



May 10, 2016

Premier's Highly Skilled Workforce Strategy Expert Panel
Submitted by email: highlyskilledworkforce@ontario.ca

Dear Premier Wynne,

On behalf of the Ontario Society of Professional Engineers (OSPE), we are pleased to submit our recommendations to support the Government of Ontario's Highly Skilled Workforce Strategy.

For the attached submission, OSPE's Research and Innovation Task Force provided input on how Ontario can better use intangible assets such as the skills and innovative potential of its diverse and talented workforce to create wealth in our technology-driven knowledge economy.

Knowledge is the ultimate renewable resource. Unlike natural resources, it cannot be depleted by use and overuse. As the advocacy association for the province's engineering community, OSPE believes the 225,000 Ontarians with bachelor's degrees or higher in engineering are key to Ontario's success in a knowledge economy. As natural problem-solvers, engineers develop innovations and products that drive economic growth and improve the quality of life for all citizens. Many engineers are also business leaders in private, public, educational, and non-profit organizations and would be an excellent source of talent to serve on the Premier's Highly Skilled Workforce Strategy Expert Panel.

We encourage government and policymakers to connect with OSPE to utilize the expertise of our committee and task force members. To arrange a meeting, please contact Catrina Kronfli, Policy Analyst, at ckronfli@opse.on.ca or (416) 223 -9961, ext. 243.

Sincerely,

A handwritten signature in black ink that reads "M. Monette".

Michael Monette, P. Eng.
President and Chair
Ontario Society of Professional Engineers

A handwritten signature in black ink that reads "Sandro Perruzza".

Sandro Perruzza
Chief Executive Officer
Ontario Society of Professional Engineers

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1. What type of workforce does Ontario need to adapt to the demands of a technology-driven knowledge economy? Is the highly skilled workforce description, as defined in the previous section, the best definition for Ontario? If not, how should it change? What is it missing? What indicators would best measure progress?

OSPE believes the highly skilled workforce description provides a good starting point. Although the definition mentions that “a highly skilled workforce requires a *working environment* that recognizes and leverages generational differences and is supportive of staff,” OSPE believes it is important that the definition specifically mention the “key players” that support Ontario’s highly skilled workforce. The definition states that workers “must self-advocate and make decisions on their own career paths,” but various key players, including employers, post-secondary institutions, educators, and government also play a role and should be added to the definition.

With regards to individual traits and skills that educational institutions, communities, and employers must work together to support, the definition mentions strong literacy and numeracy skills. OSPE believes that science, technology, engineering, and math (STEM) skills are integral to supporting Ontario’s knowledge economy and should be added to the definition. While science and math provides students with problem-solving skills and analytical thinking, engineering is the application of these skills and their implications on society. These are all duly needed to succeed in STEM and non-STEM professions.

The Government of Canada defines a knowledge-based economy as “an economy that is directly based on the production, distribution, and use of knowledge and information.”¹ Entrepreneurs and businesses play an important role in this regard. OSPE therefore recommends that the Premier’s Expert Panel consider the importance of the following traits for today’s highly skilled workforce: entrepreneurship, innovative thinking and technological literacy.

With regards to indicators, OSPE recommends the Expert Panel also consider match rates for regulated professions to measure progress in growing a highly skilled workforce in Ontario. Based on 2011 data from the National Household Survey, OSPE’s 2015 report found that only about 30% of employed individuals in Ontario who held a bachelor’s degree or higher in engineering were working as

¹ “Maximizing Canada’s Engagement in the Global Knowledge-Based Economy: 2017 and Beyond,” Government of Canada, last modified July 8, 2013, <http://www.horizons.gc.ca/eng/content/maximizing-canada%E2%80%99s-engagement-global-knowledge-based-economy-2017-and-beyond%C2%A0>.

engineers or engineering managers.² This finding was the lowest match rate of the fifteen regulated professions OSPE's 2015 report compared. OSPE believes the skills and capabilities of engineering graduates who completed a rigorous degree but work in jobs that do not specifically generate new economic activity is a lost opportunity.

Many entrepreneurs cite the challenges of advancing innovative ideas that if successful would generate significant economic activity and benefits to Ontario. One significant challenge exists regarding access to risk capital that today demands giving up control of ideas to the financing bodies or facing the burden of high overhead to obtain and administrate funding. There continues to be a significant lost opportunity to the economy while such issues are left unaddressed. OSPE would be happy to discuss possible solutions to this problem, many of which are included in OSPE's paper.

Also on the topic of metrics, *Lifelong Learning: Growing Our Highly Skilled Workforce* does not explain which stakeholder(s) will measure the progress towards growing Ontario's highly skilled workforce (i.e., government, employers, and/or post-secondary institutions) and what mechanisms or incentives will be developed to meet the various metrics. These decisions will likely emerge as the Expert Panel examines recommendations from across the province. However, government should continue to consult with organizations like OSPE to develop evidence-based policies and programs.

Finally, OSPE believes that the definition of Ontario's highly skilled workforce should specifically mention that Ontario (and Canada) is transitioning towards a knowledge economy, which the current working definition neglects to mention. In their 2015 study, Richard Florida and Greg Spencer explain that the prevailing narrative has been that Canada's resource-rich west is the primary source of long-term prosperity. As the authors point out, the drop in oil prices challenged the notion that Canada's success lies in its natural resources. Florida and Spencer argue that the "path to sustained prosperity in today's economy turns on knowledge, innovation, and creativity."³ Florida and Richard also offer their own definition of the knowledge economy and recommendations.⁴

² Ontario Society of Professional Engineers (OSPE), *Crisis in Ontario's Engineering Labour Market: Underemployment Among Ontario's Engineering-Degree Holders* (Prism Economics and Analysis, 2015), 12-13.

³ Richard Florida and Greg Spencer, "Canada's Urban Competitiveness Agenda: Completing the Transition from a Resource to a Knowledge Economy," (Martin Prosperity Institute, 2015), 6.

⁴ Florida and Spencer define the knowledge economy as one that offers something new, different, and better, and creates higher value, whereas resource-based economies turn out standard products at a lower cost. They explain these economic models have been historically separate. They argue that Canada should combine the models by using its resources to fuel the growth of the knowledge economy, while deepening and expanding the resource economy with technology and knowledge.

Given that the Premier's Expert Panel has been appointed to develop a strategy to help the province's workforce adapt to the demands of a technology-driven knowledge economy, providing the aforementioned context or preamble would strengthen the definition. The traditional factors that have sustained Canada's economy in the past are changing and a reliance on natural resources is no longer sufficient.⁵

2. What partnerships are needed to support development of a highly skilled workforce?

As noted in the previous section, OSPE's 2015 study found that about 30% of employed individuals in Ontario who held a bachelor's degree or higher in engineering worked as engineers or engineering managers.⁶ Moreover, 33% of engineering-degree holders worked in jobs that did not necessarily require a university degree.⁷

This means that there is a large engineering capacity within the province available to tackle engineering-based economic development activities if suitable conditions can be established. In fact, the Conference Board of Canada estimated that the amount of GDP (or value-added) that engineering and applied science and technicians and technologists contribute in each industry was \$54.7 billion in 2011 (or 3.3% of Canadian GDP).⁸

The skills that engineering-degree holders possess will be increasingly in demand in a knowledge economy. To help engineering degree holders enter the workforce, OSPE provides numerous opportunities for both OSPE members and non-members.⁹

However, OSPE believes co-op opportunities play an important role in bridging the knowledge that students gain in the classroom to the workforce. OSPE strongly recommends that engineering students participate in experiential

⁵ "Maximizing Canada's Engagement in the Global Knowledge-Based Economy: 2017 and Beyond," Government of Canada, last modified July 8, 2013, <http://www.horizons.gc.ca/eng/content/maximizing-canada%E2%80%99s-engagement-global-knowledge-based-economy-2017-and-beyond%C2%A0>.

⁶ Ontario Society of Professional Engineers (OSPE), *Crisis in Ontario's Engineering Labour Market: Underemployment Among Ontario's Engineering-Degree Holders* (Prism Economics and Analysis, 2015), 12-13.

⁷ Ibid, 9.

⁸ Julie Adès, *Canada's Engineering and Applied Science Technicians and Technologists: Assessing Their Economic Contribution* (Ottawa: The Conference Board of Canada, 2016).

⁹ OSPE provides professional development courses, job search workshops, a bridge training program for foreign trained engineers funded by the Government of Ontario, a Pilot Mentorship Program funded by Status of Women Canada that supports female engineering graduates in the early stages of their careers, Engineering Employment Events (E3s) across Ontario to connect job seekers to engineering employers, a free Job Board, and hosts year-round networking and volunteer opportunities. For more information on OSPE's professional development and career services, visit www.ospe.on.ca.

learning offered by their post-secondary institutions. While the terms may differ (co-op programs, internship, or work placement), experiential learning provides students with hands-on work experience needed to build one's skills and professional network, while better positioning a recent graduate entering the workforce.

The 2013 National Graduates Survey (NGS) of the class of 2009-2010 found that the proportion of bachelor-degree holders who reported that they found their job to be "closely" or "somewhat" related to their completed education was higher among those who completed a co-op program (87%) than those who did not complete a co-op program (80%).¹⁰ Moreover, Bachelor-degree holders who completed a co-op program showed higher employment rates than non-co-op graduates (86% employed full-time versus 79%), as well as higher earnings (\$55,000 versus \$53,000).¹¹

The NGS found that more college graduates completed a co-op program than graduates with a Bachelor-degree (22% versus 12%). Among students surveyed in the NGS, engineering students made up a significant number of co-op participants.¹² Given that many engineering students participate in co-op programs, why are so many not working in engineering? OSPE's 2015 report did not examine reasons for this attrition. However, over 90% of fourth-year engineering students who responded to a survey conducted by IPSOS Reid on behalf of Professional Engineers Ontario said they probably or definitely intended to pursue work as engineers upon graduation.¹³

OSPE believes that employers play a key role in ameliorating labour market conditions facing recent engineering graduates. There is a surplus of recent engineering graduates with little experience and a shortage of more experienced engineers who have five or more years of engineering experience.¹⁴ Canadian employers tend to seek highly experienced engineers and are less willing to provide early career professionals with engineer-supervised employment experience that new employees need to achieve their Professional Engineer (P.Eng.) designation.¹⁵

¹⁰ Sarah Jane Ferguson and Shunji Wang, "Graduating in Canada: Profile, Labour Market Outcomes and Student Debt of the Class of 2009-2010," (Minister of Industry, 2014), 24.

¹¹ Ibid, 25-26.

¹²¹² The field of study major groupings with the largest proportions of graduates from a co-op program were "architecture, engineering and related technologies" (35%), "mathematics, computer and information sciences" (28%), and "business, management and public administration" (15%). Among the minor groupings, "engineering" (37%) and "natural resources and conservation" (18%) were the most common among co-op graduates.

¹³ Ontario Society of Professional Engineers (OSPE), *Crisis in Ontario's Engineering Labour Market: Underemployment Among Ontario's Engineering-Degree Holders* (Prism Economics and Analysis, 2015), 6.

¹⁴ Resources for Results, *Mentoring Women for Early Career Advancement in Engineering: Status of Women Canada Needs Assessment Paper for The Ontario Society of Professional Engineers*, (Resources for Results, 2015), 3.

¹⁵ Ibid.

OSPE believes that more employers need to be willing to take on an engineering student or recent engineering graduate. Currently, the Government of Ontario offers the Co-operative Education Tax Credit that businesses can receive,¹⁶ in addition to other wage subsidy programs available at the federal level. OSPE recommends that the province work with employers to identify other initiatives that will incent businesses to hire engineering students or engineering graduates.

OSPE also recommends that the Government of Ontario encourage post-secondary institutions, including those offering engineering programs, to increase both financial and human resources in their Career Services or Career Centres. This will further support students looking to secure a co-op opportunity that will, in turn, improve their employment outcomes following graduation.

With respect to international engineering graduates, OSPE's 2014 report, *From the World to the Workplace*, found that a large majority of employers who were surveyed indicated that they have significant difficulty in assessing a non-Canadian undergraduate degree in engineering (63% found it "difficult" or "very difficult" to assess non-Canadian qualifications).¹⁷ Moreover, about one-fifth of employers said they discount non-Canadian experience, either because they are unsure that it is commensurate with Canadian standards or because it is difficult to validate the experience described by a job seeker.¹⁸

OSPE recommends that engineering employers, especially small companies, develop internal mechanisms to properly assess foreign credentials or seek the assistance of third-party educational assessment agencies. OSPE also concurs with the Ontario Chamber of Commerce's (OCC) recommendation that the Government of Ontario should better publicize programs like the Express Entry system to employers and other stakeholders. The OCC's report found that less than 7% of small and medium-sized enterprises in Ontario used the immigration system for hiring purposes.¹⁹ OSPE also recommends that the government streamline the application for such programs so that they are less administratively burdensome for employers and hiring managers.

As the OCC's *Passport to Prosperity* report explains, the skills gap costs Ontario's economy up to \$24.3 billion in foregone GDP and \$3.7 billion in provincial tax revenue annually.²⁰ According to a 2016 survey of its membership,

¹⁶ Under the Ontario Co-Operative Education Tax Credit, a maximum credit of \$3,000 is available for co-op employees who work between 10 weeks to 4 months.

¹⁷ Ontario Society of Professional Engineers (OSPE), *From the World to the Workplace: Hiring and Recruitment Perceptions of Engineering Employers and Internationally Trained Engineers in Ontario* (Prism Economics and Analysis, 2014), 19.

¹⁸ Ibid, 26, 30.

¹⁹ Kathryn Sullivan, *Passport to Prosperity: Ontario's Priorities for Immigration Reform* (Ontario Chamber of Commerce 2016), 5, 9.

²⁰ Ibid, 4.

the OCC found that the skills gap in Ontario is worsening as 39% of employers experienced difficulty filling a job opening over the last 12 to 18 months because they could not find someone with the right qualifications.²¹ Thus, integrating newcomers and internationally trained professionals into Ontario's economy and labour market represents a tremendous opportunity for the newcomers and their families, as well as the economy and province as a whole.

Examine Math Curriculum

The C.D. Howe Institute suggests that Canada must “do a much better job of boosting the supply of the kinds of high-skilled workers that are in high demand, including pushing more students to take more degrees in science, technology, engineering and math.”²² However, in engineering, demand is very high as undergraduate applications to engineering programs have grown by 90% over the last decade.²³ Pushing more students into STEM disciplines will not, in and of itself, help students successfully transition into the knowledge economy.

Instead, greater attention needs to be paid to numeracy skills in children. Math skills of Canadian 15-year-olds slipped significantly between 2003 and 2012 on the “PISA” test (Program for International Student Assessment) run by the Organization for Economic Co-operation and Development (OECD). OECD test results showed that 54% of Canadians aged 16 to 65 scored below the level considered appropriate for full participation in a modern technological society – a figure that has increased from 47% only a decade ago.²⁴ As reported in an article by the *Toronto Star*, in Ontario standardized EQAO math test results have fallen by four percentage points between 2009 and 2013, and among Grade 6 students it has fallen seven percentage points over the past five years.²⁵

In the American context, poor math skills could cost the economy \$75 trillion over the next 80 years according to a study by Harvard University mentioned in an

²¹ This figure represents a 9% increase from survey data on the same question by the OCC in 2014.

²² Barrie McKenna, “Canada’s labour market not keeping up with ‘changing times’: report,” *Globe and Mail*, February 2, 2016, accessed February 9, 2016, <http://www.theglobeandmail.com/report-on-business/economy/jobs/canadas-labour-market-not-keeping-up-with-changing-times-report-says/article28494862/>.

²³ Simona Chiose, “Ontario universities’ engineering programs set to be expanded,” *Globe and Mail*, March 20, 2016, accessed March 21, 2016, <http://www.theglobeandmail.com/news/national/engineering-programs-in-ontario-universities-look-to-expand/article29307185/>.

²⁴ Graham Orpwood and Emily Sandford Brown, *Closing the Numeracy Gap: An Urgent Assignment for Ontario* (Toronto: Graham Orpwood and Emily Sandford Brown, 2015).

²⁵ Louise Brown, “Elementary students to get hour of math every day under new Ontario plan,” *Toronto Star*, April 4, 2016, accessed May 7, 2016, <https://www.thestar.com/yourtoronto/education/2016/04/04/elementary-students-to-get-hour-of-math-every-day-under-new-ontario-plan.html>.

article by the *Toronto Star*.²⁶ Moreover, poor math skills hinder a student's interest in and ability to enter engineering and other STEM programs.

To begin, OSPE recommends that the Government of Ontario examine existing math curriculum in partnership with elementary schools, post-secondary schools, teachers, curriculum advisors, students, and employers. Public stakeholder consultations will provide the Ministry of Education with an opportunity to discuss the previously mentioned issues, identify challenges facing educators and students, and develop appropriate actions.

OSPE is pleased that under the \$60 million renewed math strategy, the Government of Ontario will require students from Grades 1 to 8 to have at least 60 minutes of math instruction a day starting September 2016. The strategy also requires each school to have at least one "math lead teacher" – up to three in larger schools – who is "deeply knowledgeable about teaching math" and would receive up to five days of math professional development a year.²⁷

However, given that 83% of Grade 3 elementary teachers and 80% of high school teachers have not taken math since high school,²⁸ OSPE believes that more could, and should, be done for future generations in the knowledge economy. Whereas the United Kingdom requires those entering teachers' college to take a math proficiency test, OSPE's second recommendation to the province is that educators instructing elementary school students in math *and* science should be required to hold post-secondary degree(s) in these subjects.

Third, OSPE recommends that the province consider introducing advanced math courses, such as calculus and algebra, earlier in the high school curriculum. This is important because some students may not recognize that math is required for certain post-secondary programs, and it also provides students with more instruction in advance mathematics prior to entering university. Students who are not adequately prepared for university-level mathematics may not succeed in their program or miss the opportunity to maximize their post-secondary experience.

Taken together, OSPE's second and third recommendations aim to help elevate the importance of STEM subjects in Ontario's education system for the

²⁶ Louise Brown, "New report pitches mandatory math test as part of education overhaul," *Toronto Star*, April 12, 2016, accessed May 7, 2016, <https://www.thestar.com/yourtoronto/education/2016/04/12/new-report-pitches-mandatory-math-test-as-part-of-education-overhaul.html>.

²⁷ Louise Brown, "Elementary students to get hour of math every day under new Ontario plan," *Toronto Star*, April 4, 2016, accessed May 7, 2016, <https://www.thestar.com/yourtoronto/education/2016/04/04/elementary-students-to-get-hour-of-math-every-day-under-new-ontario-plan.html>.

²⁸ Louise Brown, "New report pitches mandatory math test as part of education overhaul," *Toronto Star*, April 12, 2016, accessed May 7, 2016, <https://www.thestar.com/yourtoronto/education/2016/04/12/new-report-pitches-mandatory-math-test-as-part-of-education-overhaul.html>.

knowledge economy, and better prepare students who will one day form part of Ontario's highly skilled workforce.

3. How are employers and educational institutions preparing workers and learners for an increasingly digital and technological world?

North American educational institutions are evolving and adapting to prepare students for the future of work. As one education consultant notes,

“One of the trends [in higher education] is the development of startup thinking, entrepreneur thinking, getting to a culture of change. That is unusual for higher education. There is a different student body. The classic ivory tower is changing... we are blending work with academics in new ways.”²⁹

Ryerson University, for instance, recently launched its Master of Engineering Innovation and Entrepreneurship. Ryerson University's business incubator, the Digital Media Zone (DMZ), also offers entrepreneurs and start-ups with the resources to develop their innovations and products.

OSPE's Research and Innovation Committee noted that to foster innovation and entrepreneurship in youth the province must encourage and nurture a culture of risk-taking. One committee member noted that during a visit to Silicon Valley, the atmosphere was filled with new ideas. Individuals shared and collaborated, and more importantly, were not embarrassed by the fact that they started a company and later shut it down. Instead, they viewed this experience as an accomplishment. OSPE recommends that the province work with innovation centres across the province to develop business courses that embed a culture of entrepreneurship, innovation, and risk-taking in high school students.

OSPE also believes that engineering programs need to evaluate existing curriculum against industry needs and labour market trends. As OSPE CEO Sandro Perruzza told the *Globe and Mail*,

“If you look at where the jobs are in Canada, it's all around technology. Do we need to expand [engineering] programs? I think we do, but we need to do it in emerging technology, in mechatronics, in nanotechnology, things you [students, industry, and Ontario's economy] will need in five to 10 years.”³⁰

²⁹ George Lorenzo, “The Six Tech Advances in Higher Ed That Are Preparing Students For the Future of Work,” *Fast Company*, March 9, 2016, accessed March 11, 2016, <http://www.fastcompany.com/3057576/the-future-of-work/the-six-tech-advances-in-higher-ed-that-are-preparing-students-for-the-fu>.

³⁰ Simona Chiose, “Ontario universities' engineering programs set to be expanded,” *Globe and Mail*, March 20, 2016, accessed March 21, 2016, <http://www.theglobeandmail.com/news/national/engineering-programs-in-ontario-universities-look-to-expand/article29307185/>.

OSPE has shared its perspective by participating in the Ministry of Training, Colleges and Universities' (MTCU) consultations on the future of engineering education, which will present its findings in Spring 2016. OSPE is also an active member of the Engineering Change Lab. The Engineering Change Lab is comprised of 36 organizations that are working together to unlock the potential of the engineering profession in Canada systemically, experimentally, and collaboratively.

Importance of Business and Communications Skills

Although OSPE agrees that workers and learners need to be trained and educated to succeed in today's increasingly digital and technological world, "soft skills" remain integral to success in the labour market. In the previously mentioned Globe and Mail article, Perruzza adds that,

"Employers tell us that engineering students are extremely competent. It's a question of: Are they employable? Can they work in a group setting? Can they communicate?"³¹

There is concern amongst employers and other stakeholders about business and communications skills in engineering graduates. Harvey Weingarten, President of the Higher Education Quality Council of Ontario (HEQCO), stated in an article by the *Toronto Star* that executives look to hire people with communication, problem-solving, critical thinking, and teamwork skills, "yet this is where they [employers] see students being deficient."³² Interestingly, while 83% of educational providers believe their graduates are equipped for the workforce, only 34% of employers and 44% of students surveyed by McKinsey agreed.³³

To address employers' concerns, HEQCO recruited six Ontario colleges and universities to participate in a pilot project in the Fall of 2016.³⁴ The project will submit incoming students to a 90-minute online test of literacy, numeracy, and problem-solving skills. The same test will be administered to the graduating class as they leave their post-secondary institution. The project aims to measure what students actually learn, beyond just course marks, namely whether students have the skills (core literacy, numeracy, and problem-solving) that employers seek.³⁵

³¹ Simona Chiose, "Ontario universities' engineering programs set to be expanded," *Globe and Mail*, March 20, 2016, accessed March 21, 2016, <http://www.theglobeandmail.com/news/national/engineering-programs-in-ontario-universities-look-to-expand/article29307185/>.

³² Louise Brown, "Young grads need to brush up on 3Rs, employers say," *Toronto Star*, February 22, 2016, accessed March 23, 2016, <http://www.thestar.com/yourtoronto/education/2016/02/22/young-grads-need-to-brush-up-on-3-rs-employers-say.html>.

³³ McKinsey and Company, *Youth In Transition: Bridging Canada's Path from Education to Employment* (2015).

³⁴ Queen's University, the University of Toronto, the University of Guelph, George Brown College, Durham College, and Humber College are participating in this pilot project.

³⁵ Louise Brown, "Queen's testing students' 'soft skills' to gauge how they'll cope in job world," *Toronto Star*, February 22, 2016, accessed February 23, 2016,

OSPE notes that communications skills are an issue for other demographics in the labour market, specifically international engineering graduates.³⁶ OSPE therefore recommends that the Government of Ontario not lose sight of the importance of so-called “soft skills” as the province begins to support learners and workers for the technology-based knowledge economy. Technical skills and business and communication skills should go hand-in-hand as the inability to articulate one’s innovation, for instance, will hinder an entrepreneur’s ability to succeed.

4. Ensuring supply meets demand is a tenet of any successful economy. Employers report being unable to find skilled job candidates. Research also suggests that Canadian businesses are investing less than other countries in workplace training. What can employers do to support the knowledge-based economy?

Invest in Up-Skilling

A 2016 CBC News article noted that with technological advances like robotics and 3-D printing, the employment landscape will shift.³⁷ The World Economic Forum anticipates that nearly 4.8 million office and administrative jobs will disappear globally by 2020 – industries that are dominated by women. In comparison, male-dominated industries, like architecture, engineering, science, technology, mathematics, manufacturing and production, stand to gain hundreds of thousands of jobs.³⁸ As Jane Wilson, Director at Community MicroSkills Development Centre explains, unless women currently employed in traditional and soon-to-be obsolete roles are provided with training and skills development, many will be out of work.³⁹ As the Government of Canada notes, “participation in the knowledge-based economy will require Canadians to possess higher basic skills in literacy, numeracy, and critical thinking. All Canadians will need the right

<http://www.thestar.com/yourtoronto/education/2016/02/22/queens-testing-students-soft-skills-to-gauge-how-theyll-cope-in-job-world.html>.

³⁶ In its 2014 report *From the World to the Workforce*, OSPE found that international engineering graduates emphasized technical skills and educational qualifications in their resumes and cover letters at the expense of profiling non-technical skills, such as communication skills, team work skills, presentation skills, and working with non-technical colleagues. This propensity to emphasize technical skills over soft-skills consequently shapes an interviewer’s assessment of whether the applicant is a good “fit” for the organization.

³⁷ The Canadian Press, “Job prospects for women especially bleak, experts warn,” *CBC News*, February 5, 2016, accessed April 22, 2016, <http://www.cbc.ca/news/business/women-work-jobs-1.3435163>.

³⁸ World Economic Forum, *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution* (Geneva: World Economic Forum, 2016).

³⁹ Aleksandra Sagan, “Why Canada is on the brink of a gender-based economic crisis,” *Toronto Star*, February 5, 2016, accessed February 9, 2016, <http://www.thestar.com/business/2016/02/05/why-canada-is-on-the-brink-of-a-gender-based-economic-crisis.html>.

education, training, and skills to navigate, work, and engage in an increasingly demanding world.”⁴⁰

Canada’s labour supply needs to keep pace with the transition towards a knowledge economy. It is important to note that the rate of Canadian adults aged 25 to 64 in some form of job-related education is lower than key competitor nations, particularly the United States.⁴¹ Over the past 20 years, Canada employers have reduced investment in on-the-job training and mentoring for inexperienced, early-career engineers, apparently as cost-cutting measures in response to an increasingly competitive, globalized market.⁴²

To address the above challenges, OSPE agrees with the Toronto-based C.D. Howe Institute – part of the solution lies in employers investing in up-skilling their workforce⁴³ and recognizing the value of such investments for business productivity and the province’s economic growth.

OSPE also recommends that the Government of Ontario develop a targeted plan of action to work with non-profits, like OSPE, who offer professional development and job training programs, and to continue providing funding for such programs. Professional development and other forms of training will help underutilized pools of labour, such as youth, women, immigrants, and Aboriginals, overcome the barriers they may face in entering the labour market and succeeding in a technology-based knowledge economy.

Address the Retention of Women in Engineering

Engineering has remained a less common career choice for women in Canada. In 2014, women made up 19% of undergraduates enrolled in engineering programs, and 19% of those awarded undergraduate degrees from Canadian engineering programs.⁴⁴ As of 2014, only 17% of newly licensed engineers in Canada were female.⁴⁵

⁴⁰ “Maximizing Canada’s Engagement in the Global Knowledge-Based Economy: 2017 and Beyond,” Government of Canada, last modified July 8, 2013, <http://www.horizons.gc.ca/eng/content/maximizing-canada%E2%80%99s-engagement-global-knowledge-based-economy-2017-and-beyond%C2%A0>.

⁴¹ Craig Alexander, *Job One Is Jobs: Workers Need Better Policy Support And Stronger Skills* (Toronto: C.D. Howe Institute, 2016), 6.

⁴² Lee Weissling and Andrea Ritter, “Now Hiring Engineers?” *The Voice*, OSPE. Fall 2013. Retrieved from http://www.nxtbook.com/dawson/ospe/thevoice_2013fall/index.php?startid=14.

⁴³ Craig Alexander, *Job One Is Jobs: Workers Need Better Policy Support And Stronger Skills* (Toronto: C.D. Howe Institute, 2016), 5-6.

⁴⁴ Resources for Results, *Mentoring Women for Early Career Advancement in Engineering: Status of Women Canada Needs Assessment Paper for The Ontario Society of Professional Engineers*, (Resources for Results, 2015), 3.

⁴⁵ *Ibid*, 4.

Women's attrition rates are high in the process towards professional licensure in engineering.⁴⁶ OSPE's survey⁴⁷ of Canadian Trained Engineers found that women leave the profession for various reasons, like to enter managerial roles, due to the expectation of earning more in another line of work, a perception of increased opportunity for promotion in other fields, a dislike of workplace culture in engineering, or plans to return to university to complete an advanced degree.⁴⁸ Research from Australia and the United States identifies workplace culture and policies as another factor in women's career decision-making,⁴⁹ such as unsatisfactory pay and promotion opportunities, difficulties combining work with childcare responsibilities, and sexual harassment, discrimination, and bullying.⁵⁰

Fouad et al. (2012) note that predictors for retention of female engineers were connected to workplace culture and policies, including opportunities for training and development, supportive supervisors and co-workers, and less perceived sexism, discrimination, and harassment in the environment.⁵¹

Canada will have a significantly smaller labour force in 2017 as nearly all members of the baby boomer generation will be 60 years of age or older. To ensure supply meets demand in Ontario's knowledge economy, engineering employers in Ontario need to examine workplace cultures and policies, and develop strategies that will help retain women engineers. As the Government of Canada notes in *Maximizing Canada's Engagement in the Global Knowledge-Based Economy*, "it will be in Canada's national interest to ensure that as many Canadians as possible have the opportunity to participate in the workforce..."⁵²

⁴⁶ Ibid, 1.

⁴⁷ This survey is part of the needs assessment phase for the development of OSPE's Pilot Mentorship Program for Women funded by Status of Women Canada. A total of 1,566 individuals responded to the online survey (530 women and 1036 men). The program matches a protégé (females who are recent graduates with an engineering degree or in the early stages of their career) to a mentor in the engineering profession based on their areas of interest and engineering experience. Mentors provide a protégé with personalized support to enable them to make a smooth transition into engineering and licensure. The program supports Engineers Canada's 30 by 30 initiative, which a commitment to increase the number of female newly licensed engineers to 30% by 2030. To learn more about OSPE's mentorship program, visit <https://www.ospe.on.ca/engineering-professional-success>.

⁴⁸ Resources for Results, *Mentoring Women for Early Career Advancement in Engineering: Status of Women Canada Needs Assessment Paper for The Ontario Society of Professional Engineers*, (Resources for Results, 2015), 10.

⁴⁹ Ibid, 11-12.

⁵⁰ Mary Ayre et al., *Not All Women Leave! Reflections on a Cohort of "Stayers" in Civil Engineering*, Paper presented at 2011 Annual Conference and Exposition, Vancouver, British Columbia, <https://peer.asee.org/18956>.

⁵¹ Nadya A. Fouad et al., *Stemming the Tide: Why Women Leave Engineering* (2012), University of Wisconsin-Milwaukee, http://www.studyofwork.com/files/2011/03/NSF_Women-Full-Report-0314.pdf.

⁵² "Maximizing Canada's Engagement in the Global Knowledge-Based Economy: 2017 and Beyond," Government of Canada, last modified July 8, 2013, <http://www.horizons.gc.ca/eng/content/maximizing-canada%E2%80%99s-engagement-global-knowledge-based-economy-2017-and-beyond%C2%A0>.

5. What existing policies, programs or initiatives to create a highly-skilled workforce can be scaled up or broadened to reach more people?

In January 2016, Premier Christy Clark announced that British Columbia will introduce coding curriculum in September 2016 for all grades.⁵³ The province has shifted its economic agenda from a focus on natural resources to bolstering B.C.'s knowledge economy, specifically the technology sector that employs 86,000 people and more than forestry, mining, oil and gas. This shift is also in response to the fact that computer science skills are critical. Technology is where future job growth lies, but Canada is expected to be short more than 180,000 information, communications, and technology workers by 2019.⁵⁴ Training the next generation of British Columbia's coders is also expected to attract international technology companies to the province where they can find people with the requisite skills.⁵⁵

OSPE applauds British Columbia for taking a proactive approach by providing younger generations with the computer literacy needed to succeed in today's technology-based knowledge economy. This step is indicative of government's ability to evolve. In Ontario, elementary schools do not offer computer science courses. It is not until Grade 10 that computer studies are offered, but none are mandatory for Ontario students. Meanwhile, technology firms say that by the time students get to high school, it is too late to start teaching basic computer skills. Instead, firms say students need to learn and work with code as early as age six to meet growing job demand.⁵⁶

OSPE would ask the Government of Ontario to consider the following questions if it too were to implement similar curriculum changes to generate a skills advantage for youth when entering the labour market: Does coding appeal to all students? Is coding the only skill that today's youth need to succeed in the knowledge economy? Besides coding, should students be introduced to STEM subjects, entrepreneurship, innovative thinking, and technological literacy?

As Melody Ma, a Vancouver-based web developed and kids coding advocate mentions in a *CBC News* article, teaching computer science has residual

⁵³ Students in middle grades will learn how to code, debug algorithms, and use various coding techniques, while high school students will have the opportunity to specialize in particular areas of technology. By introducing basic coding into school curriculum, B.C. follows New Brunswick, Nova Scotia, New York City, and Britain, Australia.

⁵⁴ Sean Silcoff, "B.C. to add computer coding to school curriculum," *Globe and Mail*, January 17, 2016, accessed February 4, 2016, <http://www.theglobeandmail.com/technology/bc-government-adds-computer-coding-to-school-curriculum/article28234097/>.

⁵⁵ Tamsyn Burgmann, "B.C. grade-school students to get computer coding training in new curriculum," *Toronto Star*, January 18, 2016, accessed February 4, 2016, <http://www.thestar.com/news/canada/2016/01/18/bc-grade-school-students-to-get-computer-coding-training-in-new-curriculum.html>.

⁵⁶ Kate Dubinski, "Getting cracking with coding," *The London Free Press*, December 22, 2014, accessed February 11, 2016, <http://www.lfpress.com/2014/12/22/getting-cracking-with-coding>.

benefits, like fostering creative and computational thinking. She therefore recommends more of a focus on the “soft benefits” of computer science that are equally beneficial for students.⁵⁷ Similarly, Greg Smith, lead developer at London tech firm InnerGeek, notes that programming for kids is more about the fundamental logic that allows them to learn how to think.⁵⁸

Teachers in British Columbia will be given the opportunity to learn about coding during professional development days.⁵⁹ If Ontario were to follow, OSPE recommends that government partner with private sector technology companies. Technology companies possess the expertise to develop coding curriculum and know what students and future coders needed to succeed in this broad sector.

OSPE’s Research and Innovation Task Force also notes that companies in Ontario are unable to source qualified candidates with coding skills, and are consequently hiring coders from the United States. According to a study by the Information and Communications Technology Council (ICTC) mentioned in an article by the *Ottawa Citizen*, there will be as many as 182,000 high-paying technology jobs available in Canada by 2019. The report argues that schools in Canada are not producing enough high technology expertise to fill those positions, calls for mandatory computer science for children beginning in kindergarten, and the creation of a nationwide “Digital Talent Strategy.”⁶⁰

To address the talent shortage in the technology sector, OSPE recommends that the Government of Ontario review existing processes for amending curriculum. Curriculum that can be changed quickly and without bureaucratic delay is more responsive to market needs. This will also ensure that Ontario’s youth can effectively compete on the global stage and businesses in Ontario can find domestic talent to fill jobs that are in demand.

⁵⁷ CBC News, “Christy Clark’s plan to teach coding to kids flawed says educator,” *CBC News*, January 20, 2016, accessed February 4, 2016, <http://www.cbc.ca/news/canada/british-columbia/kids-coding-not-ready-1.3412909>.

⁵⁸ Kate Dubinski, “Getting cracking with coding,” *The London Free Press*, December 22, 2014, accessed February 11, 2016, <http://www.lfpress.com/2014/12/22/getting-cracking-with-coding>.

⁵⁹ CBC News, “Christy Clark’s plan to teach coding to kids flawed says educator,” *CBC News*, January 20, 2016, accessed February 4, 2016, <http://www.cbc.ca/news/canada/british-columbia/kids-coding-not-ready-1.3412909>.

⁶⁰ Vito Pilioci, “Canada isn’t producing enough tech grads to fill thousands of upcoming jobs, research says,” *Ottawa Citizen*, March 9, 2016, accessed March 11, 2016, <http://ottawacitizen.com/technology/tech-biz/canada-isnt-producing-enough-tech-grads-to-fill-thousands-of-upcoming-jobs-research-says>.



About the Ontario Society of Professional Engineers

The Ontario Society of Professional Engineers (OSPE) is the voice of engineers in Ontario. We represent the entire engineering community, including engineers, engineering professionals, graduates and students who work or will work in several of the most strategic sectors of Ontario's economy. OSPE elevates the profile of the profession by advocating with governments, offering valued member services and providing opportunities for ongoing learning, networking and community building. OSPE was formed in 2000 after members of Professional Engineers Ontario (PEO) voted to separate regulatory and advocacy functions into two distinct organizations.

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