Future of work and higher education in Canada, 2021

Karla Barcellos   6/10/21

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To understand the future of work and education, we first must know the trends in the indicators that direct its evolution. It is known that the dynamics between education and work are highly related to the curricular design of academic programs. The programs in essence must respond to the social, economic, and cultural needs of the locality, region, country, and international plans. The intrinsic link is that the educational offer responds to demographic, social, economic, and cultural demands. The great disruption for the future of work and education did not come for a big technological change, non for a big demographic revolution. It came because of a pandemic that hit the world at an unexpected moment.

In March 2020, governments around the globe declared a state of emergency to support the response to the global COVID-19 pandemic, calling for unprecedented stay-at-home and social distancing measures to ensure the safety of citizens. COVID-19 social distancing rules led to an acceleration in the process of technological adaptation, which forced the markets to expand and open their services, adapting them so that they were accessible and online friendly (Budd, et al., 2020).

Canada's COVID-19 related total deaths have been 23,965 so far. On a per capita basis, fatalities have been below most of the countries, and they were below the United States until the second week of April of 2021. Canada's mass vaccination began in December 2020 and plans to vaccinate every Canadian that wants by September 2021, starting with the older people. This is important after that around 90% of these deaths were among those aged over 70 years.

1. Economic Outlook

Canadian economic activity has improved in the recent months despite the introduction of tighter containment measures, reporting a GDP increase of 2.3% in the last quarter of 2020, and 0.7% in January 2021, although still 3% below pre-pandemic levels (Statistics Canada, 2021). The industries that supported the growth were retail trade, construction, real estate, and rental and leasing. They have benefited from increased business inventories, the ongoing recovery in exports, more investment in machinery and equipment, and higher government spending (Statistics Canada, 2021). Also, there has

been strong momentum in the housing market but there are concerns about the risk of a bubble, given the exposure of the Canadian banking system to home loans (Axios Capital, 2021).

By industry, goods and services production were up in January 2021, but the 20 industrial sectors were split between expansions and contractions. From January 2020 to January 2021, the industries most affected were arts entertainment and recreation, while the most benefited was the cannabis sector. However, as a contribution to the percentage change in GPD retail had the most negative contribution and wholesale was led on the positive side.

For the monetary side, at the beginning of the pandemic the Bank of Canada cut its policy rate to 0.25% and has supported the economy with some other measures that provide liquidity support.

The pandemic also affected the CPI inflation, in recent months it has risen to the low end of the target range (1-3%), while core inflation is still below 2%. The fall in prices of components such as gasoline and hotel accommodation as well as airfare have continued to hold down inflation. Excess supply is expected to control inflation through the projection period and return to the 2% target in 2023 (Bank of Canada, 2021).

Canadian consumer confidence rose to a new record in March as vaccine rollouts accelerate across the country and the nation's housing market booms. The Bloomberg Nanos Canadian Confidence Index jumped to its highest reading since polling began in 2008. Confidence has also strengthened in business. Many firms consider they have overcome the impacts of the pandemic on their activities and now expect an increase in domestic and foreign demand, compared to last year's low levels. Consumption will gain strength with improvement in confidence, and the reopening of parts of the economy, and rising foreign demand will support exports and business investment. Still, some businesses tied to high-contact services continue to report weakness in demand (Bank of Canada, 2021).

The pandemic has raised the yields in Canada and US. Since the beginning of 2021, US Treasury yields, and Government of Canada, or "GoC", bond yields have been moved higher, after the expectations of this happens. Since January of this year, "GoC" 10-year

bond yields have moved over 80 basis points, now trading at 1.47%. These represent substantial moves, especially given that we are only one quarter into 2021.

Finally, Canadian investors acquired 10.5 billion of foreign securities, mainly from the US stock market. Foreign investment in Canadian securities reached 8.5 billion, comprised mainly of Canadian stock market shares. Activity reflected strong foreign investment in corporate securities, moderated by a continued large divestment in government securities (Statistics Canada, 2021).

2. **Labour market conditions**

The economic impacts of the second wave have been uneven across the provinces, though a uniform theme has been resilience. Provinces with greater restrictions, including Ontario, Quebec, and Alberta have suffered larger employment setbacks (TD Bank, 2021).

Over the past five years, the unemployment rate in Canada dropped to its lowest point in 40 years. However, the fast COVID-19 outbreak and the measures to contain its spread harmed the services side of the economy. Unemployment then spiked sharply in the second quarter of 2020, particularly in the hospitality, tourism and airlines industries that have seen massive layoffs (IBISWorld, 2021).

As the economic growth, the impacts in the employment are different by province, while it rebounds in Quebec and Ontario, it increases in British Columbia, and Alberta. Employment increased in seven provinces in March, including Ontario and Quebec.

The pandemic limited the last years' improvement in job creation. The unemployment rate fell 0.7 percentage points to 7.5% the lowest since February 2020. In March 2021, employment rose 1.6% and was within 1.5% of its pre-COVID February level. Employment among youth aged 15 to 24 rose by 5.0%, mainly in part-time positions. Despite this improvement, young women have been facing challenges.

By industry, the employment rate in 2020 was like 2016, canceling out the progress made in the 2017-2019 lapse. Employment in retail trade and accommodation and food services increased after lifting the restrictions on non-essential stores in many regions. February employment increases were concentrated in low-paying jobs, with less growth in the information, culture and recreation industry, where the fall was steady from September

2020 to January 2021 (Statistics Canada, 2021). Indeed, the latter had the worst effect on the unemployment rate in addition to the accommodation and food services industries.

Canada's economy had a strong growth rate through to late 2020, but the resurgence of cases and the reintroduction of lockdown measures lower the expectation for the first quarter of 2021 to be in the negative side (Bank of Canada, 2021). After a decline in real GDP of 5.5% in 2020, the Bank projects a growth by 4% in 2021, almost 5% in 2022 and around 2.5% in 2023 (Bank of Canada, 2021). Close to 80% of jobs lost during last year's recession have been recovered and unemployment rate stood at 8.2% in February (Canada, 2021). This agrees with TD Bank's forecast of growth in real and nominal GDP for Canada and provinces, and the expectation of employment recuperation and a slow growth rate in unemployment (6.1% in 2022).

However, we must consider downside risks like a possible third wave of infections, vaccine inefficacy and slower rollouts, social unrest due to inequality and premature withdrawal of policy support. On the other hand, better news on vaccine manufacturing and effectiveness, more widespread distribution to emerging markets and, more fiscal support than currently envisaged (TD Bank, 2021).

Also, the U.S fiscal stimulus programs and progress in vaccination should indirectly benefit the Canadian economy propelling provincial exports. (TD Bank, 2021). Some provinces are also reaping the benefits of a commodity bull market. Indeed, the solid bounce back in the WTI benchmark price above the US$60 provides much needed respite for Alberta (TD Bank, 2021).

3. Population characteristics and Immigration Dynamics

In the last 20 years the Canadian population has grown substantially, increasing from 30.7 million in 2000 to 38.1 million in 2020. During this last year, the population increased by 149,461 (+0.4%) to reach 38,048,738 on January 1, 2021, about one-quarter of the growth seen in 2019 (575,038 or +1.5%) (Statistics Canada, 2020).

In 2020, Canada welcomed 184,624 immigrants, down by almost half from 2019 and the lowest in any year since 1998. The pre-pandemic target for immigration set by Immigration, Refugees, and Citizenship Canada was 341,000. The decrease in the

number of non-permanent residents caused by COVID-19 played a major role in the slower growth in 2020. More non-permanent residents left Canada than came to the country in 2020 (-86,535)—the largest net loss since comparable data have been available (Statistics Canada, 2020). The population pyramid in Canada passed from the natural increase to the migratory increase as main driver of population growth and Seniors outnumbering children in Canada and it is expecting that the number of Seniors outnumbering children in Canada.

In the other hand, the international migration accounted for 81.9% of population growth in 2019/2020, but border restrictions due to the pandemic had the largest impact on population growth in the same period. Canada admitted 284,387 immigrants in 2019, down from 2017/2018 and 2018/2019 when over 300,000 were admitted annually before travel restrictions, with 34,271 arriving in the second quarter of 2020. The number of non-permanent residents rose by 77,172 in 2019/2020, less than half as 2018/2019 (+168,662), due to fewer study permit holders and asylum claimants in the same period (Statistics Canada, 2020).

IRCC has presented a 3-year Immigration Levels Plan for yearly admissions since 2017. It was developed in consultation with provinces and territories, stakeholder organizations and the public. Applicants are selected based on categories of economic contributions; family reunification; support for refugees, protected persons and humanitarian compassionate needs. The 2021-2023 Plan has been developed considering the evolving situation of COVID-19 and its implications for permanent resident admissions. The projected admissions are 401,000 for 2021, 411,000 for 2022, and 421,000 for 2023 (Immigration Refugees and Citizenship Canada, 2019).

4. Global and Canadian student demand.

Between 2009 and 2019, the share of 25-34-year-olds with a tertiary degree increased in all OECD and partner countries. In Canada, the share increased by 7 % during this period, lower than the OECD average of 9%. In part, this likely reflects the already high proportion of Canadians in 2009 with tertiary education. In 2019, 63% of 25-34-year-olds had a tertiary degree in Canada compared to 45% on average across OECD countries (OECD, 2020).

From the gender perspective, younger women are more likely than younger men to achieve tertiary education in all OECD countries. In Canada, 71% of 25–34-year-old women had a tertiary qualification compared to 55% of their male peers, while on average across OECD countries the shares are 51% of younger women and 39% of younger men (OECD, 2020).

Young people can face barriers to labour market entry as they leave school and start looking for work, but higher educational attainment increases their chance of being employed and to earn higher incomes. On average across OECD countries, the employment rate in 2019 was 61% for 25-34-year-olds without upper secondary education, 78% for those with upper secondary or postsecondary non-tertiary education as their highest attainment and 85% for those with tertiary education. In Canada, the shares are 57% for below upper secondary, 79% for upper secondary or post-secondary non-tertiary and 86% for tertiary attainment. Having a tertiary qualification also carries a considerable earnings advantage in most OECD and partner countries. In Canada, in 2017, 25–64-year-olds with a tertiary qualification with income from full-time, full-year employment earned 39% more than full-time, full-year workers with an upper secondary education compared to 54% on average across OECD countries (OECD, 2020).

International student mobility has been expanding quite consistently in the past twenty years. In 2018, 5.6 million tertiary students worldwide had crossed a border to study, more than twice the number in 2005. In Canada, the share of foreign or international students increased from 10% in 2014 to 14% in 2018. Meanwhile 3% of Canadian tertiary students have enrolled abroad compared to 2% in total across OECD countries. English-speaking countries are the most attractive student destinations overall in the OECD area, with

Australia, Canada, the United Kingdom, and the United States receiving more than 40% of all internationally mobile students in OECD and partner countries. Among students leaving Canada to study, the most popular destination country is the United States (OECD, 2020).

International students increasingly contribute to Canada's postsecondary landscape. Over the past decade, from the 2009 to 2019 academic period, enrolments for Canadian students in formal programs grew by 10.9% (from 1,486,602 to 1,648,923). Over the same period, the number of international students more than tripled from 101,304 in 2009 to 318,153 in 2019. As a result, over a decade, the proportion of international student enrolments changed from 6.4 to 16.2% by 2019 and represented 57.2% of the total growth in all program enrolments. The international students originate from 225 countries, with over half from China and India. Two-thirds of international students were pursuing a credential at the bachelor level or higher; the most common field of study was business, management, and public administration (Statistics Canada, 2020).

From 2001 to 2019, the most common major field of study for adults aged 25 to 64 with either a college diploma or university degree was 'business, management, marketing, and related support services (Statistics Canada, 2021).

5. **Global and Canadian labour market demand**

Talent availability and the labour cost were the main factors setting job location, technology adoption and emerging job roles in Canada and United States in 2018. The job roles that emerged that year were Software and Applications Developers and Analysts, Data Analysts and Scientists, Managing Directors and Chief Executives, General and Operations Managers, Sales and Marketing Professionals, Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products, Human Resources Specialists, Financial Analysts, Electrotechnology Engineers, and Financial and Investment Advisers (World Economic Forum, 2018).

According to a recent survey, companies have included in their activity's new technologies and areas of knowledge related to information and software. The survey says that 88% of the companies adopted the use of big data analytics, 78% Internet of Things, more than 50% also adopted technologies related with app and web-enables markets, machine

learning, cloud computing, augmented and virtual reality, digital trade, encryption, new materials, wearable electronics, and blockchain (World Economic Forum, 2018).

In average, the most emerging roles between 2013 and 2017 in Canada and United States were the real stated agent, software engineer, marketing specialist, manager, and recruiter, driver, data analyst, account executive, finance analyst, human resources specialist. The most declining roles in the same period were administrative assistant, salesperson, customer representative, lifeguard, administrative office manager, manager or retail, editor, sports instructor, food and beverage server, and chef. (World Economic Forum, 2018).

In 2020 the global demand for positions as data analyst and scientists, AI an ML, and Big Data Specialists continued increasing, while data entry clerks, administrative and executive secretaries decreased (World Economic Forum, 2020).

In British Columbia, 2019 projections for the next 10 years show an increase in job openings in the food services and drinking places, hospitals, business, building and other support services, and health care, computer systems design and related services, oil and gas extraction (and their support activities). The motion picture and sound recording industries have the most growth with a rate of 3.6%. Nursing and residential care have an expected rate of 3.2% (British Columbia, 2019).

B.C.'s forestry sector is in a period of adjustment largely driven by a shift in the annual timber supply down to a more long-term sustainable level. The forestry sector is comprised of four industries: Forestry and Logging; Support Activities for Agriculture and Forestry; Wood Product Manufacturing; and Paper Manufacturing. Together these industries are expected to reduce employment by 1 percent per year over the next 10 years, after which employment is expected to stabilize in line with a lower, but sustainable, annual timber supply (British Columbia, 2019).

In British Columbia, the projections show that the top decreasing job openings are related with retail trade, repair, personal and non-profit services, wholesale trade and finance. The sectors with worse negative rate of growth for the next 10 years previsions are paper manufacturing (-1.8%), forestry and logging (-1.7%) and fishing, hunting, and trapping (-1.6%) (British Columbia, 2019).

6. College education and labour during COVID-19

In 2020, most young Canadians aged 15 to 19 (80%) were in school. A higher proportion of young adults aged 18 to 24 were in school (49%) were in school than the 38% who were employed. Among adults aged 20 to 24, the proportion being employed increased to 44% while 42% are still in school. For those in the 25- to 29-year-old age group, most (72%) were no longer in school and were employed.

Trends in on-time and extended-time high-school graduation rates. High school graduation is the foundation for further education. It has become an essential milestone for students and provides economic and social benefits for society. Graduation from high school is now widely considered the minimum requirement for successful entry into the labour market. In 2016, the high-school graduation rates in Canada for students who completed high school within three years of entering Grade 10 ("Secondary 3") was 79% while the extended-time graduation rate was 88%. A larger proportion of females (83%) completed high school in the expected time than that of males (75%). The extended-time graduation rates ranged from 83% in Alberta and Quebec to 94% in Newfoundland and Labrador. This pattern is observed in all provinces and territories. (Statistics Canada, 2020).

Finally, about the employment by education and their COVID effects, all unemployment rates by educational level almost doubled, for all levels. The general rate went from 5.7% to 9.5%. High school from 7% to 12%, some postsecondary education from 7.9% to 15.4%. People with a postsecondary certificate or diploma passed from 4.7% to 8.3% due the pandemic.

By province, the impact was different depending on the gender and region. In Ontario, while males with some postsecondary education observed a rate of 16.5%, women have an unemployment rate of 18.4%. The lowest unemployment rate was observed by people with a postsecondary certificate or diploma. In males, it passed from 5% in 2019 to 8.4% in 2020 and in females from 4.4% to 8.1%.

It is important to consider that there is a considerable number of recent college graduates with a previous bachelor's degree and college major field by educational pathway and sex. Some college students decided to be part of their institution's programs after

achieving their bachelor's degrees. Among recent graduates of Canadian college certificate or diploma programs, 14% had previously completed a bachelor's degree or higher: 9% had completed a bachelor's degree or higher at a Canadian postsecondary institution and 5% had completed a foreign bachelor's degree or higher. College graduates with a prior bachelor's degree—particularly younger ones—studied primarily in college programs that were related to their bachelor's degree, and they commonly found occupations that were also related to their studies. This shows that the bachelor's-to-college combination is typically not a case of one credential replacing another, but of the two credentials providing greater value to the graduate than either one would alone (Wall, 2021).

Analyzing the apprenticeship training in Canada, for the government this policy training is the key to become a skilled tradesperson. In the coming years there may be a potential shortage since trades workers are aging at a faster rate than the rest of the workforce. To counter this, federal and provincial governments are investing in training programs for future tradespeople (Jin, 2020).

Despite the increasing need for skilled tradespeople, data suggest that the overall certification rate has declined over time in apprenticeship programs. Over the past three decades, the number of certificates awarded to apprentices has been growing at a slower rate than the number of new registrations (Jin, 2020).

Desertion is one of the problems the apprenticeship training is facing since 2008. Only a few of the registered apprentices completed the program on the designated time. At the end of the expected program duration, only 16% achieved certification, while 64% remained attending the program and 20% abandoned it (Jin, 2020).

7. Future of work and education in Canada

The health-turned-economic crisis has distorted even the most informed labour market projections. Job postings have plummeted, unemployment has reached historic highs, and many businesses have been forced to permanently close (Davidson & Ruparell, 2020). While the reopening of parts of the economy points at the risk of new waves of infections, the vaccination process has become part of the uncertainty framework.

The Office of the Director of National Intelligence in the US in their Global Trends 2040 consider the next structural forces for the next years:

The global employment landscape will continue to shift because of new technologies, notably automation, online collaboration tools, artificial intelligence (AI), and perhaps additive manufacturing. Tasks that once seemed uniquely suited to human abilities, are already automated or potentially amenable to automation in the next decade. Studies have estimated that automation could eliminate 9% of existing jobs and radically change approximately 1/3 in the next 15 to 20 years. Emerging tech will also create jobs and enable greater virtual labor mobility through internet based freelance platforms that match customers with self-employed service providers as well as speed-of-light commercial data and software transmission.

Countries with aging populations will promote a faster adoption of automation, as they will see a reduction of their workforces over the next two decades. China is projected to lose 11% during this period. Automation will help companies to replace and augment the potential of workers in countries where the workforce is aging the most. Automation is likely to spread more slowly in other countries, with the key being whether it offers cost advantages, including over low-skilled labor.

The number of jobs created by new technologies is likely to surpass those eliminated during the next 20 years, according to historic records. One study by the World Economic Forum estimates that by 2025, automation will have created 97 million new jobs and displaced 85 million existing jobs. Several factors, including skills, flexibility, demographic factors, underlying wages, the share of jobs susceptible to automation, and access to continuing education could influence how well individual countries can adapt to automation. For example, countries with growing working-age cohorts are likely to experience more employment dislocations or a downward pressure on wages than countries with older populations at comparable levels of automation.

Over the next two decades, eight new technologies will transform the economy, work, business, and learning. All stakeholders are preparing for the transition, but the optimal or robust strategies are unclear. Emerging technologies, such as artificial intelligence (AI), data analytics, sensors, blockchain, robotics, telepresence, 3D printing and synthetic

biology, are creating a global digital infrastructure that will transform the economy and the nature of work. Over the next decade, many jobs, industries and communities are expected to face disruption. Firms may become more virtual. There may be fewer traditional jobs, and more virtual gig work. Some people may become "surplus" to requirements. The structural changes could have implications for macroeconomic theory and policy. The digital transition could have widespread positive and negative impacts (Policy Horizons Canada, 2018).

Some examples of AI are the next: in marketing, predictive technology based on customer's reactions (we have seen some of this applied from Netflix, Spotify, etc.). In banking, there are technologies for customer support, for detecting anomalies and credit card frauds. In finance, AI helps to take better trading decision based on the predicted market prices. There are examples for most of the fields or industries, for agriculture, healthcare, gaming, autonomous vehicles and chatbots.

A specific use of technology can be appreciated in the Robotic Process Automation (RPA). RPA is technology that can automate business processes that are, structured and repetitive. A company can use RPA tools to communicate with other digital systems, capture data, and retrieve information, process a transaction, and more. Financial firms were the first to adopt RPA, but it expanded to companies in many industries, including healthcare, retail, manufacturing. Call centre operations consolidate one customer's information and displays it on one screen. RPA can support data migration, entry, and processing without risking human error. In healthcare and insurance, this technology is used to input and process claims, etc. Adding a number, RPA software revenue grew 63% in 2018 to $846 million, with nine of the top 10 vendors changing market share position in 2018.

Automation exists to substitute work activities undertaken by human labour with work done by machines. Workplace substitution by machines has freed up humans to focus on higher-value tasks or create new ones. Workers may need to upgrade their skills or move into new roles, and may also be impacted on their wages.

Initially, automation and AI alarmed technology experts, they had the fear of the machine advancements would destroy jobs. Then, a wave of reassurances minimized their

negative impacts. Today experts have a mixed understanding about if automation will bring benefits and stresses alike. They affirm that automation and AI will affect tasks in virtually all occupational groups, but the effects will be of varied intensity, and drastic for only some of them. In the U.S. 25% of the employment will face high exposure to automation, and 70% of current tasks are at risk of substitution.

The impacts will vary across occupations, places, and demographic groups. "Routine", predictable physical and cognitive tasks will be the most vulnerable as well as smaller, more rural communities, young people, and minorities.

While only one in seven jobs may be lost to automation, many more could experience significant change in Canada. Previous OECD research suggested that 14% of total jobs across the OECD faced a high risk of automation in 2013, while 32% may experience significant change to how they are carried out, with Canada experiencing lower automation risk than the OECD average (The Organisation for Economic Co-operation and Development (OECD), 2020).

Automatable tasks are more prevalent in certain occupations and sectors, and neither occupations nor sectors are evenly distributed within Canada.

Across Canada, provinces face a similar risk of losing jobs to automation. In the 2011-16 period, the share of jobs at high risk of automation in nine out of ten Canadian provinces fell, due to the creation of jobs in less risky occupations and loss of jobs in riskier occupations. Since 2011, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia have created jobs mostly in occupations presenting a lesser risk of automation, although this may entail greater job market polarisation. In Alberta, employment grew in the health sector, education, and business administration, which are at lower risks of automation. Meanwhile, in Prince Edward Island, Nova Scotia and New Brunswick, jobs have disappeared in occupations at higher risk of automation such as food processing, woodworking, and garment workers (The Organisation for Economic Co-operation and Development (OECD), 2020).

In Ontario, the creation of jobs in occupations at lower risk of automation has been sustained over the 2011-2018 period. The occupation that has grown the most is Business and Administration Associate Professionals, having added around 140 000 jobs. This is

followed by other high-skill and professional occupations, such as Business and Administration Professionals and Science and Engineering Professionals, which have added around 70 000 and 60 000 new jobs respectively between 2011 and 2018. The number of Health Professionals and Teaching Professionals has also increased, by about 55 000 and 40 000.

Some middle-skill occupations that typically face a rather high risk of automation, such as General and Keyboard Clerks, Customer Service Clerks and Numerical and Material Recording Clerks, have shed jobs. However, jobs have been created also in occupations facing a higher risk of automation over the 2011-2018 period, although not as many as in low-risk occupations. Two examples are Sales Workers and Drivers and Mobile Plant Operators, that have created around 30 000 jobs, respectively. Other Canadian provinces have also created jobs predominantly in occupations at lower risk of automation between 2011 and 2018, including Alberta, Manitoba, Quebec, and Saskatchewan. On the other hand, Newfoundland and Labrador and Prince Edward Island have lost jobs predominantly in riskier occupations, while New Brunswick and Nova Scotia have lost jobs predominantly in less risky occupations.

8. **Technological change creates, destroys, and transforms jobs.**

Over the next 10 years, economic growth is expected to generate about 1.7 million new jobs (174,000 on average every year), which represent an annual average growth rate of 0.9%. In the long term, job creation will become increasingly constrained by the slower pace of growth anticipated in the labour force (Statistics Canada, 2019).

Over the next decade, automation should lead to a further deceleration in the demand for occupations with a high content of routine tasks, as productivity gains arising from technological innovations limit their employment growth. (Statistics Canada, 2019). On the other hand, employment growth tends to concentrate more on occupations with larger intensity of interpersonal and non-routine tasks, where automation and technological progress are complementary to their work (Statistics Canada, 2019).

Some of the forecasts that we analyzed in the present document are:

The Conference Board of Canada estimates that nearly one in five Canadian employees are in occupations at high risk of automation, with few or no options to transition into lower-risk occupations without significant retraining. The top five industries in which these occupations are most concentrated are: accommodation and food services, manufacturing, retail trade, construction, and health care and social assistance (Conference Board of Canada , 2020).

Based on total number of people employed, the top five occupations of this type in Canada are: food counter attendants, kitchen helpers, and related; cashiers; administrative assistants; general office support workers; and cooks (Conference Board of Canada , 2020).

Most of the workers who identify as one or more of the following groups are disproportionately represented in the top five high risk occupations: Indigenous, female, youth (aged 15–24), and visible minority (Conference Board of Canada , 2020).

The Canadian Occupational Projection System estimated the employment growth by industry that reflects the future trends anticipated in production and labour productivity for 42 industries.

- In principle, occupations directly linked to industries that are expected to have strong employment growth will benefit from this positive outlook. The reverse occurs for those tied to industries with weak employment growth.

Industries projected to post the strongest growth in employment (i.e., above, or around 0.9% annually) are also those projected to post the strongest growth in production or those that are characterized by a high degree of labour intensity.

Industries Projected to Have the Strongest Employment Growth, Projection 2019-2028 (average annual growth, in percentage)

The top 10 industries are: computer system design and related services; health care; social assistance; legal accounting, consulting, and other professional services; arts, entertainment, and recreation services; management, administrative and other support services; food services; air, retail, water, and pipeline transportation services; fabricated

metal products and machinery; elementary and secondary schools; and, architectural, engineering, design and R&D services.

Employment growth is expected to be faster in high-skill occupations, and slower in low-skill and some management occupations. The top ten occupations are: Specialist physicians; nursing coordinators and supervisors; General practitioners and family physicians; Registered nurses and registered psychiatric nurses; Physiotherapists; Optometrists, chiropractors and other health diagnosing and treating; Occupational therapists & Other professional occupations in therapy and assessment; Social and community service workers; Nurse aides, orderlies and patient service associates & Other assisting occupations in support of health services; and, Software engineers and designers.

The industries that are projected to post the weakest growth or declines in employment over the projection period are: retail trade; postal, courier, warehousing and storage services; colleges, CEGEPs and Vocational Schools; public administration; electric, gas and water utilities; universities; motor vehicles; computer, electronic and electrical products; textiles, clothing, leather and furniture; agriculture; forestry and logging; wood manufacturing; printing and related activities; paper manufacturing; and, fishing, hunting and trapping.

9. Conclusions

The pandemic has led people of all ages to have a higher degree of technological integration. Now, workers must know how to use basic technologies. For example, workers of all levels must what Zoom is and how to use it, so they do not have problems like the kitty lawyer. All those who are studying know how to use the camera and have learned how to take online classes. This has led to the development of technologies to improve online education. Specialists mention that this integration would cause an educational alliance in a short time between large technology companies and elite universities. Companies such as Google, Amazon, Facebook, will oversee the technological infrastructure and the design of functional, entertaining, and dynamic educational tools that keep the student's attention, while the University will validate the certification (Walsh, 2020).

Over the next decade, advanced technologies will put education within the reach of many more individuals around the world and will allow greater specialization in curriculum and teaching methodologies than ever before (Glenn, 2008).

With these benefits comes the challenge of ensuring that university infrastructure and operations are in place to support the adoption of technology on campus and online. As ever, administrators will need to weigh carefully how budget funds are spent, decide what emerging technologies show the most promise, and determine how best to support these technological advances while avoiding the ever-present risk of obsolescence (Glenn, 2008).

But perhaps the most critical question facing the academic world is something far more fundamental: namely, what it will mean to be an educated person in the 21st century. Technological changes will effectively change the skill sets of the future workforce, as well as its approach to work in general. As a result, societies around the world will need to consider how to make the most of these new opportunities and thus ensure that they remain competitive in the global marketplace (pg. 15, p.2) (Glenn, 2008).

In general, automation affects employment in two different ways. By displacing workers from tasks that they were previously performing, labour market disruptions occur over the transition period. But eventually, the increase in real wages resulting from higher productivity leads to the creation of new jobs to produce the goods and services that people want to buy with their extra income. Historical evidence suggests that technology ended up creating more jobs than it destroyed, as jobs have been reallocated at the industrial and occupational levels.

AI will transform almost all industries and disrupt the global labor force, creating new job fields, eliminating others, and driving significant economic and social redistributions. Human-machine teaming will be common for many future jobs. To harness the advantages of AI while mitigating unemployment, countries and corporations will need to focus on education and retraining their workforce. Most experts agree that automation is not expected to destroy many jobs over the next 10-20 years, as specific tasks rather than entire occupations are most likely to be automated. For instance, the introduction of computers sped up some aspects of jobs, enabling workers to do the other tasks better.

Rather than destroying occupations, computers redefined them. But this process required workers to learn new skills.

The literature also suggests that industries and occupations involving routine tasks are generally more at risk of being automated and experience lower employment growth than those involving cognitive tasks. Indeed, automation tends to restrain labour demand since an increasing part of production growth is being met by productivity growth.

Education post-Covid-19 needs to consider these trends to focus their efforts in programs that labour market will require and will bring the opportunities to those that their current credentials are or are starting to be obsolete in the new labour market. This means to improve the programs that have maintained their position in the demand and supply of jobs and credentials and to introduce new options in line with the new framework and the future expectations. As in the past century when the Canadian economy evolved from agriculture to manufacturing to services, the trends may us think that the Canadian economy should move from services to stronger customer-oriented services in a context of high automation.

References

Conference Board of Canada . (2020). *Responding to automation. How adaptable is Canada's Labour Market.*

Axios Capital. (2021). Retrieved from http://www.axioscapital.com/

Bank of Canada. (2021). *Bank of Canada will hold current level of policy rate until inflation objective is achieved, continues quantitative easing.* Retrieved from https://www.bankofcanada.ca/2021/01/fad-press-release-2021-01-20/

Bank of Canada. (2021). *Business Outlook Survey—Spring 2021.* Retrieved from https://www.bankofcanada.ca/2021/04/business-outlook-survey-spring-2021/

Bloomberg. (2021). *Canadian Consumer Sentiment Hits Another Record on Housing.* Retrieved from https://www.bloomberg.com/news/articles/2021-03-29/canadian-consumer-sentiment-hits-another-record-on-housing

British Columbia. (2019). *Labour Market Outlook 2019 Edition.* British Columbia: BC Government. Retrieved from https://www.workbc.ca/getmedia/18214b5d-b338-4bbd-80bf-b04e48a11386/BC_Labour_Market_Outlook_2019.pdf.aspx

Canada, T. C. (2021). *Canadian Outlook.* Retrieved from https://www.conferenceboard.ca/focus-areas/canadian-economics/canadian-outlook

Davidson, M., & Ruparell, S. (2020). *The future of Ontarios Workers.* Institute of Public Policy and Economy.

Ecampus Ontario and Future Skills Centre. (2021). *Is the Future Micro?* Retrieved from https://micro.ecampusontario.ca/wp-content/uploads/2021/03/Is_the_Future_Micro-1.pdf

Glenn, M. (2008). *The future of higher education How technology will shape learning.*

IBISWorld. (2021). *Recent Trends – National Unemployment Rate.* Retrieved from https://www.ibisworld.com/ca/bed/national-unemployment-rate/20/

Immigration Refugees and Citizenship Canada, I. (2019). *2020 Annual Report to Parliament on Immigration.* Retrieved from https://www.canada.ca/en/immigration-refugees-citizenship/corporate/publications-manuals/annual-report-parliament-immigration-2020.html

Jin, H. L. (2020). *Factors associated with the completion.* Statistics Canada. Retrieved from https://www150.statcan.gc.ca/n1/en/pub/75-006-x/2020001/article/00008-eng.pdf?st=dyVBNvkd

Last Name, F. M. (Year). Article Title. *Journal Title*, Pages From - To.

OECD. (2020). *Education at a Glance 2020: OECD Indicators.* Paris: OECD Publishing. doi:https://doi.org/10.1787/69096873-en

Policy Horizons Canada. (2018). *The Next Generation of Emerging Global Challenges.* Retrieved from https://horizons.gc.ca/en/2018/10/19/the-next-generation-of-emerging-global-challenges/#working-in-the-digital-economy

Statistics Canada. (2019). *Annual Demographic Estimates: Canada, Provinces and Territories, 2019.* Retrieved from https://www150.statcan.gc.ca/n1/pub/91-215-x/2019001/sec2-eng.htm

Statistics Canada. (2019). *Canadian Occupational Projection System (COPS).* Retrieved from http://occupations.esdc.gc.ca/sppc-cops/l.3bd.2t.1ilshtml@-fra.jsp?lid=22&fid=1&lang=en#Fig9

Statistics Canada. (2019). *Population Projections for Canada 2018 to 2068, Provinces and Territoties 2018-2043.* Retrieved from https://www150.statcan.gc.ca/n1/pub/91-520-x/91-520-x2019001-eng.pdf

Statistics Canada. (2020). *Annual Demographic Estimates: Canada, Provinces and Territories.* Retrieved from https://www150.statcan.gc.ca/n1/pub/91-215-x/2020001/sec1-eng.htm

Statistics Canada. (2020). *Canada's population estimates.* Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/210318/dq210318c-eng.htm

Statistics Canada. (2020). *Canada's population estimates, fourth quarter 2020.* Canada: Statistics Canada. Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/210318/dq210318c-eng.htm

Statistics Canada. (2020). *Canada's population estimates: Subprovincial areas.* Canada: Statistics Canada. Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/210114/dq210114a-eng.htm

Statistics Canada. (2020). *International students accounted for all of the growth in postsecondary enrolments in 2018/2019.* Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/201125/dq201125e-eng.htm

Statistics Canada. (2020). *Table 17-10-0020-02 (formerly CANSIM 051-0017) – Estimates of the components of interprovincial.* BCStats. Retrieved from https://www2.gov.bc.ca/assets/gov/data/statistics/people-population-community/population/population_highlights_2020q3.pdf

Statistics Canada. (2020). *The output of educational institutions and the impact of learning.* Retrieved from https://www150.statcan.gc.ca/n1/pub/81-604-x/2020001/ch/cha-eng.htm

Statistics Canada. (2021). *Canada's international transactions in securities, February 2021.* Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/210416/dq210416b-eng.htm?HPA=1

Statistics Canada. (2021). *Gross domestic product, income and expenditure, fourth quarter 2020.* Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/210302/dq210302a-eng.htm

Statistics Canada. (2021). *Labour Force Survey, February 2021.* Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/210312/dq210312a-eng.htm

Statistics Canada. (2021). *Postsecondary enrolments, by field of study, registration status, program type, credential type and gender.* Retrieved from https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3710001101

Statistics Canada. (2021). *Recent developments in the Canadian economy: Assessing the economic recovery from COVID-19.* Retrieved from https://www150.statcan.gc.ca/n1/pub/36-28-0001/2021003/article/00005-eng.htm

TD Bank. (2021). *Provincial Economic Forecast.* Retrieved from https://economics.td.com/provincial-economic-forecast

The Organisation for Economic Co-operation and Development (OECD). (2020). *The local impacts of automation in Canada.* Retrieved from https://www.oecd-ilibrary.org/sites/cc3455c3-en/index.html?itemId=/content/component/cc3455c3-en

Wall, K. (2021). *Completion of a college certificate or diploma after a bachelor's degree.* Statistics Canada. Retrieved from https://www150.statcan.gc.ca/n1/pub/75-006-x/2021001/article/00001-eng.htm

Walsh. (2020). *The coming disruption. Intelligencer.* New York: Intelligencer. Retrieved from , https://nymag.com/intelligencer/2020/05/scott-galloway-future-of-college.html

World Economic Forum. (2018). *The Future of Jobs Report 2018.* Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

World Economic Forum. (2020). *The Future of Jobs Report.* Retrieved from https://www.weforum.org/reports/the-future-of-jobs-report-2020