexible entry and exit points, ensuring that, as an individual's career progresses (or doesn't), there are opportunities to build on existing skill sets, or to acquire new ones.

The availability of lifelong learning opportunities, with flexible entry points, becomes increasingly relevant as the potential for technology to disrupt the labour markets grows. To be sure, the impact of phenomena like automation should not be overestimated, and as technologies emerge, we must remember that some technologies will be enabling (those that assist humans) and some will be replacing (those that are more likely to displace humans) (Acemoglu, 2016).

Polytechnics are exceptional in their ability to connect the supply and demand sides of the labour market. As such, they are well positioned to anticipate how emerging technology will impact the labour market, and therefore, identify the occupations and skill sets that should be supported with academic programming. For example, at present, polytechnics are producing much of the talent that automates—the mechatronics and robotics that design and operate automated and robotic systems, and the skilled tradespeople who build and maintain automated machinery and infrastructure.

Further, as a result of their flexible entry points and ability to deploy short-term and modular credentials, polytechnics are well positioned to absorb and re-deploy labour that may be displaced as a result of emerging technology.

How the Federal Government Can Better Contribute to the Skills Agenda

Canada's ever-present challenge is getting the right people, with the right skills, to the right jobs. The nation's productive capacity suffers when the skills individuals possess are poorly aligned with the jobs they take. Policies that improve the efficiency of skill-matching in labour markets are essential, so Canada must do a better job of helping individuals to navigate through both the labour market and post-secondary education.

Canada needs a future-focused effort that addresses the economy and labour market of the coming decades. To date, it appears that federal and provincial labour market actions focus overwhelmingly on building workers for the current economy, filling current job vacancies, and rectifying existing and earlier skills mismatches. Future-proofing skills for all Canadian workers is a critically important mission and this can be achieved by focusing data collection efforts beyond existing surveys such as the Labour Force Survey, and creating new surveys with a sharper focus on skills.

Yet, positive signals are coming from the federal government. The 2017 federal budget placed a significant focus on innovation and skills. The Innovation and Skills Plan invested new money in WIL, expanded Canada Students Loans and Grants to be made available to adults looking to retrain, and created a new skills organization that will seek to deploy innovative skills training pilots (Government of Canada, 2017). While positive, more can be done, and specifically more can be done to better harness the proven contributions of Canada's polytechnics.

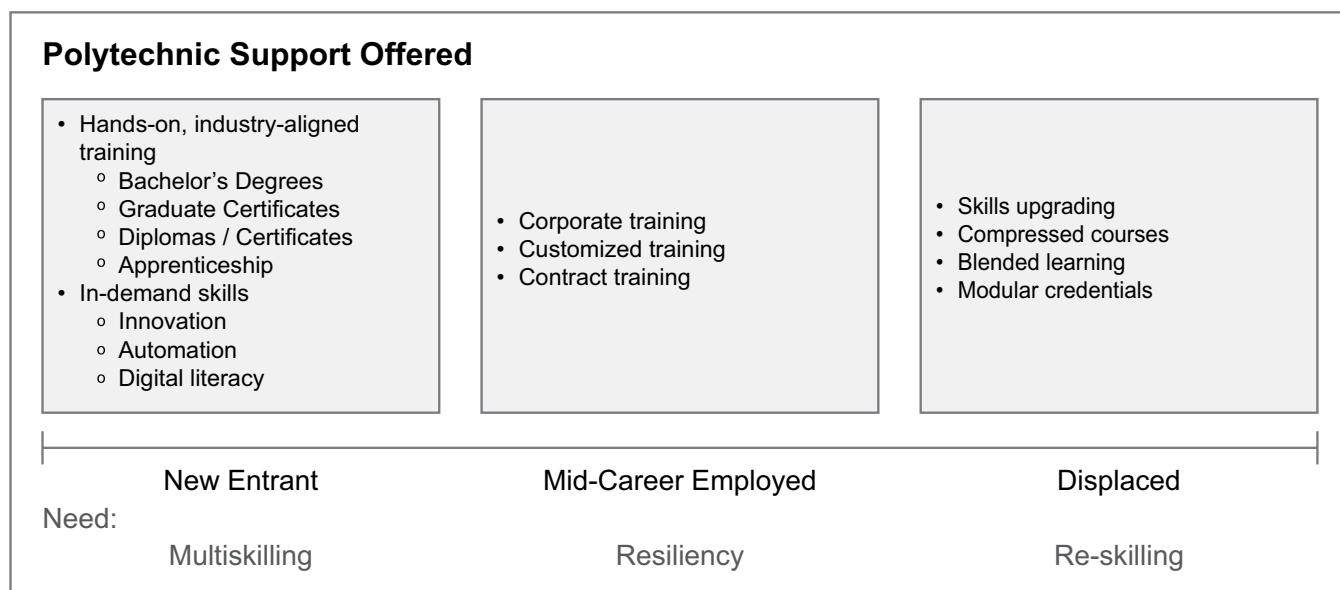


Figure 5: Polytechnic supports offered at different labour market entry periods. Reprinted from Polytechnics Canada (2017).

To increase the productivity of Canada's human capital, the federal government should:

- Invest in a "Skills in-Demand" Survey, and;
- Invest in and scale existing capabilities in Prior Learning Assessment and Recognition (PLAR).

Demand-side data are strikingly lacking in Canada.

Polytechnic institutions and learners would both benefit from having clear signals from employers about the skills they require in their workers. Polytechnics would also benefit if all Canadian employers had better (timely, local, granular) awareness of the talent supply in education and training programs, and skills on offer across all credentials. This lack of awareness of "Made in Canada" talent is all the more concerning given the large amount of publicly funded post-secondary institutions that exist in Canada, and given the federal support to individual learners across the learning system.

Equipping individuals with in-demand skills requires first identifying and forecasting the skills necessary for a rapidly evolving labour market. Currently, an employer survey with a specific focus on skills does not exist. Therefore, the federal government should prioritize creating a survey that can inform learners and educators, ultimately creating better labour market alignment between job seekers and employers.

Second, in order to assist workers who have been displaced, there are Prior Learning Assessment and Recognition (PLAR) capabilities that exist in Canada's polytechnics (and community colleges) that could be scaled and used to address the needs of a 21st century workforce, given what we know about our demographic challenge and shrinking working population.

PLAR is the identification and validation of formal and informal learning. PLAR smooths labour market transitions by allowing individuals to establish their existing skill sets and market these skills for future employment or education and training opportunities.

As polytechnics already have core expertise in conducting PLAR, federal investments to enhance these capabilities can address the issue of job displacement due to technological change, by more effectively identifying the re-training and upskilling needs of displaced individuals, and better matching them to existing employment opportunities based on identified skill sets.

With respect to the demographic deficit and its effects on the skilled trades, the key to enhancing innovation, growth, and productivity is ensuring that we have the talent to sustain it. Surely, growth will lag when there exists a deficit in the talent

that knows how to build. In order to ensure Canada is able to effectively maintain and build its in-demand skilled trades talent, the federal government should:

- Implement a Nationally Registered Apprenticeship Number (NRAN), to track apprenticeship pathways, and;
- Ensure that there is apprenticeship involvement on all federally procured infrastructure projects.

There is a dearth of data on Canada's apprentices. At present, the best available tools for Canadian policymakers studying apprentices are the National Apprenticeship Survey (NAS) and the Registered Apprentice Information System (RAIS).

Administered only intermittently by Statistics Canada, the NAS surveys apprentices and collects information on the work and training experiences before, during, and after their involvement in an apprenticeship program (Statistics Canada, 2017b). That said, the data collected through the NAS suffer from significant time lag—the most recent survey was conducted in 2015, which studied cohorts of apprentices that went through their training from 2011-2013 (Statistics Canada, 2017b). The experiences of apprentices in 2011 are guiding policymakers in 2017.

The annual RAIS gathers information on individuals who receive training and those who obtain certification in a trade where apprenticeship training is being offered. Therefore, RAIS is useful in tracking macro-level apprenticeship enrolment and completion trendlines (Statistics Canada, 2017c). Yet, it is unable to provide details on the apprentice's level of training, duration of training, wages, interprovincial migration, previous level of educational attainment, or any qualitative measures such as barriers encountered during training, motivations for completion, or entrepreneurial aspirations post-certification.

In order to better inform policy decisions on apprenticeship, more timely and relevant data are needed—particularly on the various pathways apprentices take through the labour market and to completion of their certifications. The concept is to assign a unique federal identifier to all registered Red Seal apprentices in Canada, and use existing electronic infrastructure to create an online portal for connecting with registered apprentices. Through the NRAN, the federal government, training institutions and employers across Canada would have accurate, up-to-date labour market information on the supply of active apprentices, their trades, and where and how they are progressing toward certification.

Additionally, in implementing the Innovation and Skills Plan, the federal government should make it easier for people to respond to labour market trends and improve the economic

opportunities for all workers in all sectors. This includes supporting Canada's need for certified tradespeople, using the unprecedented opportunity of the \$190 billion that has been dedicated to infrastructure. The impact of these funds can be multiplied if they are leveraged to ensure that our next cadre of skilled workers are getting the experience they need to both build and maintain our next generation infrastructure.

When the federal government procures a new infrastructure project, a simple solution is to award points on bids to employers who are involved in apprenticeship—be it the training of apprentices, or simply activity in the apprenticeship community broadly, as has been suggested by the Canadian Apprenticeship Forum.

Apprenticeship, by definition, requires employment, and therefore there is a role for the federal government to ensure that Canada's young apprentices and prospective apprentices will be able to grow their experience by participating in federally procured projects. Ensuring the federal government provides the opportunity for apprentices to build their experience will further attract talent to the trades that demonstrate significant demand.

Conclusions

The shifting forces that a pivoting economy creates are never easy to tame, let alone leverage in a way that creates inclusive benefits. However, Canada's polytechnics have, since their creation, acted at the leading frontier of change: polytechnics not only adapt to change, they drive it.

Although our economy faces challenges, wrought with low levels of innovation, productivity, and growth—each of which is compounded by changes in technology and demography—Canada is nonetheless in possession of the solutions that will drive success in the economy of the future. However, all solutions have not yet been effectively leveraged to reap the full benefit of their potential impact. To date, Canada's polytechnics have been underutilized by the federal government as solutions to the challenges outlined above.

To stimulate innovation and productivity, and to kickstart macroeconomic growth, the federal government needs to better use the many assets that are contained within, and produced by, Canada's polytechnics.

As the national advocate for Canada's large and research-intensive polytechnics, I urge the federal government to make polytechnic innovation services more accessible to industry, to scale applied research funding to a level that meets industry demand, to create and disseminate better information on our human capital by deploying new surveys that will ensure we have our finger on the pulse of where skills and demographic deficits

will impact us most, and lastly, to efficiently deploy the talent our labour market already demands by smoothing transitions through endeavours like PLAR.

On a global stage, Canada sits in an enviable position, but better is always possible. Harnessing all that Canada's polytechnics have to offer is one way to get us there.

Contact

✉ nrobinson@polytechnicscanada.ca

Polytechnics Canada

✉ dkomesch@polytechnicscanada.ca

Polytechnics Canada

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The Journal of Innovation in Polytechnic Education is pleased to announce a call for papers for a special issue devoted to the topic of **"Innovation in Sustainable Solutions"**. This may include papers that spotlight pedagogical approaches within, or the impact of projects or programs focused on sustainable infrastructure and construction, alternative energy, smart cities, or advanced manufacturing. These are each areas where innovative solutions and wide-ranging talent and skills are needed, and which polytechnics are uniquely positioned to address. Papers may include success stories, best practices, evidence of curriculum shifts to accommodate new needs, or examples of industry partnering with polytechnics to address their own operational need for talent or innovations to help companies grow. To submit a paper, please visit www.jipe.ca. To be considered for publication in this special issue, please submit your paper by **January 15, 2019**.

