LMi INSIGHTS

The Future of Work in Canada: Bridging the Gap

Key Findings

- A review of recent reports on the future of work, with a focus on Canada, reveals several important gaps in terms of the insights and information that Canadians, policy makers and stakeholders need to make informed decisions.

- Our analysis has identified the following major gaps in the prevailing literature:

  - Examinations of the complex interrelationships between the major drivers of the future of work are limited;

  - Research often presents single trajectory forecasts with few, if any, scenario analyses;

  - Studies are predominantly national with limited provincial/territorial or sub-provincial findings; and,

  - Specificity as to what skills will be needed and how to share the responsibilities of upskilling workers to prepare for the future of work is lacking.

- LMIC will work with its stakeholders to close gaps in these key areas and develop a framework for research and analysis on the future of work. This will include an evaluation of new methods and best practices for the collection and distribution of labour market information in a timely manner. It will also aim to illustrate the interconnected nature of the changes taking place and the information and insights needed to assess their implications in a meaningful way.

Introduction

The future of work is a topic of great interest among policy makers and stakeholders. In recent years many initiatives have been launched in this area including, for instance, the University of Toronto's Faculty Initiative: The Future of Work, RBC Future Launch, Public Policy Forum

and TD Bank Group's Future of Work strategic partnership, and Canada Beyond 150's Socio-Economic Inclusion and the Future of Work initiative. Growing interest in the future of work has been driven by increasing concerns related to potential job losses and labour market

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disruptions associated with recent technological advancements such as robotics and artificial intelligence (AI).

However, recent technological advancement, while important, is only one of the "mega trends" that will impact the future of work. Others include:

- **Demographic shifts** leading to an aging workforce, increased retirements and slowing or declining labour supply;

- **Climate change's** range of effects on different sectors, workers and Canadian regions;

- **Financialization's** influence on investment types, income distribution and a changing demand for specific skills sets; and

- **Uncertain trade patterns'** impact on supply chains, production, industry composition and related jobs.

Each of these broad areas has the potential for disruption and brings unique policy challenges, opportunities and uncertainties – all of which are compounded by their complex interrelationships.

How Canadians adapt to the future of work will be determined by their perceptions and expectations. Clearly, having informed and comprehensible insights is essential but, as it stands currently, the lack of a shared understanding of the risks and opportunities of the future of work is creating confusion. Given the recent emphasis in the literature, we focus here on three of the mega trends: (i) technological advancement, (ii) demographic shifts and (iii) climate change.[1] We review the latest research in these areas with a special focus on the implications for Canada. A brief overview of the issues surrounding these mega trends is presented in Table 1.

This issue of *LMI Insights* is an initial foray into the future of work. It aims to add clarity to the prevailing evidence in the areas noted above and to hone in on the current gaps in labour market information, as addressing these gaps will help to ensure policy makers and stakeholders are better equipped with the tools and insights they need to shape the future of work.

Research gaps in the future of work for Canada

In our review, we examined a total of 38 reports and, while our focus was on Canada, we included a number of key reports with an international dimension.[2] The first step was to systematically assess the structural approaches taken in the vast array of studies. This exercise revealed the following gaps:

- *Limited thematic areas*: Three-fifths of the Canada-specific studies focus on the impacts of technological advancements such as AI. The remainder address climate change or demographics. While some reports mention multiple mega trends, none explicitly consider the interactions among these mega trends.

- *Inconsistent approaches*: Differing methodologies, metrics and definitions limit comparability across studies, even in similar subject areas. Although a wide variety of interdisciplinary methods can strengthen the overall analyses, it can make actionable insights difficult to discern.

- *Single trajectory forecasts*: While the bulk of studies include some quantitative analysis, few present confidence intervals or scenario analyses. For example, only one Canadian report considers different scenarios for its analysis.

- *Limited granularity*: Only a quarter of the Canadian-focused reports include labour market forecasts at the provincial level, and only two studies provide insights at some sub-provincial level.

The three main future of work themes and the findings from the literature are discussed in greater detail below. An exhaustive review of the literature is not the objective here. Rather, the goal is to focus on the recent evidence from reports related to these mega trends, as they pertain to the future of work in Canada (see also Table 1).

Table 1: Summary of mega trends analyzed in the literature

Mega Trends	Examples of Potential Impacts	Number of Studies
Technological Advancements • Automation of production • Artificial intelligence (AI) • Digitization • Robotics	• Widespread and/or rapid job loss • Restructuring of existing occupations • Emergence of new jobs and careers • Increased demand for advanced technical and "soft" skills • Falling demand for routine and mid-skill jobs • Shifting business models	25
Demographic Shift • Aging population • Increased average age of workforce • Migration and immigration • Urbanization	• Loss of high-skilled workers (esp. those with soft skills) • Budgetary challenges due to smaller tax base (higher old-age dependency ratio) • Economic growth constrained by labour and/or shortages	17
Climate Change • Higher average temperatures • Increased intensity of extreme weather events	• Lost productivity due to extreme weather • Changing distribution of sectors dependent on climate (e.g., agriculture and tourism) • Challenges for carbon-intensive sectors and worker displacement • Increased investment in "green" sectors • New jobs and careers to emerge, including new skill requirements	4

Note: Although 38 reports were reviewed, the thematic numbers do not add to the totals because some reports discuss multiple themes.

Source: LMIC's Future of Work: Annotated bibliography, version 1.

Technological Advancement

Two central themes emerged in the literature on technology: (i) the substitution versus complementarity of jobs and machines; and (ii) the shifting composition of skill requirements. The latter area is a particular challenge that we will address in greater detail in a future *LMI Insights* on labour shortages, skills shortages and mismatches.

1. *Substitutability or complementarity of technology and its impact on jobs*

Arguably the most important aspect of new technologies' impact on the labour market is the potential for large-scale job losses. The controversial question is whether machines will substitute (i.e., replace) human labour and create widespread unemployment, or if they will complement workers' tasks and increase labour productivity without widespread layoffs. There are two dominant schools of thought regarding this issue.

In the first school of thought, automated processes and machines will be substituted for workers in large numbers. The classic study in this area is Frey and Osborne (2013). They find that recent developments in automation put 47 per cent of total U.S. employment at "high risk" of being replaced by technology.

A second school of thought suggests automation will replace only a relatively small share of jobs in their entirety. Rather, instead of being substituted for machines, most occupations will be restructured and, in many instances, only certain tasks of each job will be automated. Restructuring can occur within a job's current context (e.g., using text scanning algorithms to aid paralegal research), or it may imply changing work routines and new employer/employee relations even though core tasks remain unchanged (see Box 1). Regardless of what path restructuring follows, Arntz et al. (2017) argue that on average only 9 per cent of

total employment in the OECD countries are at high risk of being fully automated (see also Kim et al. (2017)). Likewise, a study by McKinsey Global Institute (2017) finds that less than 5 per cent of occupations in the U.S. are fully automatable, and that only around half of work activities are at risk of automation. Of course, all note that a range of other factors, e.g., government intervention and corporate behaviour, will determine the pace and location of automation and job loss.

In the Canadian context, Lamb (2016) applies the models of both Frey and Osborne and McKinsey to Canadian data. He estimates that 42 per cent of the Canadian labour force is at high-risk of being affected by automation within the next 10 to 20 years. That does not imply 42 per cent of jobs will be entirely lost, rather it means that workers will need to acquire new skills to adapt to the changing nature of job requirements (see below). Based on Lamb's estimation, 36 per cent of Canada's labour force is employed in high-skilled occupations with a low risk of being affected by automation. The report concludes that Canadian jobs involving routine tasks, which are mostly done by low-skilled workers, are highly susceptible to automation. And, even here, these jobs may be only restructured not eliminated entirely. Another Canadian study by Oschinski and Wyonch (2017) shows that industries where more than three-quarters of the jobs are at high risk of automation account for only 1.7 per cent of employment.

Overall, results of the studies discussed above suggest that different methodologies lead to significantly different predictions as to the susceptibility of jobs to automation. And, while Canada appears to be in a relatively strong position to handle the coming technological changes, it will be important to continually monitor and assess the broad and burgeoning research related to automation and labour market impacts.

2. *Upskilling workers to prepare for technology's effects*

The second dimension of technology's impact is the effect of technology on skills requirements for newly created jobs. The central question here is whether workers will have the proper skills and qualifications that the jobs of the future will require (Hewitt, Business Council of Canada, 2016).

Deloitte's (2017) report emphasizes that automation will change the nature of qualifications and of the skills needed to perform jobs. They define eight models based on what they call "future-proofed" skills. Within each one, multiple occupations are identified as high-risk or low-risk of being lost to automation, depending on the skill set associated with those occupations. In a similar exercise, RBC (2018) assesses 300

Canadian occupations and their related essential skills and suggests that demand for workers with management skills who display strong critical thinking (referred to as "solvers") and for workers with strong analytic abilities (referred to as "providers") is expected to increase the most. They estimate that the Solvers and Providers will comprise 45 per cent of working Canadians by 2021.

The Advisory Council on Economic Growth (2017) estimates that technological advancements will threaten more than 10 per cent of Canadian jobs. To ensure Canadians will have the right skills and capabilities to benefit from the opportunities created by technology, the Advisory Council expects that the annual expenditure on training and post-secondary education will need to increase by approximately $15 billion.

To complement post-secondary education, Lamb and Doyle (2017) argue that employers should provide training programs to current workers in order to equip workers with the skills required to adapt to the changing world of work. Such efforts from employers will be more successful if supported by public policy action. This includes investing in technology research and development, creating a culture of lifelong education, promoting flexible training programs and facilitating collaboration between businesses and post-secondary schools (Lamb and Lo, 2017).

Demographics: Aging Population

Many countries, including Canada, are confronted with aging populations and declining workforces. While the post-World War II baby boom led to large increases in population and labour supply, the subsequent "baby bust", i.e. lower fertility, is one of the underlying causes of slowing labour force growth. In parallel, in recent years, Canada has seen a rapid increase in the proportion of persons aged 65 and over. As the outsized generation of baby boomers begin to retire, the overall supply of

workers is being dragged down (Fields et al, 2017).

This demographic shift is expected to create several economic and social challenges, including an increase in age related public expenditures such as health and long term care spending, changing patterns of savings and consumption, a reduction in the tax base and lower GDP per capita growth driven mainly by the slowdown in labour force expansion. In fact, some argue the primary challenge of an aging population is how to adjust labour supply in order to mitigate the impact on Canada's economy (see ILO, 2018a). Indeed, future projections of labour demand in Canada show a total of 4.4 million job vacancies stemming from demographic shifts versus only 700,000 created from economic expansion (McDaniel et al., 2015). This is likely to spur concerns over labour and skills shortages, an issue we will address in a forthcoming issue of *LMI Insights.*

A key research question will be how best to develop and implement a range of strategies aimed at improving productivity, increasing labour supply through effective immigration and encouraging more labour force participation among under-represented groups, including older workers, Indigenous people and other groups.

Climate Change

Climate change is a global phenomenon which will have considerable impacts on employment, growth and income distribution. These impacts will vary significantly across geographic regions and economic sectors, yet the overall impact could be enormous. A federal government study estimates that, without abatement and mitigation efforts, climate change will cost the economy $21-$43 billion annually by 2050 (Environment and Climate Change Canada, 2016).

There are also risks and opportunities associated with implementing policies to mitigate climate change. This is particularly important as Canada

is committed to tackle climate change through international agreements such as the 2015 Paris Agreement. A key principle of long-term climate policy is the "phasing out" of polluting industries and the expansion of environmentally sustainable, or "green" sectors. The impact of climate change in carbon-intensive and green sectors will depend enormously on the policy actions taken to curb climate change and promote a sustainable economy (Barbier, 2016).

An ILO (2018b) report estimates that the adoption of sustainable practices to mitigate climate change could create 18 million net jobs globally. And while an Environment and Climate Change Canada (2016) report highlights the potential for net-positive employment impacts in Canada, it cautions that the net impacts mask the extent of labour market disruptions. Indeed, this is true of all mega trends' labour market impacts.

This latter study points to the fact that, while greening the economy offers the promise of job creation, it is necessary to find well-balanced policies that will effectively support Canadians' transition to a low-carbon economy. In this respect, policies will need to be fine-tuned for each sector to balance the overarching policy goals with the multiple potential impacts on, for instance, employment, trade, productivity and innovation. A key challenge for research will be to better understand the link between policy design and the potential labour market, social and economic implications.

Way Forward

The three mega trends discussed above – technological advancement, demographic shifts and climate change – each represent large, complex areas of research. Moreover, research in each area is geared toward forward-looking analysis and prediction; endeavours that are replete with uncertainties and data limitations.

Yet one of the largest gaps found in our assessment is the lack of analyses on the combined impacts of the current mega trends. This is crucial as it is the full set of trends and their interactions that will impact labour markets and pose real-world policy challenges. These interactions will, in some cases, intensify separate impacts. In other cases, the interactions may work to mitigate negative impacts.

These interactions are far more complex than presented here, especially when other mega trends are taken into consideration such as climate change (which interplays with both technology and an aging workforce). As mentioned at the outset, other mega trends not discussed here include trade, financialization, business innovation, changes in education systems and more.

Table 2: An illustration of interactions and research questions: Technological advancement, demographics and climate change		
Interacting Mega Trend and Specific Outcome	**Technological Advancements**	
	Substitutability: Job losses	**Complementarity: Demand for skills and workers**
Demographics: Falling labour force participation	How does the decline in the workforce from aging stack up against job losses anticipated from technology?	How to mitigate the loss in human capital and labour supply incurred by older workers exiting the labour market?
Climate change: Increasing investments in green energy	To what extent can renewable energy sectors mitigate job losses in other sectors?	What competencies are required to meet the labour demands in a growing green sector?

A few illustrative examples of research questions surrounding the three mega trends in question are presented in Table 2. The table highlights that even the questions posed will differ, depending on: (a) what one believes will be the dominant impact of technology; and (b) which aspect of other mega trends will interrelate with technology's impact. In addition, the wide scope of research demands that a variety of scenarios of varying likelihood should be assessed.

Policy choices in all of these areas will play an important role and will, in some cases, drive outcomes.

Although the need to study the complex interactions between mega trends is essential, it is important that such efforts also bridge the other gaps mentioned above. In the Canadian context, this means greater attention needs to be paid to provincial- and sectoral-level impacts, and how the responsibilities of

upskilling workers will be shared among various levels of government, private-sector firms and other actors. Further, policy makers should be fully aware of the uncertainties and caveats surrounding any forward-looking analyses. The development of multiple scenarios is a helpful tool to communicate the caveats of forecasting the future of work.

As a first step in addressing these gaps, LMIC is working with its partners and stakeholders to develop a framework to analyze the interactions between technological advancement and demographic shifts. The focus will be on the most granular analysis possible and should include the development of several scenarios for consideration.

While much remains to be studied and analyzed, this issue of *LMI Insights* provided a review of the many reports in recent years on the future of work in Canada and documented key gaps in labour market information and insights in this evolving and topical subject area. A fuller summary of reviewed reports are available in our annotated bibliography available on our website.

Acknowledgements

References

All references mentioned in the text can be found in the Labour Market Information Council's Annotated Bibliography – Future of Work (August 2018).

Endnotes

1. These three mega trends are chosen because they are the most commonly addressed in the recent literature surrounding the future of work. Although, as discussed below, technology and automation dominate the future of work discussion, demographics and climate are important parts of the emerging dialogue. The other trends, while important, figure into the larger debate to a much smaller extent and are beyond the scope of this issue of *LMI Insights*.

2. As of August 2, 2018, 38 reports were reviewed (26 focused specifically on Canada and 12 were non-Canadian).