SEEDING RURAL INNOVATION

NURTURING THE TECH FRONTIER IN ALBERTA

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Research by

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Information and Communications Technology Council

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PREFACE

The Information and Communications Technology Council (ICTC) is a not-for-profit national centre of expertise for strengthening Canada's digital advantage in a global economy. Through trusted research, practical policy advice, and creative capacity building programs, ICTC fosters globally competitive industries enabled by innovative and diverse digital talent. In partnership with an extensive network of industry leaders, academic partners, and policymakers from across Canada, ICTC has empowered a robust and inclusive digital economy for over 30 years.

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EXECUTIVE SUMMARY

The information and communications technology (ICT) sector has become increasingly important to Alberta's economy in recent years. During the 2014 oil price crash, Alberta's economy underwent rapid declines in gross domestic product (GDP) and employment, while technology remained strong, with noticeable growth in the number of software, energy technology, and clean technology companies.[1] Tech also maintained strong positioning during the COVID-19 pandemic, even while GDP and employment in other sectors declined.[2] In fact, from February 2020 to August 2023, participation in Alberta's digital economy grew by nearly 30%, adding over 55,000 jobs. Among others, roles in software development (full-stack, back-end development, etc.), digital infrastructure (DevOps, cybersecurity, etc.), and data (data science, data analysis, etc.) posted strong growth. While digitalization has been underway in Alberta for some time, it was undoubtedly accelerated by the pandemic, causing technology to permeate other, more traditional sectors of the province's economy. By 2021, verticals like health tech, cleantech, and agtech were important components of Alberta's technology ecosystem. In fact, according to recent research by Cisco, Alberta ranked fourth in the country for digital readiness in 2023, with the province placing in the top three for "Human Capital" due to its strong labour force.[3]

1 "In 2016, over 1,300 technology companies called Alberta home, a more than 40% increase over 2012." Companies in highly innovative areas like energy technology and software development accounted for much of this growth. See: Cutean, A. et al., "A Resilient Recovery," ICTC, 2022, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/ab-covid-report-final-6-30-22.pdf

2 Cutean, A. et al., "A Resilient Recovery," ICTC, 2022, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/ab-covid-report-final-6-30-22.pdf

3 "Canada's Digital Readiness," 2023, Cisco, https://www.cisco.com/c/m/en_ca/digitalreadiness-2022.html

While most Canadian provinces experienced a year-over-year decline in venture capital (VC) activity in 2022, Alberta's deal activity surpassed that of 2021, setting a record high for the fifth consecutive year in a row. Businesses in the province secured $729 million across 85 deals, with tech sector deals accounting for the largest proportion, at 27%. Deal activity declined slightly in Q1 2023, however, businesses in the province still managed to secure 16 deals and $198 million, with tech again accounting for one-quarter (25%).

Despite its success over the years, much of Alberta's technology activity is in its two largest cities, partially limiting its impact on the rest of the province, including in rural areas. For example, of the 101 VC deals in Alberta since Q1 2022, 73% occurred in Calgary, 24% occurred in Edmonton, and just 3% occurred elsewhere. Prior ICTC research found that large population centres account for approximately 84% of Alberta's clean technology job postings and 92% of Alberta's clean technology companies, and 60% of Alberta's agri-food technology job postings and 62% of Alberta's agri-food technology companies.

Yet, rural communities are also essential to Alberta's economy and labour market, and as digital transformation continues across sectors, these communities—and their unique opportunities and needs—will grow and evolve. Today, talent plays a key role as both a barrier and an enabler. Rural employers need a robust and diverse talent base to grow and scale their companies but face multi-pronged barriers to accessing and retaining it.

First, demographic changes squeeze the local talent pool at entry and senior levels. Each year, a significant portion of rural youth move to urban centres, often seeking educational or employment opportunities, and many do not return; at the same time, with an older average age than in urban centres, many senior-level workers will soon retire and exit the workforce. As a result, rural employers note significant talent shortages across roles. The skilled trades make up the greatest demand, with more employers seeking to hire workers in this field than the next three combined. This is followed by workers in professional services or scientific roles, sales roles, and technology roles. The shortage is so acute that many employers highlight it as a top impediment to growth, productivity, and efficiency.

Challenges retaining youth and attracting new workers are strongly tied to limitations with digital skills training. Here, employers described a self-propelling cycle whereby a lack of local educators and fewer youth creature barriers for rural communities when it comes to acquiring the infrastructure needed to deliver digital skill training locally and consistently—limited education training opportunities, in turn, dissuade interested candidates and teachers from staying in rural areas; finally, the combination of these factors hamstrings the growth of the local technology ecosystem.

4 "Canadian Venture Capital Market Overview," 2022, CVCA, https://www.cvca.ca/assets/files/reports/year-end-2022-vc-pe-canadian-market-overview/CVCA_VC_Q4_2022_FINAL-2.pdf

5 Ibid.

6 Ibid.

7 "Canadian Venture Capital Market Overview," 2022, CVCA, https://www.cvca.ca/assets/files/reports/year-end-2022-vc-pe-canadian-market-overview/CVCA_VC_Q4_2022_FINAL-2.pdf; "Canadian Venture Capital Market Overview, 2023, CVCA, https://www.cvca.ca/assets/files/reports/q1-2023-vc-pe-canadian-market-overview/CVCA_VC_Q1_2023_2023-05-17-202559_qqsq.pdf

8 Cutean, A. et al., "A Resilient Recovery," ICTC, 2022, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/ab-covid-report-final-6-30-22.pdf

While digital training capacity is a multi-faceted barrier that is also influenced by factors like broadband infrastructure, rural employers are looking to creative ways to fill gaps, including attracting remote workers and international talent, and broadening their local talent pool by engaging with underrepresented groups, and retooling existing workers. Notably, many employers state delivering in-house or consultant-facilitated training to upskill and reskill existing workers. Employers in rural Alberta also express a sense of loyalty to their workforce, viewing the experience and domain knowledge of existing workers as key assets to be built upon, not replaced.

While the lack of skilled talent presented again as a major barrier to digital transformation—42% of employers note the shortage of skilled labour as a core challenge to both implementing and operating technology—overall, rural Alberta employers are excited about the possibilities that digital adoption and digitization affords. In fact, nearly half of rural businesses surveyed have a digital transformation strategy in place, or will soon develop one; core areas of focus include cloud transition, and ecommerce acceleration.

Although the urban-rural divide will not soon be eclipsed in the province nor across Canada, rural employers are dedicated to innovation; they see technology as a tool to fuel future growth, and digital transformation as an important strategy to attract and retain workers in the future. More, as technology continues to permeate sectors of strength in these areas—like agriculture, energy, and manufacturing—rural Alberta is ripe with opportunity.

INTRODUCTION

Rural communities are both a critical component of the province's economic health and key to a resilient and equitable rebound from the COVID-19 pandemic. A 2012 study by the Conference Board of Canada found that in 2016, "rural areas contributed to the existence of almost 250,000 jobs in Alberta's urban centres, including almost 155,000 through an indirect contribution and another 95,000 through an induced contribution."[9] The same study found that rural Alberta accounted for nearly $16 billion in labour income, and that "one dollar of economic activity in rural Alberta was estimated to contribute to $0.74 of economic activity in the province's urban centres." A second study commissioned by the Alberta Association of Municipal Districts and Counties in 2018 found that while rural Alberta is home to only 18% of the province's population, it represents 41% of the public and private investment in the province and 26% of provincial GDP.[10] With digitalization transforming the global economy, it is critical to understand and nurture the contribution of rural businesses to Alberta's growing digital economy.

9 "Alberta's Rural Communities: Their Economic Contribution to Alberta and Canada," March 2012, Conference Board of Canada, https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/csi14195/$FILE/alberta-rural-communities-report.pdf

10 "The Economic Contribution of Rural Alberta," 2018, Nichols Applied Management Inc., https://rmalberta.com/wp-content/uploads/2019/05/The-Economic-Contribution-of-Rural-Alberta-AAMDC-FINAL-.pdf

The urban-rural divide shows itself in the tech labour market. While many reports focus extensively on Alberta, Calgary, and Edmonton's digital economies, few discuss digital economy opportunities and trends in the context of rural Alberta; this further perpetuates a dominant narrative on Alberta's larger cities, risking overlooking the innovations and unique needs of rural communities.

Accordingly, this paper leverages mixed methods including a literature review, an employer survey, and key informant interviews, to fill the research gap on rural Alberta's digital economy; it highlights unique value propositions, opportunities for growth, labour market needs, and future paths forward.

Section I provides a recent history of economic and demographic trends in rural Alberta, including key industries, economic and labour market growth, and changes in population.

Section II discusses the state of digitalization, innovation, and technology adoption in Alberta and provides forward-looking insights as to how technology might shape rural Alberta in the years to come.

Section III unravels labour market trends, challenges, and opportunities facing rural Alberta before highlighting strategies to build rural Alberta's talent pipeline and position it for continued and accelerated growth.

PART I

RURAL ALBERTA

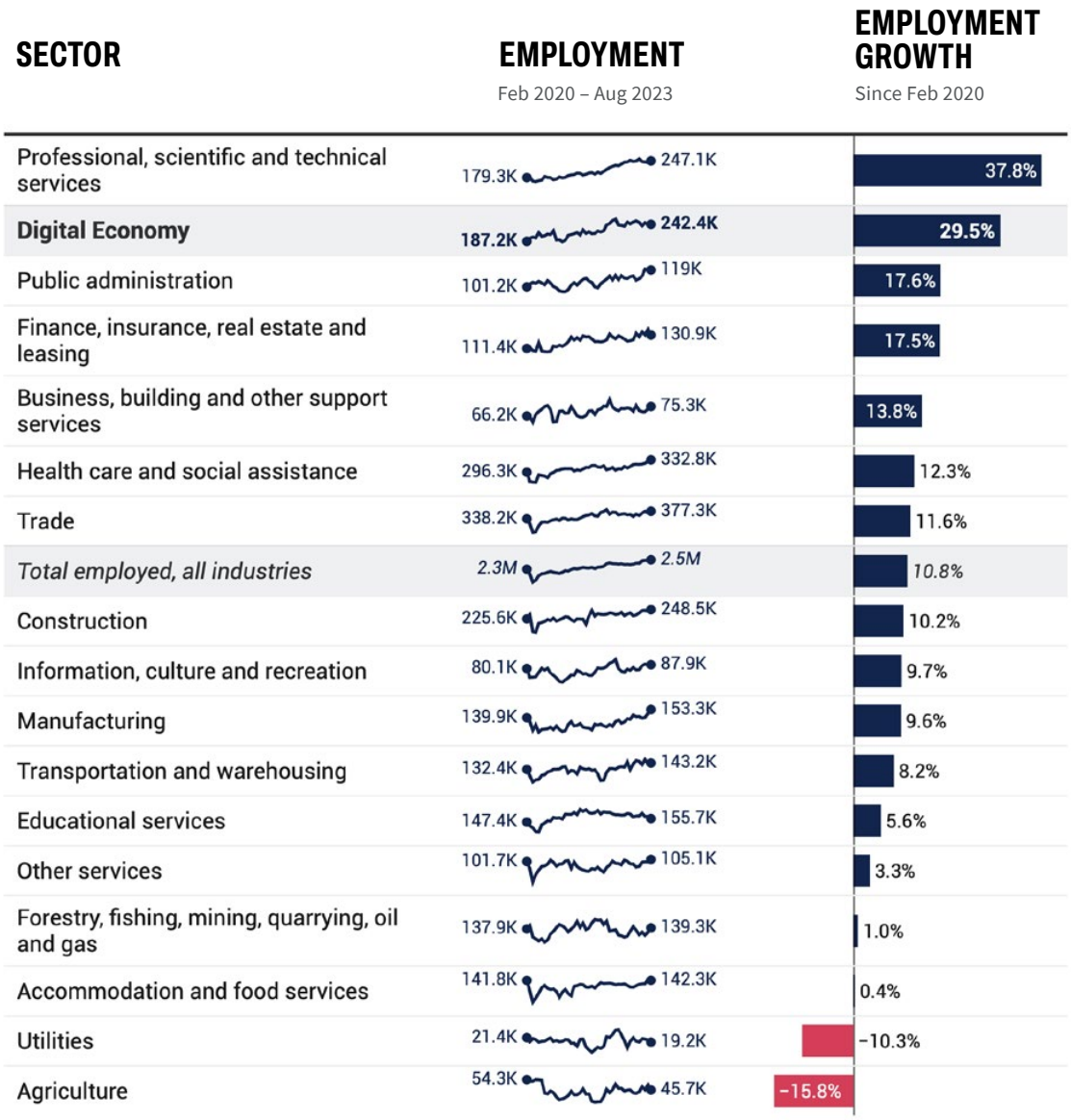
A RECENT HISTORY OF ECONOMIC AND DEMOGRAPHIC TRENDS

ZOOMING OUT: RECENT ECONOMIC AND LABOUR MARKET CHANGES IN ALBERTA

Alberta's economy and labour market have undergone a series of significant changes and shifts over the last decade: the oil crash of 2014, the focused economic diversification of 2016-19, the COVID-19 pandemic, and the Ukraine war and subsequent spike in global energy demand are just a few examples. While the first major signs of growth in Alberta's digital economy coincided with the period of diversification, the pandemic supercharged its scaling ability. In fact, in August 2023, Alberta's digital economy employed over 242,000 Albertans, an increase of nearly 30% or more than 55,000 jobs since before the pandemic—by contrast, while employing more people overall, participation in the general economy grew by just shy of 11% during the same period.

Undoubtedly, digital technology has played a critical role in Alberta's economic and labour market rebound from the pandemic, and it will continue to do so going forward, providing high-quality employment opportunities for Albertans. Calgary and Edmonton are well-known across Canada and internationally as robust clusters of digital activity, skilled talent, and world-class training in areas like fintech, digital infrastructure, healthtech, and AI. Yet, rural communities have their own set of needs and opportunities; while different from those in urban centres, they present unique value propositions for digital transformation and labour market evolution.

FIGURE 1 **Employment in Alberta by Sector, February 2020-August 2023**



Employment data adjusted for seasonality. Data source: Stats Canada, ICTC.

DEMOGRAPHIC TRENDS IN RURAL ALBERTA

URBANIZATION AND POPULATION CHANGE

While the events of the last few years have ushered in unprecedented growth in digitization across Canada and Alberta, for the past 50 years, larger demographic trends like urbanization, interprovincial migration, and immigration have reshaped the geography of the province's population. Much like the rest of Canada, the percentage of Albertans who live in rural areas has declined. According to Statistics Canada, 25% of Albertans lived in rural areas in 1976 (e.g., areas with fewer than 1,000 inhabitants and a population density below 400 people per square kilometre).[11] By 2022, this dropped to 15.2%.[12]

What defines a location as "rural" is as much about its unique attributes, culture, and history as it is about statistical delineation. For example, in this study, participants who live in areas like Cold Lake, St. Albert, Medicine Hat, and Grande Prairie consider themselves to be part of rural Alberta despite the fact that these areas are no longer technically recognized as such by Statistics Canada. Irrespective of how smaller communities in Alberta are officially defined, they have mostly experienced a consistent pattern over the years: an exodus of workers—namely youth—to large urban centres like Calgary and Edmonton.

TABLE 1 **Percentage of population living in rural Alberta according to various definitions**

DEFINITION	2016	2021
Areas with less than 1,000 inhabitants and a population density of fewer than 400 people per km^2	16.4%	15.2%
Everywhere that is not a city and/or not part of a census metropolitan area (CMA)	27%	26%
Everywhere except for the Calgary, Edmonton, Lethbridge, and Red Deer CMAs	37%	35%

Data Source: Various (see in-text footnotes)

11 "Alberta Urban and Rural Population, 1976-2011," 2015, Government of Alberta, https://open.alberta.ca/opendata/alberta-urban-and-rural-population-1976-2011

12 "Population growth in Canada's rural areas, 2016 to 2021," 2022, Statistics Canada, https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021002/98-200-x2021002-eng.cfm

Interestingly, Alberta's population is less rural and more urban than Canada's population generally, according to a recent publication by Statistics Canada. In 2021, 15.2% of Albertans lived in a rural area, compared to a national average of 17.8%.[13] Moreover, from 2016 to 2021, Alberta's rural population declined by 2.7%, representing the second-lowest rural growth rate of any Canadian province.[14] The reasons for this steeper-than-average decline are many, with three resonating:

1 **Technically Speaking: Outgrowing "Rural" Status.** As communities grow—and become larger and more densely populated—they tend to be reclassified by Statistics Canada as urban. While residents of those communities may still regard themselves as "rural," the reclassification leads to what can be perceived as an artificial drop in the rural population.

2 **Come From Away—to Urban Centres.** While interprovincial migration to Alberta has seen an upward swing in recent years, international migrants are now the biggest driver of Alberta's population growth. For a variety of reasons—including access to community, social services, and economic opportunities—these individuals are more likely to settle in urban versus rural areas.[15]

3 **The Great Youth Exodus.** As discussed extensively by interviewees in this study and as will be elaborated on later in this report, it is not uncommon for young rural Albertans to move to large urban centres. The reasons for these relocations are often the pursuit of education and/or career opportunities—in many cases, those who leave do not return.

Looking forward, urbanization in Alberta is expected to continue. From 2023 to 2051, Alberta is expected to add an additional 2.6 million people to its population, representing an average annual growth rate of 1.5% per year.[16] In terms of drivers, 55% of this increase is expected to derive from international migration, 28% is expected to come from births, and 17% is expected to be caused by interprovincial migration.[17] Notably, by 2051, the government expects Alberta's population to be even more urban and less rural, with four in every five people living in the Edmonton–Calgary corridor. Despite the unique value propositions of many rural communities, ultimately, this demographic trend places added pressure on rural communities. Faced with the prospect of a further declining population—and thereby challenges in accessing talent—rural communities may struggle to benefit from economic opportunities.

13 "Population growth in Canada's rural areas, 2016 to 2021," 2022, Statistics Canada, https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021002/98-200-x2021002-eng.cfm

14 Ibid.

15 "Population statistics," 2023, Government of Alberta, https://www.alberta.ca/population-statistics.aspx#data-tables

16 Ibid.

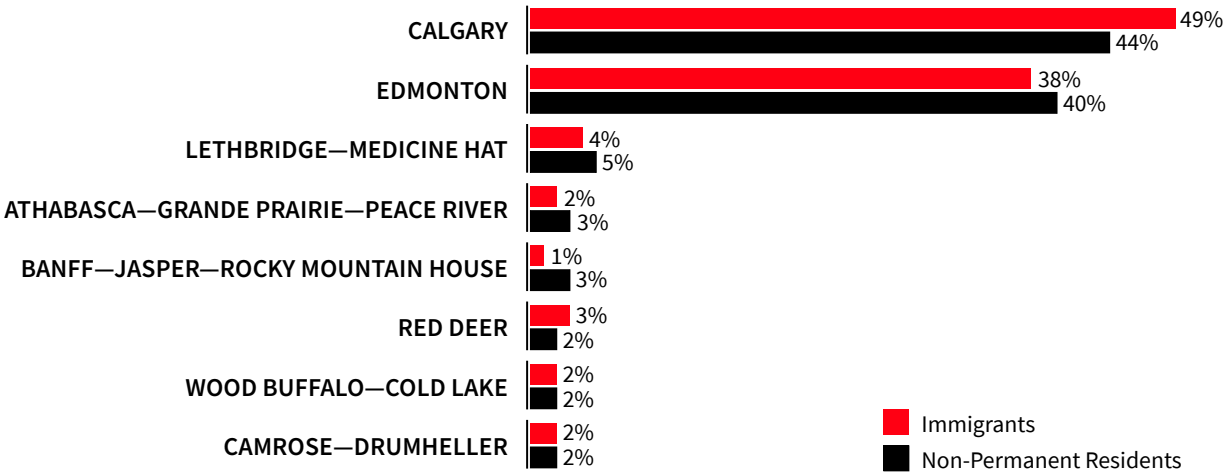
17 Ibid.

IMMIGRATION

International migration already acts as Alberta's largest driver of population growth[18] (expected to account for more than half (55%) of Alberta's population growth from now until 2051[19]). These workers, in particular, play a critical role in filling in-demand technical and digital roles in the province. According to a Statistics Canada report from June 2022, "In the 2010s, immigrant workers (those born outside of Canada) accounted for 84% of the growth in the total labour force, [and] 55% of the growth in high- and medium-skilled jobs."[20] While most newcomers to Alberta tend to settle in urban centres, immigration and greater ethnic diversity can be important components of rural Alberta's future talent pipeline. A focus on attracting these workers to locations outside of Calgary and Edmonton is key to filling current talent demand and securing and safeguarding future growth opportunities.

Today, Calgary and Edmonton account for the vast majority of Alberta's immigrant (87% collectively) and non-permanent residents (84% collectively).

FIGURE 2 **Immigrant Households in Alberta by Economic Region**



Data source: 2021 Census of Population

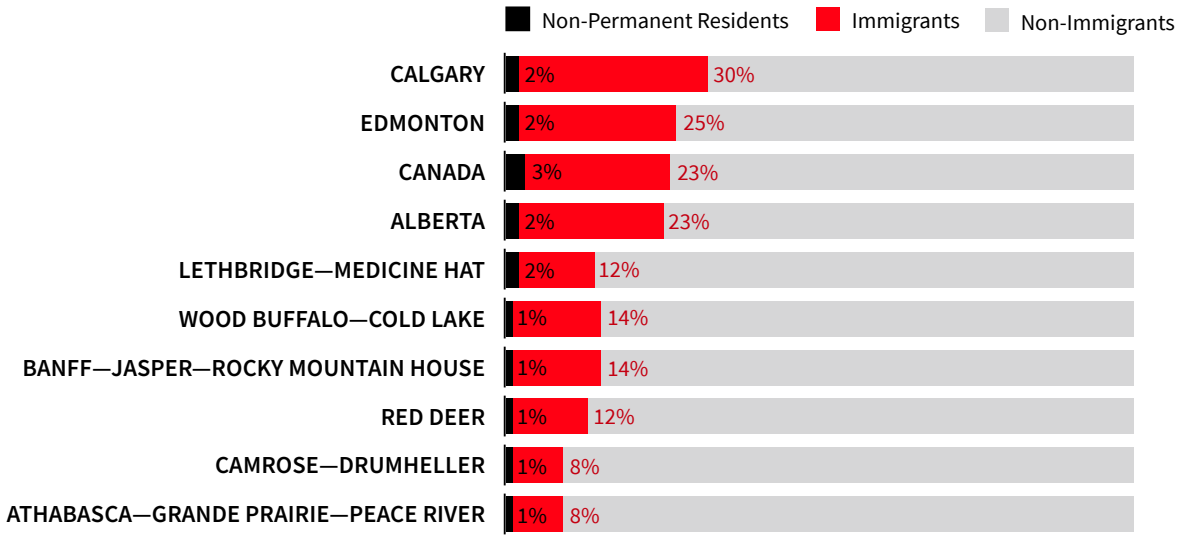
While the above trends are somewhat expected given the proportion of Alberta's population in Calgary and Edmonton, Figure 3 shows that immigrants and non-permanent residents also account for a lower proportion of rural versus urban populations. Notably, just 9% of households in Camrose—Drumheller and Athabasca—Grande Prairie—Peace River, 13% of households in Red Deer, and 15% of households in Banff—Jasper—Rocky Mountain House, Wood Buffalo—Cold Lake, and Lethbridge—Medicine Hat. By contrast, they make up 32% of Calgary households, 27% of Edmonton households, 25% of Albertan households, and 26% of Canadian households.

18 Ibid.

19 Ibid.

20 'Immigration as a source of labour supply," 2022, Statistics Canada, https://www150.statcan.gc.ca/n1/daily-quotidien/220622/dq220622c-eng.htm

FIGURE 3 **Immigrant Households in Alberta by Economic Region**



Data source: 2021 Census of Population

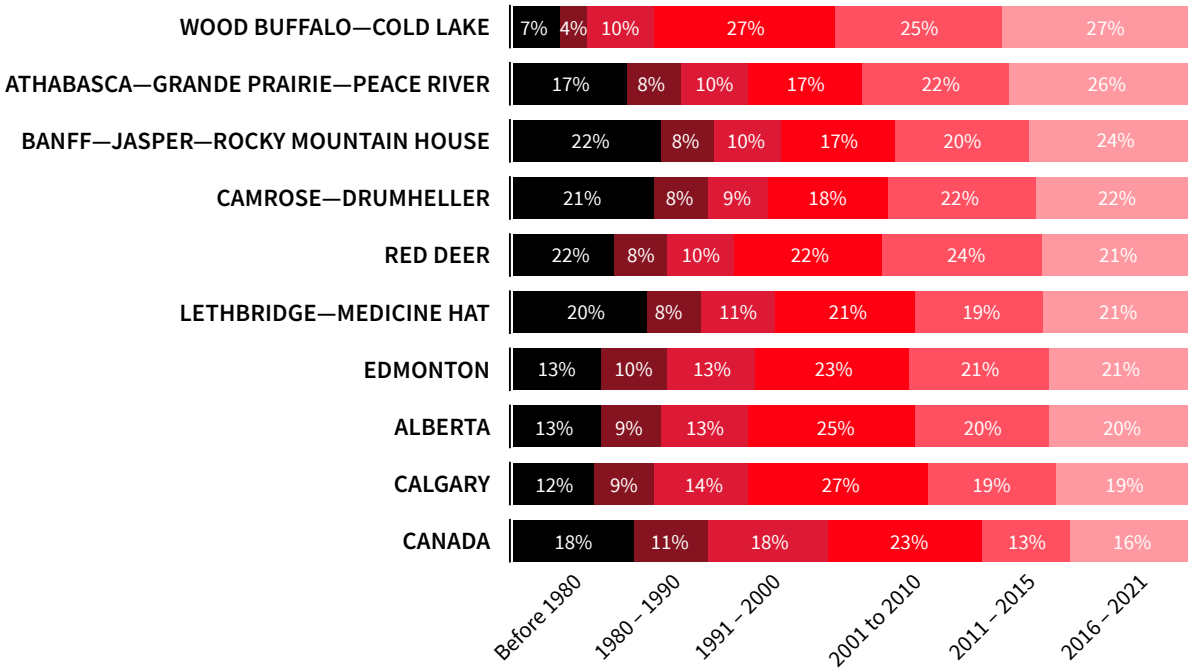
Although historical data has pointed to newcomers residing in large urban centres, more recent data suggests that immigration to some rural regions may be increasing. For example, Figure 4 shows that *recent immigrants* (e.g., who moved to Canada between 2011 and 2021) account for a relatively larger percentage of all immigrants living in rural Alberta. Recent immigrants make up about half (44% to 52%) of immigrants living in Wood Buffalo—Cold Lake, Athabasca—Grande Prairie—Peace River, Red Deer, Camrose—Drumheller, and Banff—Jasper—Rocky Mountain House. Compare this to about 40% of recent immigrants living in Alberta and 38% of all immigrants living in Calgary. While the reasons for this shift are not entirely known, research and interviewees in this study suggest that factors increasingly plaguing urban centres across Canada—namely, the high cost of living and lack of affordable housing—may be aiding rural communities in attracting skilled newcomers. Added to this is the growth of remote work, enabling more people to work for companies in urban centres without needing to live in them. The latest census data showcases a similar trend in neighbouring BC: while the greater Vancouver area (GVA) is still home to the largest number of immigrants in the province, the share of the region's recent newcomers dropped to 78% in 2016-2021 (from 81%, 2011-2016). At the same time, communities including Nanaimo, Kelowna, Prince George, Prince Rupert, and Squamish experienced increases in recent arrivals.

18 Ibid.

19 Ibid.

20 'Immigration as a source of labour supply," 2022, Statistics Canada, https://www150.statcan.gc.ca/n1/daily-quotidien/220622/dq220622c-eng.htm

FIGURE 4 **Immigrant households in Alberta by period of immigration and economic region**



Data source: 2021 Census of Population

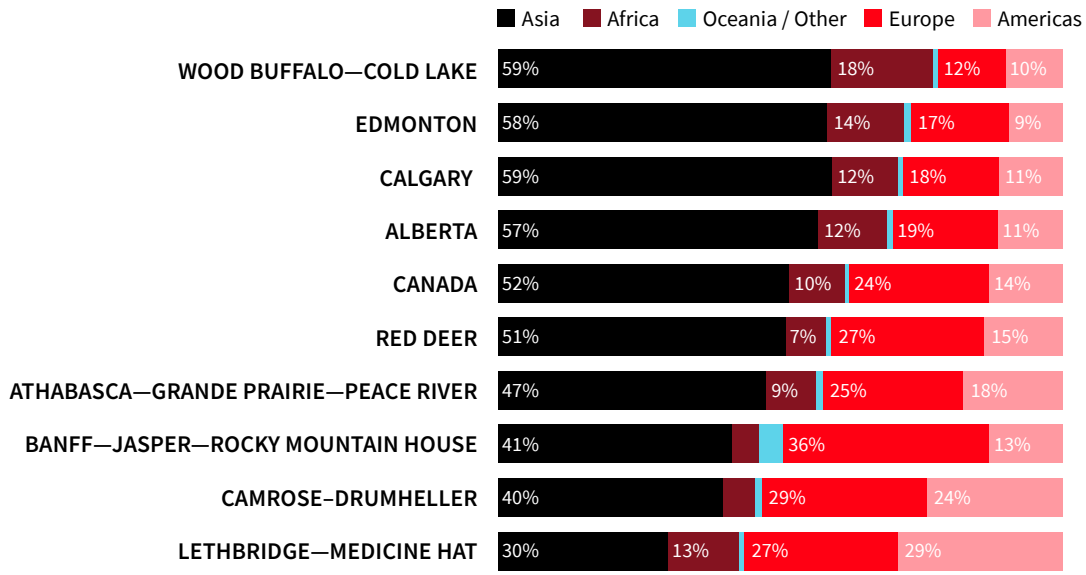
Where people immigrate from also varies by region. In large urban centres like Calgary and Edmonton, and in Alberta and Canada as a whole, a high percentage of immigrants come from regions that are culturally dissimilar to Canada, such as Asia and Africa. Alternatively, except for Wood Buffalo—Cold Lake, a high percentage of immigrants in rural Alberta come from regions that are culturally similar to Canada, such as Europe and the Americas. With immigration accounting for so much of Canada's population and labour force in the years to come, the ability to attract and retain a culturally diverse workforce will be increasingly important, making equity, diversity, and inclusion a strategic area of importance to Albertan businesses.

18 Ibid.

19 Ibid.

20 'Immigration as a source of labour supply," 2022, Statistics Canada, https://www150.statcan.gc.ca/n1/daily-quotidien/220622/dq220622c-eng.htm

FIGURE 5 **Immigrant households in Alberta by place of birth and economic region**



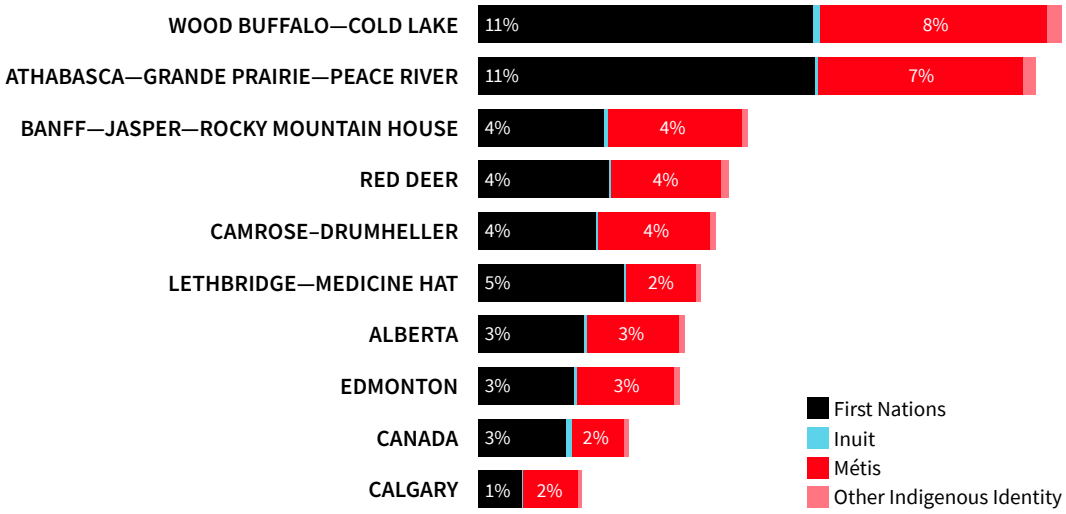
Data source: 2021 Census of Population

INDIGENOUS PEOPLES

Rural Alberta tends to have a higher percentage of Indigenous Peoples than its urban centres. Indeed, while just 7% of Albertan households identify as Indigenous, this is the case for nearly one-fifth (18% to 19%) of households in Wood Buffalo—Cold Lake and Athabasca—Grande Prairie—Peace River, and nearly one-tenth (8% to 9%) of households in Banff—Jasper—Rocky Mountain House, Red Deer, and Camrose—Drumheller. Meanwhile, just 3% of Calgary households identify as Indigenous.

Indigenous identity has important implications for Alberta's labour force. In areas where there is a high percentage of Indigenous Peoples, it is important for employers to establish close, reciprocal relationships with the community and create valuable training and employment opportunities for Indigenous talent. In areas with a low percentage of Indigenous Peoples, it becomes important for employers to expand recruitment strategies beyond personal networks and adopt equity, diversity, and inclusion best practices for creating safe and inclusive workplaces. Indigenous talent is an important strength of rural Alberta, but discriminatory practices and unsafe workspaces can prevent both employers and Indigenous talent from reaching their full potential.

FIGURE 6 **Indigenous identity by economic region**

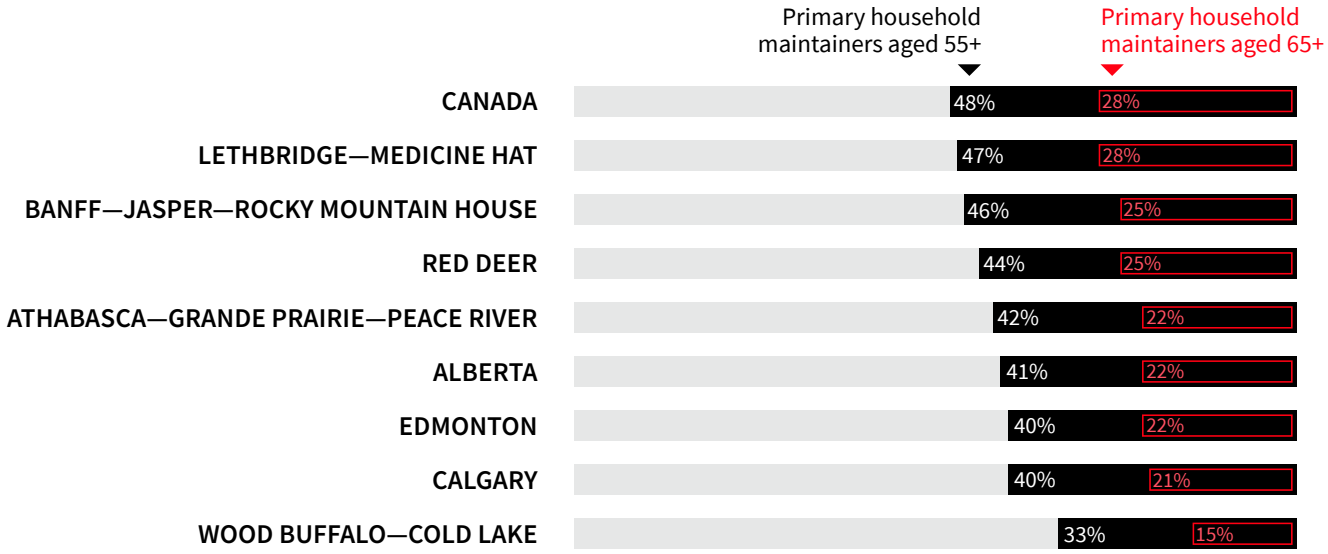


Data source: 2021 Census of Population

AGE DEMOGRAPHICS

Researchers have long suggested that rural Albertans are older than their urban counterparts and that rural demographics are shifting toward an older population more rapidly.[21] Yet, age demographics in rural Alberta are not homogenous and vary by region. As shown in Figure 7, among rural areas of Alberta, Camrose—Drumheller has the largest percentage of primary householders over age 55 and over age 65; this is followed by Lethbridge—Medicine Hat, Banff—Jasper—Rocky Mountain House, and Red Deer.[22] Alternatively, Wood Buffalo—Cold Lake, Calgary, Edmonton, and Athabasca—Grande Prairie—Peace River have the lowest percentage of primary householders over age 55 and 65. While age distribution has many impacts on local economies, it is a significant factor in labour market availability, retention, and training. Although this complex relationship will be discussed in more detail in Section III, an aging population was expressed as a concern by many businesses in rural Alberta. When combined with the relatively high percentage of youth that relocate from rural areas to urban centres, rural Alberta faces a looming talent crunch at both entry and senior levels.

FIGURE 7 **Primary household maintainers above age 55 and 65 by economic region**

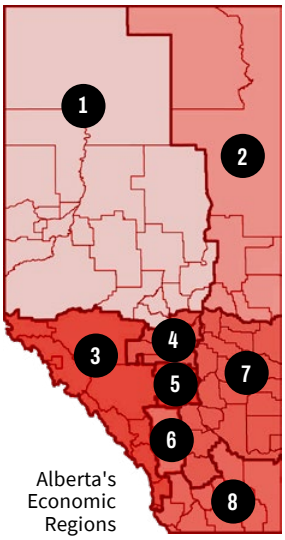


Data source: 2021 Census of Population

ECONOMIC TRENDS IN RURAL ALBERTA

KEY INDUSTRIES

Rural Alberta is economically diverse, with a select range of regional industries. While oil and gas, agriculture, and forestry are rural Alberta's largest industries, specific regions specialize in other areas, such as food processing, transportation and warehousing, tourism, and manufacturing. A 2018 study commissioned by the Alberta Association of Municipal Districts and Counties identifies key industries in different parts of rural Alberta according to labour force, investment, and GDP data (see Table 2).[23] The data shows that while mining and oil and gas often led rural areas in terms of GDP, agriculture tends to be the largest employer, and infrastructure and power projects make up a significant portion of planned projects.[24]



Alberta's Economic Regions

TABLE 2 **Key Industries Across Rural Alberta**

	REGION	KEY INDUSTRIES	TOP INDUSTRY Labour Force	TOP INDUSTRY Investment	TOP INDUSTRY GDP	PLANNED INVESTMENTS
1	**Northwest**	Conventional oil and gas Forestry	Agriculture Forestry	Mining and oil and gas	Mining and oil and gas	Oil and gas and pipeline projects
2	**Northeast**	Oilsands	Mining and oil and gas	Mining and oil and gas	Mining and oil and gas	Oil and gas and pipeline projects
3	**Mountain**	Tourism Natural gas	Mining and oil and gas	Mining and oil and gas	Mining and oil and gas	Pipeline projects
4	**Capital**	Manufacturing	Construction	Housing	Construction	Oil and gas and pipeline projects
5	**Central**	Conventional oil and gas	Agriculture	Mining and oil and gas	Construction	Power and pipeline projects
6	**Calgary**	Transportation and Warehousing Retail, Entertainment	Construction Professional services Agriculture	Housing and Real Estate	Housing and Real Estate	Infrastructure and commercial projects
7	**East**	Agriculture Conventional oil and gas	Agriculture	Utilities	Mining and oil and gas	Pipeline and industrial projects
8	**South**	Agriculture Food Processing Conventional oil and gas	Agriculture	Mining and oil and gas	Mining and oil and gas	Wind power and transmission line projects

Adapted from: "The Economic Contribution of Rural Alberta," 2018, Nichols Applied Management Inc., https://rmalberta.com/wp-content/uploads/2019/05/The-Economic-Contribution-of-Rural-Alberta-AAMDC-FINAL-.pdf

23 "The Economic Contribution of Rural Alberta," 2018, Nichols Applied Management Inc., https://rmalberta.com/wp-content/uploads/2019/05/The-Economic-Contribution-of-Rural-Alberta-AAMDC-FINAL-.pdf

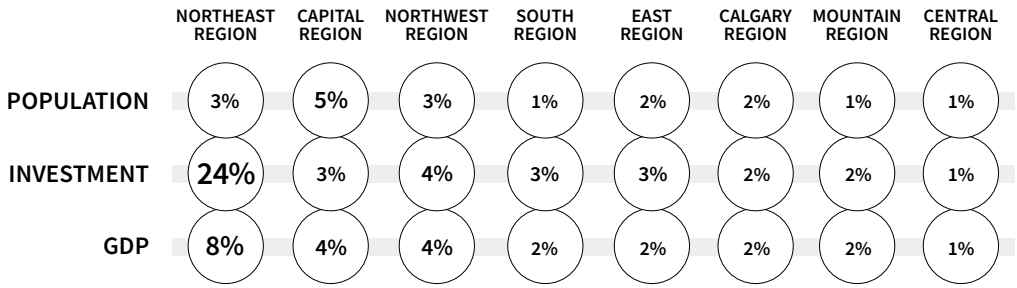
24 Ibid.

GDP AND INVESTMENT

A Government of Alberta study from 2010 found that from 1991 to 2006, communities that had a strong metropolitan influence (e.g., were located close to and were economically integrated with a metropolitan area) were more economically advantaged, while those with no metropolitan influence were least economically advantaged.[25] In this study, the economic advantage was defined as having higher labour force participation, lower unemployment rates, the lowest incidence of low income, lowest reliance on government income, and close to the urban median income. A later study by the Conference Board of Canada in 2012 had similar findings but added that from 2001 to 2006, employment and GDP growth was stronger in urban and urban-influenced areas than it was in rural areas.[26] Moreover, this study found that the goods sector accounted for a larger share of rural GDP during this time, whereas the services sector accounted for a larger share of urban GDP. Nonetheless, services as a share of rural GDP increased over the course of the study period, led by increases in the finance, insurance, and real estate sectors.

A more recent study commissioned by the Alberta Association of Municipal Districts and Counties in 2018 found that rural Alberta accounts for approximately 41% of Alberta's investment and 26% of the province's GDP.[27] Each region's contribution to these statistics is outlined in more detail in Figure 8. Notably, the northeast region, where the dominant industry is mining and oil and gas extraction, is a significant outlier, contributing as much as 8% to the province's GDP and accounting for nearly a quarter (25%) of provincial investment. As noted by the study authors, the majority of this and future investments target oil sands and pipeline projects. While the global demand for energy continues to keep commodity prices high—and oil and gas will play a significant role in Alberta's near-term economic prospects and labour market needs—these companies are also looking for new ways to boost productivity and improve efficiency at times by leveraging technology. These shifts impact the demand for talent. In some cases, fresh talent with new skills is needed. In other cases, existing workers need to build on their current skill sets or adopt new ones altogether.

FIGURE 8 **Economic contribution to Alberta's population, investment, and GDP**



Adapted from: "The Economic Contribution of Rural Alberta," 2018, Nichols Applied Management Inc., https://rmalberta.com/wp-content/uploads/2019/05/The-Economic-Contribution-of-Rural-Alberta-AAMDC-FINAL-.pdf

25 Sorensen, Marianne, "Rural Alberta Profile," 2010, Rural Development, Government of Alberta, https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/csi13499/$FILE/alberta-rural-profile.pdf

26 The Economic Contribution of Alberta's Rural Communities," 2012, Conference Board of Canada, https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/csi14195/$FILE/alberta-rural-communities-report.pdf

27 "The Economic Contribution of Rural Alberta," 2018, Nichols Applied Management Inc., https://rmalberta.com/wp-content/uploads/2019/05/The-Economic-Contribution-of-Rural-Alberta-AAMDC-FINAL-.pdf

LABOUR FORCE

MAJOR FIELD OF STUDY

Despite regional variations, urban populations are more likely to have a post-secondary certificate, diploma, or degree than rural populations. As shown in Table 3, approximately 60% to 65% of Calgary and Edmonton's population have obtained a post-secondary certificate, diploma, or degree; meanwhile, this is the case for about half (46% to 56%) of the population in more rural economic regions. The types of post-secondary certificates, diplomas, and degrees that urban and rural populations hold also vary. In urban areas, certifications in topics like (a) business, management, and marketing; (b) engineering; (c) computer and information sciences and support services; and (d) social sciences are more common. Meanwhile, certifications related to (a) mechanic and repair technologies and technicians; (b) construction trades; (c) agriculture and veterinary sciences, services, and operations; (d) transportation and materials moving; and (e) natural resources and conservation are more common in rural areas. While the educational backgrounds of rural workers have traditionally aligned with the talent needs of the dominant sectors in those areas, rural employers expressed challenges sourcing skilled talent in areas like technology or business as their needs shift and/or their business operations diversify. As will be discussed in the next section, where workers with specific educational backgrounds are located impacts business strategy, including strategies related to hiring, human resource management, organizational planning, and digital adoption.

TABLE 3 **Major Field of Study as a Percentage of the Population by Economic Region**

	Alberta	Calgary	Edmonton	Wood Buffalo	Banff	Red Deer	Lethbridge	Camrose	Athabasca
No post-secondary certificate, diploma, or degree	41%	35%	40%	44%	44%	47%	49%	49%	54%
52. Business, management, marketing	12%	14%	12%	9%	9%	9%	8%	8%	7%
51. Health professions and related programs	8%	8%	9%	7%	7%	9%	9%	8%	7%
47. Mechanic and repair technologies and technicians	3%	2%	2%	5%	4%	3%	3%	4%	5%
13. Education	4%	4%	4%	4%	4%	4%	4%	4%	4%
46. Construction trades	3%	2%	3%	5%	3%	4%	3%	4%	4%
15. Engineering, engineering-related technologies, and technicians	3%	3%	4%	5%	3%	3%	3%	3%	3%
12. Culinary, entertainment, and personal services	2%	2%	2%	2%	3%	2%	2%	2%	2%
48. Precision production	2%	1%	2%	2%	2%	2%	1%	2%	2%
01. Agricultural and veterinary sciences, services, and operations	1%	1%	1%	1%	1%	2%	2%	3%	1%
14. Engineering	4%	6%	3%	3%	2%	1%	1%	1%	1%
49. Transportation and materials moving	1%	0%	1%	2%	1%	1%	1%	1%	1%
03. Natural resources and conservation	1%	0%	0%	1%	2%	1%	1%	1%	1%
45. Social sciences	2%	3%	2%	1%	2%	1%	1%	1%	1%

	Alberta	Calgary	Edmonton	Wood Buffalo	Banff	Red Deer	Lethbridge	Camrose	Athabasca
43. Security and protective services	1%	1%	1%	1%	1%	1%	1%	1%	1%
44. Public administration and social service professions	1%	1%	1%	1%	1%	1%	1%	1%	1%
11. Computer and information sciences, support services	2%	3%	2%	1%	1%	1%	1%	1%	1%
50. Visual and performing arts	1%	2%	1%	1%	1%	1%	1%	1%	1%
19. Family and consumer sciences/human sciences	1%	1%	1%	1%	1%	1%	1%	1%	1%
42. Psychology	1%	1%	1%	1%	1%	1%	1%	0%	1%
22. Legal professions and studies	1%	1%	1%	0%	1%	1%	1%	1%	0%
31. Parks, recreation, leisure, fitness, and kinesiology	1%	1%	1%	0%	1%	1%	1%	0%	0%
30. Interdisciplinary studies	1%	1%	1%	1%	1%	0%	0%	0%	0%
24. Liberal arts and sciences, general studies, humanities	1%	1%	1%	0%	1%	0%	1%	0%	0%
26. Biological and biomedical sciences	1%	1%	1%	0%	1%	0%	1%	0%	0%
40. Physical sciences	1%	1%	1%	0%	1%	0%	0%	0%	0%
09. Communication, journalism and related programs	1%	1%	1%	0%	1%	0%	0%	0%	0%
39. Theology and religious vocations	0%	0%	0%	0%	0%	0%	0%	1%	0%
23. English language and literature	0%	1%	1%	0%	0%	0%	0%	0%	0%
04. Architecture and related services	0%	1%	0%	0%	0%	0%	0%	0%	0%

Data Source: 2021 Census of Population[28]

OCCUPATION

When looking at Alberta's population by occupation, we see that rural Albertans are more likely than urban Albertans to be employed in (1) trades, transport, and equipment operators and related occupations and (2) natural resources, agriculture, and related production occupations; and less likely than urban Albertans to be employed in (1) business, finance, and administration occupations, (2) occupations in education, law and social, community, and government services, (3) natural and applied sciences and related occupations, and (4) health occupations. Workers in the skilled trades (including those with Red Seals) are in high demand in rural Alberta and will likely remain so—the acute shortage of these workers is felt in rural regions, just as it is across the province and, increasingly, across the entire country.[29] In addition to this, however, the growing demand for talent in fields like business and technology (combined with the limited supply of these workers in rural regions) puts increasing pressure on local educational institutions to diversify their training offerings to meet evolving employer demands, while simultaneously causing employers to look to other talent streams (including from other regions) to fill current-day needs.

28 Note: for all major fields of study not listed here, the number of individuals with this type of credential was too low and therefore either suppressed or 0%, including: Other, 5. Area, ethnic, cultural, gender, and group studies; 10. Communications technologies, technicians, and support services; 16. Indigenous and foreign languages, literatures, linguistics; 25. Library science; 27. Mathematics and statistics; 28. Military science, leadership, and operational art; 29. Military technologies and applied sciences; 41. Science technologies and technicians; 38. Philosophy and religious studies; 54. History; 60. Health professions residency and fellowship programs; 55. French language and literature; and 61. Medical residency and fellowship programs.

29 Jessica Wong, "Demand for skilled trades is soaring. So what's standing in the way of more apprenticeships?" March 14, 2023, CBC News, https://www.cbc.ca/news/canada/skilled-trades-education-1.6773564

	Alberta	Calgary	Edmonton	Lethbridge	Camrose	Red Deer	Banff	Athabasca	Wood Buffalo
Sales and service occupations	23%	24%	24%	23%	24%	21%	29%	22%	21%
Business, finance and administration occupations	16%	18%	16%	13%	14%	13%	13%	14%	13%
Trades, transport and equipment operators and related occupations	19%	17%	20%	20%	21%	21%	21%	24%	28%
Occupations in education, law and social, community and gov't services	11%	11%	12%	11%	10%	9%	8%	10%	11%
Natural and applied sciences and related occupations	8%	11%	8%	4%	5%	4%	5%	4%	6%
Health occupations	8%	8%	8%	9%	9%	7%	6%	6%	5%
Occupations in manufacturing and utilities	4%	3%	3%	6%	5%	4%	4%	5%	5%
Occupations in art, culture, recreation and sport	2%	3%	2%	2%	2%	1%	3%	1%	1%
Natural resources, agriculture and related production occupations	4%	2%	2%	9%	8%	16%	8%	11%	7%
Legislative and senior management occupations	1%	1%	1%	1%	1%	1%	1%	1%	1%

SECTION II

RURAL ALBERTA'S DIGITAL ECONOMY

Still growing and evolving today, rural Alberta's digital economy is comprised of four main parts:

1 **Digitizing businesses in traditional sectors.** These are companies in sectors like agriculture, energy, or infrastructure that are increasingly adopting technology. These businesses are often larger employers and in the earlier stages of digitization; they usually leverage technology to improve productivity or drive efficiencies, while a smaller number are more digitally mature and deploy digital-based services or products in addition to their core business offerings.

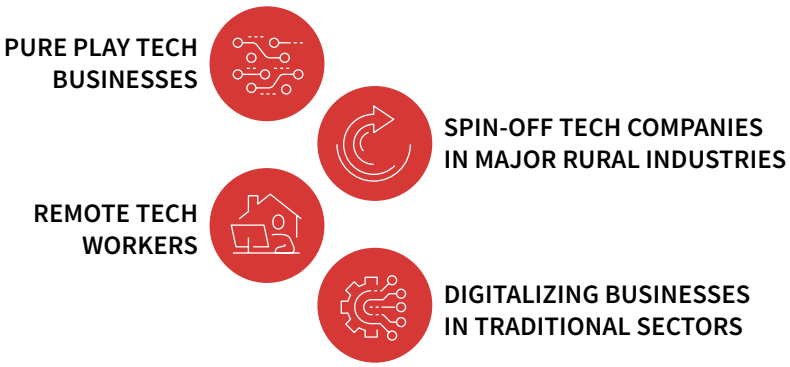
2 **Spin-off technology companies from major rural industries.** These businesses, often smaller startups, grew hand-in-hand with increasing digitization in traditional sectors. They provide technology services specifically to fill a need in an industry—for example, a data analytics firm that offers crop health monitoring and predictions based on real-time data.

3 **Pure-play tech companies.** These businesses, operating most commonly as smaller local startups or satellite locations of larger companies, provide pure-play and relatively generic (i.e., not specifically tailored to a certain sector or industry) technology products or services to rural Alberta businesses. The most common examples include tech consultancy services to aid digital transformation, consultant contractors and web development firms.

4 **Remote technology workers.** With the large-scale adoption of remote work starting in 2020 and continuing—at least largely to some degree—today, many technology workers gained additional flexibility during the pandemic that allowed them to relocate from urban centres. Some of these workers settled in rural areas of the province, with Lethbridge and Red Deer seeing the greatest influx of workers. While working for companies outside of rural Alberta, these workers still contribute to their local digital ecosystems by sharing knowledge, expertise, and resources.

Each of these contributors experiences different drivers, barriers, and needs, and each has unique impacts on the rural demand for digital labour and skills.

The Four Main Components of Rural Alberta's Digital Economy

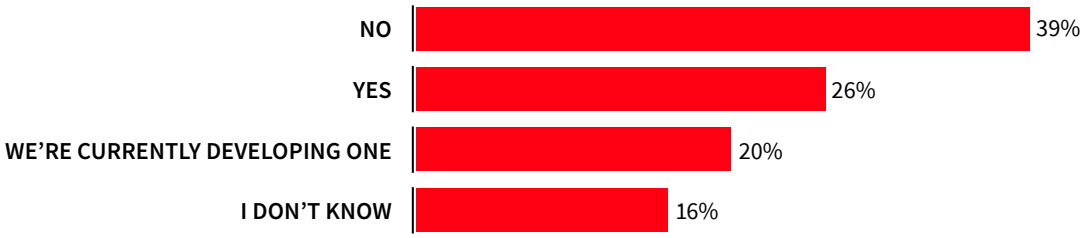


DIGITALIZATION AND TECHNOLOGY ADOPTION

Digitalization and technology adoption in traditional sectors accounts for a large swath of rural innovation activity. As technology increasingly impacts all sectors of the economy, tailored solutions are being developed for sectors like retail, construction, agriculture, mining, manufacturing, finance, and more. All of these businesses have the potential to not only digitalize their business operations (and, in so doing, boost efficiency) but also adopt industry-specific technology solutions.

Rural Alberta businesses are aware—and at times, excited—about technology's potential, but many are in the early stages of their digital transformation journey. In response to this study's employer survey, 39% of rural Alberta businesses do not yet have a technology adoption strategy, one-quarter (26%) do, and one-fifth (20%) are in the process of developing one. Accordingly, just under half (46%) of rural businesses either currently have a strategy or will soon. This finding suggests that technology adoption and digitalization, though unchartered territory for some, is generally seen as important for businesses operating in rural Alberta. Respondents confirmed that business decisions relating to technology are becoming increasingly important and, in some cases, are believed to be core to business evolution. Many interviewees further corroborate this notion, suggesting that technology investments are becoming more top of mind and prioritized.

FIGURE 9 **Does your company have a technology adoption or digital transformation strategy?**

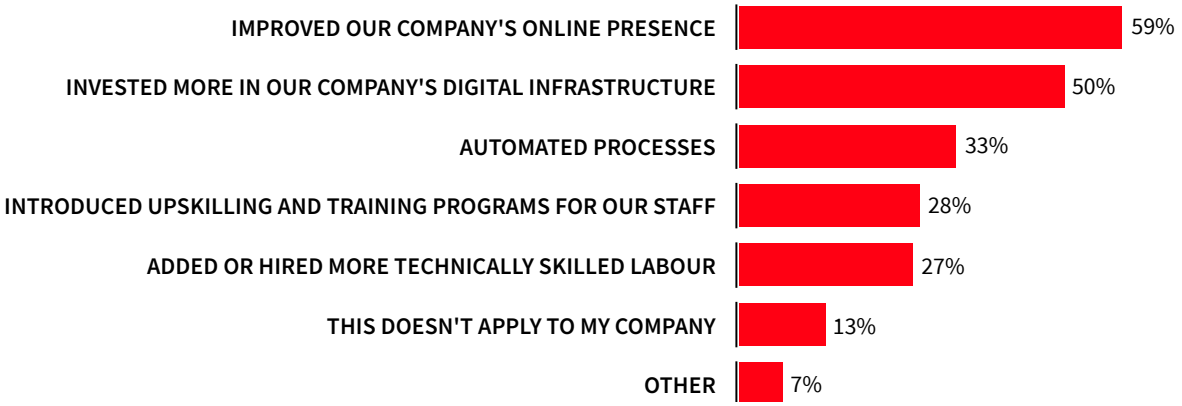


Data source: ICTC survey

When asked how businesses responded to recent digital trends, results varied, but they can be grouped into two core types of interventions: i) related to business operations and ii) related to staffing.

Tied to business operations, most businesses (59%) noted improving their company's online presence (including on their websites, social media, etc.; this is likely due to the importance of having an online presence to attract and facilitate business during the pandemic), half (50%) invested in their digital infrastructure (including websites, cybersecurity infrastructure, databases, servers, etc.), and a third (33%) automated some processes. Related to staffing, 28% upskilled their internal staff with core digital or technical skills (including in cases where previous staff functions were automated), and 27% hired more technically skilled labour to fill new talent shortfalls (when these shortfalls emerged or became more acute due to changes in business operations).

FIGURE 10 **How has your company responded to digital trends? Select all that apply.**



Data source: ICTC survey

KEY TRENDS DRIVING RURAL TECHNOLOGY ADOPTION

For many rural communities, the past few years have been characterized by rapid efforts to digitalize and adopt technology to stay competitive or adapt to changing consumer needs. According to this study's interviewees and advisory committee members, several core trends act as drivers of technology adoption in rural Alberta:

DIGITALIZATION AND OTHER TRENDS RELATED TO THE COVID-19 PANDEMIC

Participants highlighted that the pandemic caused an abrupt transition to a "digital by default" modus operandi. While recent research finds that the pandemic supercharged technology adoption across countries and sectors, rural Alberta businesses noted the biggest changes in the rise of remote work, the adoption of cloud and AI technology, and an acceleration of e-commerce. While the changes themselves were not altogether surprising or unexpected, many participants said that had the pandemic not occurred, these developments would have taken several years to fully materialize in their regions. Interestingly, some of these developments—namely remote work and e-commerce—are also believed to have influenced the culture of rural communities.

As one interviewee noted, "Remote meetings are something you'd have never ever seen up here; it just wasn't acceptable, and now it's commonplace." In addition to creating a stronger business case for cloud technologies, improved telecommunications infrastructure, and remote meetings, participants felt that remote work reduced the "distance" between rural communities and Alberta's large urban centres while simultaneously creating new considerations for workers themselves, who increasingly experience challenges disconnecting and compartmentalizing their work and home life. Overall, many participants were excited about the opportunity for more extensive remote collaboration between Alberta's rural and urban technology communities, something that was viewed as cornerstone to bridging the digital divide and creating a more equitable playing field.

The growth of e-commerce and new customer expectations during the pandemic also caused many businesses to establish or strengthen their online presence, including implementing e-commerce tools, boosting their social media presence, and investing more heavily in digital marketing. At the same time, the unpredictable supply chains that plagued the early days of the pandemic (which, for some communities, still persist) caused fluctuations in commodity prices that made predictive and dynamic pricing a priority for most businesses. Similarly to how remote work can negatively impact corporate culture and innovation, the growth of e-commerce—fuelled by pandemic slowdowns and shutdowns—also produced undesirable effects for brick-and-mortar businesses, including permanent closures. The shuttering of physical commercial businesses—some that were core community connection points and meeting places—also created a cultural shift for certain rural communities.

GRAPPLING WITH ONGOING LABOUR SHORTAGES AND LOOKING TO AUTOMATION

Many study participants discussed a cyclical relationship between digitization and automation and the workforce. On the one hand, a low supply of digitally skilled workers in rural Alberta (and hence, ongoing labour shortages) drives a need for efficiency and automation. As stated by one interviewee, "With the current labour shortages, people are [hard to find] and come at a premium…. The more you can digitalize systems, the less human capital is required." On the other hand, digitization and automation itself—while often linked to increases in efficiency or productivity—can also displace workers or lead to job losses. That said, most employers believe that where displacement in one area occurs, digitization will create new jobs in other areas.

Today, digital and technical labour shortages pose a significant risk to businesses in rural Alberta. They impact daily operations (including limiting worker and system efficiency), and they constrain growth (some businesses noted plans to deploy new products and services that respond to evolving consumer demand, but the lack of digitally skilled talent hampers their ability to execute). In response to this pressing and long-standing labour shortage, many employers look to automation as a viable solution to streamlining their businesses, or they engage consultants. As noted by one interviewee, many businesses are unable to hire workers because of a lack of available staff, so they increasingly use those funds to automate tasks or engage consultants on contracts. The most automated tasks include inventory and asset management, legal and administrative services, and distribution.

NEW TECHNOLOGY AND DATA STANDARDS

Another important driver of rural technology adoption relates to data and its use. Robust data collection, storage, and sharing are becoming basic requirements for businesses to take part in global supply chains and export markets. Many of Alberta's rural industries are export focused (i.e., of energy products, agricultural goods, etc.), and increasingly, downstream businesses are requesting data to inform the federal government's Net Zero targets, environmental reporting, supply chain traceability, automation, and more.

Other industry standards that continue to drive the need for technology adoption are cybersecurity and interoperability. While most Canadian businesses grapple with building and maintaining their cyber infrastructure—and as a result, the CIRA Cybersecurity Survey identified that 30% of Canadian companies experienced a data breach in 2022[32]—many organizations in rural Alberta use outdated, legacy software that poses high cybersecurity risks and is often not interoperable with modern ICT infrastructure.

32 "2022 CIRA Cybersecurity Survey, CIRA, 2022, https://www.cira.ca/en/resources/documents/cybersecurity/2022-cira-cybersecurity-survey/

INVESTMENTS IN RURAL BROADBAND INFRASTRUCTURE AND SUCCESSION PLANS

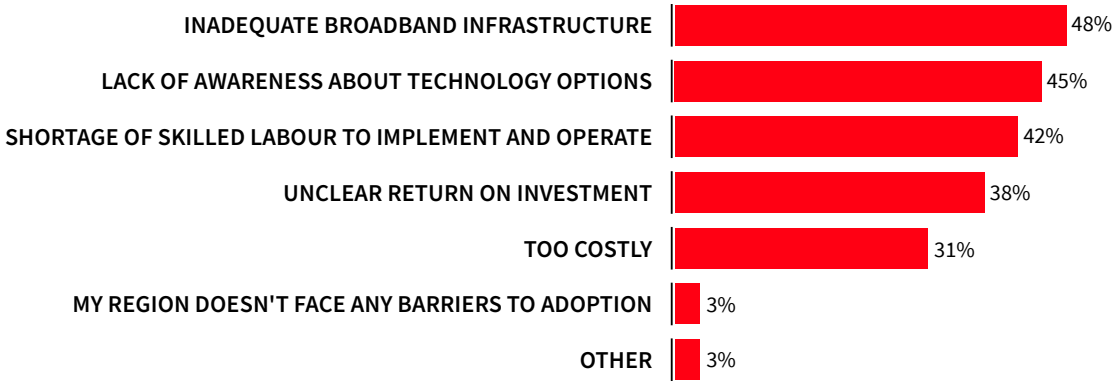
Looking forward, participants were excited about the impact that growing access to rural broadband will have once new infrastructure materializes (including the ability to attract more remote workers) and the impact that new talent and workers will have on the acceptance of technology tools. As one interviewee noted, many small to medium-sized businesses are currently drafting succession plans, and the belief is that as younger generations take on management and leadership roles, rural Alberta will see a wave of technology adoption and growth.

BARRIERS TO TECHNOLOGY ADOPTION (AND THEIR SOLUTIONS)

Despite a growing need for digitalization, not all businesses have adopted technology to date. While some businesses interviewed in this study were clear leaders in their industry and region—early adopters of cloud services, SaaS solutions, automation, and AI—interviewees cautioned that many small to medium-sized businesses struggle to adopt not just emerging technologies but technologies that many consider standard practice. As one interviewee noted, "Some of the really small businesses have gotten online, but many haven't updated their business plans to include anything digital." Another commented that "technology isn't having a huge impact on [their region's] traditional industries because there isn't a whole lot of adoption going on." Still, another cautioned that "a lot of businesses don't have a digital adoption strategy—many aren't even set up on Google."

Interviewees in this study cautioned that technology adoption is a "deeply personal" process and that for each business, the barriers to adoption are as complex and unique as its value proposition. Nonetheless, rural businesses face common challenges: according to this study's employer survey, the top barriers are **infrastructure-related, awareness-based, cost-based,** and **talent-based. Infrastructure** was the biggest barrier to digital transformation for many businesses; inadequate broadband infrastructure was selected as a barrier by nearly half (48%) of respondents. **Awareness** plays a big role as well; here, a lack of clarity about technology options (including which technologies are the best fit for their needs as opposed to which are "trendy") was selected as a barrier by 45% of respondents. **Cost** was a key factor, too: 38% of respondents noted an unclear return on investment with technology adoption, and 31% said the sheer cost of technology solutions is a big barrier. Last but not least, the lack of **talent** took third place as the most critical barrier for rural business digital transformations: 42% of employers noted the shortage of skilled labour as a core challenge to both implementing and operating technology.

FIGURE 11 **From your perspective, which of the following barriers prevent businesses in your region from adopting technology? Select all that apply.**



Source: ICTC survey

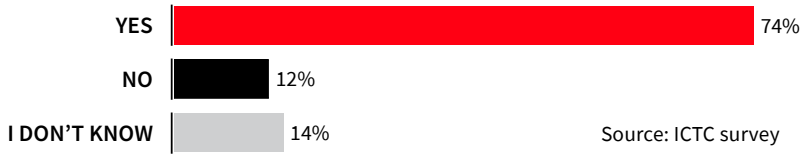
These findings suggest several easy-to-action steps that experienced industry leaders and support systems like industry associations can take to help businesses in their region adopt technology. A lack of awareness about technology options, for example, can begin to be addressed through industry-focused information sessions. Similarly, regional associations can collaborate with technology specialists to help local businesses calculate technology risk and return on investment (ROI). In the next section, common barriers and solutions for technology adoption are explored in more detail.

BROADBAND INFRASTRUCTURE

One of the biggest barriers to technology adoption (and labour attraction) is a lack of suitable broadband infrastructure, a fundamental requirement for the adoption of modern technology. When discussing broadband, participants noted not just a lack of broadband availability but also slow speeds and unaffordable prices when services are available. Notably, among business respondents who did see broadband infrastructure as a barrier to technology adoption, nearly three-quarters (74%) felt that it impacted their business growth strategy, at times hamstringing growth altogether.

With economic recovery top of mind for businesses, job seekers, and government alike, delivering resilient and functional broadband infrastructure—or offering suitable alternatives—should be a top priority. Interviewees suggested that despite its current limitations, broadband infrastructure is or will soon improve, and many lauded the expansion of Starlink to large portions of rural Alberta as a key lifeline. Recent federal and provincial investments in telecommunications infrastructure were also positively viewed.

FIGURE 12 **Has your company's growth strategy been impacted by inadequate broadband infrastructure?**



Source: ICTC survey

LABOUR SHORTAGES

Labour shortages, which are discussed in more extensive detail in Section III, have a severe impact on organizations' ability to adopt and successfully implement new technologies. At the most basic level, not having employees who are aware of new technology products and services and how they apply to real-world business challenges prevents businesses from considering new technologies in the first place. Beyond this, labour shortages prevent organizations from successfully developing new technologies, from successfully integrating new technologies into the workplace, from achieving the full return on investment that technologies can provide, and from properly maintaining and repairing new technologies to prevent downtime. Employers participating in this study note the most acute labour shortages in the skilled trades—the demand for workers in these roles nearly surpassed the demand for all other roles combined. Skilled trades shortages were followed by shortages in professional and scientific roles, sales and business development roles, core technology roles, and management or supervisory roles.

COST AND FINANCIAL RISK

Cost and financial risk can be significant barriers to technology adoption for small to medium-sized businesses, regardless of where they are located. For early adopters, there is an inherent risk that solutions might not work exactly as advertised, or as planned, or might not work optimally within specific business contexts. But even well-established solutions involve risk: businesses may roll out technology and be met with a lack of buy-in from customers and employees, or otherwise achieve a mediocre return on investment. Technology costs also add up quickly. Add to that varied and unique needs, differing employee responses, and other considerations of companies at the very start of their digital transformation journey. One interviewee representing a pure-play technology company in rural Alberta shared the story of a client looking to move their business online. In order to do so, they needed to upgrade their entire point-of-sale system, which added additional and previously unforeseen costs on the part of the employer. Another employer—this time a rural business that adopted technology—commented on how subscription service costs to support their online store appeared affordable at first, but they did not take long to add up. Subsidies or grants, such as those offered through programs like the Canadian Digital Adoption Program,[33] were highlighted by interviewees as key to enabling greater digital adoption among rural businesses.

33 New Canada Digital Adoption Program to help small businesses thrive in the digital economy," 2022, BDC and PMO, https://www.bdc.ca/en/about/mediaroom/news-releases/new-canada-digital-adoption-program-help-small-businesses-thrive

CUSTOMER AND PARTNER BUY-IN

Businesses—and particularly early technology adopters—can be limited by the willingness of their customers and partners to buy into new technologies. Moreover, many programs are only notably more efficient when they entirely replace legacy systems, such as outdated software and physical paper files. Several interviewees shared stories of how their clients or partners are limiting their ability to adopt new technologies because of their reticence to evolve from "business as usual." One employer noted that while they themselves are "a big proponent of digitalization," their digital transformation is "going slowly due to their clients." They added that while "[this company is] really proactive, [its] success level is a fair bit lower than [it] would like because it is such a big undertaking to try and get [their] clients to understand the importance of digitalization." Another interviewee shared a similar story about traditional service providers like accountants, finance, and insurance brokers, which nearly all businesses engage with: "A lot of [rural] businesses are still working with small accounting firms that aren't able to adopt new technologies easily and, in my opinion, that creates tension. If I'm an expert user of technology X, but my accountant doesn't work with digital technology or electronic documents, now I have to print everything, I've got to do all of that [non-digital] work, and to me, that's counterproductive."

Offering some solutions, one interviewee highlighted that technology adoption requires having a good understanding of where your partners are in their own journey with data and technology and that "it's okay to speak with your clients about what's expected of them and work together to create a strategy for digital service delivery." Conversely, other interviewees felt that buy-in among partners and clients will naturally improve as younger generations enter the workforce and increase the proportion of "digitally minded" people. To this point, many interviewees commented on how new entrants to the workforce are already inspiring change. One interviewee, a farmer, shared their experience of being inspired by young, tech-savvy workers on the farm: "I am boggled at the brilliance of these kids that are willing to take the time to self-tech and learn how to integrate things into industry…. These kids are helping us adopt technologies faster… and it has changed the way we farm…. It's a beautiful example of how there are gaps that people can come in and fill extremely well."

AWARENESS, KNOWLEDGE, AND SKILLS

Ultimately, rural businesses need to be aware of technology solutions to adopt them. Yet, with an ever-growing number of available solutions, staying up to date with technology is no easy task. Beyond awareness, businesses need to be able to identify which solutions are right for them, determine what they can afford to purchase, integrate, and manage without being overly inundated, and calculate benefits and ROI. Because of this, many rural communities run digitalization and technology adoption programs to help local businesses interface with and integrate new technologies.

Some of these programs teach basic-level business processes, like establishing a social media and web presence, using products like Google Analytics, and integrating remote work tools like Teams and Zoom. Others focus on making websites more engaging and interactive for clients. Still, others deliver more sophisticated solutions: for example, Alberta not-for-profit Cybera teamed up with Innovate Canmore in September 2022 to run a "how to begin your machine learning and data science" workshop. The workshop helped local businesses answer pertinent questions, like: When am I ready? What data should I collect? Who do I need to hire? And what tools do I need?[34]

Building awareness and skills requires time and resources that many businesses do not have. As one interviewee noted, "Even when you share resources, a lot of businesses won't use them because they just don't have the capacity to go through everything that they need to go through in order to utilize them." While time and resources can be a significant constraint, many interviews brought forward ideas on how to tackle this barrier and grow awareness and knowledge of digital adoption in rural Alberta:

Partnering with an ICT Solutions Consultant

That's where I come in. Businesses don't need to hire a permanent, dedicated person to do this work for them. They can hire me to say, 'Hey, we want to do this, but we don't know what resources we can use, and we don't know how. Can you get the ball rolling?'

Partnering with a Local College

Machine learning seemed like a good fit, but my background really had nothing to do with digital technology, so it was going to be a steep learning curve. We partnered with a local college, which was able to give us an introduction to machine learning.

Leaning on Large Urban Centres

Urban centres play a big, big role…. I mean, we've seen that in the broadband infrastructure space…. Calgary has a lot of expertise… and they've been really willing to share and help others through capacity building. They've done a really good job of helping other communities understand why they might want this technology.

Leaning on Technology Businesses

For me, the biggest piece is what I call technology integrators—people with a unique, balanced understanding of both industry problems and needs and how technology can help them in some way. I'm a product manager, so I'm not in a technical role, but I understand enough to be able to talk to technical people and then translate what they're saying to industry.

34 "How to Begin Your Machine Learning and Data Science Journey – Canmore," 2022, Cybera, https://www.cybera.ca/event/how-to-begin-your-machine-learning-and-data-science-journey-canmore/

Utilizing Digital Economy Support Programs

The Digital Economy Program with Digital Mainstreet and Business Link is really useful and helps walk businesses through what they need to be online." Under the program, Digital Services Squads made up of local students and recent grads "work one-on-one with small business owners in order to help them adopt digital technologies to grow and stay competitive.[35]

Connecting Industry with Relevant Information

We used funding from the province to bring in programming for our non-technology industries and then invited industry associations to take part. We didn't want to invite all 300 members, so we invited some of their senior people and made it their job to promote it with their membership. Our role is really to bring together the right people, organizations, and concepts to make innovation happen, and there is a great need for that type of cross-pollination across the province... There can't be a bunch of people working on the farm and a bunch of people working in tech. There needs to be programs that tie the two together, that act as the branch between the two.

SPIN-OFF COMPANIES FROM RURAL INDUSTRY

When local businesses choose to build technology products internally, they sometimes result in spin-off companies that are deeply engrained in rural industries like oil and gas, agri-food technology, retail and wholesale, and manufacturing. Some prominent examples include Auto-Star, a point-of-sale technology company based in Medicine Hat, which first started as an automotive company but later developed inventory management software for mechanics and car dealerships[36]; EZ Ops, an oil field management software company that is based out of Valleyview Alberta and raised $1 million from Alberta Innovates in June 2021[37]; IronSight, which has its roots in rural field operations and is now based out of Edmonton and Calgary[38]; and Decisive Farming, a precision agriculture company, which spun out of a family-owned crop-input company from Beiseiker.[39]

Due to their close connection to rural industries, spin-off companies may be less likely than pure-play technology companies to relocate to large urban areas as they scale.[40] When companies like Decisive Farming, Auto-Star, and EZ Ops remain in rural areas, they create valuable employment opportunities for technology workers in places like Irricana, Acme, Olds, Valleyview, and Medicine Hat. That said, spin-off companies usually face immense pressure to relocate specific business units and, at times, entire companies to large, urban centres like Calgary and Edmonton to gain better access to larger and better talent pools, broadband infrastructure, investors, clients, export market opportunities, industry support systems, and other scaling resources.

35 "Digital Economy Program," 2023, Digital Mainstreet, https://digitalmainstreet.ca/digital-economy-program/

36 "Auto-Star," 2023, Auto Star, https://www.auto-star.com/company-profile/

37 "EZOPS," 2023, EZOPS, https://www.ezops.ca/

38 "IronSight," 2023, IronSight https://www.ironsight.app/

39 "Decisive Farming," 2023, TELUS Agriculture, https://decisivefarming.com/about-us/

40 Matthews, Mairead and Rice, Faun, "CONTEXT MATTERS Strengthening the Impact of Foreign Investment on Domestic Innovation," 2022, ICTC, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/fdi-ip-canadian-innovation-2022.pdf

This pressure further mounts when considering chronic labour shortages in rural areas, making it more difficult to recruit local talent. Accordingly, companies like IronSight, which has its roots in rural field operations, may decide to relocate to a large urban centre while keeping satellite offices in rural areas.

Nonetheless, rurally engrained technology verticals are an exciting opportunity for rural Alberta. Previous research by ICTC has found that technology companies that operate in rurally engrained industries like agri-food (as opposed to more urban industries like financial services) are more likely to be based out of and create jobs in rural Alberta. As shown in Figure 13, small population centres of between 1,000 and 29,999 people accounted for over a quarter (26%) of agri-food technology job postings in Alberta from March 2020 to March 2022 and just under a quarter (23%) of Alberta's agri-food technology companies. Meanwhile, this is the case for just 2% of Alberta's financial technology job postings and 0% of Alberta's financial technology companies.

While much of Alberta's tech sector is based in Alberta's larger cities, rurally engrained technology verticals provide a valuable opportunity for rural Alberta to lead. Indeed, several of this study's interviewees felt rural Alberta should play to its strengths and, instead of trying to succeed in areas like fintech and pure-play technology, drive growth in technology verticals where rural communities already have a competitive advantage. As one interviewee urged, "Let's not try to make rural Alberta the next San Francisco…. We're forgetting what we already have… the land, the cattle, the sun, the water, the energy sources, the expertise, knowledge, and skill set that went into creating remote electronic systems for oil and gas—think of what we can do with all of this."

	Healthcare Technology	Clean Technology	Financial Technology	Agriculture Technology
Most common verticals among companies	Biotechnology Enterprise software and information systems Medical devices Decision and risk analysis	Energy efficiency Digitization Renewable energy production and storage Sustainable fuel development Carbon capture, utilization, and storage	Blockchain and cryptocurrency Payments Capital markets Accounting and expense management Lending Insurance	Precision farming High-tech farming equipment Animal-focused technologies Enterprise services Controlled growing environments Crop protection and nutrition

35 "Digital Economy Program," 2023, Digital Mainstreet, https://digitalmainstreet.ca/digital-economy-program/

36 "Auto-Star," 2023, Auto Star, https://www.auto-star.com/company-profile/

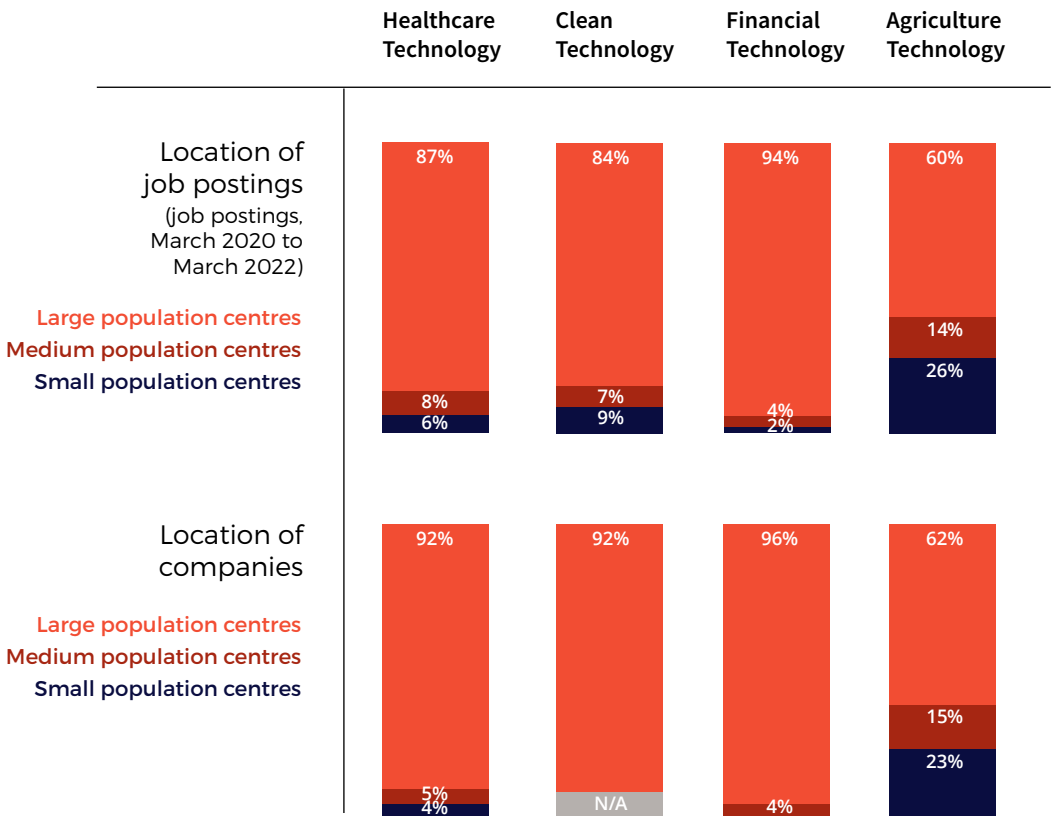
37 "EZOPS," 2023, EZOPS, https://www.ezops.ca/

38 "IronSight," 2023, IronSight https://www.ironsight.app/

39 "Decisive Farming," 2023, TELUS Agriculture, https://decisivefarming.com/about-us/

40 Matthews, Mairead and Rice, Faun, "CONTEXT MATTERS Strengthening the Impact of Foreign Investment on Domestic Innovation," 2022, ICTC, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/fdi-ip-canadian-innovation-2022.pdf

FIGURE 13 **Location of Alberta's technology industries**



Data Source: Cutean, A. et al., "A Resilient Recovery," ICTC, 2022, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/ab-covid-report-final-6-30-22.pdf

PURE-PLAY TECHNOLOGY COMPANIES

Rural Alberta is home to a collection of small, pure-play technology businesses, including IT consultants, web developers, database, records, and information managers, custom software developers, small-scale data centres, and telecommunications engineering firms. Like spin-off companies, many of rural Alberta's pure-play technology businesses face pressure to move their operations and headquarters to large, urban centres in order to scale and access talent. In this study, many such rural-based businesses chose not to relocate but admitted that remaining in a rural area would likely impact their ability to grow in the future. Regardless of company type, all-digital economy businesses in rural Alberta highlighted a shortage of skilled talent in their regions as a central barrier to advancement.

REMOTE TECHNOLOGY WORKERS

Finally, remote workers account for many of the tech workers in desirable but geographically limited towns like Banff and Canmore. While these workers earn high salaries and contribute to the local economy, remote workers also offer an avenue for smaller towns to begin building local technology knowledge and skills, and a local tech talent base. With the right initiatives and infrastructure in place, remote workers can be the foundation for future technology companies. Indeed, for one interviewee in this study, attracting remote workers was a foundational part of their community's plan to develop a local tech sector:

> *We've had a number of families move here recently as remote tech workers. They're working for companies in places like Vancouver, the Okanagan, and Texas, but they want to live here. And it's good for us because once they're here, we can get them involved in developing some of our other companies because they have the right skills.*

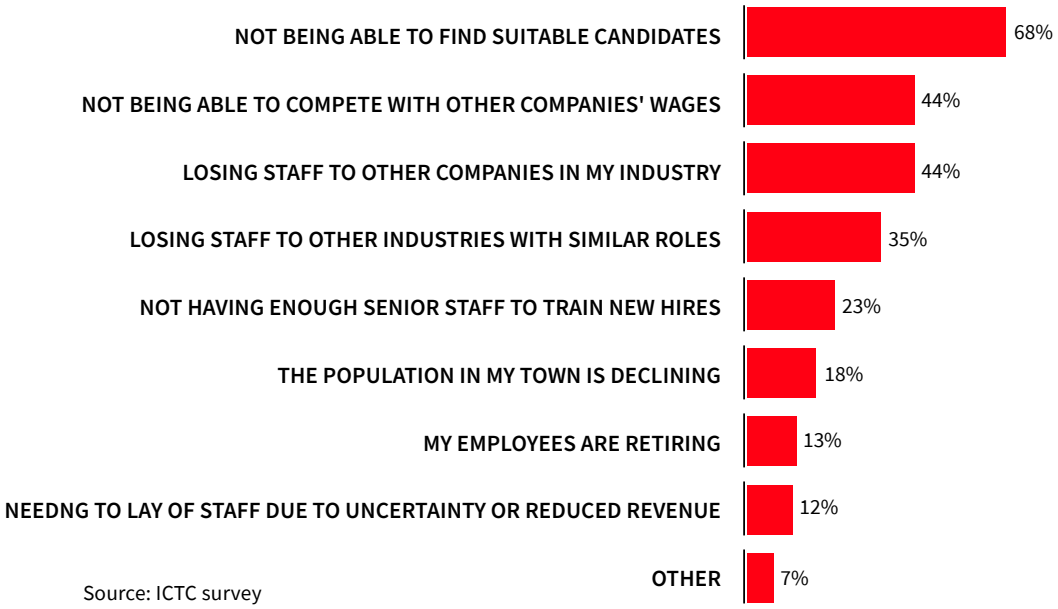
SECTION III

ALBERTA'S RURAL TALENT PIPELINE: TRENDS, CHALLENGES, AND OPPORTUNITIES

As discussed in Section I, demographic trends like urbanization, interprovincial migration, and immigration are reshaping rural Alberta's population and, in turn, rural Alberta's talent pipeline. Over time, both the total number and proportion of Albertans who live in rural areas has declined. While this is partially due to a reclassification of rural areas into urban areas as they grow, other trends are also contributing to rural Alberta's population decline. First, international immigration now accounts for much of Alberta's population and labour force growth, and for a variety of reasons, these individuals are more likely to settle in urban versus rural areas. Second, rural Alberta's population is aging: many young rural Albertans move to urban centres in pursuit of education and career opportunities at a young age and, in many cases, do not return. While all of Alberta and Canada are facing extensive labour shortages, for rural Alberta, this trend is exceptionally more pronounced.

In this study, participants highlighted labour shortages as one of the most pressing challenges facing businesses in rural Alberta—and not just for technology roles but across the economy. Indeed, respondents to this study's employer survey identified "not being able to find suitable candidates" as the number one threat to their workforce in the coming years, followed by "losing staff to other companies in my industry," "not being able to compete with other companies' wages," and losing staff to other industries with similar roles."

FIGURE 14 **Which of the following will be a threat to your workforce going forward?**



Source: ICTC survey

IN-DEMAND AND "DIFFICULT-TO-FILL" ROLES

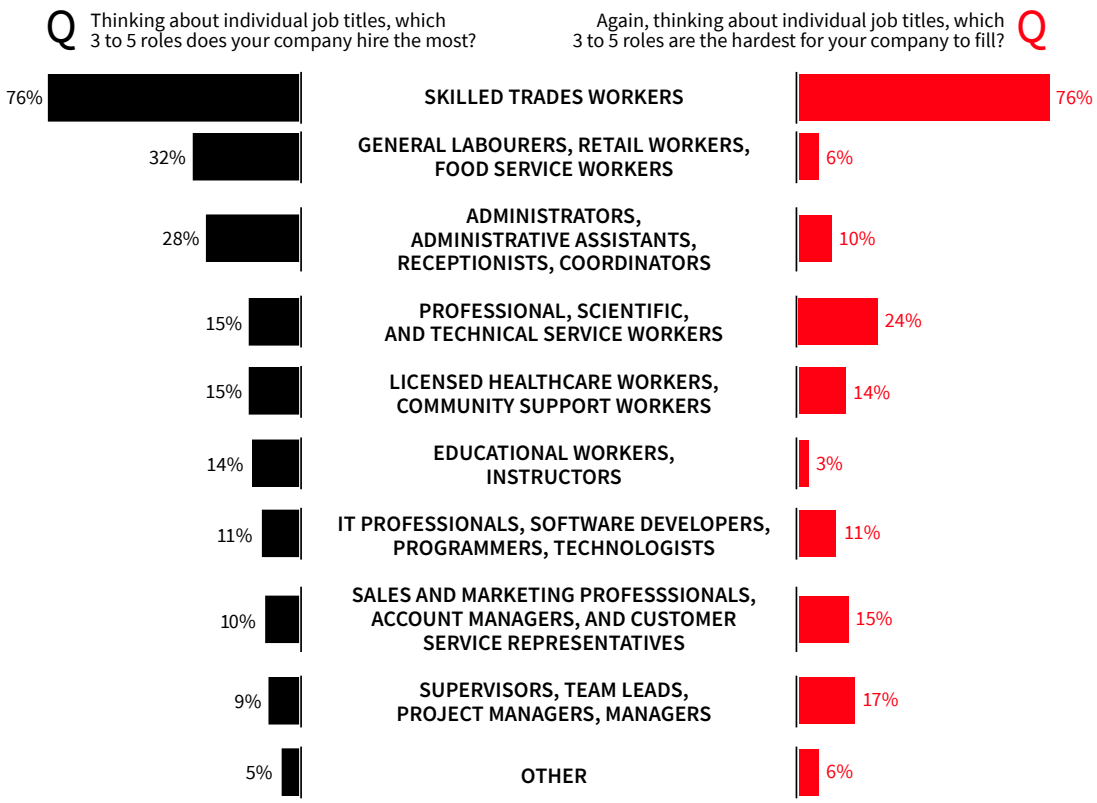
When asked which roles are most in demand and which are hardest to fill, respondents to this study's employer survey identified skilled trades workers as rural Alberta's single most pressing labour market need. Notably, this category was identified by just over three-quarters (76%) of the survey respondents. While workers in the skilled trades come with a diverse and robust roster of technical competencies, increasingly, many such occupations also require digital skills. For example, recent research by the Conference Board of Canada identifies that workers in Canada's skilled trades ecosystem need digital skills, including the ability to effectively use computerized machinery and the ability to utilize digital tools and resources to source, review, and analyze data to make decisions. As examples, the report identifies that workers in the automotive trades increasingly need to use digital diagnostic tools to solve vehicle issues; workers in the manufacturing trades need base-level knowledge or programming to set up and manage equipment that can communicate with other equipment; and workers in the construction trades need information management skills to organize product information for construction sites.

While the skilled trades represent the strongest labour need, many other roles were also identified as in demand. At a high level, these roles can be separated into three distinct categories: (1) specialized roles that are both needed in high volume and are difficult to fill, (2) unspecialized roles that are needed in high volume but are not difficult to fill, and (3) specialized roles that are not needed in as high of a volume but are nonetheless needed by businesses often and are difficult to fill.

41 Bridging Generational Divides: Advancing Digital Skills in Canada's Apprenticeships and Skilled Trades Ecosystem," September 15, 2020, Future Skills Centre, https://fsc-ccf.ca/research/bridging-generational-divides/

While these categories are explored in more detail in the section below, here is a summary of the findings:

FIGURE 15 **In-demand and difficult-to-fill roles**



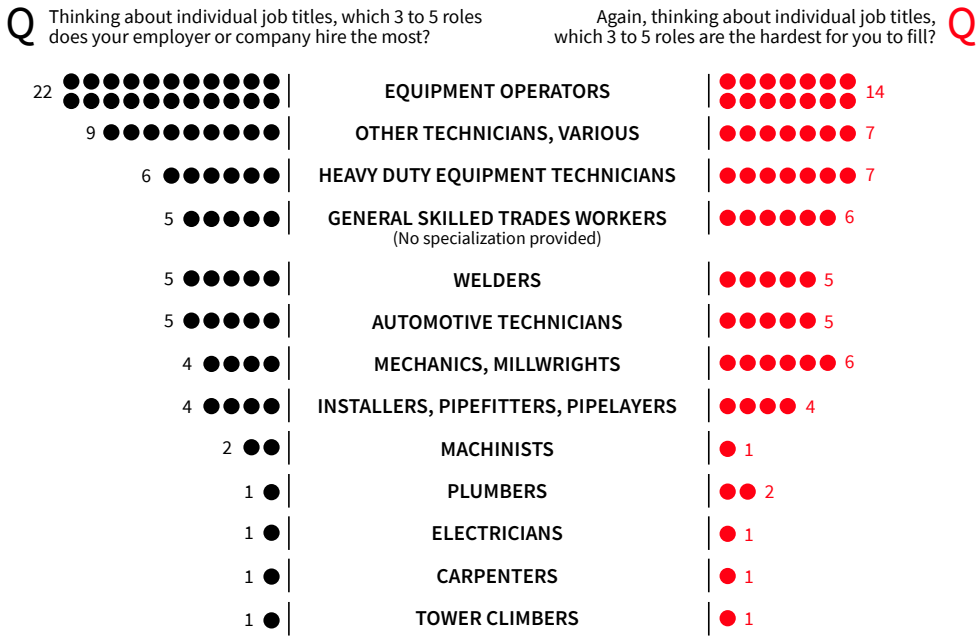
Source: ICTC survey

HIGH-VOLUME AND DIFFICULT-TO-FILL ROLES

When asked, “Which three to five roles does your company hire the most?” and “Which three to five roles are hardest for your company to fill?” just over three-quarters (76%) of respondents who answered this question indicated skilled trades. The responses suggest that skilled trades workers are the largest and most urgent labour market need in rural Alberta, likely due to their close involvement in many rural industries. Looking at the trades roles that respondents mentioned in more detail, we see that equipment operator roles, technician roles, and heavy-duty equipment technician roles are both very high in demand and difficult to fill.

Automotive technicians, welders, installers, and mechanics and millwrights are slightly less in demand but are still needed often and difficult to fill. As exemplified above, while the skills for these roles are inherently technical and not necessarily digital, increasingly, roles in the skilled trades are required to have several base-level digital skills. Tradespeople need skills such as data analysis, information management, and virtual collaboration to effectively work with increasingly digitized equipment and machinery in order to deliver the highest value for clients.

FIGURE 16 **In-demand and difficult-to-fill roles**



Source: ICTC survey

COMMON AND SPECIALIZED ROLES THAT ARE DIFFICULT TO FILL

Many professional, scientific, and technical roles are not needed in as high of a volume as trades workers and general labourers but are nonetheless difficult for businesses to fill. This is because these roles need long-term, specialized training, making talent not only more difficult to find but also much less transferable between roles. In addition to sales, marketing, and senior leadership roles, many of the roles included in this category relate to digital technology, including IT professionals, software developers, programmers, and technologists. As is explored in the pop-out section below, how businesses design their digitalization and technology adoption strategies and whether they choose to hire technology roles remotely out of large urban centres greatly impacts what types of digital technology roles are in-demand in rural areas.

DIGITAL ADOPTION STRATEGIES AND THEIR IMPACTS ON RURAL DEMAND FOR TECH WORKERS

When businesses design their digital strategy, they can choose to either hire technology talent internally or outsource tech services. Many of the rural businesses that were interviewed for this study opted to outsource technology services (e.g., IT consulting, systems and information management, cybersecurity, and web development) and buy ready-made software and hardware solutions (as opposed to developing new products internally). Similarly, outsourcing was a common way for this study's survey respondents to address core technology needs: approximately one-fifth (18%) of survey respondents always outsource technology work, while 52% sometimes do this. While part of this decision is related to budgeting (e.g., it is cheaper and less risky to outsource than hire internal staff), several interviewees explained that while they would like to hire long-term internal staff, severe labour shortages make that option unavailable: "It's very difficult to find qualified people here, so, if I were to look for anybody, I would outsource."

Importantly, how businesses design their digital strategy shapes their region's labour market needs. When businesses outsource technology services and adopt ready-made solutions, they are more likely to change the types of skills needed at their company as opposed to generating new demand for labour. For example, one inspection services company that was interviewed for this study adopted remote sensing and inspection technology and, because of this, started hiring remote inspectors in place of in-person inspectors. Another interviewee automated some of their more labour-intensive processes, and while they no longer needed physical labourers, they did need people who could operate and maintain new machinery, the machinery itself being partially digitized. Yet another adopted decision-support software, changing the scope of their existing roles to include data input and interpretation.

Alternatively, businesses that hire internal talent and build internal technology products are more likely to generate new demand for technology roles. Yet, even when companies do opt for this strategy, severe labour shortages in rural areas mean that new digital talent is often hired remotely and based in Alberta's large urban centres.

The following quotes, taken from this study's interviewees and advisory committee members, highlight just how endemic this reality is:

When a hiring request comes in, we'll look within rural areas as much as possible but then go to Edmonton, Calgary, or Canada. In Fort McMurray or Edmonton, it's not as difficult to find [digital] workers as it is in Cold Lake, Slave Lake, or Bonnyville, but still, we hire remotely nearly 100% of the time.

I've been on the hunt for a statistician for a long time but have not had any luck. That's obviously going to be a remote position because there aren't many statisticians on the ground in the first place, certainly not in this community, that aren't already fully tasked and fully employed.

Once we have more systems out in the environment, we'll probably hire a remote data and AI manager…They'll work remotely, so that can be from anywhere in the world.

We've recently started hiring more remote drone operators, and with that, we're able to employ people in all areas of the country. These roles can be in rural Alberta, but some of the roles we're looking for are very specialized. We'll try to hire locally first, then Alberta-wide, then Canada-wide.

We're about 26 kilometres northeast of Edmonton. I want to say that we have local residents working here, and we do look at talent [here], but due to the nature of our technologies, a lot of our employees in engineering and various administrative roles come from a more urban environment.

For every piece of software developed, you're looking at a 10-person team. And once it's built, you get rid of them, and they move on to the next one. So, it's kind of like a transient workforce environment where they only exist for the project, and then they're gone, and someone else comes in to maintain it.

It's not a labour gap; it's a canyon. If a farm wants to move to digital adoption, just to get basic networking is a two-day delay and a couple hundred kilometres worth of travel time to bring someone in. I mean, rural Canada has a huge labour shortage in general…let alone any kind of technology support.

A big challenge for us is we need to rely on labour from outside our region to meet labour demand.

We don't care where people come from as long as they're willing to drive here on occasion. It's really a matter of the talent and skills we're trying to access. Wherever they come from, we'll take them.

I think the most likely path for our local industry is outsourcing [technology] roles as much as possible…We have a huge shortage of tech talent in Alberta in general, not just here, but in general.

So many things happen online now, so I can hire people living in Calgary… [but] I would like to be able to employ people within my region who will, in turn, reinvest that money into my community.

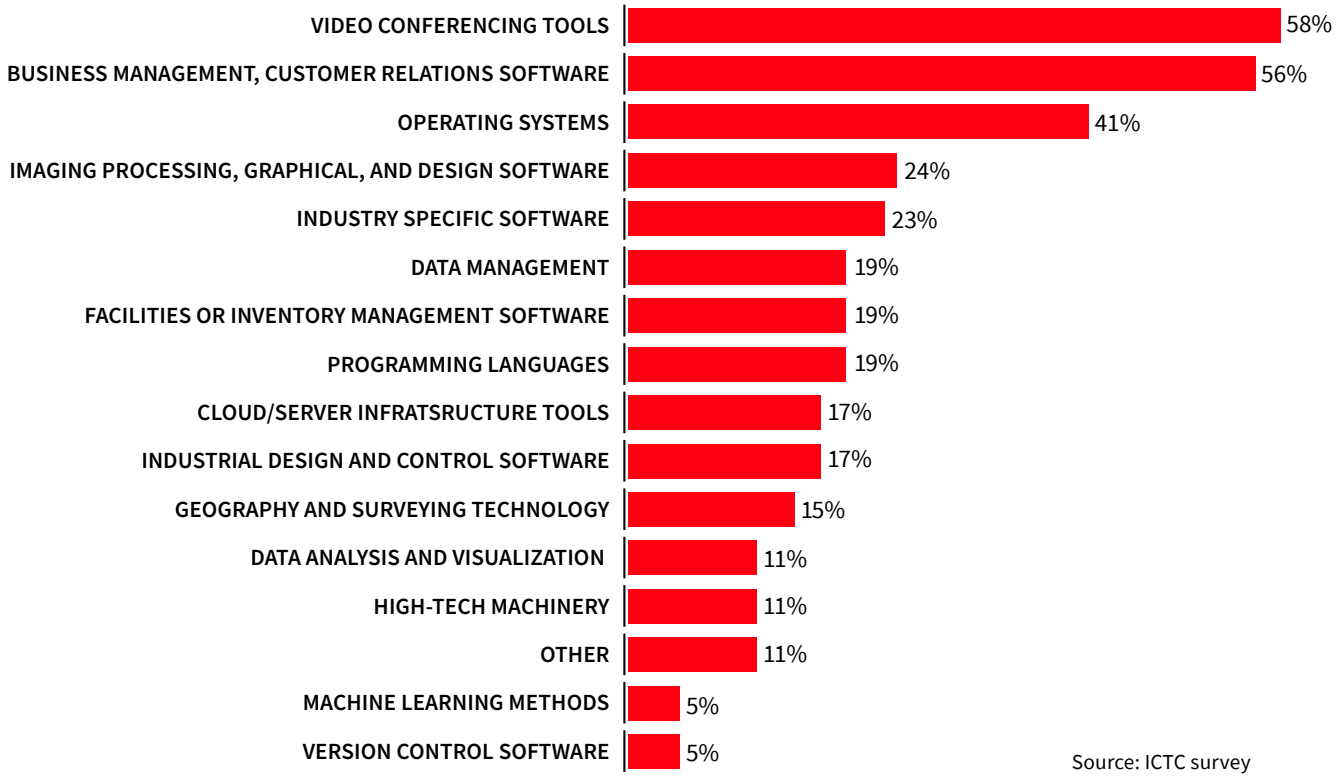
Yes, [we find it challenging to hire new employees], but the main issue is our location. We want to draw on rural residents because that's how we can contribute to the development of our rural economy.

DEMAND FOR DIGITAL SKILLS

Many roles in rural Alberta require "digital economy skills" irrespective of whether they are considered "technology roles." As part of this study's employer survey, respondents were asked which digital skills, software, and technologies employees need to be familiar with. Skills like the ability to use video conferencing tools, knowledge of business and customer relations management software, and familiarity with operating systems were selected by the largest percentage of respondents. Industry or job-specific tools were selected by one-quarter of respondents, including image processing, graphical and design software, facilities or inventory management software, industrial design and control software, and geography and surveying technology. Finally, core technology skill sets, such as programming languages, data management best practices, and cloud/server infrastructure tools, were selected by one-fifth of respondents.

Because many rural businesses in Alberta are engaged in technology adoption, as opposed to technology development, digital skills demand also relates more to technology adoption than it does to development. This is evident in the high percentage of businesses that require workers to be familiar with specific software packages or programs as opposed to technology development tools (e.g., programming languages, cloud infrastructure tools, data analysis and visualization, version control software, and machine learning methods).

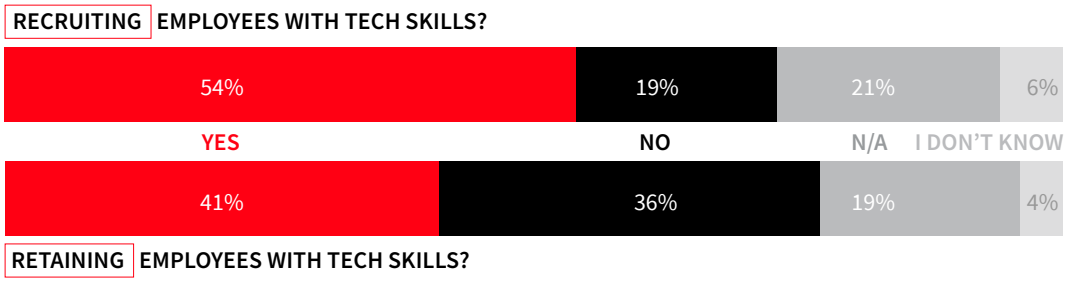
FIGURE 17 **Which software or technology do your employees need to be familiar with?**



Source: ICTC survey

Notably, many respondents find it difficult to recruit and retain workers with digital technology skills. Among respondents, 54% indicated that they have difficulty recruiting employees with technology skills, while 41% indicated they have difficulty retaining these workers. As is explored next, one core factor curtailing the ability of rural businesses to recruit and retain tech-savvy workers is the notable challenge in delivering digital skills training in these areas.

FIGURE 18 **Overall, over the last 12 months, have you had difficulty...**

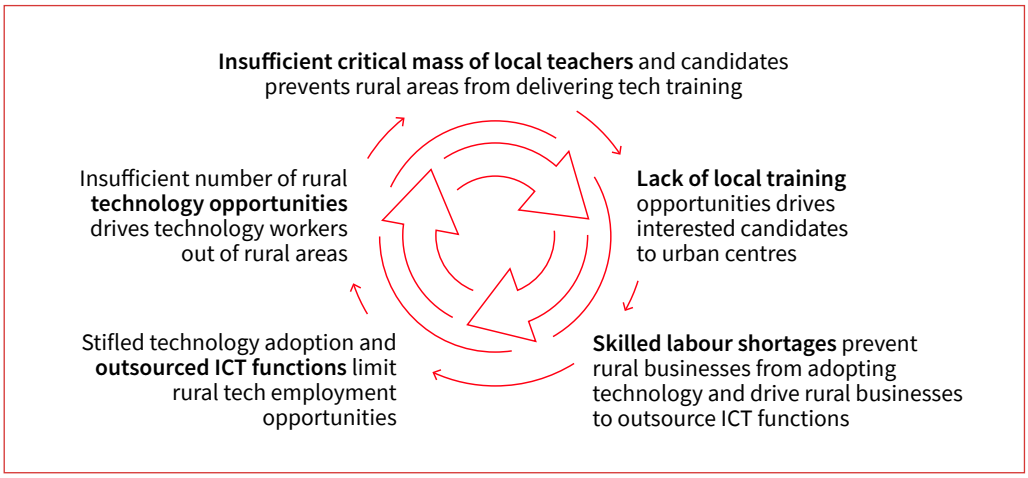


Source: ICTC survey.

DIGITAL SKILLS TRAINING AND WORKFORCE DEVELOPMENT CHALLENGES IN RURAL ALBERTA

Research by the OECD on education and healthcare delivery worldwide highlights that with population decline, class sizes in rural areas are becoming smaller, and access to educators is becoming scarcer. Similarly, participants in this study highlighted how difficult it can be to access educational services, especially in more "niche" areas like technology; many also reference how difficult it can be to deliver digital skills training in rural areas. In many ways, rural Alberta is stuck in an ongoing cycle when it comes to digital skill development: a lack of local teachers and fewer candidates (students) prevents rural communities from acquiring the ongoing infrastructure needed to deliver digital skill training locally—the limited training opportunities in turn drives interested candidates and teachers out of rural areas; moreover, candidates who leave rural areas in pursuit of this training often do not return. An added complication is that a lack of digitally skilled local talent can prevent local businesses from adopting technology, further reducing the number of opportunities to interact with and work on technology. Together, these trends reduce the overall number of technology workers, teachers, and training opportunities located in rural areas.

FIGURE 19 **The ongoing cycle of insufficient critical mass**



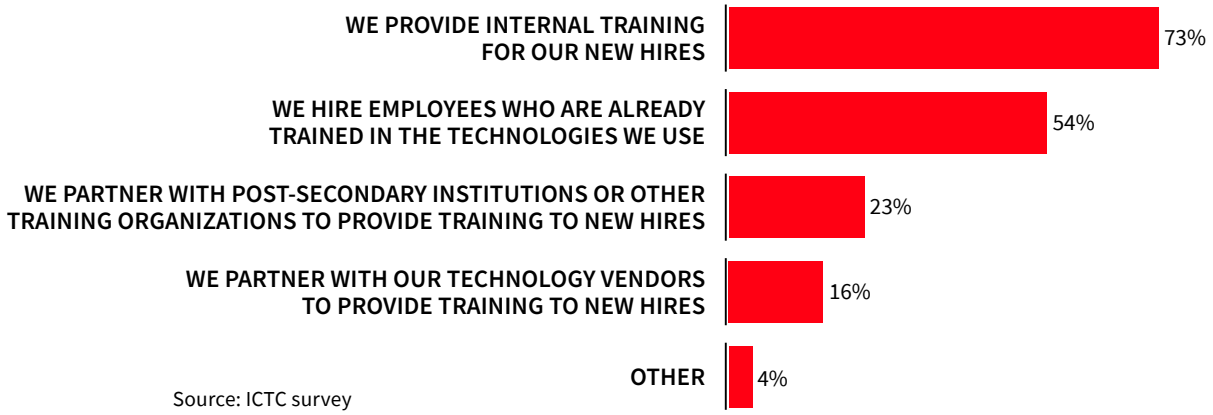
As outlined in a previous report by ICTC, mass is a crucial component of workforce development and retention: "For talent…to remain in an ecosystem, there must be sufficient critical mass and business density to absorb former employees of [sunsetted businesses], pay competitive salaries, and prevent [talent] from moving to other jurisdictions." In addition to this, study participants also noted that critical mass is necessary for workforce development programs to be cost-effective and worthwhile. As one of the study's advisory committee members shared, "[Rural colleges] would love to offer tech programming, but there is no way we can find enough learners to set up a cohort and allow us to deliver technology training in a sustainable way." Conversely, in large urban centres like Calgary and Edmonton, the critical mass to justify new technology training programs, secure instructors, and enrol students is there.

Rural businesses face barriers to delivering digital skills training to their existing workers, too. In response to this study's employer survey, roughly one-quarter (23%) of respondents identified "not having enough senior talent to train new hires" as a threat to their workforce. This challenge is further heightened by the demographic shifts that many rural communities expect in the coming years. With an older average workforce, rural Alberta must brace for a larger wave of retirements as older workers exit the workforce altogether; this further constrains the availability of senior-level workers to train new hires.

Some training options are available through technology vendors or consultants, though cost and location complicate the ability of businesses to leverage these sources in the longer term. Study participants highlighted that while technology vendors usually provide limited digital skills training at the outset of digital adoption or when businesses first purchase new hardware, software, or machinery, a lack of critical mass in rural Alberta again makes it difficult for vendors to sustain training opportunities over time. In many cases, vendors' training teams are located far from rural Alberta in places like Calgary, Toronto, Vancouver, or even Phoenix, Texas, and Seattle. As one interviewee noted, in an ideal situation, "Businesses have the processes in place to deliver [long-term] training themselves, but staffing shortages, turnover, and other challenges can prevent this from working because organizational capacity and knowledge gets lost."

When asked how they develop their employees' technology skills, nearly three-quarters of survey respondents (73%) indicated that they provide internal training to new hires with the—usually limited—staffing capabilities they have on hand. Meanwhile, more than half (54%) indicated that they hire employees who are already trained in the technologies they use (when they can find them, even if that means that the individual works remotely from an urban centre), a quarter (23%) indicated that they partner with post-secondary institutions or other training organizations, and approximately 16% indicated that they partner with technology vendors.

FIGURE 20 **How do you develop your employees' technology skills?**



Source: ICTC survey

Despite some of the challenges outlined above, interviewees in this study were excited about future opportunities to deliver rural workforce development and training in new ways and were especially keen on the prospect of upskilling or reskilling their existing workers. Many rural Alberta employers expressed a sense of loyalty to their local workforce and regarded the experience and domain knowledge of these workers as key assets and transferrable skills that could be applied to new roles when combined with specialized technology training. These opportunities are explored in more detail, identifying opportunities for rural workforce development at the provincial, community, and business levels.

STRATEGIES TO DEVELOP RURAL ALBERTA'S PIPELINE

Interviewees and advisory committee members outlined strategies for developing digital economy talent in rural Alberta. While many of these strategies can be adopted by individual businesses and industry members, others are more applicable to entire communities, rural towns and municipalities, and province-wide organizations. These strategies are explored in more detail in the sections below, with specific examples and case studies provided where possible.

STRATEGIES FOR BUSINESSES

ATTRACT AND RETAIN NEWCOMERS

International migration to Alberta is expected to account for more than half (55%) of Alberta's population growth in the near term and an even larger proportion of the growth in Alberta's labour force.[44] Yet, skilled immigrants are currently less likely to settle in rural than urban Alberta. Because of this, immigrants and permanent residents represent a much lower percentage of the population in rural versus urban Alberta (as outlined in Section I, just 9% of households in Camrose—Drumheller and Athabasca—Grande Prairie—Peace River, 13% of households in Red Deer, and 15% of households in Banff—Jasper—Rocky Mountain House, Wood Buffalo—Cold Lake, and Lethbridge—Medicine Hat compared to 32% of Calgary households, 27% of Edmonton households, 26% of Canadian households, and 25% of Albertan households). While rural businesses are unable to address all the reasons why immigrants are more likely to settle in urban versus rural Alberta, interviewees in this study did highlight a handful of strategies that rural businesses can use to better attract and retain newcomer talent.

One interviewee, an immigrant to Canada, noted that it is important for businesses that hire immigrants to provide avenues for immigrant peer mentorship and support. They noted that it is crucial for immigrants to be mentored, supported, and, in a best-case scenario, managed by people from similar backgrounds who can help them understand how rural Albertan organizations work and how to integrate into businesses and the culture. They further highlighted that people from different cultural backgrounds often need to learn how to overcome cultural hurdles and work together. While they have the soft skills needed to do so, they may lack cultural knowledge about Canadian organizations and business practices, namely in rural areas. For example, in some countries, manager authority is very strict and important, while in a Canadian context, people may be encouraged to challenge management suggestions and decisions or openly ask questions. Having a mentor, team member, or manager who understands the immigrant experience can help newcomers grasp cultural differences faster and can help them better integrate and advance in their organizations. Considering that there is often a low number of immigrants working in rural businesses and communities, several interviewees highlighted the importance of creating virtual or hybrid immigrant support networks whereby immigrant workers from different rural communities can connect to provide mentorship and support.

44 "Population statistics," 2023, Government of Alberta, https://www.alberta.ca/population-statistics.aspx#data-tables

Another consideration is the newcomer onboarding process. One interviewee said that "EDI is ultimately about onboarding" but that "right now, onboarding processes are very fragmented because companies aren't thinking about onboarding as a pathway for immigrant success." They added that "immigrants come to their first job [in Canada] with a lot of energy and passion because they're excited to contribute but will often slow down and lose that momentum because of their company's onboarding process." Accordingly, many interviewees felt it was important for rural businesses to work with equity, diversity, and inclusion experts and organizations representing newcomer workers to improve their onboarding processes and create a better experience. While the onboarding process may seem like a minor consideration, research has shown that effective onboarding is key to employee retention.[45]

ATTRACT AND RETAIN MORE WOMEN

Women continue to be underrepresented in Canada's digital economy. While recent research by ICTC highlights that more women have entered the digital sphere in recent years—namely, as new developments have taken place in fields like biotech, where women are well-represented—representation is still nowhere close to parity.[46] Further, career advancement pathways continue to lag, leaving few women in leadership or executive roles.[47] Interviewees also felt that women are an "underutilized" and "untapped" resource in many rural industries. As one interviewee, a recruiter, commented, "A lot of qualified women come through the door, but due to issues like childcare and not being able to travel to rural communities, it can't work." They added that "supervisors and clients aren't always willing to accommodate women's needs" and "a lot of the time, [being a woman] is viewed as a weakness."

Another interviewee said that while things are improving, the labour force is still very male dominated in roles like industrial trades. In response to these challenges, interviewees felt it was important to continue to challenge biases, advocate for women candidates, help new mothers transition back into the workforce, and reduce financial barriers for women, such as childcare support.

DEVELOP LOCAL TALENT

While their ability to do so is often constrained by time, finances, and human resources, it is important for businesses to not just hire but also help foster local talent, including helping existing staff upskill and reskill as needed. Several businesses participating in this study noted that they extensively participate in local talent development and, by doing so, have started building what could become a reliable and ongoing pipeline of new talent. While employers were keen to eventually look to opportunities to upskill existing workers, the focus was on attracting local Indigenous talent and engaging students, encouraging them to work in their local communities.

45 "Create an Exceptional Onboarding Journey for Your New Employees," Gallup, 2021, https://www.gallup.com/workplace/247076/onboarding-new-employees-perspective-paper.aspx

46 Maryna Ivus, Maya Watson, "Gender Equity in Canada's Tech Ecosystem: Attracting, Retaining, and Supporting Entry and Mid-Level Talent," ICTC, May 2022, https://www.digitalthinktankictc.com/reports/gender-equity-in-canadas-tech-ecosystem

47 Allison Clark, Justin Ratcliffe, Mansharn Toor, "Empowering Women in the Digital Economy: Addressing Tech's Untapped Potential," ICTC, June 2023, https://www.digitalthinktankictc.com/reports/empowering-women-in-the-digital-economy

Two different approaches to talent development are outlined in more detail in the quotes below:

> *We do a lot of workforce development programs, particularly with local Indigenous communities. We try to be a safe place for people to come to and try and see if this industry is for them. And if it is, we have a step-by-step process where we take them through their training. We're a bit of a leader in that regard…we spend a lot of time fostering a safe learning environment internally.*

> *My biggest strategy is professional engagement. One of the students I employ is taking a program that they won't finish for two, maybe three years, but it's all the more incentive for them to stick around with me in the meantime while they're seeing it through. Co-op students are similar. They're fresh out of school [and need experience]. If they spend their first three or four years with me after school and then leave to work somewhere else, that's fine with me. That's more than I could ask for.*

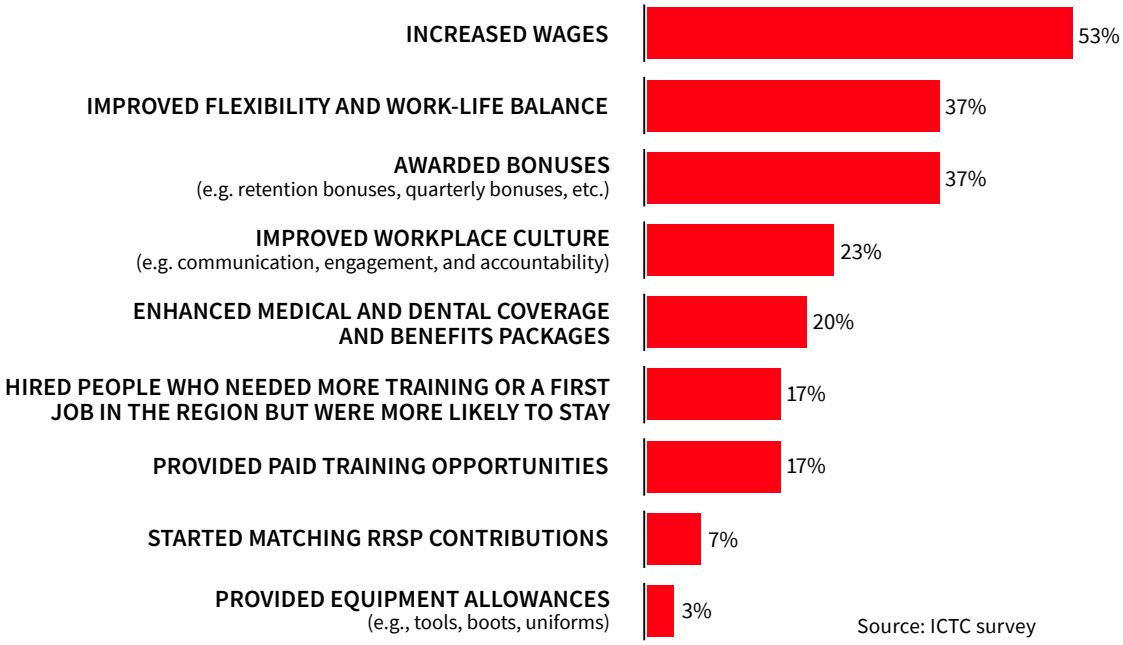
Overall, interviewees who spent time developing local talent saw themselves in reciprocal relationships with their employees: while employees gain industry experience and, many times, paid training, employers gain access to loyal employees who are likely to remain with their organizations for a longer-than-average period of time.

IMPLEMENT RETENTION STRATEGIES

With the expansion of remote employment opportunities, rural businesses have more competition than ever when it comes to retaining local talent. When asked what steps they have taken to increase employee retention in their business or region, more than half of survey respondents (53%) indicated that they had "increased wages," more than a third (37%) indicated that they had awarded bonuses and improved workplace flexibility and employee work-life balance, just under a quarter (23%) had improved their workplace culture (23%), approximately one-fifth had enhanced their benefits packages (20%), provided paid training opportunities (17%), or targeted workers who needed extensive training or a first job but, because of this, were also more likely to stay.

An important finding is the many ways to facilitate employee retention beyond just increasing wages and awarding bonuses. For instance, interviewees saw improved flexibility and work-life balance as an important aspect of employee retention, particularly given the high level of flexibility and work-life balance provided by remote roles. Further research suggests that younger employees are motivated by benefits beyond the financial, and in many cases, they expect flexibility; these workers view things like diversity, equity, work-life balance, and commitment to environmental protection as key influencing factors when accepting an offer of employment.[48] Interviewees reiterated how important it is for businesses to establish reciprocal relationships with their employees, offering things like paid training, a first job in Alberta or Canada, or equipment allowances in return for greater loyalty and retention.

FIGURE 21 **What steps have you taken to increase employee retention in your business or region?**



Source: ICTC survey

DEALING WITH THE CRUNCH: AUTOMATING TASKS

While employers in this study were highly interested in strategies to attract and retain talent, ultimately, they also referenced the need to implement stopgaps in the absence of talent. Many interviewees in this study suggested looking at opportunities to automate certain tasks where local talent was not available to fill in-demand roles. Indeed, many businesses interviewed for this study had already automated certain tasks and roles, namely, inventory and asset management, legal and administrative services, and distribution. However, where labour shortages can be solved through automation and efficiency solutions, not all tasks are easily automated.

48 "Welcome to Generation Z," Deloitte, https://www2.deloitte.com/us/en/pages/consumer-business/articles/understanding-generation-z-in-the-workplace.html

Specifically, interviewees noted that client-facing roles and roles that require a physical, human presence are not good candidates for automation and will need to be addressed through other means. Technology roles—like software developers, data analysts, etc.—were also regarded as roles that were not easily broken into tasks that could be automated.

STRATEGIES FOR COMMUNITIES

FOSTER LOCAL TALENT

Many communities that participated in this study are implementing impactful programs to help facilitate technology adoption and digital skills development in their regions. Often, community groups play a "connector" or "facilitator" role, connecting interested parties with relevant information, training, organizations, people, and tools. In addition to this, community groups help aggregate demand for information, training, and resources to make them easier and more cost-effective for interested parties to access. One community that participated in this study regularly connects with local businesses to see what technologies or software programs they require training for and then looks for opportunities to aggregate training demand at the industry level. Another interviewee shared how many of their community members had zero foundational technology skills and were in dire need of digital skills training before taking on new roles. In response, their organization launched an "Intro to Technology" micro-credential that adult learners could take to learn how to use basic tools like tablets and computers. Yet another organization improved technology training for local high school students by engaging technology businesses from their region to deliver coding and robotics programs. Finally, one interviewee used funding from the province to deliver technology adoption training to local industry associations, who could then share these learnings with their members.

EXPAND INTERNATIONAL HIRING AND IMPROVE SETTLEMENT SERVICES

Many study participants discussed strategies that can be implemented at the community level to expand international hiring and improve settlement services. In terms of expanding international hiring, study participants suggested that communities should (1) work with the Government of Alberta to fill labour gaps by streamlining existing immigration programs, (2) help local businesses access organizations and services that can connect them with international workers, and (3) help newcomers connect with potential employers and navigate preliminary conversations, which can sometimes be "awkward" and "heavily biased on both sides." Beyond this, many newcomers face barriers to employment and career progression even after arriving in Canada. While it is up to individual businesses to implement equitable recruitment, hiring, and onboarding processes, communities can help in other ways, for instance, by facilitating newcomer mentorship networks or providing local businesses with access to EDI resources and consultants.

48 "Welcome to Generation Z," Deloitte, https://www2.deloitte.com/us/en/pages/consumer-business/articles/understanding-generation-z-in-the-workplace.html

Still, one study participant, an immigrant themselves, mentioned that "oftentimes, people invest in coming to rural areas but then leave to city centres because they have a community there, because they have access to people who speak their own language, eat their own foods, visit their temples, and do the things they want to do." While they described that as "a hard selling point" that is difficult for rural communities to address, they did note that there are other aspects outside of the work world that communities can tackle. For instance, newcomers need to be able to access vital services like healthcare, financial services, childcare, and credit, which can sometimes look different in rural versus urban contexts. Helping newcomers navigate these types of services in rural contexts and reducing barriers to access is yet another part of talent retention. Moreover, workers choose where to live based on a myriad of factors outside of pay, job satisfaction, and career trajectory, many of which communities can proactively address.

ENGAGE IN HOLISTIC TALENT ATTRACTION AND RETENTION

Finally, interviewees highlighted the importance of holistic talent attraction. Building rural Alberta's talent pipeline will undoubtedly require a concerted effort to not just retain rural youth in rural areas but also attract newcomers and young adults from urban areas to rural ones. Ultimately, many of the things that make workers choose where to live fall outside a business' scope of influence: "Workers consider a range of factors beyond pay, job satisfaction, and career trajectory when choosing which positions to apply for and where to live, and the list of amenities that workers want and require is ever growing."[49] As one interviewee commented, it's important to ask, "What do young and middle-aged adults, families, and new immigrants care about?" and prioritize those things. While not an exhaustive list, some of the items that interviewees identified were broadband availability, robust and up-to-date kindergarten to Grade 12 education (with a particular emphasis on strong ICT education), recreational activities, community culture, amenities, meetups, and events, newcomer supports, and networking and mentorship opportunities. In sum, good talent attraction and retention strategies go beyond things individual companies can provide, such as wages and work-related benefits, to include quality of life and benefits provided by the community at large.

MULTI-STAKEHOLDER STRATEGIES

ENABLE REMOTE TRAINING AND WORKFORCE DEVELOPMENT

As discussed, rural communities struggle to deliver technology training and workforce development programs. Critical mass is necessary for workforce development programs to be cost-effective and worthwhile, but many local colleges struggle to find enough local teachers and students to justify rural cohorts.

49 Clark, Allison and Matthews, Mairead, "Canadian Agri-Food Sustainability," 2023, ICTC, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/canadian-agrifood-sustainability.pdf

As a result, rural students who want to pursue a career in tech are often required to move to large urban centres to access training. In many cases, these students establish local connections or find a local job and end up remaining in urban areas after graduation. Luckily, rapid digitalization resulting from the COVID-19 pandemic has made possible new approaches to technology training and workforce development. As one interviewee noted:

"One of the things COVID-19 forced post-secondary institutions to do is learn how to deliver our training through different modalities. We've learned a lot about remote learning and enabling access to learning for learners regardless of where they are.... Now you can have a teaching job in one place and reach students anywhere in the province…. You can build cohorts through a network and reach more students in a more sustainable way… and I think there are a lot of opportunities for us to build on that."

While there remain some barriers to remote learning in some areas of the province, such as a lack of suitable broadband infrastructure, interviewees felt that remote learning nonetheless represents an exciting opportunity for rural Alberta, whereby students can both remain in their local communities and access centralized workforce development and training programs focused on tech.

FOSTER CONNECTIONS BETWEEN TECH TALENT, URBAN YOUTH, AND RURAL INDUSTRIES

Past research by ICTC has identified projects and placements in non-technology industries as an important way for technology workers to build domain knowledge and become interested in working in non-technology industries.[50] Post-secondary institutions are often siloed, with a lack of integration between faculties and departments that are not closely related. For instance, past research by ICTC has shown a lack of integration between technology faculties and faculties related to medicine, agriculture, education, and geography. Importantly, which projects students work on and where students secure their first work placement, or co-op can heavily influence which industry or vertical they end up working in. Students who work on projects related to—or secure a first placement in—finance or e-commerce, for example, may be less likely to pivot to agri-food, health, clean tech, or other technology verticals.

Accordingly, it is important for post-secondary institutions to establish deeper connections between technology and non-technology faculties, both to enable cross-pollination and to inspire more technology workers to branch out into new industries. More specifically, to help build rural Alberta's talent pipeline, it will be important for post-secondary institutions to establish connections between technology departments and departments that are closely connected to rural industries, such as agri-food, forestry, energy, manufacturing, and mining.

50 Hamoni, Rosina et al., "Building Canada's Future AI Workforce," 2021, ICTC, https://www.ictc-ctic.ca/wp-content/uploads/2021/03/ICTC_Report_Building_ENG.pdf ; Clark, Allison and Matthews, Mairead, "Canadian Agri-Food Sustainability," 2023, ICTC, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/canadian-agrifood-sustainability.pdf

This will both inspire more technology workers to pursue employment in rural industries and ensure technology workers have the domain knowledge and industry-specific skills required to quickly transition into the workforce. As one interviewee shared, “A lot of the time, STEM students don’t look at [rural industries]; they look at everything else. That’s why we started to hone in on robotics clubs and school divisions that are really keen on STEM. We started telling students, ‘You can do all of that, and you can do it in [rural industries],’ and then the lights started to go off.” A second interviewee shared a similar perspective: “It’s an awareness piece…. I’m a mechanical engineer, and I work in agtech, and in my opinion, all mechanical engineers can work in agtech with a slight modification or additional course, but they need to want to.”

While creating deeper connections between faculties will introduce more post-secondary students to rural industries, the reality is that many students decide which industry they want to work in long before post-secondary, leading them to self-select out of important prerequisites even at a young age. As was identified in a recent report by ICTC about Canada’s agri-food labour market, it is increasingly evident that rural industries cannot rely solely on rural labour, and yet, many urban youths are not introduced to rural industries at a young age, limiting the number of urban workers who end up in rural careers. Going forward, it will be important for school divisions in Alberta’s urban areas to address this problem by better integrating case studies, field trips, and domain knowledge about rural industries into urban kindergarten to Grade 12 education.

LEAN ON LARGE URBAN CENTRES

Several interviewees suggested that it will be important for rural communities to lean on large urban centres where possible as they build out new programs and initiatives. One area where interviewees had seen large urban centres provide support was broadband infrastructure, but other areas of potential collaboration include digitalization strategy planning, best practices for calculating technology cost and return on investment, workforce development programs, and strategies for fostering a tech community locally.

CONCLUSION

Technology was core to Alberta's recent economic and labour market growth, and plays a key role going forward. While nearly all sectors witnessed a steep decline in output and employment during the COVID-19 pandemic, the province's digital economy remained resilient. In fact, despite a slowing global economy, employment in Alberta's digital economy makes gains—in August 2023, it employed 55,000 more people than it did in February 2020, a growth of nearly 30%.

Yet, much of this success is rooted in province's two largest cities, Calgary, and Edmonton. While not unusual, this concentration has impacts for Alberta's rural communities, who also increasingly seek to leverage technology to drive opportunities, and as a result, also seek to attract skilled technology workers. For example, despite a strong rural foothold in both the energy and agriculture sectors, in 2022 just 16% of clean technology job postings and 8% of clean technology companies were found outside of Calgary and Edmonton; agri-food technology fared better for regional diversification, with 40% of jobs and 83% of companies located elsewhere in the province.[51]

51 Cutean, A. et al., "A Resilient Recovery," ICTC, 2022, https://www.digitalthinktankictc.com/ictc-admin/resources/admin/ab-covid-report-final-6-30-22.pdf

While rural communities undoubtedly play an important role in Alberta's future, access to skilled talent is both an acute need and a significant barrier outside of urban centres. Like industry leaders in urban centres, rural employers have a need for technically and digitally skilled talent to fill core roles, and to propel digital transformation forward. Companies in urban centres have better chances to access to new entrants from post-secondary institutions, and mid and senior-level talent from local and international sources; rural employers, on the other hand, struggle to secure and retain talent on both ends—rural youth increasingly leave communities and often do not return, and an older demographic of workers means that more people inch ever-closer to retirement.

Further compounding the challenges is the diversity of talent needs in rural areas—top in-demand fields include the skilled trades, scientific roles, professional services, technology, and sales—and the limited capacity to offer consistent locally-run digital skills training. Considering this, it is no surprise that rural employers point to the lack of skilled talent as a top barrier to business growth and productivity, and to digital adoption and implementation.

The technical and digital talent crunch in rural Alberta is multi-faceted, and a complex intersection of barriers that requires multi-stakeholder solution-brokering to truly overcome and work towards building future resilience. In the meantime, though, rural employers exercise ingenuity to fill gaps; they look to attract remote workers from urban centres that may be looking for calmer and more cost-effective lifestyles, pique the interest of international talent that increasingly calls Alberta home, build better and reciprocal relationships with underrepresented groups, and continue to prioritize the retention of current workers by investing in digital skills training that can be built upon existing skillsets.

METHODOLOGY AND LIMITATIONS

RESEARCH METHODOLOGY

This report relied on a combination of primary and secondary research methods.

SECONDARY RESEARCH

SECONDARY LITERATURE REVIEW

ICTC conducted a scan of existing literature about rural Alberta's economy. The literature review helped shape the research questions and identify potential interviewees, advisory committee members, and engagement participants. It also helped identify relevant secondary data sources.

SECONDARY DATA SOURCES

Census of Population 2021 Data
ICTC used various tables from the Government of Canada's 2021 Census of Population. Data from these tables are included throughout the report.

Industry-Level Data
Pitchbook's company-level data was used to assess what types of companies make up Alberta's technology ecosystems, where these companies are located, and to identify the technology verticals in which the companies in these industries operate.

PRIMARY RESEARCH

KEY INFORMANT INTERVIEWS AND ENGAGEMENTS

ICTC convened an advisory committee, which met two times over the course of the project and conducted key informant interviews and regional engagements. The participants held senior-level roles throughout rural Alberta's digital economy. The key informant interviews were semi-structured and examined rural trends, identified in-demand and emerging jobs and skills, identified trends in digitalization and technology adoption, and assessed challenges to regional growth. Engagement sessions covered similar topics but took place in group settings. Interviews lasted from 30 to 60 minutes and were conducted virtually and over the phone; engagements were 1.5 hours in length and were conducted virtually. Interviews and engagement sessions were transcribed and coded for thematic analysis using NVIVO. Together, the interviews and engagements reached 40 individuals.

DRIVING INNOVATION IN RURAL ALBERTA SURVEY

ICTC conducted a survey of employers based in rural Alberta using Lime Survey. The survey asked employers about their approach to digitalization and technology adoption, barriers to digitalization and technology adoption, regional strengths and challenges, hiring plans, and talent and skills needs. ICTC worked with survey partners across the province to secure 146 responses.

LIMITATIONS

REGIONAL REPRESENTATION AMONG SURVEY RESPONDENTS

While the survey reached respondents from all of Alberta's economic regions, a large percentage of the survey respondents were from Northern Alberta, impacting the quality of the survey data. Approximately 45% of respondents were based in Athabasca-Grande Prairie-Peace River, 19% were based in Wood Buffalo-Cold Lake, 11% were based in Camrose-Drumheller, 10% were based in Lethbridge-Medicine Hat, and 2% were based in Banff-Jasper-Rocky Mountain House.

Despite an overrepresentation of respondents based in Northern Alberta, many respondents' companies operate in more than one economic region, improving the relevance of the survey to all rural regions. For instance, while just 2% of respondents were based in Banff-Jasper-Rocky Mountain House, 20% of respondents' companies operate in this region. Similarly, while just 10% of respondents themselves were based in Lethbridge-Medicine Hat, 21% of respondents' companies operate in this region.

Finally, it is worth noting that just 4% of respondents' businesses are headquartered outside of Alberta; accordingly, the survey provides a good representation of provincially owned and operated rural businesses.

DISTRIBUTION OF COMPANY SIZE AMONG SURVEY RESPONDENTS

Small businesses with between 1 and 99 employees accounted for the largest percentage of respondents (74%). This was followed by medium-sized businesses with 100 to 499 employees, which accounted for 13% of respondents, and then large-sized businesses with 500+ employees, which accounted for 14% of respondents. Notably, this is likely a larger percentage of large businesses than regularly occurs in the general Alberta business population.

SECTOR REPRESENTATION AMONG SURVEY RESPONDENTS

The professional, scientific, and technical services sector accounted for the largest percentage of respondents (22%), followed by other services (14%), public administration (10%), healthcare and social assistance (9%), and mining and oil and gas (8%). Construction, real estate, rental, and leasing, arts entertainment and recreation, information services, and finance and insurance were underrepresented in the survey.