Mapping Canada's Training Ecosystem: Much Needed and Long Overdue

Tony Bonen and Matthias Oschinski

IN BRIEF

The Government of Canada has recently increased investments in skills development to help Canadians prepare for the post-pandemic recovery and the future of work. However, these measures may have little impact without actionable data on the training options that can connect workers to in-demand jobs. To address this issue, Canada needs a comprehensive information system to link training, skills and jobs. This paper is a call to action for employers, training providers and government agencies of all levels to work together to lay the foundation of a robust pan-Canadian mapping of training and employment opportunities.

EN BREF

Le gouvernement du Canada a récemment augmenté ses investissements dans le développement des compétences pour aider les Canadiens à faire face à la reprise d'après-pandémie et à l'évolution du marché du travail. Mais l'impact de ces mesures pourrait être minimal en l'absence de données exploitables sur l'adéquation entre les formations offertes aux travailleurs et les emplois en demande. Pour résoudre ce problème, le Canada doit se doter d'un système d'information complet qui fasse le lien entre formations, compétences et emplois. Cette étude exhorte les employeurs, fournisseurs de formations et organismes gouvernementaux de tous niveaux à établir conjointement un mécanisme pancanadien de mise en correspondance des possibilités de formation et d'emploi.

**THE FUTURE OF SKILLS
AND ADULT LEARNING**

IRPP

ABOUT THIS PAPER

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FAST-CHANGING LABOUR MARKETS NEED QUALITY INFORMATION

Canadian workers are under mounting pressure to upgrade their existing skills and learn new ones. This process began long before the disruption brought on by the novel coronavirus as far-reaching shifts in society, such as automation and an aging population, transformed the world of work. The COVID-19 pandemic and resulting economic crisis have only heightened the importance of access to education and training for the skills that employers need.

Since March 2020, millions of Canadians have been laid off in the most dramatic retrenchment in economic activity since the Second World War.[1] While many of those layoffs were temporary, there is little doubt that hundreds of thousands of workers have yet to return to work. Compounding the disruption is the fact that even the most knowledgeable experts have little idea what the labour market will look like once the health crisis has passed, especially in the hardest-hit sectors such as oil and gas and tourism.[2]

Amid this uncertainty, we can make one confident prediction: in the months and years to come, many Canadians will be looking for jobs that demand new skills (e.g., data analytics), or will need to adapt to far-reaching changes in their existing occupations (e.g., by learning to work remotely). Such career transitions – whether from a sector unable to fully recover after COVID-19, a voluntary change or a shift induced by new automation technology – have a much higher chance of success if the affected workers are able to identify the gaps in their current skills, and then find training programs to bridge those gaps.

However, charting a new course in skills development is a daunting task, made more so by a scarcity of career counsellors for working-age people. Without a unified source of information that links training programs to skills, Canadians have little choice but to muddle through by poking around online and relying on word-of-mouth advice. Some may end up wasting time, money and energy on unsuitable training programs. Many others may not invest in training at all, thereby hampering their ability to make a fresh start in their careers. Financial incentives to encourage investment in training, such as the new Canada Training Benefit, may have little impact if potential learners do not have access to information to guide their choices.

The challenge is equally formidable for employers looking to fill the jobs. Although the large pool of job seekers should to be a boon, many businesses and other employers

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1   T. Bonen, "The Speed and Magnitude of Job Losses in 2020 Are Entirely without Precedent," First Policy Response, 3 June, 2020, http://policyresponse.ca/2008-vs-2020-whats-different-this-time-around/#tony-bonen-director-of-research-data-and-analytics-labour-market-information-council.

2   Labour Market Information Council (LMIC), "A (Small) Glimmer of Hope in Today's Job Report?" April 15, 2020, https://lmic-cimt.ca/a-small-glimmer-of-hope-in-todays-job-report; Labour Market Information Council (LMIC), "Sectors at Risk: The Impact of COVID-19 on the Canadian Tourism Industry," LMI Insights no. 30, May 2020, https://lmic-cimt.ca/wp-content/uploads/2020/05/LMI-Insight-Report-no-30.pdf; Labour Market Information Council (LMIC), "Sectors at Risk: The Impact of COVID-19 on the Canadian Oil and Gas Sector," LMI Insights no. 33, June 2020. https://lmic-cimt.ca/wp-content/uploads/2020/06/LMI-Insight-Report-no-33.pdf.

expect to face skills shortages as they ramp up production after the pandemic is over.[3] For example, manufacturers have cited a scarcity of skills as one of their top concerns after pandemic-related disruptions.[4]

The bottom line is that, while individuals and firms alike are keen to develop the skills needed to thrive in our ever-changing economy, they lack the tools to identify those skills and find out where they can best be acquired. One particular problem is that the credentials of new hires, especially recent graduates with no work experience, often give little information about their actual skills, resulting in mismatches in the workplace that are costly to all.

Only a handful of tools for assessing an individual's skills gaps are currently available, notably RBC's UpSkills, the OECD's Skills for Jobs database, and MaRS's Planext tool. But these resources are of limited use. Even if they can help an individual accurately identify skills gaps, they offer no information on where or how to rectify the situation. In particular, they provide no guidance for navigating the myriad of education and training resources that are available. Hence, a job seeker using one or more of these tools is still likely to have an array of unanswered questions: Where can I learn the skills I need? Are online courses effective? Are there university or college programs that provide the requisite skills without a four-year commitment? Are training options in my home city or province as good as those in other parts of the country? And so on.

To address these shortcomings, we need to develop a comprehensive Canadian system that links – or, in technical terms, "maps" – skills sought in the marketplace with those that can be learned through training and education programs. Such a comprehensive mapping system would have three interlocking components:

1. A database of training and education programs and providers;
2. A classification system – or "taxonomy" – of skills and other job requirements that reflects how job seekers and employers think and talk about skills;[5] and
3. Linkages that map the training database to skills and other work requirements described in the taxonomy.

Designing and implementing each of these components will take time, effort and close collaboration between all parties involved, including employers, training providers and government agencies of all levels.

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[3] For a detailed discussion of the definition, see Labour Market Information Council (LMIC), "What's in a Name? Labour Shortages, Skills Shortages and Skills Mismatches," LMI Insight Report no. 3., October 2018 https://lmic-cimt.ca/publications-all/lmi-insights-report-no-3-whats-in-a-name-labour-shortages-skills-shortages-and-skills-mismatches.

[4] Labour Market Information Council (LMIC), "Sectors at Risk: The Impact of COVID-19 on Canadian Manufacturing," LMI Insight Report no. 34, June 2020, https://lmic-cimt.ca/publications-all/the-impact-of-covid-19-on-canadian-manufacturing.

[5] A taxonomy is classification system for organizing categories in a hierarchical structure. For example, Employment and Social Development Canada has recently produced such a system in its Skills and Competencies Taxonomy that can be explored here: https://noc.esdc.gc.ca/SkillsTaxonomy/SkillsTaxonomyWelcome/f5ec9457d5a540eeb4529c2698acb19a.

Our paper offers some insights into how this difficult but vital task can be accomplished. It will – we hope – spur all stakeholders to action.

CONFRONTING THE CHALLENGE

Many organizations across the country provide training options, ranging from short online courses to year-long certificate programs and traditional four-year university degree programs. The Open Database of Educational Facilities, compiled by Statistics Canada, lists over 2,000 post-secondary and 64 vocational training institutions in Canada's 13 provinces and territories.[6] Complicating matters is the fact that education falls under provincial jurisdiction, while labour market policy is a shared federal-provincial responsibility. While this diversity encourages the provision of high-quality education across the country, it also has a significant drawback, namely, that some professional certifications and training programs cannot be easily transferred between provinces. Thankfully, there are some signs of progress, with initiatives like the Red Seal certification program for tradespeople helping to lower barriers to training and labour mobility. Nevertheless, we must recognize that, given the provincial jurisdiction over education, coordination among the three orders of government is essential to successfully identifying education and training providers.

On a deeper level, Canada faces the same challenge as other countries in shifting from a training system based on credentials to one focused on skills development. Formal credentials, such as diplomas, degrees and certificates, are meant to signal that the holder possesses specific skills and knowledge; yet, as every employer knows, most traditional credentials offer only a limited insight into an individual's real abilities and potential. To make matters worse, Emna Braham and Steven Tobin from the Labour Market Information Council point out that Canada lacks systems for capturing robust information on skills.[7] Linking the numerous opportunities for training across Canada to specific skills is thus an essential part of broadening data collection systems beyond raw information on credentials.

The fragmented nature of Canada's training sector and the dearth of high-quality skills information mean that, despite the many opportunities to acquire new skills, it is exceedingly difficult for Canadians to get an answer to this simple question:

> "What training options are available for me to learn how to do XYZ at work?"

To provide meaningful answers to this question, we need to know at a minimum what training programs are on offer. A simple list of available courses, however, is not enough. To help individuals find the right courses, we need to map the existing fragmented information on course offerings to the specific skills required for a job that are understood by both employers and job seekers. While it is true that employers are often inconsistent or unclear about the precise competencies they are looking for from job applicants, a widely

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[6] The database does not include any online providers. Adding digital courses would likely increase these numbers substantially.

[7] E. Braham and S. Tobin, "Solving the Skills Puzzle: The Missing Piece Is Good Information," *Skills Next,* January 2020, https://ppforum.ca/wp-content/uploads/2020/01/SolvingTheSkillsPuzzle-PPF-JAN2020-EN.pdf

accepted skills taxonomy used in training programs could go a long way toward creating a common understanding of what each skill comprises and a common terminology. Ultimately, the taxonomy should reflect the real-world language people use to talk about skills.

A number of skills taxonomies are already in use. While each has its own unique features, they tend to fall into two broad categories

- Conceptually rigorous taxonomies that define skills in a formal and relatively narrow sense. For example, the 2020 version of the US Bureau of Labor Statistics' O*NET system and Employment and Social Development Canada's Skills and Competencies Taxonomy include only 35 and 47 skills, respectively (though each includes about 300 other non-skill work requirements or competencies). Furthermore, the description of each skill tends to be rather vague. Among them: active listening, written communication, management of people, and problem-solving.
- Taxonomies based on online job postings, which typically include tens of thousands of unique entries. These taxonomies are extremely detailed with a diverse mix of work requirements, including specific skills and familiarity with various technologies. As these databases are compiled by for-profit businesses, such as Burning Glass Technologies and Vicinity Jobs, that specialize in collecting and structuring job postings, those responsible for the taxonomy should keep in mind that there may be fees for accessing the information.

The choice of a taxonomy for skills and work requirements is not a binary one between the two types outlined above. Ideally, it should strike a balance between the benefits and drawbacks of each, guided by the principle that it should address the needs both of employers and of Canadians navigating the world of work.

The scale and complexity of Canada's training sector call for a phased approach, starting with a project of limited scope. Over time, lessons learned from this initiative would be invaluable for expanding the mapping system. Options to narrow the project's initial scope are discussed below but, whatever its scale, the exercise will require coordination and collaboration between a diverse group of actors. Even a modest pilot project will need to bring together all levels of government, nonprofit organizations, education providers (both public and private) and potential users. Key players that could help coordinate the project and provide some of the necessary information include the Council of Ministers of Education, Canada (CMEC), the Labour Market Information Council (LMIC) and the Future Skills Centre, plus many others.

Tapping into the networks of these and other entities committed to high-quality labour market information is a crucial step toward achieving the goals laid out in this paper.

Skills demand and the changing nature of work

The COVID-19 pandemic has amplified economic inequalities and vulnerabilities, especially among those unable to work from home. Even as governments around the

world plan for a post-COVID economy, their more immediate aim must be to help individuals who have lost jobs return to work, while continuing to support those unable to return. At the same time, policy-makers cannot ignore longer-term structural shifts – such as climate change, globalization, demographic changes, and digitization and automation – that are transforming the skills demanded by employers across a wide swath of the economy.[8]

We examine below each of these long-term shifts, its impact on workplace skills, and the importance of retraining:

- Growing concern about climate change is already ushering in a wide range of new technologies and associated skills. From carbon capture and storage technologies to the infrastructure needed to support electric vehicles, new patterns of work are emerging to replace two centuries of focus on combustion engines. The consequences to precise skills that will be required from mechanics and parts manufacturers, among many others, may be hard to predict, but there is no doubt that those skills are in the throes of a shift.[9] Falling demand for fossil fuels also has unsettling implications for workers in mining and oil and gas sectors, many of whom will be forced to look for other jobs, including in the green energy sector, that require new skills and thus retraining.[10]
- Moving manufacturing capacity to countries with lower labour costs is likely to continue. Even so, the COVID-19 pandemic has exposed the fragility of highly efficient supply chains and renewed calls for "reshoring" goods production. Whether manufacturers continue moving production to regions with low labour costs or return to North America will have a tangible impact on the skills required for the economy – shifting employer requirements toward more client-oriented services versus more technical goods production skill sets. Whatever the case, Canadians will need to know where they can develop the skills required in a fast-moving, global economy.[11]
- We are in the throes of far-reaching demographic change, due to extended longevity, retiring baby boomers and lower birth rates. As the LMIC points out, these trends are leading both to lower labour force participation and thus a shrinking pool of workers, and to a decrease in the supply of "soft" skills (such as leadership and teamwork) typically acquired by mature workers over the course of a long

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[8] LMIC, "The Impact of COVID-19 on Canadian Manufacturing."
[9] LMIC, "The Impact of COVID-19 on Canadian Manufacturing."
[10] W-H. Chen and R. Morissette, "How Do Workers Displaced from Energy-producing Sectors Fare after Job Loss? Evidence from the Oil and Gas Industry," Statistics Canada, Economic Insights, September 22, 2020, https://www150.statcan.gc.ca/n1/pub/11-626-x/11-626-x2020021-eng.htm; J. Marchand, "Don't It Make My Brown Jobs Green? What Renewable Energy Means for Jobs and Job Quality," Perspectives on Work, 2017, http://www.lerachapters.org/OJS/ojs-2.4.4-1/index.php/LERAMR/article/view/3145/3117.
[11] Organisation for Economic Co-operation and Development (OECD), *Workforce Innovation to Foster Positive Learning Environments in Canada*, Getting Skills Right, 2020, https://doi.org/10.1787/a92cf94d-en. A. Beattie, "Will Coronavirus Pandemic Finally Kill Off Supply Chains?" *Financial Times*, May 28, 2020, https://www.ft.com/content/4ee0817a-809f-11ea-b0fb-13524ae1056b; D. Breznitz, "Is This Canada's Last Chance to Revive Manufacturing and Long-Term Prosperity?" *IRPP Policy Options* (Montreal: Institute for Research on Public Policy), June 24, 2020, https://policyoptions.irpp.org/magazines/june-2020/is-this-canadas-last-chance-to-revive-manufacturing-and-long-term-prosperity.

career.[12] The growing scarcity of workers with relevant skills and experience under-lines the importance of removing barriers to retraining and upskilling. Access to relevant skills and training information would improve labour market mobility and help workers adjust more quickly to unfamiliar new jobs, thereby helping employ-ers to overcome the skills shortage.

■ Automation and digitization have been increasingly impacting employment and changing the nature of work across the entire economy over the past several decades. Some contend that the COVID-19 pandemic will encourage business-es to invest even more in automation in order to ease new-found uncertainties about employees' health and safety.[13] A recent report by McKinsey & Company concludes that we have vaulted forward five years in a matter of just two months in the adoption of digital technologies.[14] However, the durability of the trend to-ward automation remains highly uncertain, and there is little agreement over just how far it will go.[15] Whether the latest wave of technological change will create more jobs than it replaces is also a matter of debate. But there is a widespread agreement that the current upheavals will continue to alter the nature of work, and the underlying skills needed for many jobs.[16] As a result, a growing number of workers will need training either in new skills or to upgrade their existing ones.

Building a labour force capable of adapting to these structural changes will, in itself, put new demands on Canada's training resources. More than that, lifelong learning will become imperative for all of us – if it is not already.

The importance of a pan-Canadian approach

Both the short-term disruptions caused by COVID-19 and the long-term structural changes outlined above point to a fast-growing demand for high-quality labour mar-ket information on training and skills. Yet job seekers often find it difficult to find such

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[12] Labour Market Information Council (LMIC), "Understanding the Interconnectedness of the Future of Work: A Case Study in What's Wrong with Current Discussions," LMI Insights no. 22, December 2019, https://lmic-cimt.ca/wp-content/uploads/2020/01/LMI-Insight-Report-no-22.pdf.

[13] S. Farshchi, "Expect More Jobs and More Automation in the Post-Covid-19 Economy," *Forbes,* April 10, 2020, https://www.forbes.com/sites/shahinfarshchi/2020/04/10/expect-more-jobs-and-more-automation-in-the-post-covid-19-economy/#6a88ef3f29b4; T. Kheiriddin, "Commentary: Robots Don't Get Sick. Will COVID-19 Speed Up Workplace Automation?" Global News, April 23, 2020, https://globalnews.ca/news/6846608/coronavirus-economy-automation.

[14] McKinsey Digital, "The COVID-19 Recovery Will be Digital: A Plan for the First 90 days," May 14, 2020, https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/the-covid-19-recovery-will-be-digital-a-plan-for-the-first-90-days.

[15] M. Crawford Urban and S. Johal, "Understanding the Future of Skills: Trends and Global Policy Responses," *Skills Next,* January 2020, https://ppforum.ca/wp-content/uploads/2020/01/UnderstandingTheFuture OfSkills-PPF-JAN2020-EN.pdf.

[16] McKinsey & Company, "The Future of Work in America: People and Places, Today and Tomorrow," July 11, 2019, https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-in-america-people-and-places-to day-and-tomorrow; D.H. Autor, F. Levy and R.J. Murnane, "The Skill Content of Recent Technological Change: An Empirical Exploration," *Quarterly Journal of Economics*, 118, no. 4 (November 2003): 1279-1333; D.H. Autor and D. Dorn, "The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market," *American Economic Review,* 103, no. 5 (August 2013): 1553-97; J. Bessen, "How Computer Automation Affects Occupations: Technol-ogy, Jobs, and Skills," Boston University School of Law, *Law and Economics Research Paper*, October 3, 2016.; F. MacCrory, G. Westerman, Y. Alhammadi, and E. Brynjolfsson, "Racing with and against the Machine: Changes in Occupational Skill Composition in an Era of Rapid Technological Advance," *Proceedings of the Thirty-Fifth Inter-national Conference on Information Systems,* 2014 Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH.

data. According to surveys conducted by the LMIC, half of Canada's prime-age workers (namely, those aged 25 to 54) are looking for more detailed information than what is currently available on the skills required for specific jobs. In fact, no other type of workplace information is more sought after, except for wage data.[17] Moreover, a third of respondents say they cannot find the details they are looking for on job certification or education requirements.[18] More generally, the surveys conclude that 47 percent of recent immigrants, 51 percent of persons with disabilities, 52 percent of recent graduates and 56 percent of the unemployed have difficulty finding labour market information relevant to their needs.[19]

This dearth of information contributes to the larger problem of lack of access to training – particularly for the less advantaged, as training opportunities for workers tend to be limited and unevenly distributed.[20] Only about one-third of Canadian workers receive job-related, nonformal workplace training that lasts on average 49 hours a year – well below the OECD average of 58 hours. In addition, workplace training in Canada is not equally available to all who need or want it: low-skilled and older workers in particular are less likely to receive training than other groups.[21] For those who do receive some kind of training, the trend is toward informal learning with a growing number of employees initiating their own self-paced e-learning.[22] A solution to this problem, namely, giving all Canadians equal access to training and education programs that they need, calls for a collaborative, pan-Canadian response.

While education in Canada is a provincial responsibility, labour markets are a shared federal-provincial jurisdiction. Workplace training falls under several umbrellas, depending on the type of program:

- A large proportion of training is funded through bilateral arrangements between the federal government and the provinces and territories, in the form of Labour Market Transfer Agreements (LMTAs) and Workforce Development Agreements (WDAs). LMTAs fund training primarily for unemployed persons eligible for employment insurance, while WDAs mostly support programs aimed at persons with disabilities and older workers.
- The provinces administer and fund formal education provided through primary, secondary and post-secondary institutions.

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[17] Labour Market Information Council (LMIC), "LMI Most Wanted by Canadians: Wages and Skills," LMI Insights no. 8, February 2019, https://lmic-cimt.ca/wp-content/uploads/2019/02/LMI-Insights-No-8.pdf.

[18] Labour Market Information Council (LMIC), "Is It Difficult to Find Information That Helps Career-Related Decisions?" LMI Insights no. 5, January 2019, https://lmic-cimt.ca/wp-content/uploads/2019/01/LMI-Insights-No.-5.pdf.

[19] Labour Market Information Council (LMIC), Public Opinion Research: Interactive Dashboard, 2019, https://lmic-cimt.ca/data-dashboards/survey-results-by-region.

[20] D. Munro, "Skills, Training and Lifelong Learning," Public Policy Forum, March 29, 2019, https://ppforum.ca/publications/skills-training-and-lifelong-learning.

[21] OECD, *Workforce Innovation to Foster Positive Learning Environments in Canada.*

[22] The Conference Board of Canada, "Canadian Employers' Investment in Employee Learning and Development Continues to Rise," January 2018, https://www.conferenceboard.ca/press/newsrelease/2018/01/31/canadian-employers-investment-in-employee-learning-and-development-continues-to-rise?AspxAutoDetectCookieSupport=1.

■ Privately owned institutions providing career-specific and vocational training must be registered or licensed under provincial or territorial legislation to ensure that they meet minimum financial, program and other requirements.

■ Employment and Social Development Canada coordinates and funds a wide variety of targeted training programs. The Indigenous Skills and Employment Training program, for example, aims to help Indigenous people to improve their skills and find employment. The Red Seal program is an initiative to set common standards for tradespeople and apprentices designed to promote skilled trades, and the Youth Employment and Skills Strategy provides support and employment services for young Canadians between the ages of 15 and 30.

Given this array of programs, any initiative to map the training system clearly requires a pan-Canadian approach. While the initial stages may take the form of a pilot project limited to a single jurisdiction or instructional program, a mapping system must ultimately cut across all jurisdictions and include every relevant program if it is to live up to expectations.

International experience

Initiatives are underway in a number of other countries to set up systems that enable employees, job seekers, employers and training providers to identify appropriate training opportunities.

Singapore launched one of the most comprehensive platforms, MySkillsFuture, in 2017. The portal is designed for three user groups – employees, employers and training providers. Employees can personalize their learning needs by assessing their interests, and then match them to the type of training needed for their chosen career path. In other words, while the platform does not map training to skills, it allows individuals to choose and undergo a skills assessment test before selecting a particular training course. Employers can use the platform to obtain information on training opportunities for their staff. Finally, training providers can post training programs and other content. The portal builds on a pilot project originally launched in 2014 with 200,000 participants testing the career-analysis and job-matching tools.

The OECD's Skills for Jobs platform enables individuals to select their current occupation and a desired target occupation, and then provides some detailed information on the skills needed to make the career transition. The platform does not, however, map skills to specific training programs.

The European Council launched its Upskilling Pathways program in 2016, targeting low-skilled adults across the European Union. The main goal of this initiative is to bring together existing policies and services in a coordinated manner and within a coherent strategy that recognizes the different needs and characteristics among those with lower skills. Upskilling Pathways comprises three steps. First, a skills assessment identifies gaps in existing skills. The individual then receives a tailored training offer from an accredited organization. Depending on the specific member country, this can be

a government agency or a nonprofit organization. Finally, whatever skills he or she acquires are validated and recognized under their national qualifications framework (e.g., in Germany, this is done by Chambers of Commerce and Industry). In addition, EU member states have been increasing their effort to align national qualifications frameworks with the European Qualifications Framework.

In the US, job seekers can obtain information on occupational skills through the My Next Move program. Developed and maintained by the National Center for O*NET Development, the platform provides information on tasks, skills, salaries and job outlook covering over 900 careers. In addition, it sets out educational requirements for specific occupations and guides the user to institutions or apprenticeship programs that offer the relevant training. My Next Move enables users to browse occupations by industry and keywords. For those unsure which career to pursue, it has a built-in "interest profiler" to help narrow the search.

As these initiatives show, the need to provide data-driven skills and training information is not confined to Canada. However, the experience of Singapore, the EU and the US suggests that getting such projects off the ground requires a sustained effort on the part of key government players. The keys to success are persistence and collaboration.

LAYING THE FOUNDATIONS FOR A ROBUST MAPPING SYSTEM

A comprehensive mapping of the training and education system comprises three interlocking components:

- An inventory or database of training and education programs and providers.
- A taxonomy of skills and other job requirements, such as knowledge domains, software and tools.
- An ability to cross-reference the skills taxonomy and the training database using one or more skills indicators.

These three components can be put in place using a phased approach, with some of the work being done simultaneously. Each phase comes with its own conceptual and logistical challenges that need to be addressed by a broad consortium of stakeholders working together. Our proposal for successfully executing this process is outlined below.

Phase 1: Set up the database

Define the scope
Setting up a database of training and education programs requires decisions on which programs and courses to include in the system, and which to exclude. For example: Should all college and university courses be included, even doctoral programs? Should basic literacy and adult high-school equivalency programs be part of the mapping? What about short online courses that provide only basic familiarity with a specific computer program?

The complexity of the mapping exercise depends crucially on its scope, which can be broadened or narrowed according to types of providers, training and/or geography. Reducing complexity, however, carries the risk of jeopardizing the quality – and thus the usefulness – of the skills training database.

In our view, the potential benefits of an ambitious approach fully justify the extra effort involved. In other words, the database should include education and training options from the widest possible variety of sources. The broader the scope of a training mapping system, the more useful it will be. We therefore recommend that it be designed to encompass post-secondary education, apprenticeship programs, certification programs and certified microcredential courses from both private and public sector providers.

Create the data architecture
Early consultations with users are critical to defining the kind of information that needs to be collected, and the form or structure it should take. Questions that need to be resolved include: Is the information on the total program cost to learners sufficient? Or will they expect to have more detailed cost breakdowns to compare across options by training hour?

Once the various types of information are identified, they need to be organized and structured. This process requires making decisions on various issues, some of which can probably be resolved quite easily (e.g., how to record the province of study), but others are more consequential (e.g., how to structure the database). These technical considerations are beyond the scope of this paper, but they need to be considered carefully alongside user consultations. Technical decisions taken early on can have wide implications down the line, particularly as more information begins to be integrated into the original data architecture. For this reason, it is essential to develop a detailed blueprint of the database prior to collecting any data.

Gather the data
Once the data architecture is determined, the collection process can begin. Unlike a regular survey, detailed qualitative information will have to be collected directly from training and education providers. Since the providers record details such as training type, course structure, location and start date in different ways, organizing the raw material into coherent structures will be a major undertaking. Another challenge will be to overcome long-standing barriers among provinces to sharing education information. Indeed, previous efforts to gather such data have run into a brick wall.[23]

Phase 2: Develop a skills and work requirements taxonomy

User consultations
No skills taxonomy is perfect. They can only be designed and developed through extensive consultations with potential users. The input of vulnerable populations –

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[23] A. Parkin, E. Hartmann, and M. Morden, "How to Build a Skills Lab: A New Model of Institutional Governance in Canada," Mowat Centre, Mowat Research #152, June 16, 2017, https://munkschool.utoronto.ca/mowatcentre/how-to-build-a-skills-lab; A. Usher, "FutureSkills Lab," Higher Education Strategy Associates, May 8, 2018, https://higheredstrategy.com/futureskills-lab.

immigrants, women, Black, Indigenous and people of colour, and persons living with disabilities – will be especially important in ensuring that the taxonomy is useful to the end-user. The lived experience of these groups would help ensure that the taxonomy reflects what people actually need, and ultimately assist in its success.

Ideally, the skills taxonomy should comprise a mix of the following:

- Formally defined skills, such as critical thinking and active learning.
- Other work requirements centred on areas of knowledge, for example, anatomy and carpentry.
- Tools and technology, for example, forklifts or the Python programming language.
- Workplace requirements, such as irregular hours, and lifting and bending.

Many of these skills and work requirements are already elements in Employment and Social Development Canada's Skills and Competencies Taxonomy and the Occupational and Skills Information System (OaSIS) project, which is an important effort to develop a pan-Canadian system linking skills to occupations. Both could serve as a useful starting point for a taxonomy specifically designed to map skills to training and educational programs.

The taxonomy must also take into account Canada's two official languages. It is crucial not only to devise a common understanding of terms, but to agree on what the equivalent term is in the other official language.

Indeed, the value of the taxonomy developed through this process is practical usability: Are the proposed skills and other work requirement categories meaningful enough for Canadians to make informed decisions about specific training programs? On a practical level, training programs must be able to fulfill the skills and work requirements listed – but that is a separate issue discussed in more detail below.

Phase 3: Map programs to skills

Create indicators to measure skills developed through training programs

The link between training programs and skills will be made via indicators – descriptors containing information on whether a skill can be obtained in the course of the training program. An indicator will contain a value assigned to each skill in the taxonomy for each training program or course linked to that skill. This value could be binary ("yes"/"no") as in the European Skills, Competences, Qualification and Occupations system to link skills with occupations; or it could be ordinal ("low"/"medium"/"high") as in the US O*NET system.

O*NET uses two indicators to map skills to occupations. Every occupation is assigned a value for the importance of each of the 35 skills, as well as a value for its level of complexity. For example, the O*NET system rates social perceptiveness – a social skill – as being more important for registered nurses than for, say, economists, as indicated by the importance ratings of 78 out of 100 for nurses and only 47 out of 100 for economists. The complexity ratings tell us that nurses' tasks that require

social perceptiveness are also more complex than those of economists (complexity ratings of 63 and 41 out of 100, respectively).[24]

A wide variety of other indicators can be used, for example, the proportion of graduates with budgeting skills at a specific level or higher; or the average improvement in skill gained through a course. Consultation with users and training providers would determine which indicators best suit Canada's needs.

Measure the skills developed through training programs and courses

The most difficult step in the mapping process may be to determine whether an education or training program delivers on its promise to develop a specific skill. Matching expectations with outcomes is at the heart of the mapping exercise and must be both accurate and credible. While close collaboration with training providers is essential, they have a strong incentive to link their programs with the largest possible set of skills, and the highest possible level of the skill development.

Balancing collaboration with the need for unbiased measurement of the skills promised by specific programs is sure to be a never-ending challenge. The greatest risk to the mapping process is that training providers come to view the rankings either as an advertisement for their programs that they can freely manipulate, or as an unfair and/or inaccurate value judgment, as has often been the case with Maclean's annual rankings of Canadian universities. Ultimately, the fear of being ranked poorly will likely dissipate if the mapping to skills has a large enough user base to incentivize widespread participation by program providers.

These concerns highlight the importance of designing a mapping system that is as functional, reliable and informative as possible. One approach to ensure quality in the early stages would be to involve a third-party assessment and validation of proposed listings. Another, as we described earlier, would be to rely on frequent validations by the system's users. Other options may emerge during the consultation process.

However, it would be extremely difficult to come up with an accurate assessment of skills that can be developed through training. Such a system would likely require testing students' skills both before and after they undertake a program, clearly a time-consuming and costly exercise. A more realistic approach may be to start only with program providers reporting the top five or ten skills and other work requirements that participants can expect to develop. This narrower, more limited approach could help simplify the challenging and potentially controversial process of linking skills outcomes to a large number of specific programs.

If the database is to be more than an interesting academic exercise, it needs to contain far more information than a list of skills linked to program names and providers. Giving priority to the needs of end-users is essential. They will surely expect information on,

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[24] Labour Market Information Council, Employment and Social Development Canada, and Statistics Canada, "Through the Looking Glass: Assessing Skills Measures Using 21st Century Technologies," LMI Insights no. 32, June 2020, https://lmic-cimt.ca/wp-content/uploads/2020/06/LMI-Insight-Report-no-32-3.pdf.

among others, the location of study, cost of enrolment, time commitment, and whether the program can be done part-time or partially completed.

Ensure information is up to date

Data on programs and specific skills must be regularly updated and verified. One approach would be a wiki-type interface, in which training and education stakeholders can easily update their information as programs change. This would require some kind of quality assurance check, and guidelines on precisely what information can be updated.[25] For example, it would make sense for training providers to update program names, costs and other logistical information, but it is less clear whether or how they could update the skills linked to their programs. Updating the linkages to skills would depend on the chosen skills indicators and measurement method. The design of the indicators should thus take into account the feasibility of straightforward, regular updates to skills information.[26]

Principles for a successful training system map

We have identified five key principles for effectively mapping the education and training system to skills:

1. *Skills indicators linked to education and training programs will be effective only if they are accurate and relevant.* In other words: Does program X actually develop skill Y? Does this information help users decide whether or not to enrol in program X? Unfortunately, skill indicators with these attributes are not readily available in Canada.[27] In the short term, simple skills indicators such as a list of the top five skills that can be developed by taking a certain course would obviate the need for a more complex system measuring, say, the level of skill development. Whatever form the skill indicators take, they will have to be continuously improved based on user feedback. As we see it, more detailed skill measurements can be designed only after an extended period of trial and error to assess user preferences.
2. *Common skills taxonomies should be used to facilitate connections to other skills information resources.* This principle is based on the same reasoning as the recommendation for a common framework for employers' work requirements.
3. *All relevant non-skills information needs to be made available, including provider, program location, duration, cost, time commitment, flexibility of arrangements, and so on.* The relevance of non-skills information can be determined through surveys, focus groups or product testing.

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[25] This means that training providers and educational institutions would enter or edit their information directly on the platform so that multiple users can provide relevant information, in much the same way as Wikipedia is organized.

[26] Some form of human-assisted machine learning could help with this. For example, Mechanical Turk, a crowdsourcing website used by businesses to hire remote workers for very specific tasks, conducts similar research on skills. Researchers post specific questions through this platform, which are then answered by the remote workers, as with a survey.

[27] Labour Market Information Council (LMIC), "Is This a Skill Which I See Before Me? The Challenge of Measuring Skills Shortages," LMI Insights no. 14, June 2019, https://lmic-cimt.ca/wp-content/uploads/2020/01/LMI-Insights-No-14-2-1.pdf.

4. *Data should be open and accessible to facilitate development of the widest pos-sible variety of platforms (websites, mobile apps, search tools, and so on) to meet the needs of different users.* This means that the database of training-linked-to-skills in-formation must be developed independently of delivery platforms so that the archi-tecture can take account of the different ways in which users process information.

5. *Information must be up to date.* All these principles will count for little if the train-ing and skills mapping system is not kept up to date. Whatever the initial linkage between a specific training course and the skills related to it, that information will soon be of little or no value if the system does not include a carefully designed process to keep it current. This applies both to program-specific information such as changes in costs, new programs being made available and stylistic changes in names, as well as to the linkages to a program's expected skill outcomes.

WHERE TO START?

Mapping the Canadian training system will be a massive undertaking. We believe that the best way of getting a project of such magnitude and complexity off the ground is to start with a pilot project. Given that the ten provinces have primary jurisdiction over education and training, the pilot would ideally involve just two or three of them. These provinces would then share with other provinces the lessons they learn and improve-ments they make that could be incorporated into future iterations of the project. Or-ganizations providing training, education and career guidance in the pilot provinces would need to be identified and brought on board. In order to keep the pilot to a manageable scale, it could prioritize mapping of training and educational programs for a specific target group, such as mid-career workers.

As mentioned above, several countries already have experience with online platforms. It would thus make sense for the Canadian pilot to include a research component centred on lessons to be learned from Singapore, the UK, the US and other international players.

Working within the three-phase framework described in the previous section, the pilot project would include the following steps:

- Identify key players in each province involved in funding, monitoring and administering training and education. These players would include provin-cial ministries and third-party organizations funded by the province; federal departments and agencies responsible for running programs directly; and pri-vate sector entities working in the province.
- Use formal and informal networks to create a comprehensive list of education and training programs (not skills) for which mid-career adults are eligible. This could take the form of two-way communication with the relevant training or-ganizations, wider surveys sent to those with knowledge of training programs, or other, more imaginative approaches to gathering raw data.
- Survey key players and related information to gather feedback on the initial skills linked to training programs, with an emphasis on the accuracy of these linkages.

- Update the list of training programs, and link each to the validated list of associated skills.
- Evaluate the linked list of training programs and associated skills to identify common themes or clusters. One example would be the time needed to complete a program. This research would focus on validating the consistency of the linkages Thus, two similar programs should not be connected to vastly different skill outcomes, unless there is a clear reason for doing so.
- Design a pilot version of the website, app or other interface.
- Test the list and interface through a series of focus groups comprising members of the chosen target group, in this case, mid-career workers.

These tasks underscore the importance of close collaboration among a variety of players if the mapping project is to get off the ground successfully. We are confident that the benefits to be reaped will be well worth the effort.

TIME TO MOVE FORWARD

Mapping skills to Canada's rich and diverse system of training will produce incalculable gains by reducing the time and energy needed to navigate the current patchwork of information spread across websites, brochures, articles and personal anecdotes.

Creating the three components of this mapping – a database of training and education programs; a meaningful taxonomy of skills and other work requirements; and the linkages between the two – is a massive undertaking that no one organization can tackle by itself. The scale of the project, combined with its complexity and the need for transparency, calls for a process that brings together all levels of government, nonprofit organizations, public and private education providers, and potential users. Furthermore, for the mapping to be a trusted source of information, it needs to be developed and maintained in a transparent way.

Given some of the complexities of sharing information between federal, provincial and territorial governments, it will be important to build a coalition that brings together a wide and diverse group of players able and willing to share and jointly coordinate such an endeavour. Thankfully, a number of organizations in this field already work collaboratively across jurisdictions. They include the CMEC, the Forum of Labour Market Ministers, the LMIC, and the Future Skills Centre as well as ministries responsible for education and training within the provinces.

This paper is a call to action for these and other organizations to convene and assess the scope and initial resources required to undertake a pilot project to generate practical insights as to how to move forward with a comprehensive mapping of Canada's training ecosystem. We believe there is little to lose and much to gain on behalf of the millions of individual Canadians and tens of thousands of businesses that would benefit from such a valuable service.

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