ALBERTA'S DIGITAL ECONOMY:

OUTLOOK 2030

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PREFACE

The Information and Communications Technology Council (ICTC) is a neutral, not-for-profit national centre of expertise with the mission of strengthening Canada's digital advantage in the global economy. For over 30 years, ICTC has delivered forward-looking research, practical policy advice, and capacity-building solutions for individuals and businesses. The organization's goal is to ensure that technology is utilized to drive economic growth and innovation and that Canada's workforce remains competitive on a global scale.

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To Cite This Report:

Maryna Ivus, Christopher Lindstrom, Heather McGeer and Olena Podolna. Alberta's Digital Economy: Outlook 2030. Information and Communications Technology Council (ICTC), March 2025. Ottawa, Canada. Author order is alphabetized.

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ACKNOWLEDGEMENTS

The contributions made to this report by our advisory committee members, key informant interviewees, and other subject matter experts are greatly appreciated. We would like to acknowledge all the contributors to this report, along with the following specific individuals:

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EXECUTIVE SUMMARY

With a digital economy that is driving innovation, job creation, and economic progress, Alberta is a crucial source of economic activity in Canada, accounting for 15.4% of the national GDP as of 2023.

At a time when national productivity is trailing behind that of other countries, Alberta is demonstrating what might be achievable for Canada if industries and policymakers innovate and invest in digital transformation. In 2023, the province's productivity rates surpassed national rates by 18%, and its information and communications technology (ICT) sector ranks among the top five most productive.

In the last five years, Alberta's digital economy has created over 60,000 jobs, raising employment to nearly 36% above pre-pandemic levels. As of December 2024, the province's digital economy employed approximately 227,300 individuals, accounting for 8.9% of total employment.

It is with this in mind that the Information and Communications Technology Council (ICTC) has released this six-year outlook on Alberta's digital economy, reviewing the previous five years of economic growth, innovation, and transformation and looking ahead at what the next six years—through to the end of 2030—might hold for employment, sectoral growth, business and entrepreneurship, and workforce development.

Alberta has demonstrated remarkable resilience over the last decade, maintaining its status as one of Canada's most productive regions and a key contributor to Canadian economic growth. The oil and gas industry continues to lead in productivity, but Alberta has been taking proactive steps to enhance economic efficiency by diversifying its most productive sectors toward high-value, technology-intensive industries. As a result, Alberta's digital economy has experienced significant growth and transformation over the past several years, driven by substantial technology investments, rapid digital transformation across industries, and a restructuring of the workforce.

The growth of Alberta's digital economy can be attributed to expansion in the ICT sector. From 2014 to 2023, Alberta's ICT sector grew at an average annual rate of 3.0%, considerably surpassing the general economy's average growth rate of 1.1%. By 2023, the province's ICT GDP had significantly exceeded the GDP of its overall economy, with a 6.8% increase compared to the general economy's 2.3% growth. This trend is typical of Alberta's ICT sector, which has often outperformed the general economy, particularly during economic challenges.

Looking ahead to the next six years, continued growth is expected to result in significant expansion of the ICT sector in Alberta. ICTC forecasts an average annual growth rate of 1.7% for Alberta's ICT GDP from 2024 to 2030, projecting it will reach $13.093 billion by 2030.

The robustness of Alberta's ICT sector is evident in ICT startups consistently outperforming the broader economy in business creation. Moreover, the growing digital adoption across industries is driving demand for ICT services; the sector is increasingly integrated with traditional industries, such as oil and gas, energy, healthcare, and manufacturing. Significant investments in emerging technologies like artificial intelligence (AI), quantum computing, and cleantech are further supported by initiatives like the Alberta Technology and Innovation Strategy and the Alberta Broadband Strategy. The synergy of these developments has the potential to enhance GDP in the medium term.

ICTC projects that Alberta's digital economy may see an average annual employment growth of 1% from 2025 to 2030, which could lead to the creation of 13,600 jobs and increase total employment to 240,100 by 2030.

Sectors that stand out as significant technology employers in the province include the professional, scientific, and technical services sector, as well as the utilities sector. Additionally, a growing presence

of technology talent in the manufacturing, mining, quarrying, oil, and gas sectors indicates ongoing digital transformation and technological integration within traditionally labour-intensive industries. In 2022, Alberta led the nation in the adoption of advanced or emerging technologies, with an average of 49.3% of companies implementing at least one such technology. As businesses increasingly acknowledge technology as being essential to their operations, the demand for technology professionals is expected to keep rising.

Alberta's growing ICT sector is driving demand for technology workers, making human capital a key challenge for digital economy employers.

To better understand talent and skill demands, this study conducted interviews and a survey with professionals and employers in Alberta's digital economy. Nearly 60% of employers reported struggling with retention, while 50% found recruitment challenging. The difficulty lies in securing talent. As technologies advance, so too does the convergence of skills and technologies within roles, resulting in a growing demand for interdisciplinary talent.

Alberta's labour market is tightening despite attractive factors such as a relatively low cost of living, affordable housing, and lower taxes. To address labour gaps, employers are focusing on training and upskilling their current employees, hiring newcomers, collaborating with recruitment agencies, and partnering with educational institutions. Work-integrated learning (WIL) plays a vital role in career progression, helping new entrants transition to mid-level roles and ensuring a strong talent pipeline.

Alberta's digital economy has become a crucial catalyst for innovation, job creation, and economic advancement. The ability to implement digital solutions across multiple industries, coupled with stabilizing macroeconomic conditions, a growing population, alignment in workforce development, and governmental support, has created a strong basis for ongoing growth that will enhance Alberta's status as a leading technology hub and a significant contributor to Canada's digital future.

KEY FINDINGS

ECONOMIC SNAPSHOT OF ALBERTA

Alberta's economy has rebounded quickly from the 2020 downturn, driven by energy sector output and job growth.

The province's economic output has been resilient and experienced the highest growth of any province in 2022 and 2023.

Alberta's labour is more productive than the nationwide average, with productivity gains in technology-intensive industries, while SMEs lag.

Alberta businesses may see less profitability and become less competitive in the coming years. Labour productivity and cost show a decline in profitability, forecasting a trend that may indicate a less competitive business environment.

Alberta led the country in the adoption of new technologies. Digital transformation was not limited to traditional sectors, but also across subsectors including agtech, AI, cleantech, fintech, health tech, IDM, and quantum technology.

ALBERTA'S DIGITAL ECONOMY

The ICT sector in Alberta has grown consistently since 2016, with year-over-year growth often outpacing the general economy. In 2023, Alberta's ICT sector reached $11.657 billion, representing 3.4% of the province's total GDP.

ICTC forecasts that Alberta's ICT sector will continue expanding. Growth projections exceed those of Alberta's general economy; by 2030, the sector's GDP is anticipated to reach $13 billion, which represents an additional $1.4 billion over 2023.

Alberta's digital economy could see an average annual growth of 1%, adding 13,600 jobs for a total employment of 240,100 by 2030.

Digital economy companies in Alberta are, on average, optimistic about their future revenue-generating capabilities, but face challenges including retention and recruitment of skilled employees, regulatory constraints, competition, customer acquisition, and financial resources.

Alberta's professional, scientific, and technical services sector, and the utilities sector, stand out as major technology employers in the province, with nearly 57% of the ICT workforce between them.

The demand for technical professionals is growing. There is an acute need for talent to fill specific roles, particularly at the middle and senior management levels.

WORKFORCE COMPOSITION AND DEVELOPMENT

Alberta's current digital economy workforce can meet employer demand for entry-level technology talent, but demand for mid- to senior-level technology professionals outpaces supply.

Immigrants are key to increasing labour supply; the proportion of immigrants in the digital economy workforce grew from 23.5% in 2020 to 34.6% in 2024.

As technology evolves, Alberta's workforce needs ongoing training. Credible, verifiable micro-credentials enable workers to upskill and demonstrate continuous learning to employers.

Employer-provided upskilling aids in retaining technology talent and addressing skills gaps; 38% of employers indicate that they plan to offer training to current technology employees.

Work-integrated learning is important for career progression, helping new entrants transition to mid-level roles, and fostering a robust talent pipeline.

INTRODUCTION

Alberta is a vital source of economic activity in Canada, contributing 15.4% of the national GDP as of 2023.[1] The province's energy sector has traditionally driven economic growth. However, over the past decade, Alberta has diversified its economy by investing in technology and innovation, establishing itself as a prominent technology hub. Since the COVID-19 pandemic, Alberta's economy has recovered; the province has benefited from several advantages, such as a relatively low cost of living, which it uses to attract and retain entrepreneurial and technology talent. Like the rest of Canada, digital adoption and diversification in Alberta have the potential to boost labour productivity and ensure economic growth amid population shifts.

Developed to provide critical insights into the evolving digital economy in Alberta, this report primarily focuses on developments in talent demand as well as the attraction and retention of skilled technology workers. The ICT sector has seen significant growth, with employment in Alberta's digital economy surpassing 220,000 by December 2022—a 27% increase from pre-pandemic levels.[2] Nonetheless, employers continue to struggle to meet their workforce needs.

The third report in a series of labour market studies that seek to understand core subsectors, as well as Alberta's digital economy, this report follows ICTC's 2024 studies on the health technology and interactive digital media (IDM) industries in Alberta.[3] It builds on previous research conducted by ICTC and industry experts, including ICTC's 2022 report on Alberta's post-COVID recovery.[4] This earlier report underscored the need for ongoing insights into labour market trends and skill shortages within the province's technology landscape.

This report explores specific subsectors that have experienced particularly rapid rates of digital transformation and increased talent demand, not only due to recent advancements in technology but also as a result of pandemic-induced changes in remote working trends, technology adoption, and consumer behaviour. The digital economy encounters a unique set of workforce challenges as businesses implement digital solutions in their product and service delivery, and the ICT sector increasingly embraces advanced and emerging technologies. With broader economic factors—such as inflation and geopolitical developments—impacting Alberta's labour market, this report seeks to provide in-depth and timely information that can aid the province's economic diversification and ongoing growth in the digital economy.

Informed by interviews with industry stakeholders, a survey of businesses in Alberta's digital economy, and secondary research, this report is structured as follows:

Section 1 of this report opens with an overview of Alberta's economic activity in recent years. It then shifts focus to the sectors propelling growth and digital adoption in the province.

Section 2 provides an overview of Alberta's digital economy, including an employment forecast through to 2030. It highlights trends specific to the technology sector regarding economic output, labour market conditions, in-demand jobs and skills, and workforce development, all contextualized within the broader economic landscape of the province and Canada. Section 2 also explores key trends in technology sector entrepreneurship and scaling in Alberta. Finally, it assesses in-demand occupations and skills.

Section 3 explores workforce dynamics in greater detail, examining who participates in the digital economy workforce, the talent strategies of employers, and workforce development.

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1 Statistics Canada, "Table 36-10-0402-01 Gross Domestic Product (GDP) at Basic Prices, by Industry, Provinces and Territories (x 1,000,000)," November 7, 2024, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610040201.

2 Alexandra Cutean, "The Digital Talent Imperative: Calgary's Economic Edge," Information and Communications Technology Council (ICTC), June 2023, https://ictc-ctic.ca/reports/the-digital-talent-imperative.

3 Todd Legere, Olena Podolna, Justin Ratcliffe, and Faun Rice, "From Concept to Care: Health Technology Talent in Alberta," Information and Communications Technology Council (ICTC), May 7, 2024, https://ictc-ctic.ca/reports/concept-care-health-technology-talent-alberta; Alexandra Cutean, Erik Henningsmoen, Todd Legere, Noah Lubendo, Mairead Matthews, Justin Ratcliffe, and Faun Rice, "Virtual Frontiers: A Study on Alberta's Interactive Digital Media Industry," Information and Communications Technology Council (ICTC), September 23, 2024, https://ictc-ctic.ca/reports/virtual-frontiers-study-albertas-interactive-digital-media-industry.

4 Alexandra Cutean, Mairead Matthews, and Mansharn Toor, "A Resilient Recovery: Alberta's Digital-Led Post-COVID Future," Information and Communications Technology Council (ICTC), June 2022, https://ictc-ctic.ca/reports/a-resilient-recovery.

SECTION 1:
AN ECONOMIC SNAPSHOT OF ALBERTA

Key Findings

- **Alberta's economy has rebounded quickly from the 2020 downturn, driven by energy sector output and job growth.**
- **The province's economic output has been resilient and experienced the highest growth of any province in 2022 and 2023.**
- **Alberta's labour is more productive than the nationwide average, with productivity gains in technology-intensive industries, while SMEs lag.**
- **Alberta businesses may see less profitability and become less competitive in the coming years. Labour productivity and cost show a decline in profitability, forecasting a trend that may indicate a less competitive business environment.**
- **Alberta led the country in the adoption of new technologies. Digital transformation was not limited to traditional sectors, but also across subsectors including agtech, AI, cleantech, fintech, health tech, IDM, and quantum technology.**

Alberta's economy and labour market have experienced substantial changes over the last decade.

The combined effects of the pandemic and the collapse in oil prices in 2020 significantly impacted the province's economic landscape, resulting in a drop in the Alberta Activity Index to a nine-year low.[5] Despite a subsequent rise in unemployment, which peaked at 15.8% in the second quarter of 2020 and was linked to a loss of approximately 337,000 jobs, recovery timelines were swift.[6]

By the end of the fourth quarter of 2020, two-thirds of the jobs lost had been regained, and household spending and housing construction rebounded significantly, largely due to increases in oil production and exports.[7] Household incomes improved, and labour market conditions strengthened in 2021 with the creation of 110,000 jobs and a reduction in the monthly unemployment rate,[8] which averaged approximately 8.7% in 2021.[9]

The Alberta labour market continued to strengthen in 2022, with nearly 82,000 new jobs created, 95% of which were in the services sector. In 2022, the unemployment rate reached record lows not seen since 2014, signalling a tightening of the labour market, with fewer available workers and an increase in job vacancies. Despite strong job creation, average wage growth remained constrained at just 1.3%, partly due to the rise in vacancies in lower-paying industries.[10]

5 Government of Alberta, "Economic Spotlight 2020: A Year in Review," March 2021, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/d792997e-4795-4dd9-aede-de3f2340a348/download/tbf-economic-spotlight-2020-year-review-2021-03.pdf.

6 Ibid.

7 Ibid.

8 Government of Alberta, "Unemployment Rate," January 10, 2025, https://economicdashboard.alberta.ca/dashboard/unemployment-rate/.

9 Government of Alberta, "Economic Spotlight 2021: Alberta Economy Year in Review," April 2022, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/9ddb19f8-6a79-480e-a285-0ff065b9982c/download/tbf-economic-spotlight-2022-04.pdf.

10 Government of Alberta, "Economic Spotlight 2022: Alberta Economy Year in Review," April 2023, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/e7268357-19a7-40e7-89ed-0bf44c85c040/download/tbf-economic-spotlight-2023-04.pdf.

Alberta's economic growth moderated in 2023 and 2024; however, the energy sector remained a strong contributor to overall output.[11] Employment continued to grow with the addition of 85,000 new jobs in 2023, while consumer spending slowed due to inflationary pressures. Price increases have since been eased through decreases in interest rates, and population growth has generated additional economic output through residential construction activity and investment.[12] Labour shortages have placed upward pressure on wages, especially in the oil and gas and construction sectors. While expectations for slower population growth moving into 2025 mean the labour force will expand at a slower rate than in previous years, this growth is still expected to outpace employment gains, leading to a moderate increase in unemployment rates.

Population Growth and Immigration

Alberta has experienced an upward trend in its population growth rate since 2021. As shown in Figure 1, the growth rate in 2020 was low, at approximately 1.4%, due to travel restrictions imposed during COVID-19 and out-migration in response to high unemployment rates in the province.[13] The sudden drop to 0.5% in 2021 can be attributed to the economic impacts of the pandemic on households, along with the collapse of oil prices in the preceding year, which further restricted household consumption capabilities.[14]

In 2021, the economy gradually began to recover, and net interprovincial migration turned positive for the first time since 2015. Alberta's relatively low cost of living, affordable housing, lower taxes, and labour market were pull factors motivating relocation decisions.[15] These factors—combined with "record levels" of interprovincial and international migration[16] and the federal Canada-Ukraine Authorization for Emergency Travel for Ukrainians displaced by the war—continued to accelerate population growth through to 2023.

In 2023, Alberta experienced its highest rate of demographic growth since 1981, at 4.1%. This was driven by an influx of non-permanent residents (e.g., temporary foreign workers, students, Ukrainian refugees) and new permanent residents.[17] These developments generated notable economic benefits, with the service and tourism sectors recovering from the previous effects of the pandemic, and retail sales—motor vehicle dealers, health and personal care, food and beverage stores, etc.—increasing by approximately 4.3%.

In 2024, Alberta's population growth rate flattened, driven by reduction in interprovincial and international net migration levels. Despite expectations for continued growth moving forward due to the province's previously mentioned pull factors, reduced federal immigration targets leading into 2025 predict significantly lower levels of growth than previous years.[18]

11 Government of Alberta, "Economic Spotlight 2023: Alberta Economy Year in Review," April 2024, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/37b5ed6d-1a01-4bb3-bd7e-e01fcdc22317/download/tbf-economic-spotlight-2023-alberta-economy-year-in-review-2024-04.pdf.

12 Government of Alberta, "Economic Trends," November 2024, https://open.alberta.ca/dataset/188558e3-185c-4145-a617-bbe3730223b9/resource/a7e068cb-f052-426e-8254-0040c1d53467/download/tbf-economic-trends-2024-11.pdf.

13 Government of Alberta, "Economic Spotlight 2020: A Year in Review," March 2021, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/d792997e-4795-4dd9-aede-de3f2340a348/download/tbf-economic-spotlight-2020-year-review-2021-03.pdf.

14 Government of Alberta, "Economic Spotlight 2021: A Year in Review," April 2022, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/9ddb19f8-6a79-480e-a285-0ff065b9982c/download/tbf-economic-spotlight-2022-04.pdf.

15 Ibid.

16 Government of Alberta, "Economic Spotlight 2022: Alberta Economy Year in Review," April 2023, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/e7268357-19a7-40e7-89ed-0bf44c85c040/download/tbf-economic-spotlight-2023-04.pdf.

17 Government of Alberta, "Economic Spotlight 2023: Alberta Economy Year in Review," April 2024, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/37b5ed6d-1a01-4bb3-bd7e-e01fcdc22317/download/tbf-economic-spotlight-2023-alberta-economy-year-in-review-2024-04.pdf.

18 Government of Alberta, "Economic Trends," November 2024, https://open.alberta.ca/dataset/188558e3-185c-4145-a617-bbe3730223b9/resource/a7e068cb-f052-426e-8254-0040c1d53467/download/tbf-economic-trends-2024-11.pdf.

ALBERTA POPULATION GROWTH

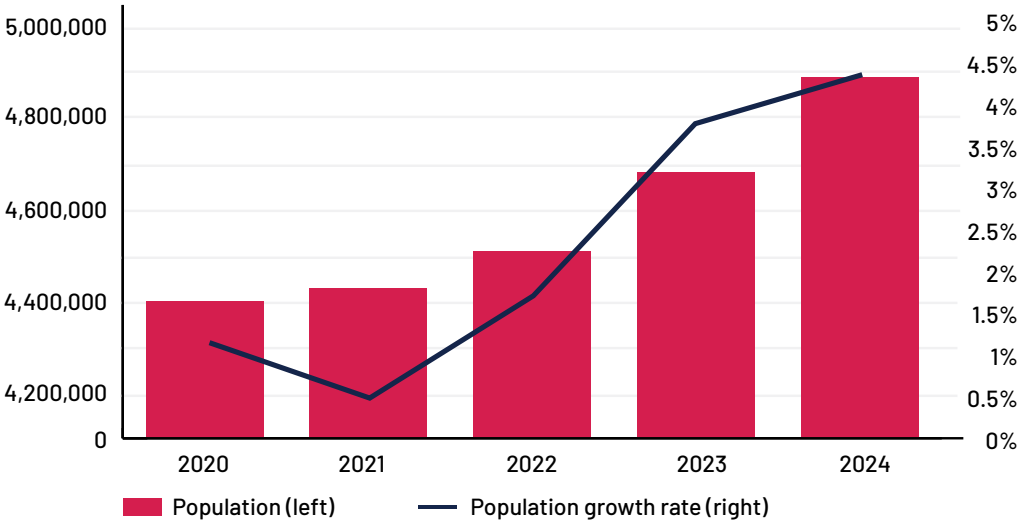

Figure 1: Alberta Population Growth, 2020–2024. Source: Statistics Canada, "Table 17-10-0009-01 Population estimates, quarterly," accessed January 2025, https://doi.org/10.25318/1710000901-eng.

Inflation

Following several years of stable and favourable inflation levels between 1% and 2%, Alberta experienced a notable inflation surge in 2021, coinciding with consumer prices rising by 3.18% while energy costs increased by over 25%.[19]

Driven by "soaring commodity prices, persistent supply bottlenecks and robust consumer demand" from pandemic lockdowns,[20] these rates were historically high, though this phenomenon was not unique to Alberta (or Canada) in that year. Food and service inflation remained relatively moderate aside from consumer durables (e.g., automobiles, household appliances, furniture), which rose by 4.1%. The steep rise in prices by 6.47% in 2022 can partially be attributed to price hikes in energy costs.[21] This time, however, food prices were significantly affected, with supply chain cost increases contributing to a markup in food costs by 8.3%.

The noticeable drop in inflation in 2023, as shown in Figure 2, reflects a decline in energy prices but obscures significant increases in housing costs, which raised home-ownership expenses by approximately 7.7% compared to the previous year.[22] Ongoing low demand for goods has put downward pressure on the prices of durable and semi-durable items, alongside reductions in energy and electricity costs and relatively stable food supply chains. As a result, inflation slowed throughout 2024 and remained lower than in recent years.[23] However, cumulative inflation growth since 2019 still surpasses cumulative wage growth by approximately 3% (Figure 3), underscoring the persistent impact of rising shelter costs (such as home-ownership expenses and rent) on the purchasing power of Albertan consumers.[24]

19 Government of Alberta, "Economic Spotlight 2021: A Year in Review," April 2022, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/9ddb19f8-6a79-480e-a285-0ff065b9982c/download/tbf-economic-spotlight-2022-04.pdf.

20 Government of Alberta, "Economic Spotlight 2021: A Year in Review," April 2022, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/9ddb19f8-6a79-480e-a285-0ff065b9982c/download/tbf-economic-spotlight-2022-04.pdf.

21 Government of Alberta, "Economic Spotlight 2022: Alberta Economy Year in Review," April 2023, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/e7268357-19a7-40e7-89ed-0bf44c85c040/download/tbf-economic-spotlight-2023-04.pdf.

22 Government of Alberta, "Economic Spotlight 2023: Alberta Economy Year in Review," April 2024, https://open.alberta.ca/dataset/13ab3f73-6e4e-4aac-b56b-bff38800aa65/resource/37b5ed6d-1a01-4bb3-bd7e-e01fcdc22317/download/tbf-economic-spotlight-2023-alberta-economy-year-in-review-2024-04.pdf.

23 Government of Alberta, "Economic Trends" November 2024, https://open.alberta.ca/dataset/188558e3-185c-4145-a617-bbe3730223b9/resource/a7e068cb-f052-426e-8254-0040c1d53467/download/tbf-economic-trends-2024-11.pdf.

24 Ibid.

ALBERTA INFLATION, ANNUAL AVERAGE

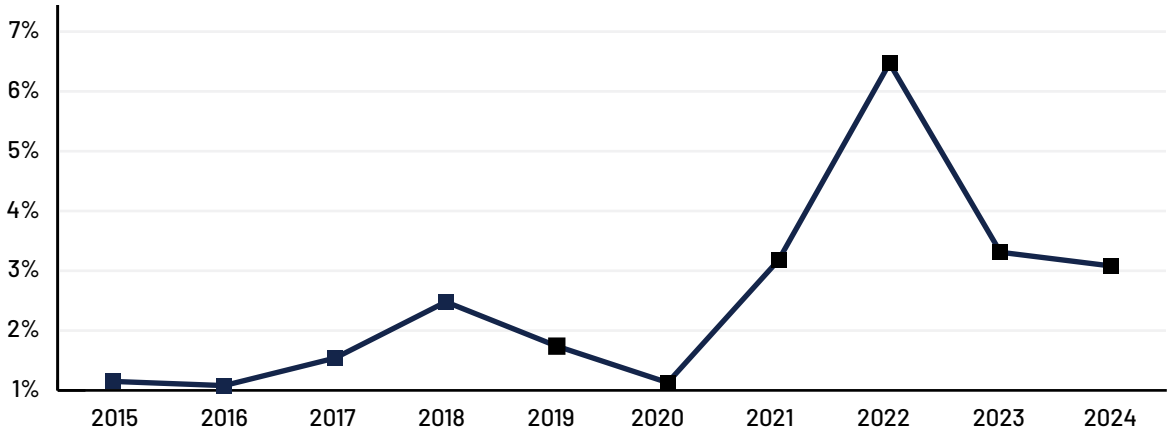

Figure 2: Consumer Price Index, Year-over-Year Percentage Change, Canada and Alberta, 2015–2024. Source: Government of Alberta, October 4, 2024, https://open.alberta.ca/opendata/consumer-price-index-year-over-year-percentage-change-canada-and-alberta.

CUMULATIVE INFLATION AND WAGE GROWTH

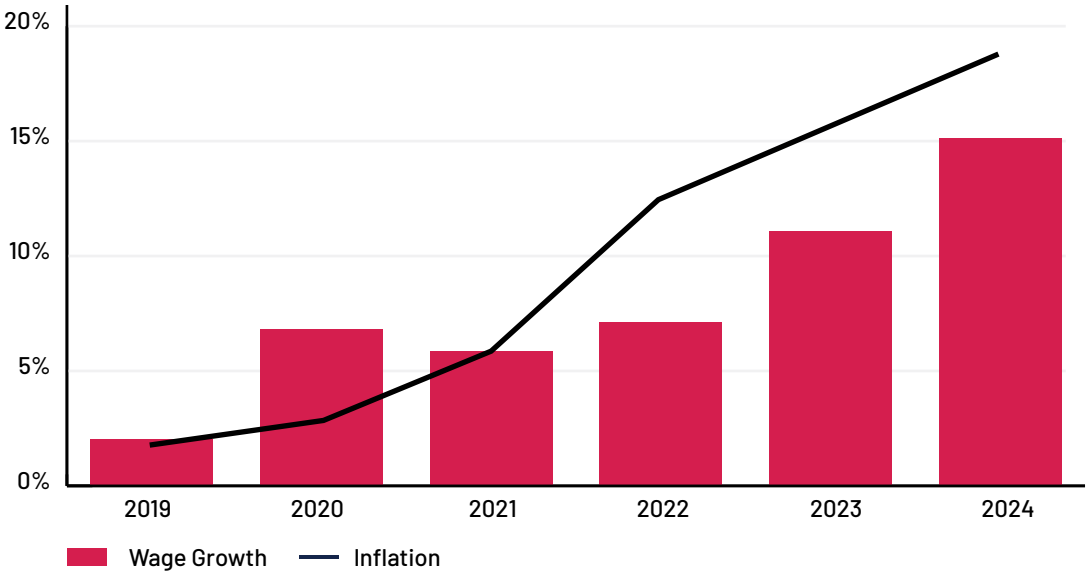

Figure 3: Alberta Cumulative Inflation and Wage Growth, 2019–2024. Source: Government of Alberta, October 3, 2024, https://open.alberta.ca/opendata/consumer-price-index-year-over-year-percentage-change-canada-and-alberta#summary; Statistics Canada, "Table 14-10-0064-01 Employee wages by industry, annual," January 24, 2025, https://doi.org/10.25318/1410006401-eng.

Economic Output

Alberta's economy has shown remarkable resilience in recent years, maintaining its role as a vital contributor to Canadian economic growth. In 2023, Alberta's GDP was the third largest among Canadian provinces, surpassing $344 billion and accounting for 15.4% of the national GDP that same year.[25]

Following recessions in 2009 and 2015 and the pandemic in 2020, Alberta's economy has bounced back.

From 2015 to 2020, Alberta's economy experienced a period of slower GDP growth when compared to the national average. However, from 2021, the province's economy began to recover, and in 2022, Alberta's GDP grew by 6.1%, around two percentage points higher than the national GDP. In 2023, GDP growth was higher than the national average for the second consecutive year, despite having slowed to 2.3% (Figure 4). This growth was slightly lower than expected;[26] however, it was still among the highest nationwide.[27] Alberta's GDP growth in 2023 was significant given challenges such as tight monetary policy, high inflation, low business investments and exports, climate change-related events,[28] and other factors impacting the economy.

Moreover, Alberta's GDP per capita, often used as a key standard of living measure, is the highest among Canada's provinces. In 2023, it was at $72,300, which was higher than the national average of around $59,000 (Figure 5).[29]

REAL GDP GROWTH, CANADA VS. ALBERTA

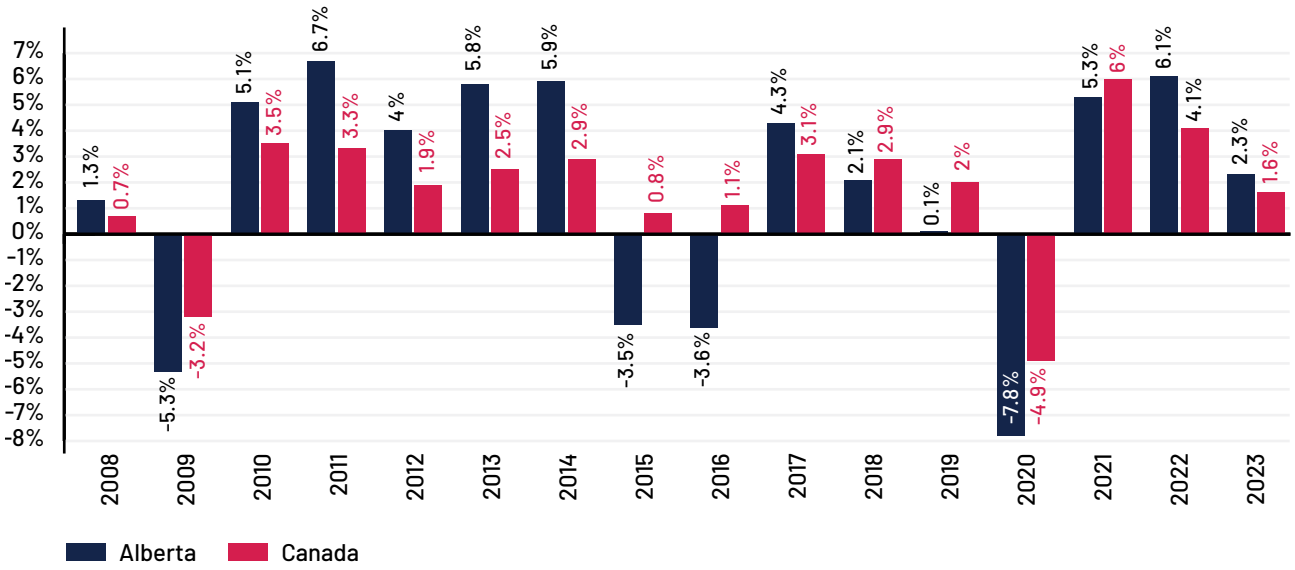

Figure 4: Real GDP Growth, Alberta-Canada Comparison, 2007–2023. Source: Statistics Canada, "Table 36-10-0402-01 Gross domestic product (GDP) at basic prices, by industry, provinces and territories (x 1,000,000)," November 2024, https://doi.org/10.25318/3610040201-eng.

25 Statistics Canada, "Table 36-10-0402-01 Gross Domestic Product (GDP) at Basic Prices, by Industry, Provinces and Territories (x 1,000,000)," November 7, 2024, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610040201.

26 Government of Alberta, "Economic Trends 2023: Alberta Year in Review," April 2024, https://open.alberta.ca/dataset/188558e3-185c-4145-a617-bbe3730223b9/resource/a2bbbea4-0e83-41b5-86af-3f0f6060893d/download/tbf-economic-trends-2024-03.pdf.

27 Statistics Canada, "Table 36-10-0402-01 Gross Domestic Product (GDP) at Basic Prices, by Industry, Provinces and Territories (x 1,000,000)," November 7, 2024, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610040201.

28 Government of Alberta, "Economic Trends 2023: Alberta Year in Review," April 2024, https://open.alberta.ca/dataset/188558e3-185c-4145-a617-bbe3730223b9/resource/a2bbbea4-0e83-41b5-86af-3f0f6060893d/download/tbf-economic-trends-2024-03.pdf.

29 Carter McCormack and Weimin Wang, "Canada's Gross Domestic Product per Capita: Perspectives on the Return to Trend," Statistics Canada, April 24, 2024, https://www150.statcan.gc.ca/n1/pub/36-28-0001/2024004/article/00001-eng.htm.

REAL GDP PER CAPITA ACROSS PROVINCES, 2023

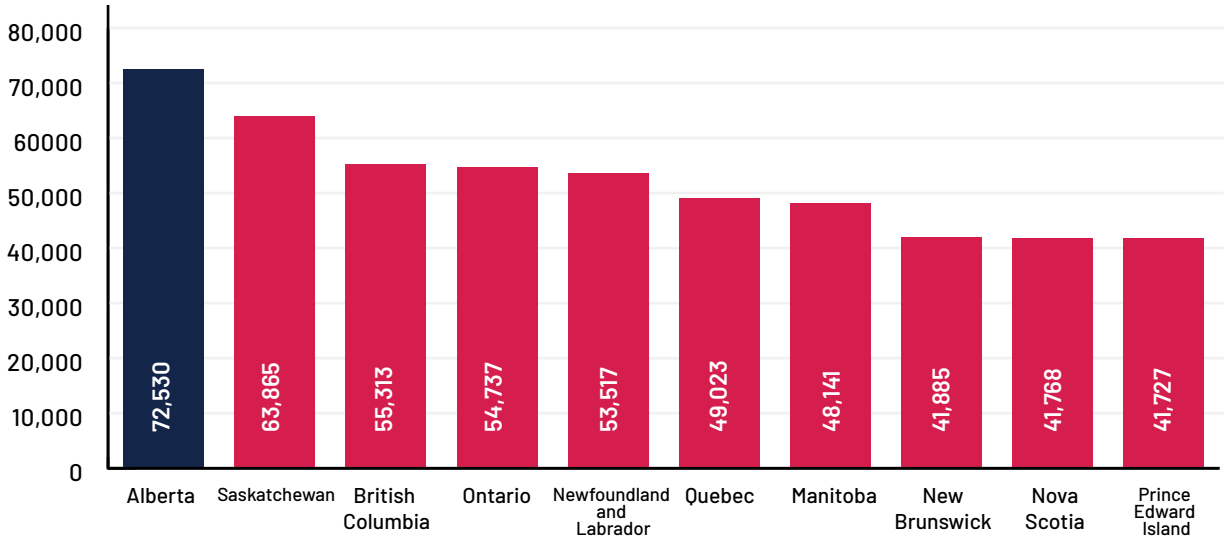

Figure 5: Real GDP per Capita Across Provinces, 2023. Source: Alberta Economic Dashboard, Government of Alberta, "Gross Domestic Product," accessed January 16, 2025, https://economicdashboard.alberta.ca/topics/gdp/.

Monetary Policy

Although interest rates have historically remained within the 1%–3% range set by the Government of Canada and Bank of Canada (BoC),[30] 2022 saw a steep deviation.

COVID-19 stimulus effects, upticks in consumer demand, and supply restrictions produced significant hikes in inflation. During recessions, the Bank of Canada will often initiate quantitative easing: a process that involves purchasing financial assets from the market to "inject" additional money supply into the economy, thereby lowering interest rates and prompting more consumption. This process pushes prices up to levels more beneficial for economic growth. To drive inflation down post-COVID-19, the Bank of Canada, therefore, reduced quantitative easing measures while increasing their interest rate targets well beyond the conventional 3% upper bound. A high interest rate—like 4.5%, observed at the end of 2024—discourages people from consuming goods in the current period by making it more appealing to save that money and accrue higher returns in the future.

The cooling effect of this monetary policy on economic activity can be observed in the reversal of trends for both variables in Figure 6. Recent inflation levels are within the conventional Bank of Canada range, although consumer prices for shelter and food are still persistently higher than pre-2022 levels.

30 Bank of Canada, "Press Release: Targets for Reducing Inflation," February 26, 1991, https://www.bankofcanada.ca/wp-content/uploads/2011/12/bocreview-mar1991.pdf; Bank of Canada, "Agreement on the Inflation-Control Target," accessed February 4, 2025, https://www.bankofcanada.ca/core-functions/monetary-policy/agreement-inflation-control-target/.

MONETARY POLICY EFFECTS

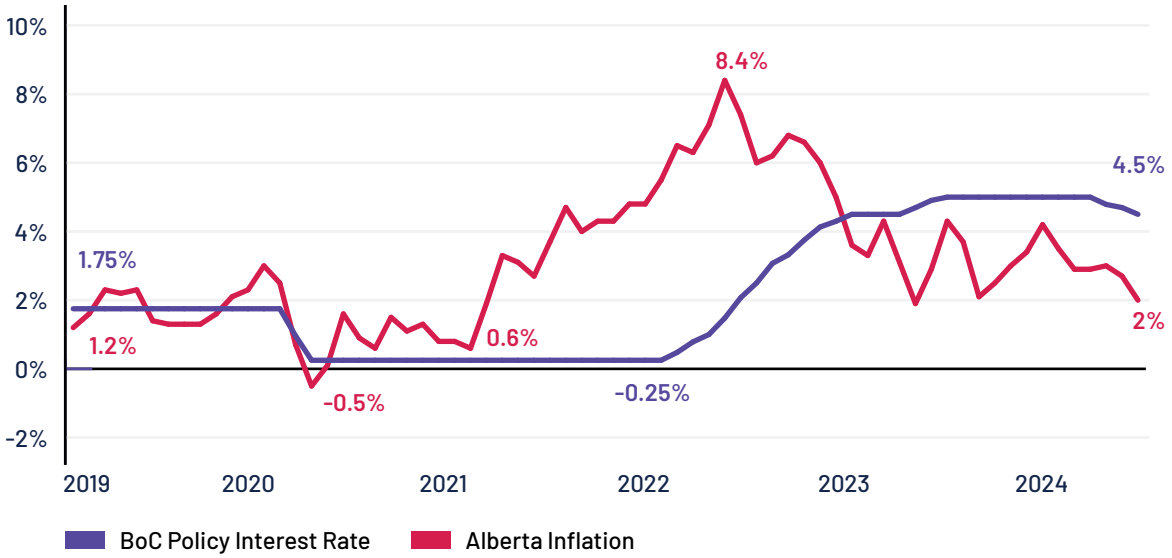

Figure 6: Monetary Policy Effects, 2019–2024. Source: Government of Alberta, October 3, 2024, https://open.alberta.ca/opendata/consumer-price-index-year-over-year-percentage-change-canada-and-alberta#summary. Bank of Canada, accessed on January 27, 2025, https://www.bankofcanada.ca/rates/interest-rates/canadian-interest-rates/.

Productivity and the Digital Transformation of Alberta

Productivity measures the efficiency of the labour force, otherwise understood as the relationship of output produced to labour input or hours worked. Economists use productivity indicators to assess the economic health and competitiveness of the economy and growth potential across sectors.

In 2023, the labour productivity of Alberta reached $77.1/hour, 18% higher than the Canadian average of $63.6/hour (Figure 7).

Alberta ranked third highest in labour productivity among all provinces and territories, following the Northwest Territories ($89.2/hour) and Nunavut ($81.8/hour).

Across sectors, resource-intensive and capital-intensive industries lead the way in labour productivity in Alberta. In 2023, the mining and oil and gas extraction industry recorded the highest productivity levels at $214.4/hour, followed by real estate, rental and leasing ($177.5/hour), information and cultural industries ($169.2/hour), and utilities ($141.9/hour). The ICT sector was among the top five for productivity levels in 2023, at $124.5/hour (Figure 8).

LABOUR PRODUCTIVITY, CANADA VS. ALBERTA

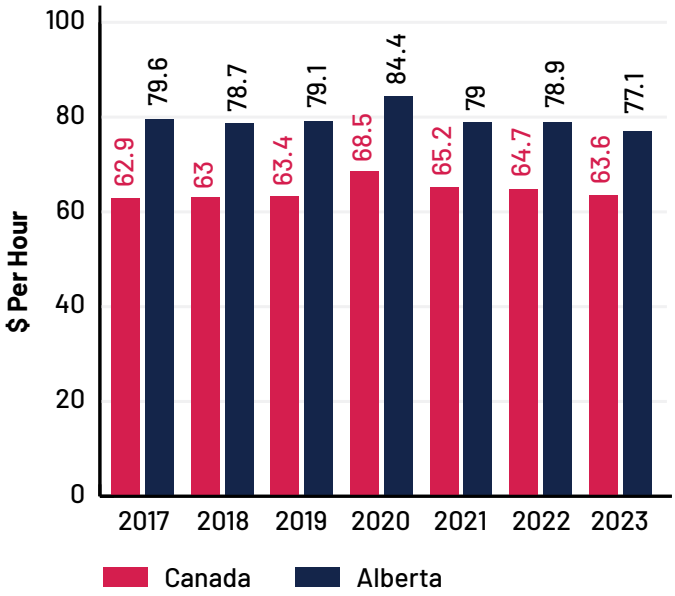

Figure 7: Labour Productivity, Canada vs. Alberta, 2017–2023. Source: Statistics Canada, "Table 36-10-0480-01, labour productivity and related measures by business sector industry and by non-commercial activity consistent with the industry accounts," February 10, 2025, https://doi.org/10.25318/3610048001-eng.

LABOUR PRODUCTIVITY BY BUSINESS SECTOR/INDUSTRY

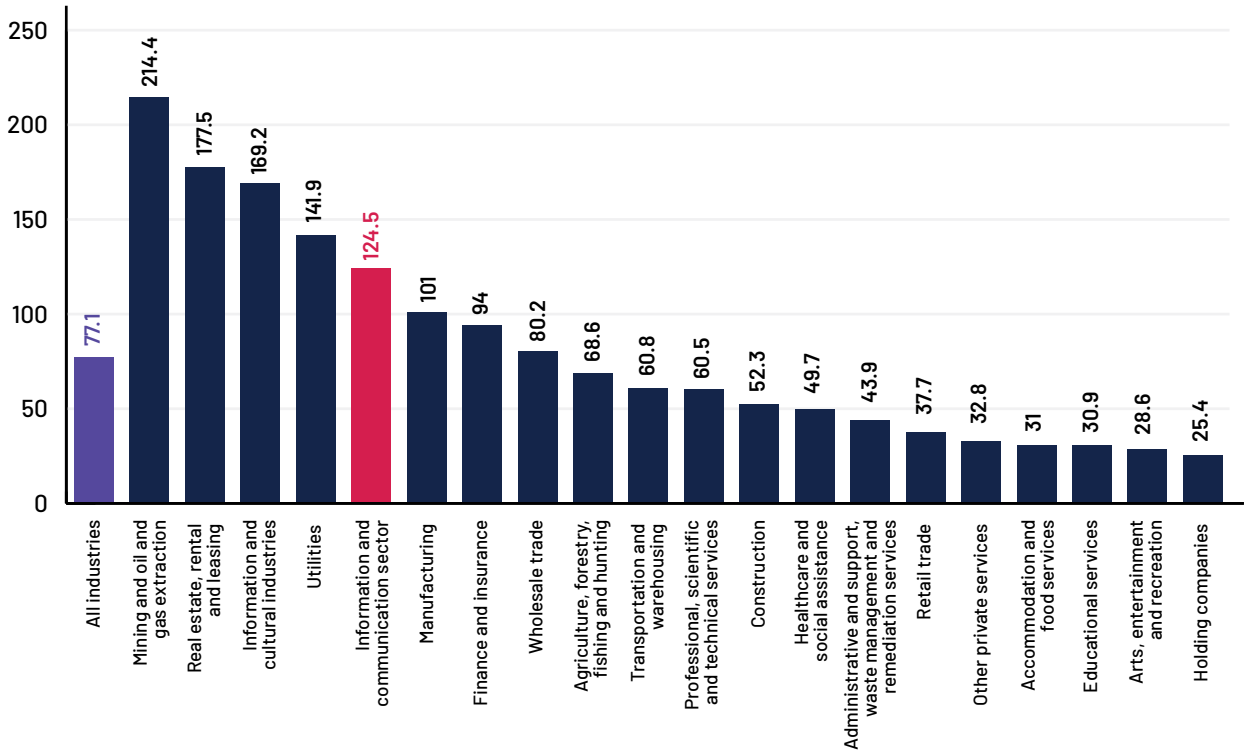

Figure 8: Labour Productivity by Business Sector/Industry in Alberta, 2023. Source: Statistics Canada, "Table 36-10-0480-01, labour productivity and related measures by business sector industry and by non-commercial activity consistent with the industry accounts," February 10, 2025, https://doi.org/10.25318/3610048001-eng. Note: The ICT sector is a custom amalgamation of industries within other sectors shown here: it is not a mutually exclusive category.

Unit labour cost—which represents the wages and benefits paid per unit of output—is another important metric to consider when analyzing labour productivity. In 2023, labour cost in Alberta was $0.6 per unit of real GDP, which is 5.3% higher than in 2022. In Alberta, since 2020, the relationship between productivity and unit labour cost has been inverse.[31] As labour productivity has decreased, unit labour costs have increased. In 2023, the unit labour cost was 17.6% higher than in 2017, while labour productivity was 3.1% lower than in 2017.[32] The case of low productivity and high labour costs indicates that workers are producing relatively less output per hour worked while receiving higher wages, suggesting that business profitability might decline and businesses might become less competitive.

Productivity growth in Canada has been a persistent concern for decades. Canada has been lagging behind other developed countries in productivity growth,[33] and in 2023, Alberta experienced a 2.3% decrease in labour productivity compared to 2022. In early 2024, the Bank of Canada escalated this issue to "emergency" status, underscoring the urgent need for action.[34] At this time, the Bank of Canada's senior deputy governor pointed out multiple factors contributing to Alberta and Canada's low productivity numbers overall. Among

31 Statistics Canada, "Table 36-10-0480-01 Labour Productivity and Related Measures by Business Sector Industry and by Non-Commercial Activity Consistent with the Industry Accounts," February 10, 2025, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610048001.

32 Ibid.

33 Jonathan Barr, "OECD Global Forum on Productivity," OECD, October 16, 2024, https://www.oecd.org/content/dam/oecd/en/about/programmes/global-forum-on-productivity/events/paris-2024/ppts/Session_2_3_Jonathan_BARR_Canada_ISED.pdf.

34 Carolyn Rogers, "Time to Break the Glass: Fixing Canada's Productivity Problem," Bank of Canada, March 26, 2024, https://www.bankofcanada.ca/2024/03/time-to-break-the-glass-fixing-canadas-productivity-problem/.

them were low business investment, particularly in machinery, equipment, and intellectual property; lack of competition and regulatory uncertainty; skills mismatches, especially for newcomers; and difficulty in scaling small companies into larger ones.[35]

To address productivity challenges, the Bank of Canada proposed an economic shift toward high-value industries that generate more output per unit of input, and toward improving processes and methods to maximize efficiency across all sectors.[36] Alberta is taking proactive steps to implement these strategies by diversifying its most productive sectors,[37] concentrating efforts on several tech-intensive and high-value industries by investing in hydrogen technology and renewable energy,[38] as well as growing other technology intensive sectors, such as advanced food manufacturing.[39] This shift aligns with research findings that demonstrate that digitally intensive sectors have experienced higher labour productivity growth over the past two decades than non-digitally intensive sectors: from 2002 to 2019, labour productivity increased by 22.1% in the digitally intensive sector and by only 6.3% in the non-digitally intensive sector.[40] ICT sector data supports these findings as well; while not as high as the oil and gas industry's productivity levels, at $124.5/hour it was 61% higher than the provincial average. The ICT sector also showed robust growth, with productivity increasing by 11.6% from 2022 to 2023 (Figure 9).

LABOUR PRODUCTIVITY IN ALBERTA'S ICT SECTOR

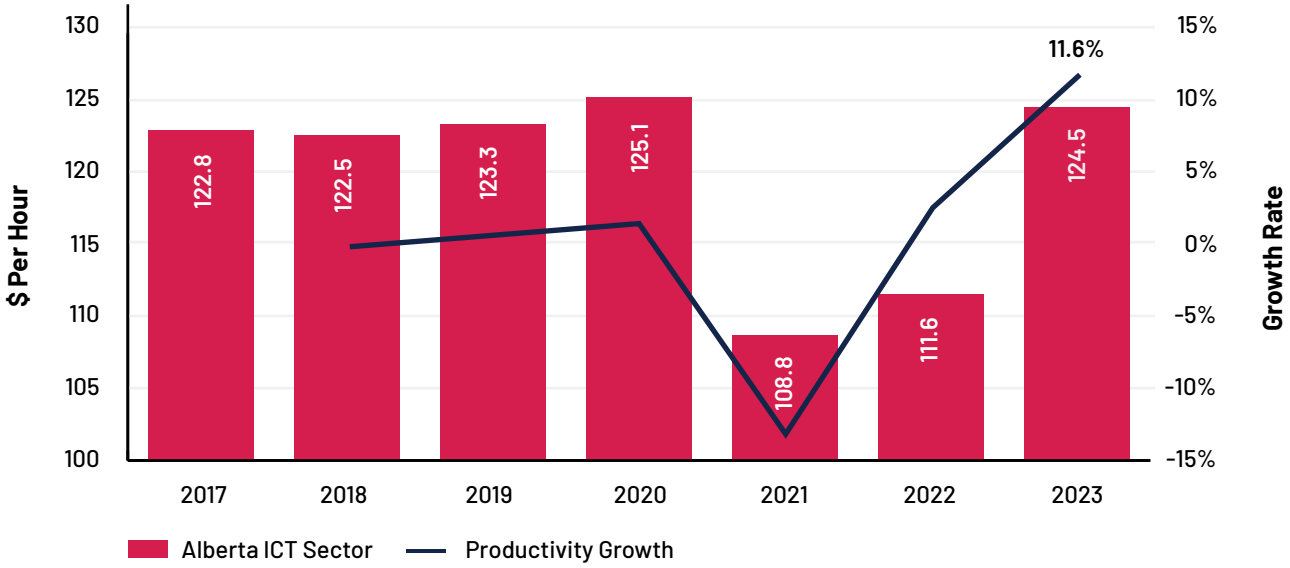

Figure 9: Labour Productivity in ICT Sector, Alberta, 2017–2023. Source: Statistics Canada, "Table 36-10-0480-01, labour productivity and related measures by business sector industry and by non-commercial activity consistent with the industry accounts," February 10, 2025, https://doi.org/10.25318/3610048001-eng.

35 Carolyn Rogers, "Time to Break the Glass: Fixing Canada's Productivity Problem," Bank of Canada, March 26, 2024, https://www.bankofcanada.ca/2024/03/time-to-break-the-glass-fixing-canadas-productivity-problem/.

36 Ibid.

37 Mark Parsons, "Productive Diversification: Maintaining Alberta's Productivity Edge," ATB Financial, August 13, 2024, https://interactive.atb.com/economic-special-report-aug-2024.

38 Tony Seskus, "Alberta Could Lead Canada in Wind and Solar Power by 2025, Expert Says," CBC News, September 21, 2020, https://www.cbc.ca/news/business/alberta-wind-and-solar-future-1.5728757.

39 Government of Alberta, "Agri-Food Investment and Growth Strategy," February 11, 2025, https://www.alberta.ca/agri-food-investment-and-growth-strategy.

40 Huju Liu, "Economic Performance Associated with Digitalization in Canada over the Past Two Decades," Statistics Canada, February 24, 2021, https://www150.statcan.gc.ca/n1/pub/36-28-0001/2021002/article/00001-eng.htm.

Small and medium enterprises (SMEs) in Canada are typically slow to adopt productivity-boosting innovations.[41] Recent studies suggest that digitalization, including AI adoption, could significantly raise productivity. Stanford University research suggests that some types of AI can make workers more productive by enabling them to complete tasks more quickly, leading to higher quality work and potentially bridging "the skills gap between low- and high-skilled workers."[42] Another study by McKinsey & Company estimates that generative AI could increase labour productivity growth 0.1% to 0.6% annually through 2040, depending on adoption rates.[43] While not leading in AI adoption globally, Canada is well-positioned to benefit from AI over the coming decade.[44] The Canadian Chamber of Commerce's Business Data Lab projects that under fast adoption scenarios, Canada could reach U.S. labour productivity levels by 2030 (2036 under slow adoption), and Organisation for Economic Co-operation and Development (OECD) average productivity levels by 2028 (2032 under slow adoption).[45]

Sectors Driving Growth and Technology Trends in Alberta

Several key sectors are digitalizing in Alberta and driving growth across the economy.

AGRICULTURAL TECHNOLOGY AND AGRI-FOOD INNOVATION

Innovation in agricultural technology and the agri-food industry has been progressing since the introduction of Alberta's carbon offset program in the early 2000s, and was further propelled by the Government of Canada's carbon offset program in 2022.[46] Agriculture is rapidly transforming from a traditional to a technology-driven industry and plays a crucial role in Alberta's technological innovation and sectoral growth.[47] Throughout Alberta's agricultural sector, technologies that support precision agriculture, quality control and identity preservation, cellular agriculture, and controlled environment agriculture are being adopted and implemented.[48]

Alberta Innovates led the establishment of the Canadian Agri-Food Automation and Intelligence Network (CAAIN) in 2019, which works to support agricultural technology (agtech) research and innovation across Canada.[49] Programs such as the Agri-Food and Bioindustrial Innovation Program drive the development of ag and agri-food technologies within Alberta.[50] Other initiatives further support agtech development

41 Statistics Canada, "Research to Insights: Challenges and Opportunities in Innovation, Technology Adoption and Productivity," July 24, 2024, https://www150.statcan.gc.ca/n1/pub/11-631-x/11-631-x2024005-eng.htm.

42 James Fell, "Stanford Just Released Its Annual AI Index Report. Here's What It Reveals," World Economic Forum, April 26, 2024, https://www.weforum.org/stories/2024/04/stanford-university-ai-index-report/.

43 Michael Chui et al., "Economic Potential of Generative AI: The next Productivity Frontier," McKinsey, June 14, 2023, https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#introduction.

44 Innovation Science and Economic Development Canada, "What We Heard Report: Consultations on AI Compute," December 5, 2024, https://ised-isde.canada.ca/site/ised/en/what-we-heard-report-consultations-ai-compute.

45 Business Data Lab, "Prompting Productivity: Generative AI Adoption by Canadian Businesses," Canadian Chamber of Commerce, May 2024, https://businessdatalab.ca/wp-content/uploads/2024/05/Prompting_Productivity_Report_May_2024.pdf.

46 Government of Alberta, "Alberta emissions reduction and energy development plan," April 2023, https://open.alberta.ca/dataset/7483e660-cd1a-4ded-a09d-82112c2fc6e7/resource/75eec73f-8ba9-40cc-b7f4-cdf335a1bd30/download/epa-emissions-reduction-and-energy-development-plan.pdf

47 Alexandra Cutean and Mairead Matthews, "Seeding Rural Innovation: Nurturing the Tech Frontier in Alberta," Information and Communications Technology Council (ICTC), September 2023, https://ictc-ctic.ca/reports/seeding-rural-innovation.

48 Ibid.

49 "About Us," Canadian Agri-food Automation and Intelligence Network, accessed January 30, 2024, https://caain.ca/about-us/.

50 "Agri-Food and Bioindustrial Innovation Program," Alberta Innovates, accessed February 6, 2025, https://albertainnovates.ca/funding/agri-food-and-bio-industrial-innovation-program.

and commercialization. For instance, one Calgary-based venture capital firm's $15 million fund focuses investment on agricultural technology startups.[51] Alberta boasts a strong network of agtech startups; the Thrive Canada Accelerator, which supports early-stage agri-food technology startups, consisted of 40% Alberta-based businesses in its 2023 cohort.[52]

ARTIFICIAL INTELLIGENCE

Alberta, along with Ontario and Quebec, possesses a high concentration of AI-related research, innovation, and investment that has been cultivated through targeted initiatives. For over 20 years, the Province of Alberta and the University of Alberta have invested in AI research, becoming a hub for top AI talent,[53] and Edmonton is home to the Alberta Machine Intelligence Institute (Amii)—one of three National AI Institutes administered through the federal Pan-Canadian AI Strategy.[54]

The Government of Alberta's Major Innovation Fund—launched in 2018—supports AI development in areas such as autonomous systems, open data technologies, and smart agriculture. Alberta's 2021 Micro-credential Pilot Program establishes partnerships with industry and educational institutions to support worker training and credentialing in a variety of industries and sectors, including a micro-credential specifically in "machine learning and artificial intelligence."[55]

CLEAN RESOURCE TECHNOLOGIES

Over the past five years, renewed national and international focus on net zero goals has led to rapid growth of cleantech companies in Canada, with Alberta a provincial leader in this space. Edmonton Global, a business development agency, reported over 900 cleantech companies headquartered in Alberta as of August 2022.[56] Alberta is home to Canada's first industrial hydrogen hub and four leading commercial carbon capture, utilization, and storage (CCUS) projects along with extensive CCUS infrastructure.[57] This sectoral growth is bolstered by a boost in the procurement of cleantech products and services by oil and gas companies, as well as the beginning stages of small modular nuclear reactor development to supply heat and power to the oil sands sector and Alberta's electricity grid.[58]

Alberta's cleantech portfolio includes four key focus areas: renewable and alternative energy; energy storage and minerals; hydrogen; and carbon capture, utilization, and storage. The Alberta Clean Technology Industry Alliance supports clean technology development in the province. The Energy Transition Centre, an incubation space run by Innovate Calgary and the University of Calgary, has created over 40 direct jobs, attracted "over $8 million in private investment, developed 20 clean technologies enroute to commercialization and trained over 700 industry professionals."[59]

FINANCIAL TECHNOLOGY

Alberta is the first province to have established a regulatory sandbox for the finance and financial technology sectors to support innovation and new investment in the financial technology space.[60] Over 150 fintech firms are headquartered in the province, which is quickly becoming a hub for fintech development and operations due to favourable banking and trust

51 "AVAC Group Launches $15 Million VC Fund for Canadian AgTech Startups," Calgary.Tech, May 6, 2023, https://calgary.tech/2023/05/06/avac-group-canadian-agtech-fund-carrot-ventures/.

52 "Six Calgary Companies Chosen for THRIVE Agtech Accelerator," Calgary.Tech, February 1, 2023, https://calgary.tech/2023/02/01/calgary-companies-thrive-agtech-accelerator/.

53 "Artificial Intelligence at the U of A," University of Alberta, accessed February 6, 2025, https://www.ualberta.ca/en/research/our-research/artificial-intelligence.html.

54 "The Pan-Canadian AI Strategy," The Canadian Institute for Advanced Research (CIFAR), accessed January 30, 2025, https://cifar.ca/ai/.

55 Government of Alberta, "New Micro-credential Learning Opportunities," August 30, 2021, https://www.alberta.ca/new-micro-credential-learning-opportunities.

56 "Clean Technology," Edmonton Global, accessed January 24, 2025, https://edmontonglobal.ca/sectors/clean-technology/.

57 Edmonton Global and Calgary Economic Development, "Alberta: Leading the Global Energy Transition," August 2022, https://edmontonglobal.ca/wp-content/uploads/2022/08/CED-2021_AlbertaEnergyTransition_2-Pager_FINAL_WEB.pdf.

58 Government of Alberta, "Economic Trends," March 2024, https://open.alberta.ca/dataset/188558e3-185c-4145-a617-bbe3730223b9/resource/a2bbbea4-0e83-41b5-86af-3f0f6060893d/download/tbf-economic-trends-2024-03.pdf.

59 Margaux Dugras, "Alberta's Research Talent Is Engineering a Sustainable, Innovative Future," Edmonton Journal, December 10, 2024, https://edmontonjournal.com/sponsored/life-sponsored/albertas-research-talent-is-engineering-a-sustainable-innovative-future.

60 Government of Alberta, "Financial Services and Fintech Regulatory Sandbox," accessed January 23, 2025, https://www.alberta.ca/financial-services-and-fintech-regulatory-sandbox.aspx.

laws.[61] In January 2025, the Calgary-based digital fintech company Neo Financial was awarded Deloitte's Technology Fast 50 for having the highest percentage revenue growth over a consecutive four-year period.[62]

HEALTH TECHNOLOGY AND DIGITAL HEALTH

At the time of writing, Alberta Health Services was Alberta's largest employer and Canada's largest healthcare delivery organization, employing approximately 102,000 Albertans.[63] Health technology encompasses innovations aimed at improving quality of life, including life sciences and digital health. It consists of products or services that leverage digital technology as a significant component of production or service offerings.[64] Digital health, precision health and diagnostics, medical devices incorporating digital technology, virtual care, and related products and services are propelling advancements in the healthtech sector.[65] Notably, interviewees mentioned the rise of accelerator programs, such as the Community Safety and Wellness Accelerator[66] and the Canadian Technology Accelerator for digital health,[67] as well as the development of technologies for chronic disease management, sensor applications, and wearable devices, highlighting them as important developments in the sector. A key priority area for Alberta Innovates is health innovation, which facilitates funding for research, technology commercialization, health system transformation, and talent development within the sector.[68]

INTERACTIVE DIGITAL MEDIA

Another industry propelling the growth of the digital economy in Alberta is interactive digital media (IDM), often referred to as the creative technology or multimedia industry. IDM in Alberta comprises 177 studios across five sub-industries: video games, animation, visual effects and post-production, extended reality, digital models, and digital twins.[69] Among these sub-industries, video games is the largest in Alberta, housing 97 companies. IDM provides innovative opportunities beyond entertainment, including collaborations with Alberta's natural sectoral strengths, such as energy and healthcare, fostering mutual growth among industries.

QUANTUM TECHNOLOGIES

According to a recent study commissioned by the National Research Council of Canada, it is estimated that the quantum sector will become a $139 billion industry in Canada with more than 200,000 jobs by 2045, potentially contributing 3% to Canada's GDP.[70] Canada's National Quantum Strategy positions Alberta as a regional hub for quantum innovation. In October 2024, the Government of Canada, through Prairies Economic Development Canada, announced more than $8.4 million in funding to commercialize Alberta-made quantum technologies.[71] These investments are expected to support job creation, business development for SMEs, and talent development in the field of quantum science.

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61 "Fintech & Blockchain Business Opportunities in Alberta, Canada," Invest Alberta, accessed January 23, 2025, https://investalberta.ca/financial-services/.

62 Deloitte Canada, "Deloitte Canada reveals its annual Technology Fast 50 program winners," November 6, 2024, https://www2.deloitte.com/ca/en/pages/press-releases/articles/reveals-its-annual-technology-fast-50tm-program-winners-2024.html.

63 "People," Government of Alberta, accessed January 28, 2025, https://www.alberta.ca/people.

64 Todd Legere, Olena Podolna, Justin Ratcliffe, and Faun Rice, "From Concept to Care: Health Technology Talent in Alberta," Information and Communications Technology Council (ICTC), May 7, 2024, https://ictc-ctic.ca/reports/concept-care-health-technology-talent-alberta.

65 Ibid.

66 "Our Why," Community Safety & Wellness Accelerator (CSW), accessed January 28, 2025, https://cswaccelerator.com/.

67 Government of Canada, "United States Digital Health – Canadian Technology Accelerator," March 1, 2024, https://www.tradecommissioner.gc.ca/cta-atc/digital-health-sante-numerique.aspx?lang=eng.

68 "Health Innovation Team," Alberta Innovates, accessed January 28, 2025, https://albertainnovates.ca/about/who-we-are/teams/health-innovations-team.

69 Alexandra Cutean, Erik Henningsmoen, Todd Legere, Noah Lubendo, Mairead Matthews, Justin Ratcliffe, and Faun Rice, "Virtual Frontiers: A Study on Alberta's Interactive Digital Media Industry," Information and Communications Technology Council (ICTC), September 23, 2024, https://ictc-ctic.ca/reports/virtual-frontiers-study-albertas-interactive-digital-media-industry.

70 Innovation Science and Economic Development Canada, "Government of Canada Launches National Quantum Strategy to Create Jobs and Advance Quantum Technologies," January 13, 2023, https://www.canada.ca/en/innovation-science-economic-development/news/2023/01/government-of-canada-launches-national-quantum-strategy-to-create-jobs-and-advance-quantum-technologies.html.

71 Prairies Economic Development Canada, "MP Chahal Announces Federal Investments to Commercialize Alberta-Made Quantum Technologies," October 3, 2024, https://www.canada.ca/en/prairies-economic-development/news/2024/10/mp-chahal-announces-federal-investments-to-commercialize-alberta-made-quantum-technologies.html.

Digital Transformation and Technology Adoption

Digitally mature countries or regions must possess the infrastructure, governance, labour force, digital services, and technologies needed to support social development, economic growth, and global competitiveness.[72]

In 2023, Canada was ranked 17th globally, with Alberta placing fourth in the country for digital readiness.[73] Alberta's strong digital readiness score exceeds the national average, partly due to a robust labour force and a lower cost of living compared to other provinces.[74] The Digital Readiness Index identified areas for improvement, such as the startup environment, technology infrastructure, and the adoption of technology by government, businesses, and individuals.[75] Notably, as of September 2024, two-thirds of Alberta's rural population and 80% of Indigenous communities in Alberta lack adequate access to high-speed internet.[76]

Digital transformation is the adoption and integration of digital technologies into a business's existing products or processes or the use of emerging technologies to reinvent processes or products, or create new revenue streams.[77] While digital transformations have been underway in Alberta for some time, technology permeation to other more traditional sectors of the province's economy has accelerated over the past five years.

GOVERNMENT INVESTMENT IN TECHNOLOGY ADOPTION

Over the past few years, the Government of Alberta has introduced a variety of strategies and initiatives aimed at fostering innovation and technological development across the province. These efforts have included investments in AI (Artificial Intelligence Data Centres Strategy), clean energy (Natural Gas Vision and Strategy), broadband infrastructure (Alberta Broadband Strategy), and talent development and entrepreneurship (Alberta Technology and Innovation Strategy). Distinct in activities but interrelated in long-term objectives and outcomes, these efforts collectively aim to position the province as a recognized international leader in technology and innovation while bolstering economic growth, job creation, and global competitiveness.

ALBERTA'S ARTIFICIAL INTELLIGENCE DATA CENTRES STRATEGY, 2019

Alberta's commitment to becoming a leader in AI-driven data centre operations is a key driver of ICT sector growth. In 2019, the province announced an investment of $100 million over five years into its homegrown AI industry to boost its commercialization, attract foreign investment, and create more than 6,000 jobs.[78] The strategy emphasizes regulatory modernization and public-private partnerships, including collaborations with Indigenous communities and municipalities; major projects include the hyperscale facility in Rocky View County and the Wonder Valley AI Data Centre Industrial Park near Grande Prairie.[79]

72 Cisco, "Alberta: Encouraging Business Investment & Reducing Regulatory Burden: Cisco Canada Digital Readiness Index 2023," https://www.cisco.com/c/dam/m/en_ca/digitalreadiness-2022/pdf/Cisco_Canada_DRI_Alberta.pdf.

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

74 Nisha Menon, "Complete Breakdown of the Cost of Living in Alberta, Canada in 2024," GetGIS, April 16, 2024, https://getgis.org/blog/cost-of-living-in-alberta.

75 Cisco, "Alberta: Encouraging Business Investment & Reducing Regulatory Burden: Cisco Canada Digital Readiness Index 2023," https://www.cisco.com/c/dam/m/en_ca/digitalreadiness-2022/pdf/Cisco_Canada_DRI_Alberta.pdf.

76 Ibid.

77 Keith O'Brien, Amanda Downie, and Mark Scapicchio, "What Is Digital Transformation?," IBM, September 9, 2024, https://www.ibm.com/think/topics/digital-transformation.

78 Alberta Innovates, "Alberta Invests in Innovation to Fuel the Future," February 13, 2019, https://albertainnovates.ca/news/alberta-invests-in-innovation-to-fuel-the-future/.

79 Brady Chapman and Trevor Merrell, "Alberta Announces AI Data Centres Strategy: A $100-Billion Vision for the Future," MLT Aikins, December 10, 2024, https://www.mltaikins.com/insights/alberta-announces-ai-data-centres-strategy-a-100-billion-vision-for-the-future/.

NATURAL GAS VISION AND STRATEGY, 2020

The oil and gas sector continues to be a vital driver of Alberta's economic growth. The launch of the Natural Gas Vision and Strategy in 2020 reaffirms the sector's role in the province's economic expansion strategy going forward.[80] Aiming to position the province at the forefront of clean energy production while also expanding into high-growth, tech-intensive areas (e.g., hydrogen, clean energy technologies), the strategy outlines five objective areas, two of which have already begun implementation in recent years:[81]

1. **Alberta Petrochemicals Incentive Program (APIP)**

   The APIP was introduced to attract investment in the province's petrochemical industry and support its growth and development.[82] Since its implementation, the province has committed $600 million in grants to fund industrial projects aimed at enhancing competitiveness in the global petrochemical market. Major projects are currently underway, including a $161 million natural-gas-to-hydrogen facility by Air Products,[83] a U.S.-Canadian gas and chemical company that established an office in Alberta in 2023.[84] These projects are also partially funded by a $300 million grant through the Government of Canada's Strategic Innovation Fund, which aims to design and develop a "net-zero hydrogen energy complex" by leveraging improvements in engineering processes and innovative combinations of existing technologies. Furthermore, the economic benefits of the APIP go beyond innovation and are expected to generate advantages in the labour market as well. For instance, an additional $4 billion has been committed to a propane-to-polypropylene facility by Inter Pipeline, which is estimated to create over 16,000 construction jobs and generate $200 million in tax revenue upon completion.[85]

2. **Hydrogen Centre of Excellence**

   Announced in 2022, the Hydrogen Centre of Excellence is focused on accelerating Alberta's hydrogen economy by funding innovation and supporting technological advancements across the hydrogen value chain.[86] Two rounds of funding have been completed to date, administering close to $40 million in funding to 33 hydrogen projects. As with the APIP, funds under this program are expected to produce "downstream economic benefits" through job creation, research and development, and technology advancements.[87]

TECHNOLOGY AND INNOVATION STRATEGY, 2022

Announced in 2022, the Alberta Technology and Innovation Strategy—successor to the 2017 Alberta Research and Innovation Framework[88]—identifies five overarching goals.[89] Each goal is supported by concrete

80 Government of Alberta, "Getting Alberta Back to Work: Natural Gas Vision and Strategy," October 2020, https://open.alberta.ca/dataset/988ed6c1-1f17-40b4-ac15-ce5460ba19e2/resource/a7846ac0-a43b-465a-99a5-a5db172286ae/download/energy-getting-alberta-back-to-work-natural-gas-vision-and-strategy-2020.pdf.

81 Government of Alberta, "Natural Gas Vision and Strategy," accessed February 3, 2025, https://www.alberta.ca/natural-gas-vision-and-strategy.

82 Government of Alberta, "Alberta Petrochemicals Incentive Program," accessed February 3, 2025, https://www.alberta.ca/alberta-petrochemicals-incentive-program.

83 AirProducts, "Air Products to Receive Approximately $475 Million (CAD) in Funding for Alberta, Canada Net-Zero Hydrogen Energy Complex from Government Energy Transition Programs," November 8, 2022, https://www.airproducts.com/company/news-center/2022/11/1108-air-products-receive-475-million-cad-net-zero-hydrogen-complex-funding.

84 AirProducts, "Air Products Opens New Offices in New York State and Alberta, Canada," June 2, 2023, https://www.airproducts.com/company/news-center/2023/02/0206-air-products-opens-new-offices-in-new-york-state-and-alberta-canada.

85 Inter Pipeline, "Inter Pipeline Awarded $408 Million Grant Under Alberta's Petrochemicals Incentive Program," April 5, 2021, https://interpipeline.com/news-releases/inter-pipeline-awarded-408-million-grant-under-albertas-petrochemicals-incentive-program/.

86 Alberta Innovates, "Hydrogen Centre of Excellence," accessed February 4, 2025, https://albertainnovates.ca/strategic-initiatives/hydrogen-centre-of-excellence/.

87 Ibid.

88 Government of Alberta, "Alberta Research and Innovation Framework 2017," 2017, https://open.alberta.ca/dataset/b0e52bfa-b55e-4d4a-9c2e-7d2c455de801/resource/cd780571-3732-4a0d-8ecb-df863a1e7353/download/arif-report.pdf.

89 Government of Alberta, "Alberta Technology and Innovation Strategy (ATIS): A Strategy to Strengthen Alberta's Technology and Innovation Sector," April 12, 2022, https://open.alberta.ca/dataset/60b678e2-76d6-4231-a76b-914270ed1a3f/resource/955cd7da-a537-4c6f-a815-cb759d47d8fc/download/jei-alberta-technology-and-innovation-strategy-2022.pdf.

objectives, metrics, and initiatives for diversifying the province's economy and leveraging technology and innovation to drive forward productivity and competitiveness. The objective is to become a global leader and hub for technology and innovation and, in doing so, generate 20,000 jobs and $5 billion in annual technology revenue by 2030. Its goals are the following:

1. **"Increase the depth of Alberta's technology and innovation talent pool"** by developing the technical workforce through post-secondary institutions and micro-credential programs aligned with industry needs. The number of technical jobs and opportunities for skill development will also be improved for talent retainment.
2. **"Increase access to private capital and public investments in Alberta's technology and innovation sector"** by strengthening the province's venture capital market and attracting more public and private investment.
3. **"Advance a system of supports that facilitate commercialization of Alberta research and innovations"** by improving pathways from research into practical technologies and services using enhanced infrastructure and collaboration between research and post-secondary institutions and industry.
4. **"Optimize Alberta's technology and innovation ecosystem"** to ensure a more easily navigable and efficient digital economy landscape for skilled labour and entrepreneurs.
5. **"Enhance Alberta's reputation as a leader in technology and innovation"** to attract human capital, investment, and technology activity to the region.

The strategy addresses several core challenges and opportunities within Alberta's digital economy. For example, a common sentiment expressed by ICTC's interviewees was concern that the value generated by Alberta's innovation environment is often being captured elsewhere, with companies and talent leaving the province or country. While Goal 1 includes direct talent retainment strategies, the combination of initiatives aimed at bolstering the innovation ecosystem and investment climate will help reduce the volume of company exits from the Albertan market.

Government of Alberta Technology and Innovation Business Plan (2024–2027), 2024

In a business plan outlined by the Government of Alberta for 2024–2027, one key outcome is making Alberta "the most attractive jurisdiction for innovators in Canada." The Alberta government aims to support a vibrant innovation system that will lead to technological commercialization, talent creation, highly skilled jobs, company growth, and economic growth and diversification.[90]

This strategy reflects a commitment to incentivize investment in research and commercialization to build Alberta's innovation capacity, and increase venture capital investments in Alberta's technology companies. Other key objectives in this business plan include collaborating with post-secondary institutions and other partners to develop new cybersecurity talent across the province, support job diversification, and create new employment opportunities.

90 Government of Alberta, "Technology and Innovation Business Plan 2024–27," February 29, 2024, https://open.alberta.ca/dataset/b7334a80-7dfe-4912-9625-960c0ced612b/resource/6937f1bc-70be-49b9-a261-7187eb15301c/download/technology-and-innovation-business-plan-2024-27.pdf.

ALBERTA BROADBAND STRATEGY, 2022

The Alberta Broadband Strategy was created in 2022 to enhance province-wide access to reliable, high-speed internet by 2027.[91] With approximately $816 million in combined federal and provincial funding, the initiative aims to stimulate economic growth by improving local businesses' access to international and interprovincial markets.[92] It is also anticipated to create up to 1,500 jobs during the technology installation process and generate 2,000 employment opportunities for Alberta's rural communities. Additional positive economic benefits can be expected through improved connectivity, including human capital development (online education and learning support); regional economic development (increased productivity and participation in the digital economy); and access to digital healthcare, security, and government services. Notably, this initiative will play a vital role in addressing rural-urban disparities, particularly for Indigenous communities.

TECHNOLOGY ADOPTION BY BUSINESSES

According to Statistics Canada, Alberta led the country in the adoption of advanced or emerging technologies, with an average of 49.3% of companies implementing at least one such technology in 2022.[93] This rate surpassed the national average of 44.8%. The sectors with the highest adoption rates were utilities (86.7%), finance and insurance (76.6%), and information and cultural industries (67.3%). Conversely, the lowest adoption rates were observed in the retail trade (32.8%) and agriculture, forestry, fishing, and hunting (34.3%) industries.

Among advanced technology domains, the two with the highest adoption rates were business intelligence technologies (26.6%) and security or advanced authentication systems (21.6%) (Figure 10). Despite Alberta's strong cleantech industry, the adoption rate of clean technologies was relatively low at 9.3%. However, this could be due to the niche nature of clean technology applications.

ADOPTION RATES OF ADVANCED TECHNOLOGIES IN ALBERTA, 2022

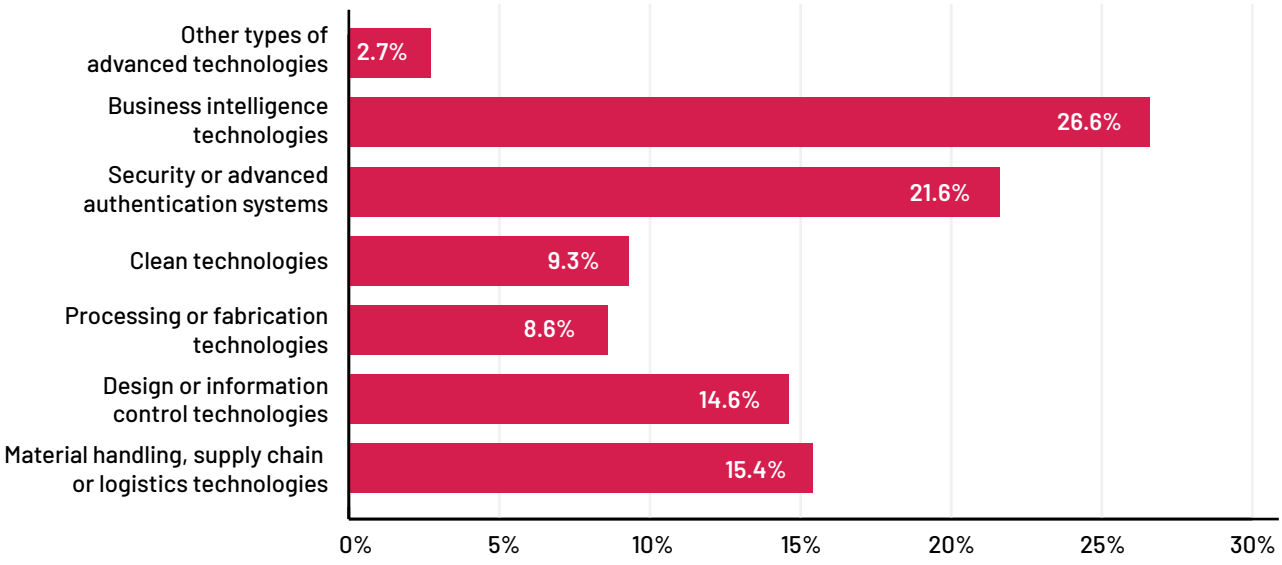


Figure 10: Adoption Rates of Advanced Technologies in Alberta, 2022. Source: Statistics Canada, "Table 27-10-0367-01 Use of advanced or emerging technologies, by industry and enterprise size," April 2024, https://doi.org/10.25318/2710036701-eng.

91 Government of Alberta, "Alberta Broadband Strategy," accessed January 30, 2025, https://www.alberta.ca/alberta-broadband-strategy.

92 Government of Alberta, "Alberta Broadband Strategy 2022: Connecting Albertans, Growing the Economy," January 2022, https://open.alberta.ca/dataset/7c985469-fb6c-4a46-8bfb-5531ccb8f5aa/resource/ff3382ee-29fc-484b-9378-245baa521e08/download/sa-alberta-broadband-strategy-2022.pdf.

93 Statistics Canada, "Table 27-10-0367-01 Use of Advanced or Emerging Technologies, by Industry and Enterprise Size," April 30, 2024, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2710036701.

ADOPTION RATES OF EMERGING TECHNOLOGIES IN ALBERTA, 2022

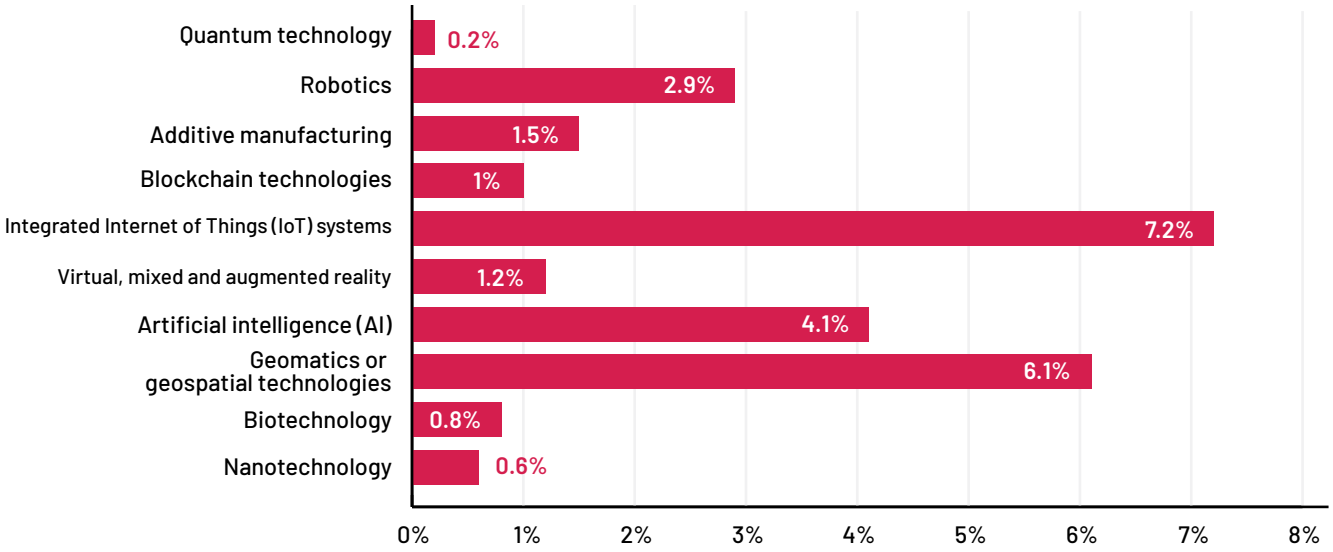


Figure 11: Adoption Rates of Emerging Technologies in Alberta, 2022. Source: Statistics Canada, "Table 27-10-0367-01 Use of advanced or emerging technologies, by industry and enterprise size," April 2024, https://doi.org/10.25318/2710036701-eng.

For emerging technologies, integrated Internet-of-Things systems (7.2%), geomatics or geospatial technologies (6.1%), and artificial intelligence (4.1%) had the highest adoption rates in Alberta (Figure 11). Unsurprisingly, quantum technologies (0.2%), nanotechnology (0.6%), and biotechnology (0.8%) had the lowest adoption rates due to their relative novelty or current market availability.

EMPLOYER SENTIMENTS AROUND TECH ADOPTION: OPPORTUNITIES AND CHALLENGES

In ICTC's interviews with digital economy employers, responses about current technology usage varied significantly. While some employers reported not actively adopting new technologies, others mentioned early adoption or a strong eagerness to adopt. Larger companies discussed their motivation to develop proprietary software solutions internally rather than relying on external technology providers. Interviewees highlighted AI/machine learning, immersive reality, automation, cybersecurity, data science, the migration to cloud computing, the increasing adoption of Internet-of-Things technologies, and the rise of quantum computing as the most critical focus areas in the province.

Across the broader economy, experts observe steady digital adoption within "non-tech" businesses due to an increased need for companies to conduct sales and transactions online, along with the growing integration of AI technologies.

An interviewee from a workforce development agency noted that their organization was incorporating new technology to "better serve client needs," while another interviewee involved in labour market research believes that the shift toward adopting new technologies could be partly attributed to a growing acceptance of software-as-a-service business models across industries in Alberta. Productivity and efficiency were also commonly cited reasons for technology adoption and digital innovation. In contrast, the primary barriers to technology adoption highlighted by interviewees included a lack of knowledge and understanding among decision makers, the high costs and infrastructure needs associated with implementing solutions like machine learning, and a general risk-averse mindset in some organizations. Interviewees noted a relatively slow uptake of digital technologies and e-commerce in regions predominantly characterized by industrial and manual work. An employer from the Grande Prairie region elaborated that although digital innovations are occurring, the "necessity to adopt a lot of these ICT technologies is less pronounced here." One employer expressed, "We really shouldn't be looking to solve

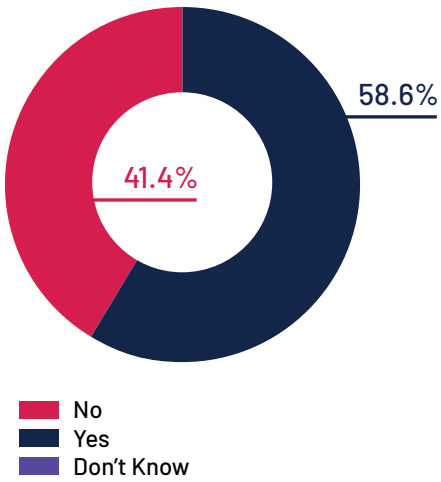
technology but looking to solve business problems.... Knowing how GenAI works isn't very practical unless you have a problem to solve, something to sell, and someone to buy it." Rural businesses continue to confront barriers related to infrastructure, awareness, costs, and talent in their digital transformation and technology adoption efforts.[94]

Employers in Alberta are generally enthusiastic about the ongoing innovation and developments in emerging technologies, but the adoption and integration of these technologies require specialized and senior technical talent that employers feel is currently in short supply. Addressing these acute talent shortages, an interviewee representing a bitcoin company shared their difficulties in finding local talent with the technical expertise necessary to work with bitcoin-specific technologies. Another interviewee from a fintech company pointed out that senior talent is "concentrated in areas like Vancouver and Toronto." Additional challenges in technology adoption may arise from a need for improved digital literacy and technical skills within the workforce. Employers are calling for increased upskilling initiatives to cultivate local talent pools and keep pace with technological advancements. The following sections of this report provide a more comprehensive discussion of in-demand jobs, the availability of talent, and workforce development.

AI ADOPTION

Across the digital economy, there is a significant focus on the adoption and application of AI to improve operational efficiency and productivity. As shown in Figure 12, although there is a somewhat even split, the majority (58.6%) of surveyed digital economy employers have plans to use AI in the next 12 months. Conversely, among surveyed general economy employers, only 7.7% of surveyed employers plan to use AI during the same period. Additionally, 69.8% of general economy employers do not plan to implement AI over the next year, while the remaining 22.5% express uncertainty in their plans, responding with "I don't know" (Figure 12).

DIGITAL ECONOMY
Plans to Use AI Over the Next 12 Months



GENERAL ECONOMY
Plans to Use AI Over the Next 12 Months

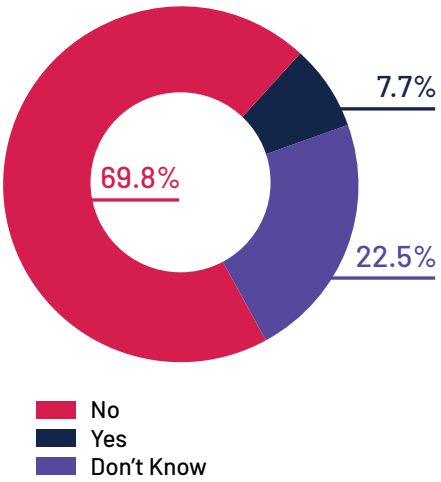


Figure 12: Plans to Use AI over the Next 12 Months, Digital Economy vs. General Economy. Source: ICTC Alberta Digital Economy Employer Survey compared with Statistics Canada Survey of Business Conditions, Alberta Subsample, December 2024.

94 Alexandra Cutean and Mairead Matthews, "Seeding Rural Innovation Report: Nurturing the Tech Frontier in Alberta," Information and Communications Technology Council (ICTC), September 2023, https://ictc-ctic.ca/reports/seeding-rural-innovation.

Some organizations are quickly adopting both traditional and generative AI systems, while others approach the technology with more caution and restrictions. Interviewees attributed this hesitance to a possible lack of understanding and knowledge regarding the technology. In some cases, the adoption process may be delayed as employers take strategic approaches to AI integration. One employer from a technology hardware company described their method as "a process by committee," mentioning that the decision to implement an AI tool took "between six and eight months." When discussing the adoption process for new technology solutions, interviewees highlighted key pillars such as needs assessments, vendor evaluations, employee training, and a gradual transition to minimize disruption.

Employers that indicated plans to use AI over the next 12 months were asked which types of AI applications they were considering implementing (Figure 13). Among the respondents from the digital economy, nearly 25% plan to use AI for data analytics, while around 20% intend to use AI for virtual agents or chatbots, marketing automation, or machine learning applications.

The least common planned AI applications among digital economy employers include machine or computer vision, biometrics, and robotics process automation. Notably, these applications are more prevalent in niche industries, which may explain their lower projected adoption. General economy employers have similar plans for AI applications as their digital economy counterparts. However, discrepancies arise where general economy employers anticipate significantly less use of augmented reality applications and considerably more applications of virtual agents, chatbots, and text analytics compared to digital economy employers.

TYPES OF AI APPLICATIONS PLANNED FOR THE NEXT 12 MONTHS Multiple select

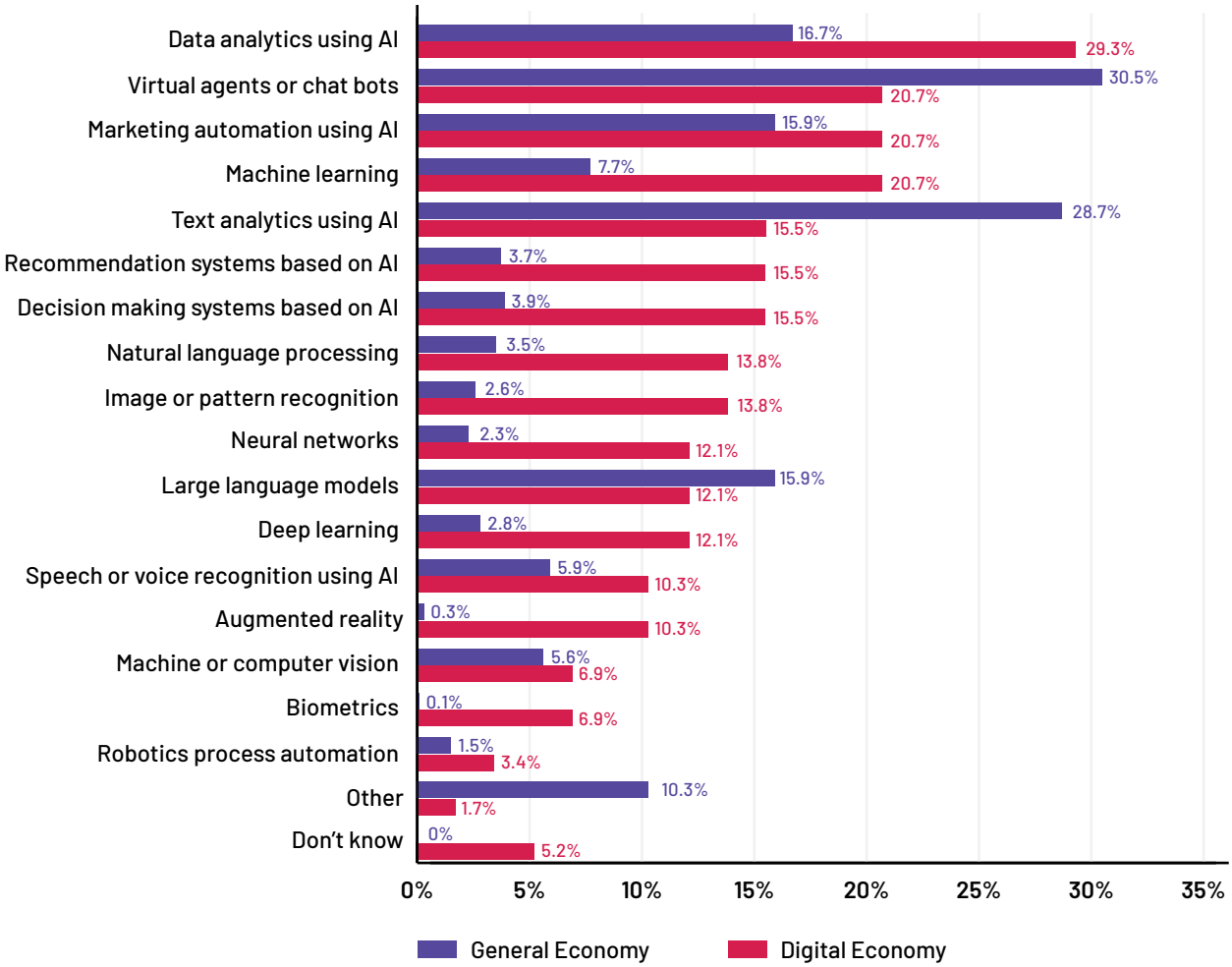


Figure 13: Types of AI Applications Planned for the Next 12 Months. Source: ICTC Alberta Digital Economy Employer Survey compared with Statistics Canada Survey of Business Conditions, Alberta Subsample, December 2024.

REASONS FOR NOT PLANNING TO USE AI OVER THE NEXT 12 MONTHS Multiple select

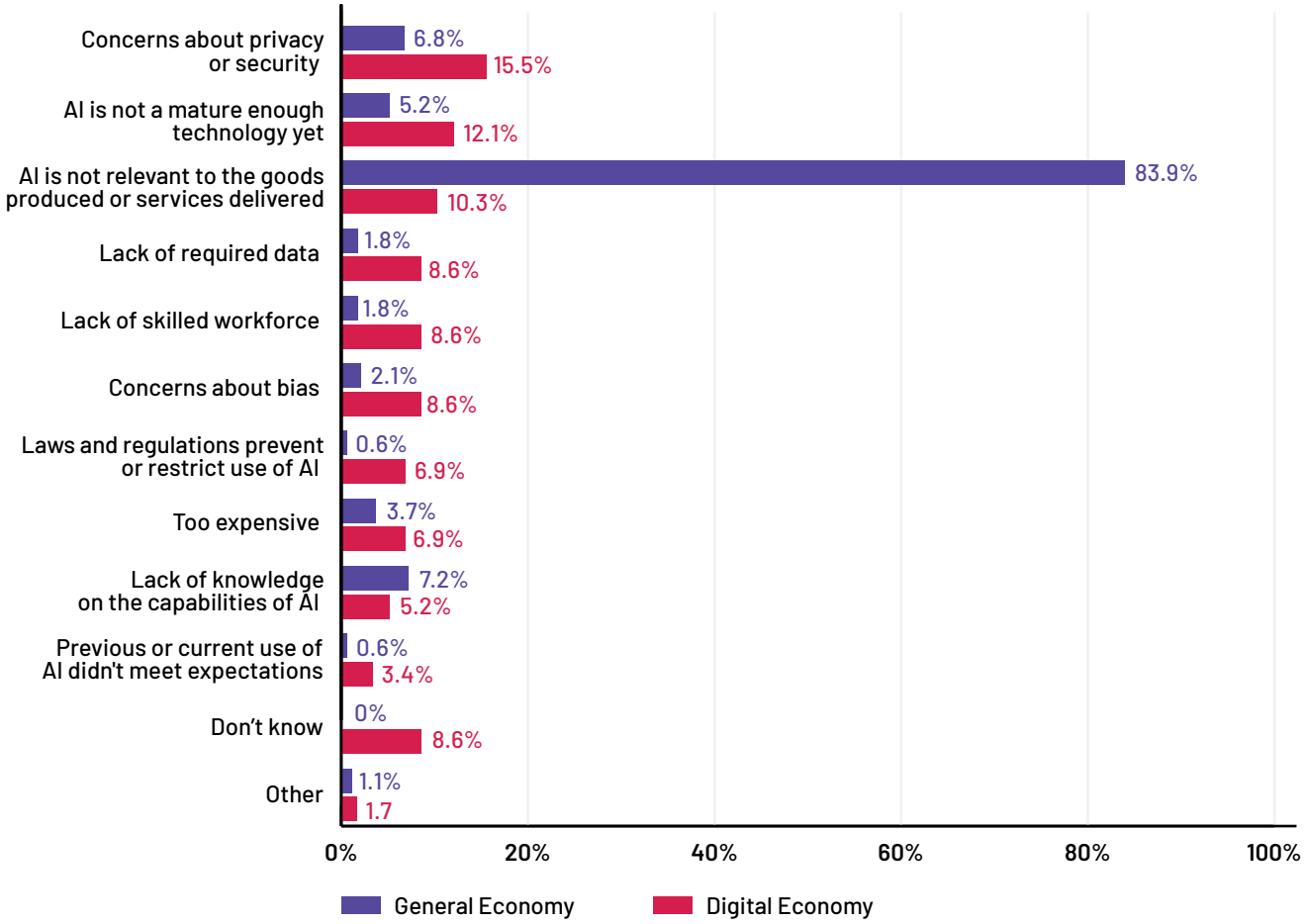


Figure 14: Reasons for Not Planning to Use AI over the Next 12 Months. Source: ICTC Alberta Digital Economy Employer Survey compared with Statistics Canada Survey of Business Conditions, Alberta Subsample, December 2024.

When survey respondents were asked about the specific reasons they would not plan to use AI over the next year, the general economy widely felt there was a lack of relevance of AI to the goods they produce or services they deliver (84%) (Figure 14). Digital economy employers were more divided in their reasoning. Many expressed concerns about privacy and security, as well as the maturity of AI, while other issues such as relevancy, insufficient data, a shortage of skilled workers, and bias also influenced their decision not to adopt or implement AI applications at this time.

Finally, most surveyed digital economy employers felt that AI's impact on the labour market would either not affect or would increase total employment within their organizations. Digital economy employers were more optimistic about an increase in total employment due to AI integration compared to general economy employers, with 27.6% of digital economy employers expecting an increase, versus 11.8% of general economy employers.

SECTION 2:
ALBERTA'S DIGITAL ECONOMY

Key Findings

- **The ICT sector in Alberta has grown consistently since 2016, with year-over-year growth often outpacing the general economy. In 2023, Alberta's ICT sector reached $11.657 billion, representing 3.4% of the province's total GDP.**
- **ICTC forecasts that Alberta's ICT sector will continue expanding. Growth projections exceed those of Alberta's general economy; by 2030, the sector's GDP is anticipated to reach $13 billion, which represents an additional $1.4 billion over 2023.**
- **Alberta's digital economy could see an average annual growth of 1%, adding 13,600 jobs for a total employment of 240,100 by 2030.**
- **Digital economy companies in Alberta are, on average, optimistic about their future revenue-generating capabilities, but face challenges including retention and recruitment of skilled employees, regulatory constraints, competition, customer acquisition, and financial resources.**
- **Alberta's professional, scientific, and technical services sector, and the utilities sector, stand out as major technology employers in the province, with nearly 57% of the ICT workforce between them.**
- **The demand for technical professionals is growing. There is an acute need for talent to fill specific roles, particularly at the middle and senior management levels.**

As the economy becomes more digital, many companies that provide traditional goods and services need staff with digital skills to facilitate e-commerce, ensure secure digital operations, and perform other ICT-related tasks. The "digital economy" encompasses the ICT sector, along with technology-related professionals in various industries. This means that all telecommunications and technology firms, as well as relevant employees in other sectors (such as an IT specialist in healthcare), contribute to the digital economy. In the analysis that follows, this report examines the current state and future outlook of Alberta's ICT sector and digital economy, focusing on present business conditions, sectors fostering digital growth and technology adoption, in-demand jobs and skills, and forecasts for digital economy output and employment.

Economic Activity and Output

As outlined in Section 1, Alberta's economy has experienced significant changes over the past decade. Despite fluctuations in the economic and labour markets, Alberta's digital economy has shown stability, resilience, and growth, even in the most challenging times.[95] The digital economy in Alberta has become a crucial driver of innovation, job creation, and economic advancement.

ALBERTA ICT SECTOR GDP AND FORECAST

The ICT sector is a vital part of the digital economy and significantly contributes to the province's economic growth across all sectors. The ICT sector encompasses businesses within four subsectors: ICT manufacturing, software and computer systems, communications services, and ICT wholesaling.[96] In 2023, Alberta's ICT sector reached $11.66 billion, representing 3.4% of the

95 Alexandra Cutean, Mairead Matthews, and Mansharn Toor, "A Resilient Recovery: Alberta's Digital-Led Post-COVID Future," Information and Communications Technology Council (ICTC), June 2022, https://ictc-ctic.ca/reports/a-resilient-recovery.

96 Innovation, Science, and Economic Development Canada, "2023 Canadian ICT Sector Profile: Digital Technologies and Investment Branch," 2024, https://ised-isde.canada.ca/site/digital-technologies-ict/en.

province's total GDP.[97] This figure is slightly lower than the contribution of the ICT sector at the national level, which accounts for 5.7% of the national GDP.[98]

The ICT sector in Alberta has consistently grown since 2016, frequently outpacing the general economy, particularly during times of economic hardship. Despite a brief slowdown due to the COVID-19 pandemic in 2020, the performance of the ICT sector remained stronger than that of the wider Alberta economy, partly driven by investments in solutions such as e-commerce, which were essential for adapting Canadian economic activities online during the pandemic.[99] In 2023, the growth of the ICT sector's GDP significantly exceeded that of the general economy, with a 6.8% increase compared to the general economy's 2.3% growth.[100]

ICTC forecasts that the Alberta ICT sector will continue expanding, with growth projections exceeding those of Alberta's general economy in the coming years. Several factors are contributing to this growth. Ongoing digital adoption across industries is driving demand for ICT services, while the sector's increasing integration with traditional industries, such as oil and gas, energy, healthcare, and manufacturing, is enhancing its influence.[101] Focusing on emerging technologies, like artificial intelligence,[102] quantum computing, and cleantech, through initiatives such as the Alberta Technology and Innovation Strategy,[103] alongside continued investment in Alberta's Broadband Strategy, is expected to boost GDP.[104]

From 2014 to 2023, Alberta's ICT sector grew at an average annual rate of 3.0%, significantly outperforming the general economy's average growth rate of 1.1%. Looking ahead to 2024–2030, this growth trajectory is expected to continue. Following the baseline scenario, ICTC forecasts an annual average growth rate of 1.7% for ICT GDP between 2024 and 2030. While the projected 1.7% annual growth rate for 2024–2030 is lower than the historical rate of 3.0%, it still signifies a substantial expansion in the sector. By 2030, the sector's GDP is anticipated to reach $13 billion, which represents an additional $1.4 billion over 2023 (Figure 15).

97 Statistics Canada, "Table 36-10-0402-01 Gross Domestic Product (GDP) at Basic Prices, by Industry, Provinces and Territories (x 1,000,000)," November 7, 2024, https://doi.org/10.25318/3610040201-eng.

98 Ibid.

99 Innovation, Science, and Economic Development Canada, "2023 Canadian ICT Sector Profile: Digital Technologies and Investment Branch," 2024, https://ised-isde.canada.ca/site/digital-technologies-ict/en.

100 Statistics Canada, "Table 36-10-0402-01 Gross Domestic Product (GDP) at Basic Prices, by Industry, Provinces and Territories (x 1,000,000)," November 7, 2024, https://doi.org/10.25318/3610040201-eng.

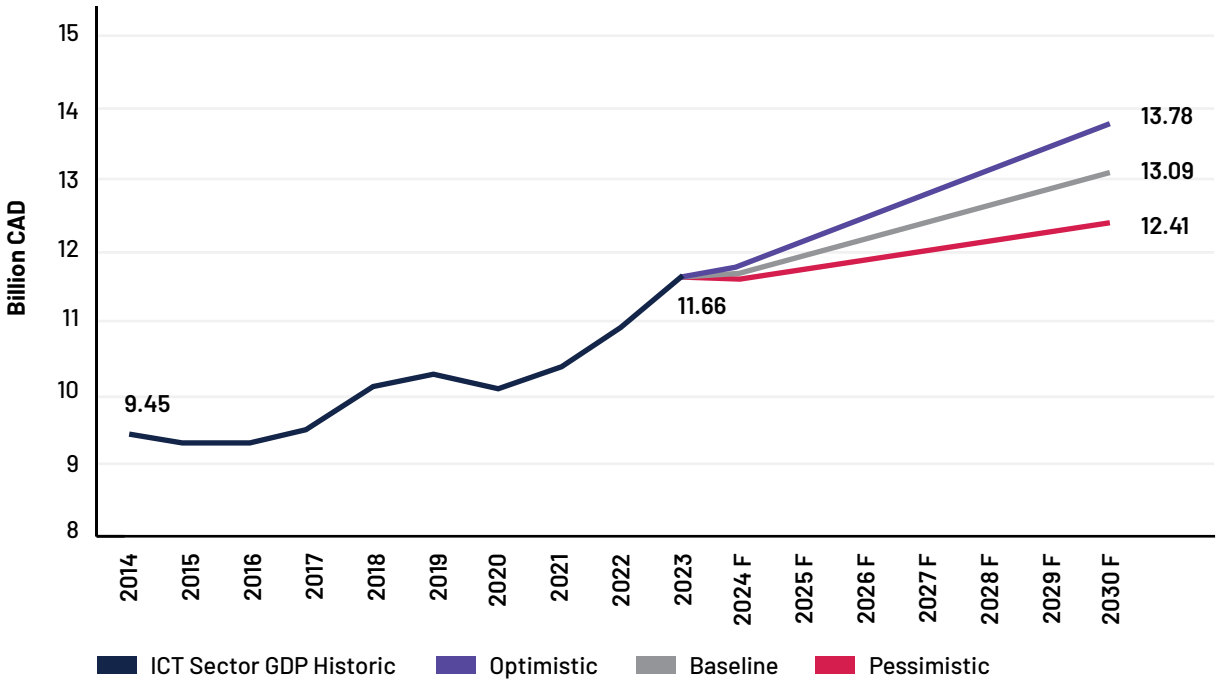
101 Canadian Manufacturers & Exporters, "Manufacturing Alberta's Future," April 2024, https://cme-mec.ca/wp-content/uploads/2024/05/2024-CME-Report-Manufacturing-Albertas-Future_web.pdf.

102 Harshal Pathak, Katie Greenshields, and Allison Choe, "How Alberta Is Setting the Stage for Artificial Intelligence Tech in Canada," Plug and Play, September 24, 2024, https://www.plugandplaytechcenter.com/insights/how-alberta-is-setting-the-stage-for-artificial-intelligence-tech-in-canada.

103 Government of Alberta, "Technology and Innovation Business Plan 2024-27," February 29, 2024, https://open.alberta.ca/dataset/b7334a80-7dfe-4912-9625-960c0ced612b/resource/6937f1bc-70be-49b9-a261-7187eb15301c/download/technology-and-innovation-business-plan-2024-27.pdf.

104 Innovation Science and Economic Development Canada, "Expanding High-Speed Internet Access in Alberta," June 14, 2024, https://www.canada.ca/en/innovation-science-economic-development/news/2024/06/expanding-high-speed-internet-access-in-alberta.html.

ALBERTA ICT SECTOR GDP



	2020	2021	2022	2023	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Historic	-1.9%	2.9%	5.2%	6.8%							
High					1.3%	2.5%	2.8%	2.7%	2.6%	2.6%	2.5%
Base					0.5%	1.7%	2.0%	1.9%	1.9%	1.9%	1.8%
Low					-0.2%	0.9%	1.2%	1.2%	1.1%	1.1%	1.1%

Figure 15: Alberta ICT Sector Real GDP and Forecast, 2014–2030. Source: Statistics Canada, "Table 36-10-0402-01 Gross Domestic Product (GDP) at Basic Prices, by Industry, Provinces and Territories (x 1,000,000)," November 7, 2024, https://doi.org/10.25318/3610040201-eng, ICTC calculations.

ICT Businesses and Entrepreneurship

As of October 2024, approximately 122,053 active businesses operated in Alberta across all industries, representing 13% of all active businesses in the country.[105] Excluding 2020—due to COVID-induced economic shutdowns—the number of business entrants and exits in the province have remained steady over time, as illustrated in Figure 16. Figures 17 and 18 indicate that trends in Alberta's business dynamics are comparable to national levels, though slightly more dynamic, with annual entrants and exits historically making up a higher percentages of total businesses.

Against this backdrop, studies indicate that Alberta's technology companies are numerous, are distributed across multiple sectors, and exhibit less volatility than businesses in other areas. A 2023 study conducted by Alberta Enterprise Corporation, in collaboration with KPMG, identified 2,378 technology firms in the province that year—comprising approximately 2% of the 937,028 businesses operating in the province at that time.[106] Between the last iteration of this study in 2021 and the most recent one in 2023, 370 (15% of total technology companies in 2023) new companies entered the market, while 308 (13%) exited. This represents a low figure in comparison to the overall economic data illustrated in Figures 17 and 18, where entrants and exits in Alberta comprised 23.06% and 23.37%, respectively, of all active businesses in 2023. Importantly, this suggests that the net increase in entrants for technology firms was higher than that of the general economy in Alberta, at 3% versus 2%, respectively, underscoring a relatively stable and expanding technology sector with a more consistent rate of business creation than the broader economy, though not significantly so.

Although the ICT sector has experienced stable growth, ICTC's survey findings indicate that business activities and strategic initiatives have been dynamic. Figure 19 illustrates that while over 60% of respondents from the general economy in the Canadian Survey on Business Conditions reported no plans to expand or restructure, only 13.8% of digital economy employers shared this sentiment. A significantly larger proportion of the latter group indicated intentions to undertake one or more of the following activities: expand without increasing physical space (25.9%), expand within their current province (22.4%), and/or expand within their current location (22.4%). This indicates that although the technology sector's expansion has remained steady, it is marked by a dynamism that surpasses that of the broader economy.

105 Statistics Canada, "Table 33-10-0270-01 Experimental Estimates for Business Openings and Closures for Canada, Provinces and Territories, Census Metropolitan Areas, Seasonally Adjusted," August 5, 2020, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3310027001.

106 Alberta Enterprise Corporation, "Alberta Technology Deal Flow Study 2023," May 2024, https://www.alberta-enterprise.ca/wp-content/uploads/2024/06/2023-Alberta_Technology_DFS_AEC_Final.pdf.

ALBERTA BUSINESS ENTRANTS AND EXITS All industries, monthly

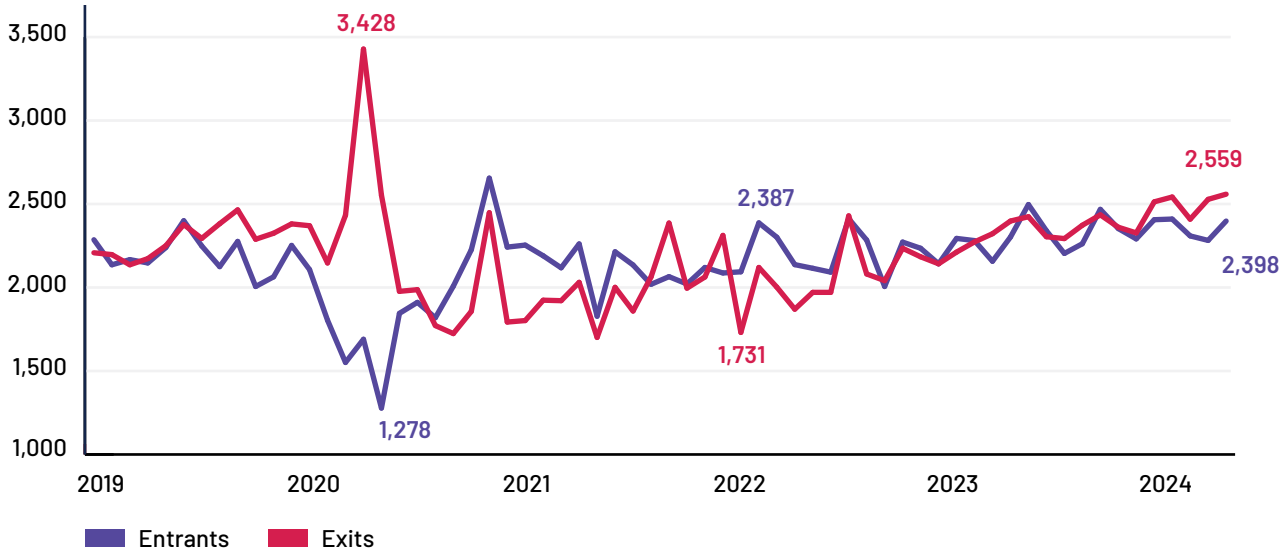


Figure 16: Alberta Business Entrants and Exits, 2019–2024. Source: Statistics Canada, "Table 33-10-0270-01 Experimental estimates for business openings and closures for Canada, provinces and territories, census metropolitan areas, seasonally adjusted," January 27, 2025, https://doi.org/10.25318/3310027001-eng.

ENTRANTS AS PERCENTAGE OF TOTAL BUSINESSES
All industries, monthly

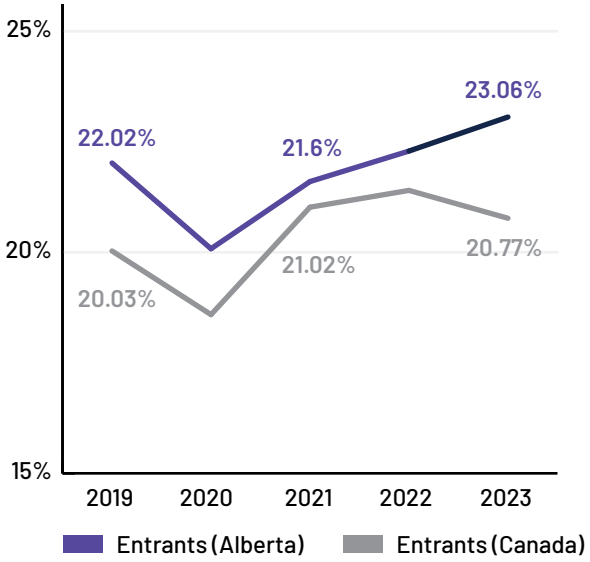


Figure 17: Business Entrants as a Percentage of Total Active Businesses, Canada vs. Alberta, 2019–2023. Source: Statistics Canada, "Table 33-10-0270-01 Experimental estimates for business openings and closures for Canada, provinces and territories, census metropolitan areas, seasonally adjusted," January 27, 2025, https://doi.org/10.25318/3310027001-eng.

EXITS AS PERCENTAGE OF TOTAL BUSINESSES
All industries, monthly

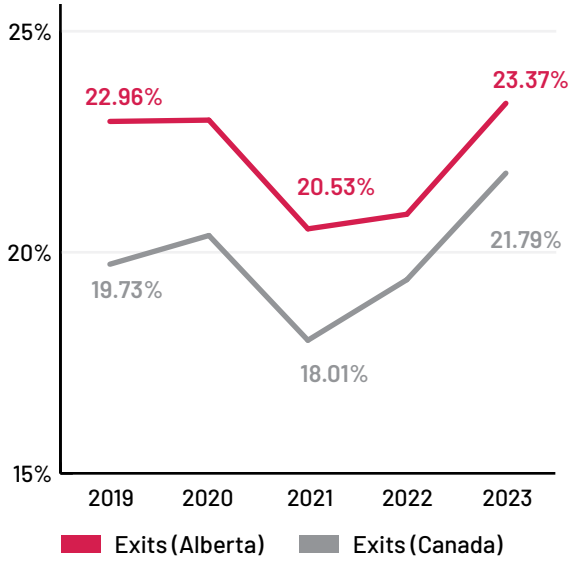


Figure 18: Business Exits as a Percentage of Total Active Businesses, Canada vs. Alberta, 2019–2023. Source: Statistics Canada, "Table 33-10-0270-01 Experimental estimates for business openings and closures for Canada, provinces and territories, census metropolitan areas, seasonally adjusted," January 27, 2025, https://doi.org/10.25318/3310027001-eng.

PLANNED EXPANSION & RESTRUCTURING ACTIVITIES Over the next 12 months

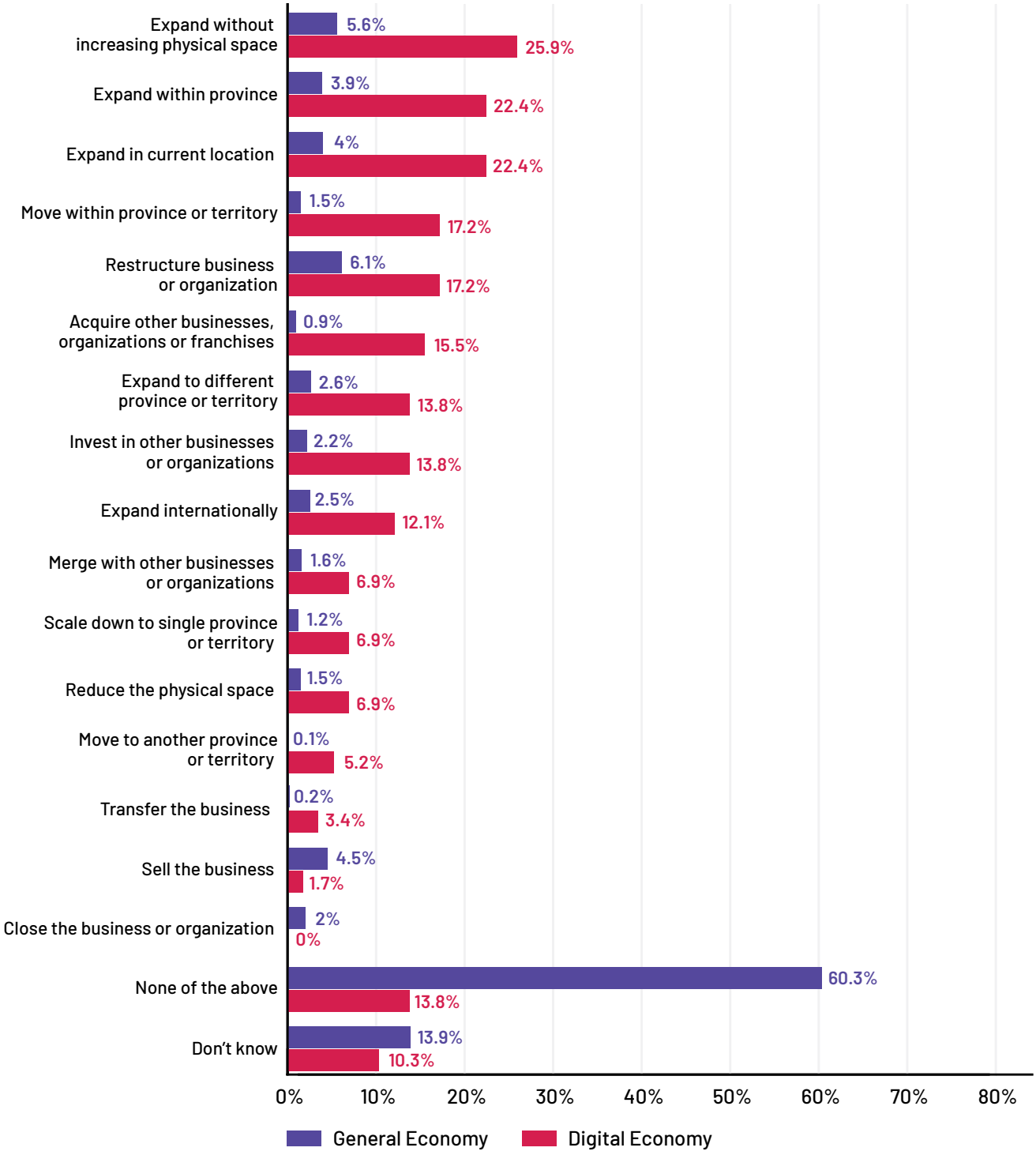


Figure 19: Planned Expansion & Restructuring Activities (over the Next 12 Months). Source: ICTC Alberta Digital Economy Employer Survey compared with Statistics Canada's Canadian Survey on Business Conditions, Alberta Subsample, December 2024.

INVESTMENT AND REVENUE IN ALBERTA'S TECHNOLOGY SECTOR

Survey results from a 2023 study by the Alberta Enterprise Corporation indicate that most businesses raise funds in Calgary (62.1%), Edmonton (33%), and other areas of Canada outside Alberta (34.5%).[107] Relatively few respondents mentioned international funding sources, apart from San Francisco/Silicon Valley and other regions of the United States (13.6% and 24.2%, respectively). Equity financing is the most common method used by businesses, representing 44% of respondents, with the majority sourced through personal savings (69.7%), grants and credits (50%), friends and family (45.5%), and angel investors (41.3%). Approximately one-third of respondents reported having received funds through venture capital investors.[108]

The majority of technology companies are located in Calgary and Edmonton. In 2023, 62.7% of all technology companies in Alberta were headquartered in Calgary, while 28.9% were in Edmonton, and 8.5% were located in other regions of the province.[109] This implies that over 90% of technology investment and business activity takes place in these two cities, underscoring the distribution of the sector across the province's two largest cities, with Calgary leading as the primary hub for both venture capital deals and technology companies overall.

Investment Challenges/ Opportunities

Alberta has a robust startup network characterized by a supportive community and infrastructure fostering innovation and collaboration. However, businesses and subject matter experts interviewed in this study outlined several challenges that have slowed innovation across industries, including bureaucracy, limited access to capital, and traditional mindsets. As discussed by a venture partner and entrepreneur, there is an identifiable gap in early-stage funding, particularly for women and minority founders, that is exacerbated by a risk-averse investment culture inherent to Alberta. Interviewees also cited a mismatch between government funding programs that require companies to be majority Alberta-owned and the reality of distributed teams.

Technology sector entrepreneurs who participated in this research discussed facing difficulties securing investment dollars and noted limited funding for companies seeking to scale beyond the seed stage. One interviewee spoke of the broader Alberta technology ecosystem being "stagnant" due to a gap in funding for companies looking to scale beyond the initial seed stage, resulting in a pattern of "companies that fail quickly." One entrepreneur spoke about a "time, talent, and treasure" triangle as the key challenges faced by businesses looking to scale. Businesses need time in the startup phase and to scale, and "timing follows political cycles, which isn't always advantageous for businesses." The second key challenge investors and entrepreneurs face is an uneven distribution of talent, where senior leaders are in demand and the talent profile in the province is still largely based on oil and gas. The third key challenge is in the sources of capital for Albertan businesses and the need to diversify the capital profile beyond government funding and traditional industries.

Despite these obstacles, interviewees identified the emerging energy sectors and technology innovations in advanced manufacturing, AI, cleantech, and agtech as presenting significant opportunities for Alberta's economic growth. In making investment decisions, the investors ICTC spoke to discussed prioritizing companies with a clear product-market fit, substantial revenue, and potential for expansion beyond Canada.

107 Alberta Enterprise Corporation, "Alberta Technology Deal Flow Study 2023," May 2024, https://www.alberta-enterprise.ca/wp-content/uploads/2024/06/2023-Alberta_Technology_DFS_AEC_Final.pdf.

108 Alberta Enterprise Corporation, "Alberta Technology Deal Flow Study 2023," May 2024, https://www.alberta-enterprise.ca/wp-content/uploads/2024/06/2023-Alberta_Technology_DFS_AEC_Final.pdf.

109 Ibid.

Businesses in Alberta's digital economy surveyed for this research are optimistic about average annual revenue growth over the next three years. Figure 20 illustrates that, on average, companies in both the general and digital economies expect their annual revenue growth in the short term to remain positive and well-preserved. The largest proportion of respondents in both groups indicated they anticipate revenue growth averaging between 1% and 5% per year going forward.

However, on either side of this median, differences in revenue expectations are notable. A larger percentage of digital economy respondents (25.9%) anticipate annual revenue growth between 6% and 10%, compared to just 9.5% of businesses in the general economy, with similar differences carrying forward across higher growth rates as well. Moreover, a smaller proportion of digital economy businesses anticipated no growth (3.4%) or negative growth (3.4%) compared to the general economy, which saw rates of 11.4% and 8.2%, respectively. This distribution of responses reinforces findings from interviews and surveys regarding the tech sector's business outlook and indicates that digital economy companies are, on average, more optimistic about their future revenue-generating capabilities.

However, companies in the digital economy face a distinct set of challenges that are less prominent throughout the rest of the economy. While both samples (approximately 42%, as illustrated in Figure 21) identified rising costs of inputs and fluctuations in consumer demand as two of their main obstacles over the next three months, these were the only two comparable issues. Human capital emerged as the primary challenge for digital economy employers, with nearly 57% and 47% of respondents indicating that retaining and recruiting skilled employees, respectively, will be difficult. Other recurring themes that uniquely impact the digital economy include market conditions (regulatory constraints, competition), customer acquisition, and financial resources (cash flow, insufficient liquidity).

EXPECTED AVERAGE YEARLY REVENUE GROWTH Over the next 3 years

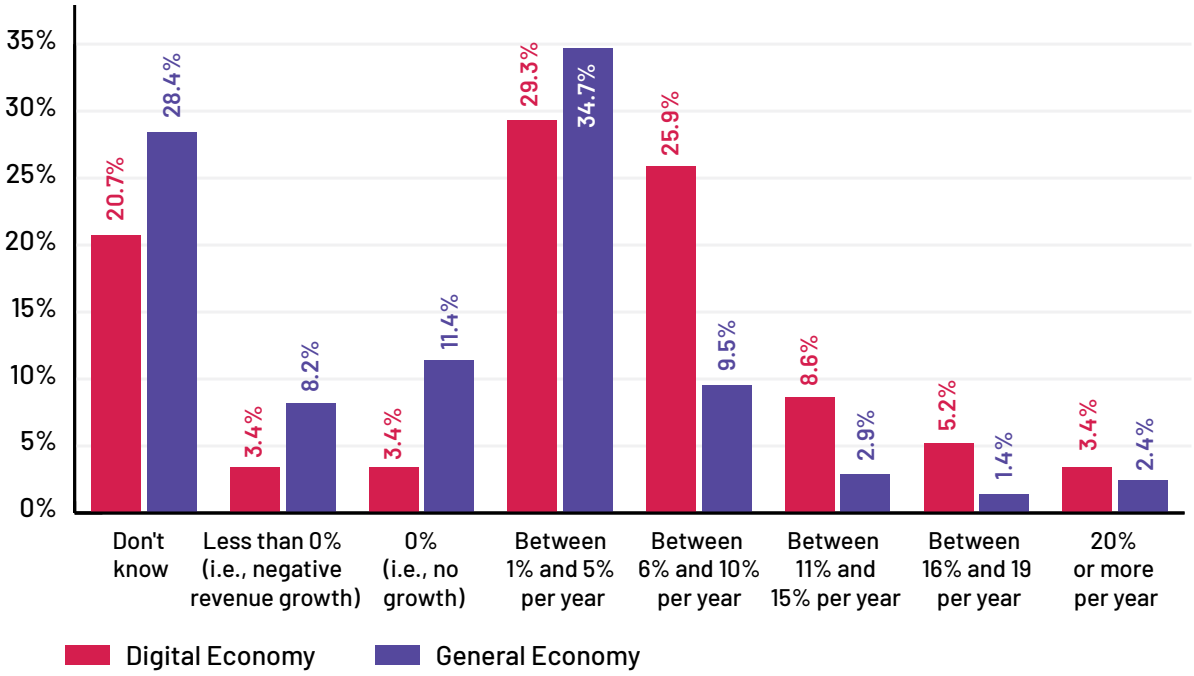


Figure 20: Expected Average Yearly Revenue Growth. ICTC Alberta Digital Economy Employer Survey compared with Statistics Canada Survey of Business Conditions, Alberta Subsample, December 2024.

EXPECTED BUSINESS OBSTACLES

Over the next 3 months (multiple select)

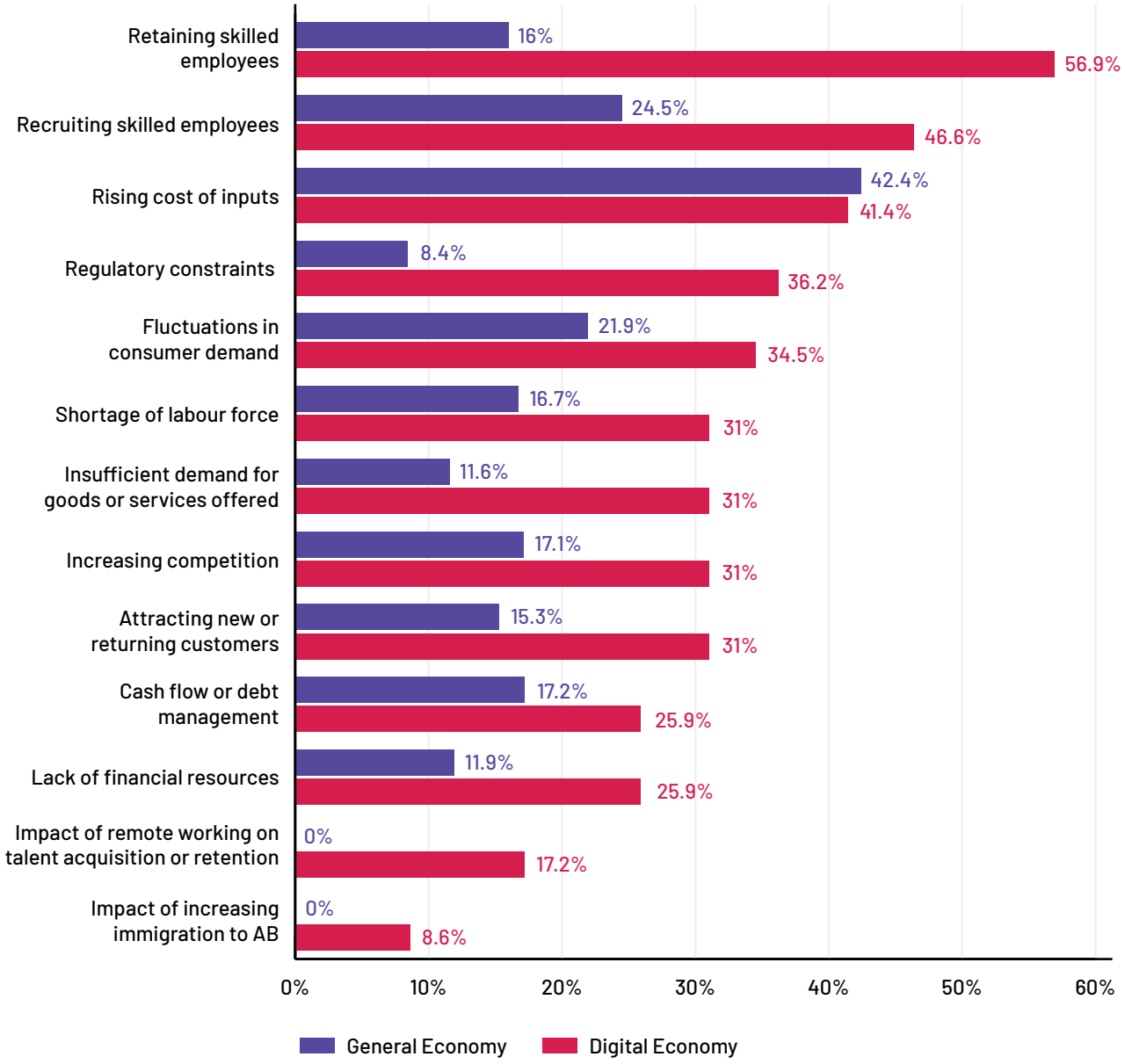


Figure 21: Expected Business Obstacles (over the Next 3 Months). Source: ICTC Alberta Digital Economy Employer Survey compared with Statistics Canada Survey of Business Conditions, Alberta Subsample, December 2024.

As of December 2024, Alberta's digital economy employed approximately 227,300 people.[110] Over the last five years, the digital economy added around 60,000 jobs, increasing employment to nearly 36% above the pre-pandemic level of 2019. The proportion of the digital economy workforce relative to the overall labour force in Canada has risen from 7.2% in 2019 to 8.9% in 2024. While this surge is impressive, it is not entirely surprising given the increasing levels of digital adoption in sectors like energy and agriculture, as well as the growth of the ICT sector.

The employment of technology workers both within and beyond the ICT sector is growing in Alberta. As of 2024, the composition of the digital economy is as follows: 75,600, or 33%, are technology workers in the ICT sector; 129,830, or 57%, are technology workers outside the ICT sector; and 21,070, or 9%, are non-technology workers in the ICT sector (Figure 22). The ICT sector in Alberta has witnessed a shift in technology workforce distribution over the past five years. As of 2024, the ICT sector employs 75,600 technology workers, representing 37% of all technology workers in Alberta. The remaining 129,830 technology workers, or 63%, are spread across other sectors. This distribution has shifted since 2020, when 28% of technology workers were in the ICT sector and 72% were in other sectors. Over four years, there has been a 9% increase in the proportion of technology workers within the ICT sector, alongside a corresponding decrease in the percentage of technology workers in other sectors. The increasing share of technical workers in the ICT sector reflects the growth and strengthening of Alberta's ICT industry.

The ICT sector is a significant source of job opportunities, with its influence extending beyond its own boundaries. It generates direct employment opportunities and creates a multiplier effect throughout the economy, leading to indirect job creation in other sectors. According to Innovation, Science and Economic Development Canada, each direct job in the ICT sector generates an additional 1.2 jobs in other sectors of the economy.[111]

ICTC measures Canada's employment in the digital economy as the sum of ICT workers (tech workers) across all sectors, ICT workers (tech workers) within the ICT sector, and non-ICT workers within the ICT sector (Figure 22). In other words, an HR generalist employed by an IT consulting firm and a data scientist working for an HR firm are both part of the digital economy. For a complete list of occupations and industries that comprise the digital economy, consult Appendix A.

As the ICT sector continues to grow, it is poised to play an increasingly significant role in Alberta's economic landscape. This expansion fosters economic diversification and diminishes Alberta's dependence on resource-based industries. Furthermore, the sector's growth draws more skilled professionals to the region who may have previously sought opportunities elsewhere.

While technology professionals can be found in organizations of all sizes and across various sectors, some economic sectors exhibit a significantly higher concentration of technology talent. As shown in Table 1, Alberta's professional, scientific, and technical services sector stands out as a major technology employer, with nearly 40% of the workforce in this sector composed of technology professionals. The utilities sector has the second-highest concentration of technology workers at 17.1%. The growing presence of technology talent in the manufacturing (8.0%) and mining, quarrying, oil, and gas (5.9%) sectors demonstrates that traditionally labour-intensive industries are embracing technological advancements. This trend reflects ongoing digital transformation and technological integration across diverse industries. As companies increasingly view technology as essential to operations, the demand for technology professionals is expected to continue to grow.

110 eTalent Canada, "Employment Data Across Industries in Alberta," Information and Communications Technology Council (ICTC), December 2024, https://etalentcanada.ca/locations/alberta.

111 Innovation Science and Economic Development Canada, "Canadian ICT Sector Profile 2023," October 9, 2024, https://ised-isde.canada.ca/site/digital-technologies-ict/en/canadian-ict-sector-profile.

ALBERTA DIGITAL ECONOMY, 2006- 2024 Components of Employment

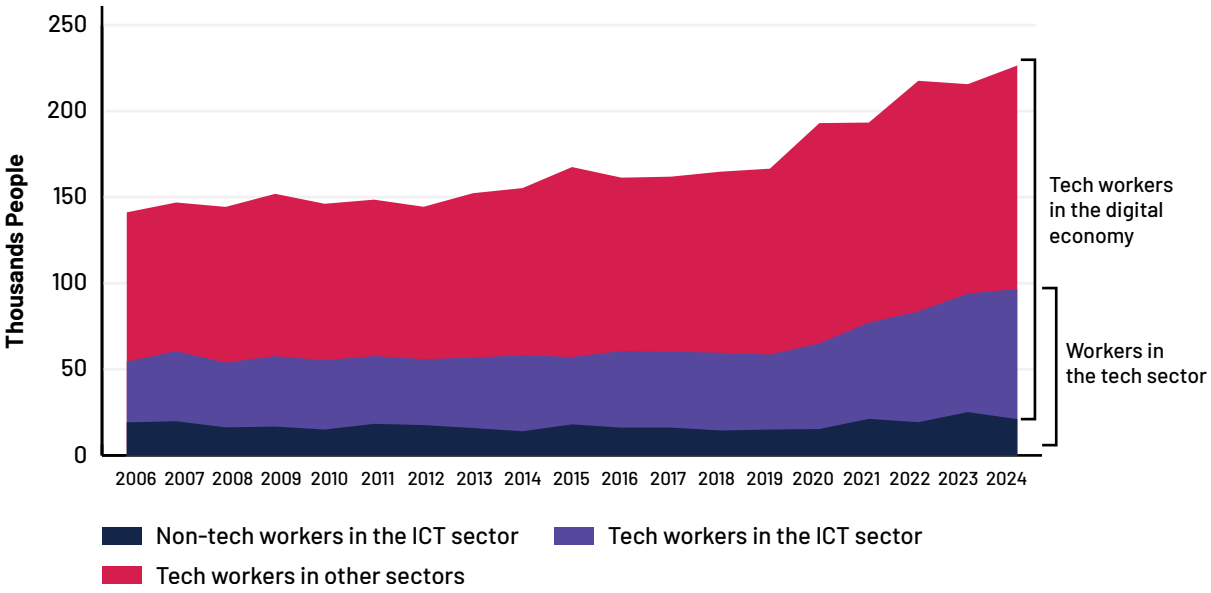


Figure 22: Alberta Digital Economy, 2006–2024. Source: Statistics Canada Monthly Labour Force Survey, ICTC calculations.

Industry	Tech workforce, thousands	Share of tech workforce in the sector, %
Professional, scientific, and technical services	92.17	39.3%
Utilities	3.66	17.1%
Information, culture, and recreation	14.23	16.2%
Public administration	13.23	10.6%
Manufacturing	12.42	8.0%
Finance, insurance, real estate, rental and leasing	5.85	6.8%
Mining, quarrying, oil, and gas	8.70	5.9%
Trade	20.07	5.6%
Educational services	6.69	4.0%
Transportation and warehousing	5.72	3.8%
Real estate and leasing	1.75	3.6%
Other services	3.54	3.3%
Construction	6.88	2.8%
Healthcare and social assistance	6.83	2.0%
Business, building, and other support services	1.40	1.7%
Accommodation and food services	1.50	1.0%

Table 1: Share of the ICT Workforce Across Industries in Alberta, 2024. Source: Statistics Canada, Labour Force Survey, ICTC calculations.

EMPLOYMENT GROWTH IN ALBERTA'S DIGITAL ECONOMY

Employment growth in Alberta's digital economy has often outpaced that of the general economy. As of December 2024, Alberta's digital economy had an annual growth rate of 5.0%, compared to a 2.9% rate across all industries.[112] The strength of Alberta's digital economy was especially evident in 2020, when employment grew by 15.9% despite lockdowns and restrictions that led to significant declines in the Canadian economy and labour market. In 2022, as the general economy rebounded, businesses reopened, and restrictions eased, the digital economy saw another substantial boost in employment, increasing by 12.5%. In 2023, there was a slight 0.9% drop in digital economy employment, followed by a robust 5.0% growth in 2024.[113] The past several years have displayed a remarkable trajectory of growth and transformation in Alberta's digital economy, propelled by substantial technology investments, rapid digital transformation across various industries, and a restructuring of the workforce.

A closer examination of employment trends in the ICT sector reveals interesting developments in the digital economy:

2022: A Year of Robust Growth

In 2022, Alberta's digital economy experienced strong tech-driven growth, primarily driven by a surge in technology investments.[114] The ICT sector saw a 15.0% rise in technical workforce employment, while employment in the technical workforce outside the ICT sector grew by 15.3% (Figure 23). This increase reflects the accelerated digital transformation across industries that was prompted by post-pandemic recovery and greater technology adoption.

EMPLOYMENT GROWTH IN THE DIGITAL ECONOMY

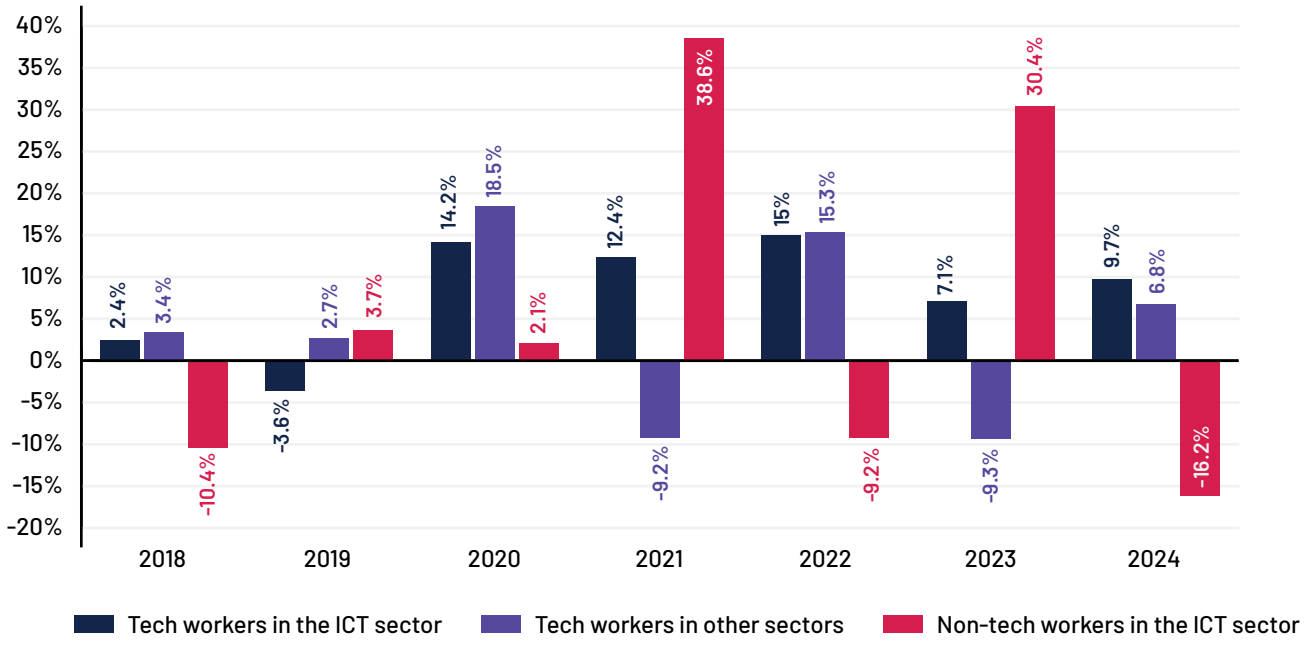


Figure 23: Employment Growth in the Digital Economy, 2018–2024. Source: Statistics Canada Monthly Labour Force Survey, ICTC calculations.

112 eTalent Canada, "Employment Data Across Industries in Alberta," Information and Communications Technology Council (ICTC), December 2024, https://etalentcanada.ca/locations/alberta.

113 Statistics Canada Monthly Labour Force Survey, ICTC calculations.

114 Isabelle Kirkwood, "Alberta Tech Is on Track to Outpace 2022 with Lively Q2 2023," BetaKit (blog), July 28, 2023, https://betakit.com/alberta-tech-is-on-track-to-outpace-2022-with-lively-q2-2023/.

Late 2022, Early 2023: The Technology Layoff Wave

At the end of 2022 into the beginning of 2023, the technology sector faced significant challenges, with major North American technology companies, including Microsoft, Amazon, Facebook, Twitter, Shopify, and Alphabet Inc., announcing layoffs due to an oversupply of talent.[115] This trend was also evident in Alberta. In January 2023, Calgary-based technology firm Benevity announced it would lay off 14% of its staff,[116] Calgary-based software company StellarAlgo laid off 21 employees,[117] and AI company Alphabet Inc.'s subsidiary, DeepMind, announced the closure of its Edmonton office.[118] Despite these setbacks, industry experts remained optimistic about Alberta's technology sector, emphasizing its continued strength and growth, describing the situation as a "readjustment" rather than a reckoning.[119] This perspective was supported by 2023 labour market statistics. While employment in the digital economy experienced a slight overall decline of 0.9%, robust growth within the ICT sector indicates adaptability within Alberta's technology industry. Although technology companies were eliminating roles in some areas, they continued to hire and invest in talent in key strategic areas; in 2023, the technical workforce experienced 7.1% growth in the ICT sector, along with a remarkable 30.4% increase in employment in non-technical roles within the sector. This substantial growth in non-technical positions signals a maturing phase for many technology companies as they focus on expanding operational capacities in areas such as business development, marketing, finance, and human resources.

2024: Rising Demand for Tech Expertise

The employment landscape in Alberta's digital economy in 2024 reflected trends seen in 2022, showing a shift toward technical expertise. While technical professionals both within and outside the ICT sector saw growth of 9.7% and 6.8%, respectively, non-technical professionals in the ICT sector faced a 16.2% decline. The strong growth in technical roles may signify a strategic move to bolster technological competencies in emerging fields such as artificial intelligence, machine learning, and advanced data analytics. The marked decline in non-technical roles within the ICT sector could indicate a restructuring of the workforce, possibly due to economic pressures or changing business demands. According to global layoff trackers, 20% of all cuts occurred in sales, marketing, and customer-facing roles, as well as HR and recruiting, while engineering and IT departments were the least likely to experience downsizing.[120] The stark contrast in growth between technical and non-technical roles reinforces this trend as companies focus on essential technical positions while reducing costs in other areas.

115 Joel Dryden, "Alberta's Tech Sector Hit by Layoffs after Boom Investment Year," *CBC News*, January 24, 2023, https://www.cbc.ca/news/canada/calgary/calgary-tech-sector-benevity-amazon-google-microsoft-layoffs-1.6723088.

116 Ibid.

117 Josh Scott, "'Cooler Financing Environment' Leads StellarAlgo to Restructure and Make Layoffs," BetaKit (blog), October 19, 2023, https://betakit.com/cooler-financing-environment-leads-stellaralgo-to-restructure-and-make-layoffs/.

118 Phil Heidenreich, "DeepMind Confirms AI Research Office Closing in Edmonton," Global News, January 24, 2023, https://globalnews.ca/news/9433340/deepmind-closure-ai-edmonton/.

119 Kevin Green, "Calgary Tech Sector Braces as Layoffs Arrive Here," CTV News, January 26, 2023, https://www.ctvnews.ca/calgary/article/calgary-tech-sector-braces-as-layoffs-arrive-here/.

120 Jared Lindzon, "Who Is Getting Laid off in Canada's Tech Industry?," *The Globe and Mail*, February 20, 2023, https://www.theglobeandmail.com/business/article-who-is-getting-laid-off-in-canadas-tech-industry/.

Present and Forecasted Employment in Alberta's Digital Economy

ICTC has developed three forecast scenarios for Alberta's digital economy employment growth between 2024 and 2030 (see Figure 24). In the optimistic scenario, Alberta's digital economy is anticipated to grow by an average of 4.9% annually, with a projected increase of 6.3% in 2025, followed by consistent high to moderate growth exceeding 4% until 2030. The baseline scenario suggests that the digital economy will see an average annual growth of 1.0%, with a higher growth rate of 2.3% in 2025. In the pessimistic scenario, the digital economy is projected to decline by an average of 3.9% annually.

In an optimistic scenario, Alberta's digital economy could create 75,100 new jobs by 2030, potentially reaching a total employment of 301,600 professionals. Several factors may contribute to the growth of the digital economy. The ongoing economic transition and digital transformation across all sectors will continue to drive demand for digital services and solutions, leading to new job opportunities.[121] Furthermore, government support through initiatives like the Alberta Technology and Innovation Strategy aims to position Alberta as an internationally recognized technology and innovation hub.[122] Consequently, future investment in emerging technologies, such as AI, quantum computing, and clean technology, is expected to generate new opportunities for growth and employment.[123] Additionally, expanding investment in Alberta's Broadband Strategy, which incentivizes workers and businesses to move to Alberta, is anticipated to boost GDP and create further jobs in the digital economy. [124]

In a pessimistic scenario, Alberta's digital economy could lose 48,500 jobs by 2030, potentially declining to a total employment of 178,000 professionals. Challenges faced by the digital economy that could negatively impact its growth include potential shortages of technical expertise, especially in emerging technologies and at middle and senior levels. Recent cuts in federal immigration targets may limit the pool of skilled technology workers necessary to meet the demand in the digital economy.[125] As Alberta already contends with competition from established Canadian and international technology hubs to attract and retain top technology talent,[126] a slowdown in immigration and population growth could result in significant labour shortages. Moreover, current economic and geopolitical uncertainty may affect investment and growth in the digital economy.[127]

While the baseline scenario forecast for the digital economy—an addition of 13,600 jobs for a total employment of 240,100 by 2030—is more modest compared to the growth witnessed in recent years, it still demonstrates the strength of Alberta's digital economy. Ongoing government support to innovate and attract investment exceeds the national average, positioning Alberta to overcome challenges and continue transitioning its economy, establishing itself as a technology hub.[128]

121 Ryan McLaughlin, "Alberta's Digital Economy Employment," Information and Communications Technology Council (ICTC), May 4, 2020, https://ictc-ctic.ca/articles/albertas-digital-economy-employment.

122 Mairead Matthews, Allison Clark, Erik Henningsmoen, Justin Ratcliffe, Todd Legere, and Mansharn Toor, "What Budget 2023 Means for Alberta's Digital Economy," Information and Communications Technology Council (ICTC), March 7, 2023, https://ictc-ctic.ca/articles/what-budget-2023-means-for-albertas-digital-economy.

123 Government of Alberta, "Technology and Innovation Business Plan 2024–27," February 29, 2024, https://open.alberta.ca/dataset/b7334a80-7dfe-4912-9625-960c0ced612b/resource/6937f1bc-70be-49b9-a261-7187eb15301c/download/technology-and-innovation-business-plan-2024-27.pdf.

124 Government of Alberta, "Alberta Broadband Strategy," accessed January 20, 2025, https://www.alberta.ca/alberta-broadband-strategy.

125 Naimul Karim, "Size of Ottawa's Cuts to Immigration Targets Takes Business by Surprise," Calgary Herald, October 25, 2024, https://calgaryherald.com/news/economy/ottawa-immigration-target-cuts-surprise-businesses/wcm/98ea1778-5bd4-4dae-905d-d4b82c38b505.

126 CBRE, "Scoring Tech Talent 2024," September 4, 2024, https://www.cbre.com/insights/books/scoring-tech-talent-2024.

127 Calgary Economic Development, "2025 Economic Outlook: Geopolitical Uncertainty Looms as Calgary Looks Ahead, https://www.calgaryeconomicdevelopment.com/newsroom/2025-economic-outlook-geopolitical-uncertainty-looms-as-calgary-looks-ahead/.

128 Knowlton Thomas, "Alberta Tech Has Taken Off Recently, Report Finds — And Is Still Positioned for Growth," Calgary.Tech, October 7, 2024, https://calgary.tech/2024/10/07/alberta-tech-taken-report-positioned-growth.

EMPLOYMENT IN THE DIGITAL ECONOMY OF ALBERTA 2007-2030

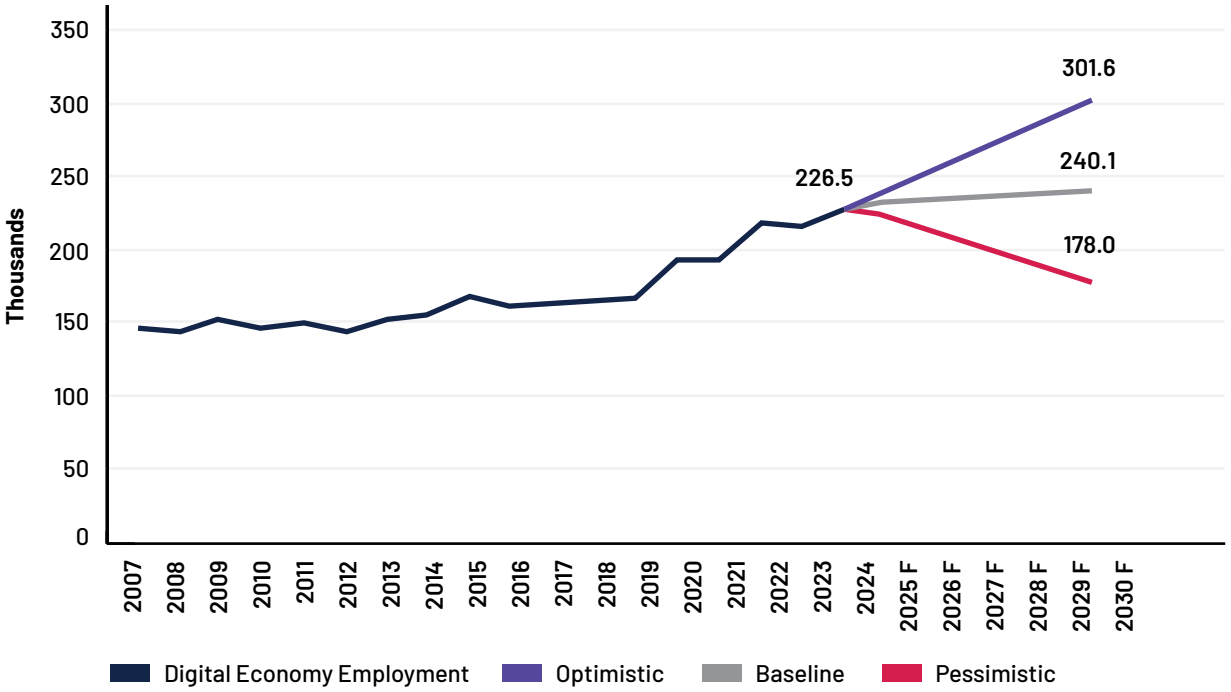


Figure 24: Present and Forecasted Employment in Alberta's Digital Economy 2007-2030. Source: Statistics Canada Monthly Labour Force Survey, ICTC calculations.

The Demand for Technology Talent in Alberta

Job posting data provides another layer of insight into the job market outlook, complementing employment data by offering a more detailed and real-time view of the job market. While employment data captures net changes in employment, accounting for job creation and losses, job posting data reflects hiring demand and immediate skill requirements. This distinction is essential, as high job posting growth may indicate difficulties in filling specific positions rather than overall employment growth. Job posting data is more sensitive to emerging roles and immediate skill demands, offering insight into the evolving needs of employers. However, it does not account for internal promotions, word-of-mouth hiring, or other non-advertised positions online, and it cannot indicate whether publicly open positions were ultimately filled. To fully understand the labour market, it's crucial to analyze both employment and job posting data, recognizing that each offers unique insights into workforce trends.

IN-DEMAND JOBS

According to job posting data from December 2019 to December 2024, the total demand for ICT jobs in Alberta's digital economy increased significantly, rising by 67% from 6,473 to 10,826 positions.[129] Demand for ICT workers peaked in 2023, but a subsequent cooling in the job market led to a 6.3% decline in job openings, dropping from 11,556 postings in 2023 to 10,826 by the end of 2024.[130]

Table 2, below, displays the top ten in-demand ICT occupations in Alberta's digital economy as of December 2024, ranked by the highest volume of job postings. The table offers an overview of each occupation's labour market dynamics, including the number of job postings, annual growth rate, and numerical increase of those postings, along with the annual employment growth rate and absolute employment increase in 2024 compared to 2023.

129 Source: Vicinity Jobs Inc. Data generated on December 15, 2024.

130 Source: Vicinity Jobs Inc. Data generated on December 15, 2024.

Business systems specialists, database analysts and data administrators, and information systems specialists are the top three in-demand ICT occupations in the digital economy; however, demand for these roles is decreasing. They are followed by web developers, programmers, user support technicians, computer network and web technicians, and software developers. Entering the top ten with growth from 2023 to 2024 are computer and information systems managers (13% growth), technical sales specialists in wholesale trade (2% growth), and graphic designers and illustrators (15% growth). Other occupations that experienced increased demand in 2024 compared to 2023 include web developers and programmers (45% growth) and user support technicians (16% growth).

Trends in in-demand roles based on job postings generally align with employment trends observed in 2024. The majority of high-demand ICT jobs saw increases in both job postings and employment numbers, indicating a growing demand for these positions. For instance, web developers and programmers experienced a 45% rise in job postings and a 33.6% annual growth in employment in 2024. However, some roles, such as business systems specialists, database analysts, and data administrators, encountered a decline in both job postings and employment growth in 2024. This trend suggests a slowdown in demand for these positions compared to the previous year. Occupations with growth in both job postings and employment confirm high demand for professionals in these fields and the availability of talent for hiring employers.

Top 10 In-demand ICT Occupations in the Digital Economy						
NOCs	**Occupational group**	**Number of job postings, 2024**	**Job postings annual growth, %**	**Job postings annual increase**	**Employment growth, %**	**Employment annual increase**
21221	Business systems specialists	899	-5%	-52	-22.3%	-675
21223	Database analysts and data administrators	562	-22%	-155	-21.6%	-1017
21222	Information systems specialists	521	-12%	-74	4.5%	908
21234	Web developers and programmers	514	45%	159	33.6%	729
22221	User support technicians	512	16%	69	2.6%	275
22220	Computer network and web technicians	435	-13%	-65	35.2%	1217
21232	Software developers and programmers	421	0%	0	65.1%	8108
20012	Computer and information systems managers	401	13%	45	54.4%	3350
62100	Technical sales specialists - wholesale trade	339	2%	8	3.5%	492
52120	Graphic designers and illustrators	337	15%	44	2.4%	142

Table 2: Top 10 In-Demand ICT Jobs in the Digital Economy, December 1, 2022–November 30, 2024. Source: Vicinity Jobs Inc. Data generated on December 15, 2024.

Interestingly, the most in-demand ICT occupations in Alberta's ICT sector mirror the demand for ICT talent seen in the digital economy sector. Job posting data for ICT roles in the ICT sector also reveal growing demand for computer engineers, software engineers, computer and information systems managers, and cybersecurity specialists. Please refer to Appendix A for an overview of ICT sector job postings, annual growth rate, and employment changes.

Employers interviewed for this study noted challenges in finding the "right" candidates for open roles and reported encountering a lack of qualified talent rather than a widespread talent shortage. According to ICTC's Alberta Digital Economy Employer Survey, 36% of respondents experienced difficulties in locating technology candidates with the necessary skills over the past year. The struggle to find candidates with the required skills or experience emerged as a significant concern, with nearly one-quarter (24%) of survey respondents identifying it as a primary obstacle in their hiring processes (Figure 25). This sentiment was echoed during interviews with Alberta employers. One interviewee remarked that in their recent hiring experience, there was "almost a surplus of talent," but only about one in four applicants for tech-based roles were qualified or met their expectations. Another employer shared this view, stating that they believe the Alberta labour market faces "not necessarily a shortage, but a challenge in terms of correctly levelling people to the skills that we're looking for." Sectors at the forefront of innovation and technological advancements, such as cleantech or healthtech, have specific talent needs that can make it "a little more challenging to connect and build a proper talent map for their organization."

CHALLENGES IN RECRUITING TECH EMPLOYEES Over the last 12 months

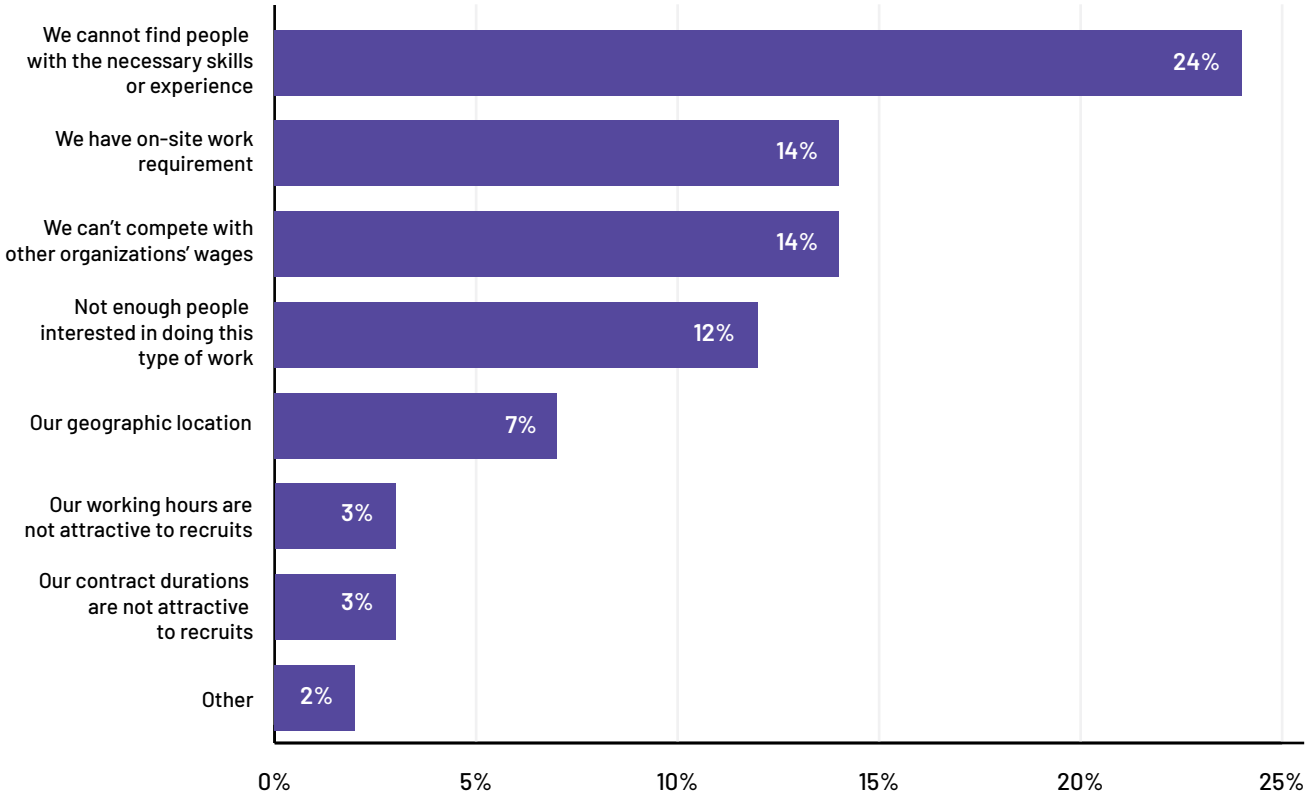


Figure 25: Challenges in Recruiting Tech Employees over the Last 12 Months. Source: ICTC Alberta Digital Economy Employer Survey, December 2024.

To this end, employers have identified acute needs for talent to fill specific roles, such as computer systems developers and programmers, particularly in sectors like medical, aerospace, and defence; software developers generally (i.e., for embedded firmware, Linux or Microsoft, or other development platforms); data scientists with a physics or statistics background; project managers, or the "seasoned professionals needed to get projects over the finish line"; experienced cybersecurity professionals with certification; and licensed technicians and engineers. Additionally, product managers "who understand how to deal with hardware and software, on a business and technical level" are in high demand across the digital economy. Sales talent is another crucial area of concern for technology employers. Some stress the importance of prioritizing customer needs and sales strategies before product development, yet attracting and retaining talent capable of bridging technical communication with sales skills continues to be a significant challenge.

Interviewees repeatedly discussed the limited availability of experienced local candidates, particularly at the middle and senior management levels. This issue is multifaceted; a workforce development professional noted "shortages of junior-entry level positions and many job openings for senior levels," as well as "not a lot of job movement or job increase within the sectors," further exacerbating the issue. Despite the growing demand for ICT skills, entry-level opportunities remain limited. One interviewee explained how many junior roles are confined to co-op and internship programs within post-secondary institutions, leaving recent graduates and newcomers to Canada with fewer pathways to build their careers. Job posting data from 2024 confirm these sentiments and reveal a higher demand for experienced professionals. Within the ICT sector, almost one-third (28%) of all ICT job postings require five to six years of experience, while only 11% of job postings require one to two years of experience.[131] Job postings in the digital economy show a slightly more balanced distribution and number of opportunities for junior talent; 31% of ICT job postings in the broader digital economy required one to two years of experience while only 15% required five to six years.[132]

Employers highlighted a highly competitive market where the challenge arises for specialized or more senior roles: "[Candidates] who have really unique skill sets, that have been working for the last 10 to 15 years … those people are just getting snatched up right away." They expressed difficulties in finding local talent, with hiring efforts focusing on outsourcing to other provinces or countries. However, attracting talent to Alberta is hindered by technology hubs in Toronto, Vancouver, and the United States. This competition affects startups in particular, which struggle to compete with larger companies for experienced technology professionals. A critical talent specialist noted that startups and SMEs often resort to hiring recent graduates and training them, only to see them get poached soon after.

IN-DEMAND SKILLS

ICTC's web scraping of job postings also uncovered the skills linked to in-demand roles. As illustrated in Table 3, below, the top 10 professional skills and competencies spanning various ICT occupations (as of December 2024) include project management, business analysis, analytical skills, agile software development, data analysis, quality assurance, automation, process design, external relations/stakeholder relations, and customer service. These sought-after skills reflect a blend of technical expertise and business acumen. Key technologies that employers are seeking expertise in across digital economy roles comprise cloud computing, structured query language (SQL), Microsoft Azure, Python, Git, JavaScript, SAP, AI, Java, and Oracle. Additionally, teamwork, communication skills, problem solving, planning, attention to detail, writing, decision making, leadership, flexibility, and troubleshooting emerged as the top 10 in-demand social-emotional skills in job postings in 2024.

131 Source: Vicinity Jobs Inc. Data generated on December 15, 2024.

132 Ibid.

Top in-demand professional skills and competencies across digital economy	Top in-demand social-emotional skills across digital economy	Top technologies across digital economy
1. Project management	1. Teamwork	1. Cloud computing
2. Business analysis	2. Communication skills	2. SQL
3. Analytical skills	3. Problem solving	3. Microsoft Azure
4. Agile software development	4. Planning	4. Python
5. Data analysis	5. Attention to detail	5. 5Git
6. Quality assurance	6. Writing	6. JavaScript
7. Automation	7. Decision making	7. SAP
8. Process design	8. Leadership	8. AI
9. External relations / stakeholder relations	9. Flexibility	9. Java
10. Customer service	10. Troubleshooting	10. Oracle

Table 3: Top In-Demand Skills for ICT Jobs in the Digital Economy. Source: Vicinity Jobs Inc. Skills reflect one year of data as of December 15, 2024.

Technical skills remain foundational for employability in the ICT sector. Employers across the sector discussed how knowledge of C++ and C# (among other programming languages), SQL, programming logic, and methodologies like Agile are among the most common in-demand skills. Skills or knowledge in cloud computing and cybersecurity were also commonly noted as in-demand within the ICT sector.

AI, the adoption of new technologies, and the evolution of the ICT sector are transforming job requirements and the types of skills in demand. Many employers interviewed for this study expressed that they are "not necessarily struggling to find skills, but [are] trying to find the right balance of skills." AI advancements and adoption require new combinations of skills, such as creativity, adaptability, problem solving, and emotional intelligence alongside conventional technical skills.[133]

Employers interviewed for this project emphasized the significance of interpersonal or "human-centred" skills, including self-awareness, communication, teamwork, collaboration, attention to detail, and empathy, especially for technical roles. Interviewees also highlighted additional skills such as critical thinking and the ability to prioritize and navigate complex decision-making processes, which are becoming increasingly valued by employers across various industries.

Certain industries require specific domain knowledge in order to apply technology skills, such as agri-food, manufacturing, finance, cleantech, and healthcare.[134] As technologies evolve, so too does the convergence of skills and technologies within technology roles, such as combining software engineering skills and machine learning knowledge. As such, there is a growing demand for interdisciplinary talent—professionals who can merge technical proficiency with business acumen and domain-specific expertise. For example, data scientists and product managers are expected not only to analyze and develop solutions but also articulate the value of those solutions to senior leaders and stakeholders. In roles that prioritize user-centric solutions, employers are seeking professionals who can apply emotional intelligence, research abilities, and an empathetic understanding of target users. Roles in technical sales—noted as high in demand by interviewees—require technical expertise and strong communication or marketing abilities. Employers largely felt that roles that require a combination of technical knowledge, interpersonal skills, and/or business acumen are the most difficult to find suitable candidates for.

133 Jack Kelly, "Why the Once-Mighty Tech Career Is No Longer Safe," Forbes, September 23, 2024, https://www.forbes.com/sites/jackkelly/2024/09/23/why-the-once-mighty-tech-career-is-no-longer-safe/.

134 Mairead Matthews, "Briefing note: Industry roundtable on the opportunity for apprenticeships in Alberta's ICT sector," Information and Communications Technology Council (ICTC). Forthcoming.

SECTION 3: WORKFORCE COMPOSITION AND DEVELOPMENT

Key Findings

- **Alberta's current digital economy workforce can meet employer demand for entry-level technology talent, but demand for mid- to senior-level technology professionals outpaces supply.**
- **Immigrants are key to increasing labour supply; the proportion of immigrants in the digital economy workforce grew from 23.5% in 2020 to 34.6% in 2024.**
- **As technology evolves, Alberta's workforce needs ongoing training. Credible, verifiable micro-credentials enable workers to upskill and demonstrate continuous learning to employers.**
- **Employer-provided upskilling aids in retaining technology talent and addressing skills gaps; 38% of employers indicate that they plan to offer training to current technology employees.**
- **Work-integrated learning is important for career progression, helping new entrants transition to mid-level roles, and fostering a robust talent pipeline.**

Digital Economy Employment Composition and Dynamics

Section 2 of this report showed that while demand for technology occupations in Alberta remains high, it cooled in 2024, and employers are seeking experienced mid- and senior-career talent. This trend has particularly impacted youth, mature workers, newcomers, and those facing additional barriers to employment. The following section outlines the demographic composition of workers in Alberta and the effects that demographic shifts have on trends in Alberta's labour market and digital economy.

YOUTH EMPLOYMENT

Alberta has a relatively young workforce compared to the national average. Albertans aged 55 years and over represent 19.6% of the workforce, which is lower than Canada's average of 21.1%.[135] When examining the composition of the digital economy by age, younger workers aged 15–34 account for nearly one-third of the digital workforce (Figure 26). Interviewees reported that younger workers entering the workforce are key drivers of digital adoption in businesses, as they are generally more willing to embrace new technologies than older workers. One business owner noted that once a business has been established for a long time, it will naturally experience generational turnover within its workforce. Consequently, it is essential to onboard and train younger workers to prevent a skills shortage in the organization as older workers retire.

135 Statistics Canada, "Table 14-10-0287-01 Labour Force Characteristics, Monthly, Seasonally Adjusted and Trend-Cycle," June 27, 2018, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1410028701.

DIGITAL ECONOMY OF ALBERTA, AGE COMPOSITION

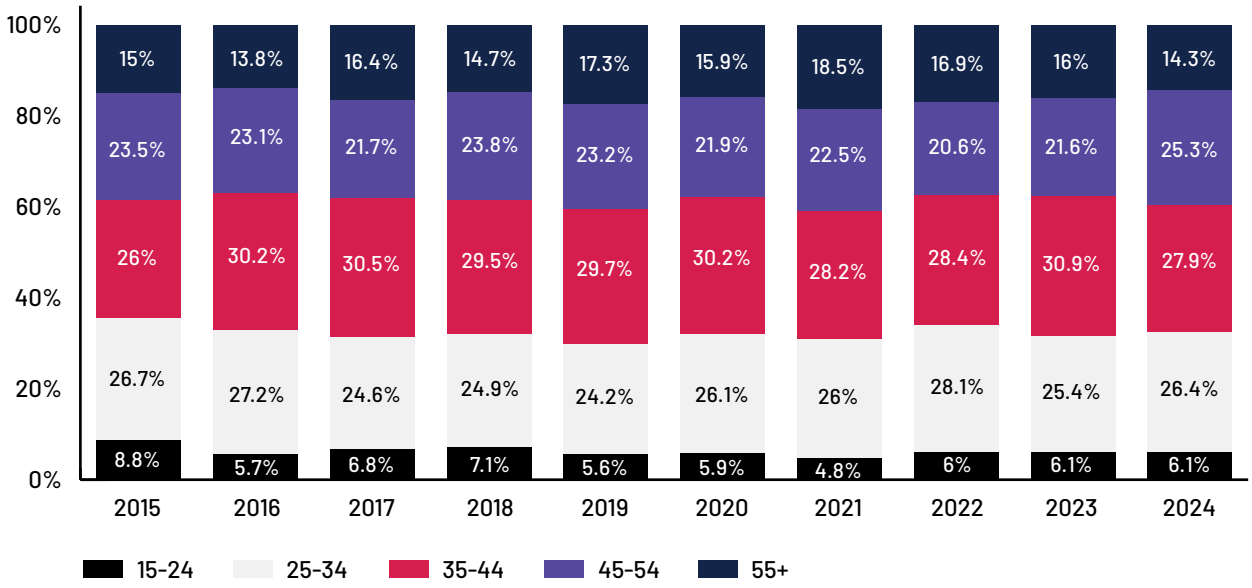


Figure 26: Digital Economy of Alberta, Age Composition. Source: Data from Statistics Canada Monthly Labour Force Survey, ICTC Calculations, January 2025.

However, there are also a number of challenges when it comes to harnessing the full potential of the young workforce. One interviewee highlighted the growing affordability crisis in Alberta, noting that increases in the cost of living across the province, even if favourable compared to other parts of Canada, have created a situation where higher incomes are becoming necessary to maintain a comfortable lifestyle in Alberta, which can lead to youth being less likely to pursue higher levels of education, or becoming "stuck" in survival jobs.[136] Similarly, another interviewee from a workforce development agency described how inflationary pressures are leading mature workers who had previously left the labour market to return to work, thus increasing the competition for jobs and making it more difficult for younger workers entering the labour market to secure their first role, or advance to mid-level roles.

GENDER COMPOSITION

In Alberta's digital economy, men have continuously been overrepresented, comprising about 70.5% of the labour force. This disparity has remained relatively steady over the past decade, underscoring the enduring nature of the issue. This contrast is particularly significant given that women account for 46.4% of employment in Alberta's general economy.[137]

Interviewees highlighted that the gender gap is not consistent across all roles within the digital economy. In specific technical positions, such as software design and development, the gender disparity is more pronounced compared to others. They emphasized the significance of introducing and promoting science, technology, engineering, and mathematics (STEM) to girls as early as kindergarten. This early exposure is deemed vital for shaping career interests and choices later in life, contributing to greater gender parity in the future ICT talent pool.

136 "A More Equitable Rebound: Inclusive Career Mobility and Advancement Beyond COVID-19," Information and Communications Technology Council (ICTC), October 2023, https://ictc-ctic.ca/reports/more-equitable-rebound.

137 Statistics Canada Monthly Labour Force Survey, ICTC Calculations, January 2025.

IMMIGRANT EMPLOYMENT

Over 37% of the employed labour force in Alberta's digital economy consists of immigrants, both landed and non-landed.[138] The proportion of immigrants in Alberta's digital economy has been increasing since 2022 (Figure 27), and there is a growing need for skilled immigrants highlighted in both federal and provincial immigration strategies. In 2023—prior to reductions in immigration target volumes—the Government of Canada implemented the Tech Talent Strategy to attract qualified technology talent to fill in-demand roles. This was achieved by introducing the Innovation Stream under the International Mobility Program and by enhancing existing technology skills recruitment programs such as the Global Skills Strategy,[139] as well as the Alberta Advantage Immigration Strategy, which facilitates the process for those looking to immigrate to Alberta.[140]

Interviewees noted a rise in the number of individuals relocating to Alberta, including international students and newcomers, which has significantly increased the pool of job seekers in the ICT sector. An interviewee from a research organization pointed out that several factors contribute to this trend. Firstly, aside from regulated professions like engineering, some ICT roles have lower barriers to entry compared to other fields (e.g., education, law, or healthcare) that may require recredentialing. Secondly, as employment in the province has historically focused on the oil and gas industry, the cultural inclination toward technology careers is less established among first-generation Albertans compared to newcomers and second-generation Canadians.

While many newcomers to the province are internationally educated professionals who have skills and experience suited to the digital economy, this talent is unfortunately often underutilized and underemployed, even in tech.[141] An interviewee from a workforce development agency stated that Alberta's ICT sector relies on immigrant technology professionals to fill mid- and high-level technology roles. However, newcomers to Alberta face barriers securing ICT roles, including credential recognition, gaining information about the job market, and challenges with biases.[142]

LEVEL OF EDUCATION

Alberta's economy workforce is well-educated, with 53% of Albertans aged 25 and over having at least some college education or higher.[143] The Canadian tech workforce, in particular, boasts even higher levels of education, with approximately 81% holding a college degree or higher. Interviewees described the importance of students and recent graduates as a key source of talent for the digital economy.[144]

138 Non-landed immigrants are non-permanent residents (or those with a work or study permit), their families, asylum claimants, protected persons, and related groups.

139 Immigration Refugees and Citizenship Canada, "Canada's Tech Talent Strategy," June 27, 2023, https://www.canada.ca/en/immigration-refugees-citizenship/news/2023/06/canadas-tech-talent-strategy.html.

140 Government of Alberta, "Alberta Advantage Immigration Strategy," February 2022, https://open.alberta.ca/dataset/d64c5435-bfe9-4d0d-93f4-a43220c87e26/resource/2c2f1f35-e28a-431b-8754-cc6a6513d393/download/lbr-alberta-advantage-immigration-strategy.pdf.

141 Tyler Farmer, Keiran O'Neill, and Mansharn Toor, "Settling for More: Matching Newcomers to Alberta's Tech Sector," Information and Communications Technology Council (ICTC), November 2021, https://ictc-ctic.ca/reports/settling-for-more.

142 Ibid.

143 "Alberta's Economy: An Overview & Sector Snapshots," Business Council of Alberta, December 9, 2021, https://www.businesscouncilab.com/wp-content/uploads/2021/12/Albertas-Economy-Economic-Overview-FULL.pdf.

144 Statistics Canada, Labour Force Survey, 2024, ICTC calculations.

WORKFORCE COMPOSITION OF THE DIGITAL ECONOMY OF ALBERTA: IMMIGRANT AND BORN IN CANADA

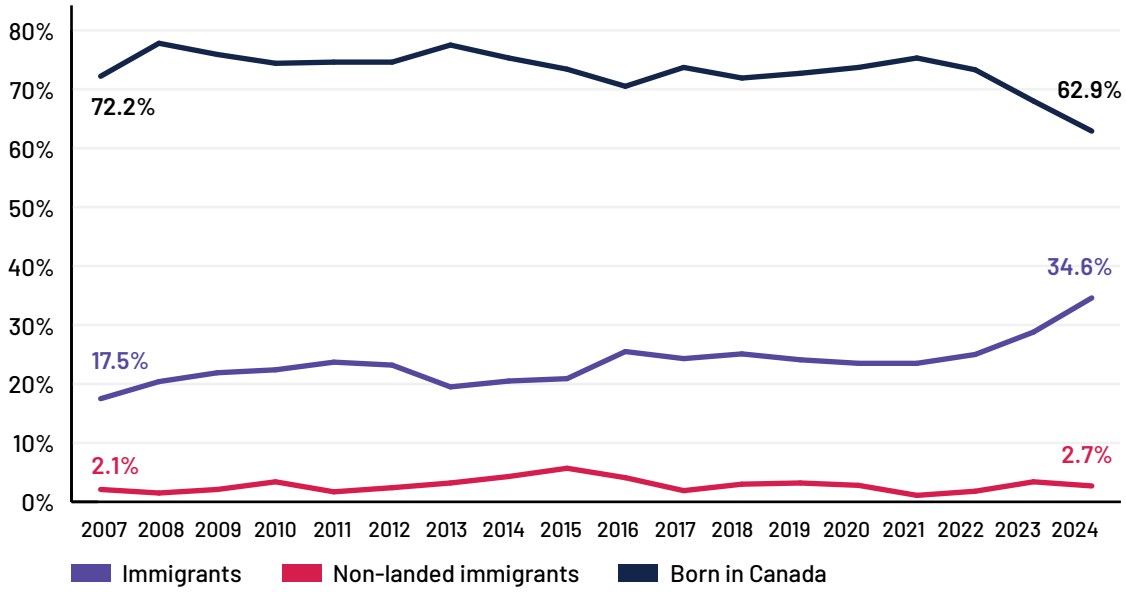


Figure 27: Workforce Composition of the Digital Economy: Immigrant and Born in Canada Breakdown. Source: Data from Statistics Canada Monthly Labour Force Survey, ICTC Calculations, January 2025.

Micro-Credentials in Alberta's Digital Economy

Traditional post-secondary education remains a baseline requirement in the technology sector and continues to carry significant weight in hiring decisions. In ICTC's survey of employers in Alberta's digital economy, 12% of respondents agreed that non-traditional education is not considered unless an applicant has a college degree. Nevertheless, other types of credentials are gaining traction in Alberta's technology sector.

Micro-credentials, as defined by the Government of Alberta, are "short-term, flexible learning programs designed to help Albertans develop the specialized, job-ready skills they need to quickly re-skill or upskill to pivot in their careers or re-enter the workforce."[145] In the digital economy, where emerging technologies continuously reshape job requirements, micro-credentials stand as a crucial element of workforce development.

Micro-credentials provide a practical solution for employers who need to assess a candidate's or employee's ongoing learning journey instead of relying solely on outdated credentials. As one employer stated, "a degree from 10 years ago holds little value in today's fast-evolving industries—what truly matters is continuous learning and skill development." Micro-credentials allow employers to view a history of learning, enabling them to confidently identify candidates who are actively remaining relevant. Research from the World Economic Forum indicates that 61% of workers will require retraining between now and 2027, and 4 million new technology-enabled roles will be added to the global labour pool in the same timeframe, and that "the fraction of employers who consider micro-credentials may indeed be expected to increase, given that 82% of companies plan to adopt education and workforce development technologies in the next five years."[146]

145 Government of Alberta, "New Micro-Credential Learning Opportunities," February 4, 2025, https://www.alberta.ca/new-micro-credential-learning-opportunities.

146 World Economic Forum, "Future of Jobs Report 2023," April 30, 2023, https://www.weforum.org/publications/the-future-of-jobs-report-2023/.

Interviewees also pointed out some shortcomings of the current credentialing and certification opportunities available in Alberta. Primarily, respondents noted that not all micro-credentials and certification programs are created equally, and that it can be difficult to determine whether a person's skill level is where it is purported to be. They emphasized the need for a verification system for these programs that employers could use to gain an accurate understanding of the skills and qualifications a program offers its participants.

The absence of standardized verification for micro-credentials places the burden of validating their authenticity on employers during the hiring process, unlike traditional post-secondary credentials, which are accompanied by established accreditation and quality assurance. This extra step not only delays hiring but also diminishes the practical value of micro-credentials if employers cannot easily trust their legitimacy. For micro-credentials to be genuinely useful, they must be competency-based, showing that the holder has mastered specific skills rather than merely completing a set number of hours in a course.[147] Without a shift toward verifiable, skills-based assessment, micro-credentials risk becoming little more than digital badges with ambiguous value in the labour market.

According to the results of ICTC's Alberta Digital Economy Employer Survey, 24% of respondents consider all forms of non-traditional education pathways when evaluating someone's experience (Figure 28). In addition, 16% of employers agree that micro-credentials are an important part of a candidate's experience, and 16% of respondents expect candidates to have education beyond a post-secondary degree.

PERCEPTIONS OF NON-TRADITIONAL EDUCATION IN HIRING AND RECRUITING PRACTICES

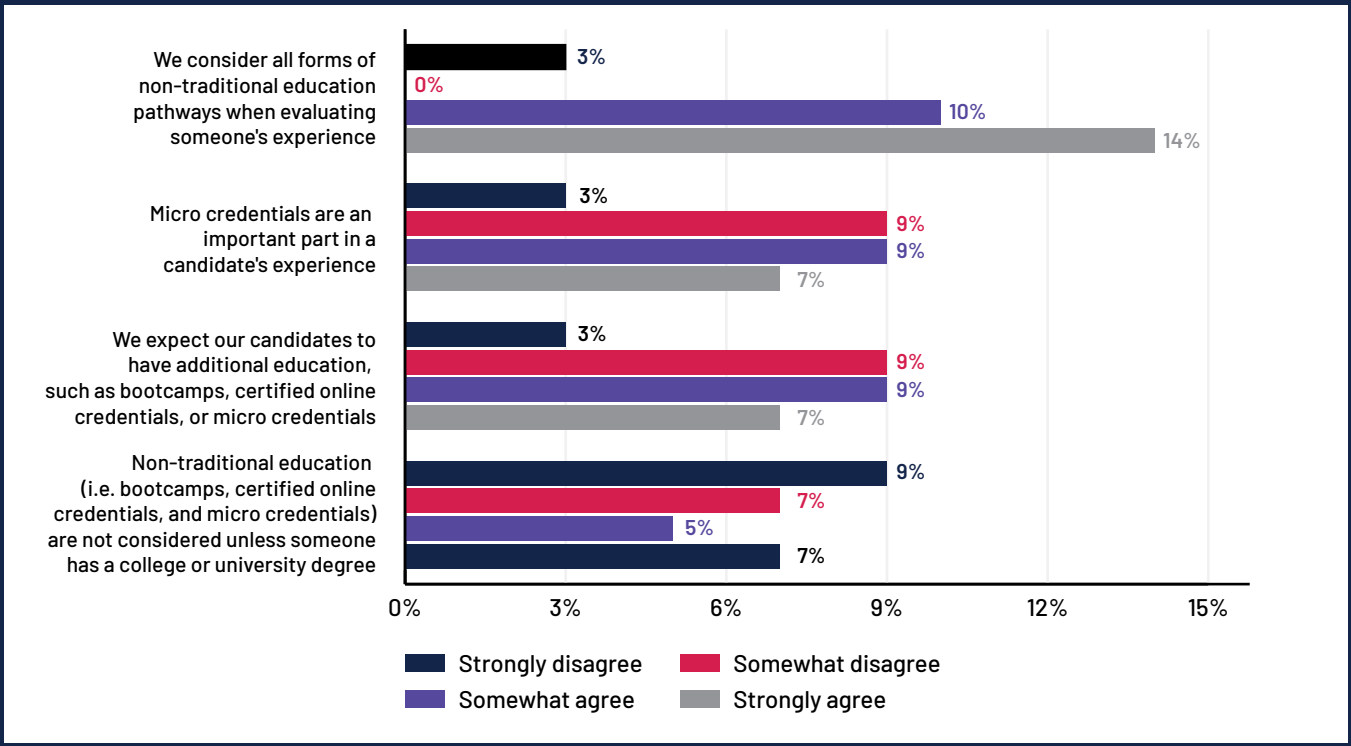


Figure 28: Perceptions of Non-Traditional Education in Hiring and Recruiting Practices, Source: ICTC Alberta Digital Economy Employer Survey, December 2024.

147 Erik Henningsmoen and Heather McGeer, "Accelerating Canada's Workforce: Micro-Credentialing in the Digital Economy," Information and Communications Technology Council (ICTC), March 2024, https://ictc-ctic.ca/reports/accelerating-canadas-workforce.

Employer Talent Strategies

RETENTION CHALLENGES

ICTC's survey findings reveal that 48% of participating employers found it difficult to retain technology employees over the past year. Among those experiencing challenges, employers cited the inability to compete with other organizations in terms of wages (19%), requirements for on-site work (14%), and a lack of necessary skills in new hires (12%) as the primary obstacles to retaining technology staff (Figure 29).

Interviewees echoed this sentiment, highlighting challenges such as intense competition for tech-skilled workers from both other provinces and countries. Regarding wage competition, an employer from a fintech company remarked, "A developer who graduates from the University of Alberta can walk into an $80,000 a year job in Alberta pretty easily. Or they can go and make $120,000 in Toronto, or they can go make US$160,000 in Silicon Valley. And so those forces all kind of play with each other, and we do see a lot of our qualified graduates leaving to the higher pay."

Competitive salaries and benefits are important, but retention also relies on providing clear career progression, leadership development, and ongoing learning opportunities. Some interviewees have reported addressing this by offering training budgets and improving employee engagement programs. Others are cultivating a culture of curiosity by encouraging employees to explore industry trends, attend conferences, and seek mentorship within and outside their organizations.

CHALLENGES IN RETAINING TECH EMPLOYEES Over the last 12 months

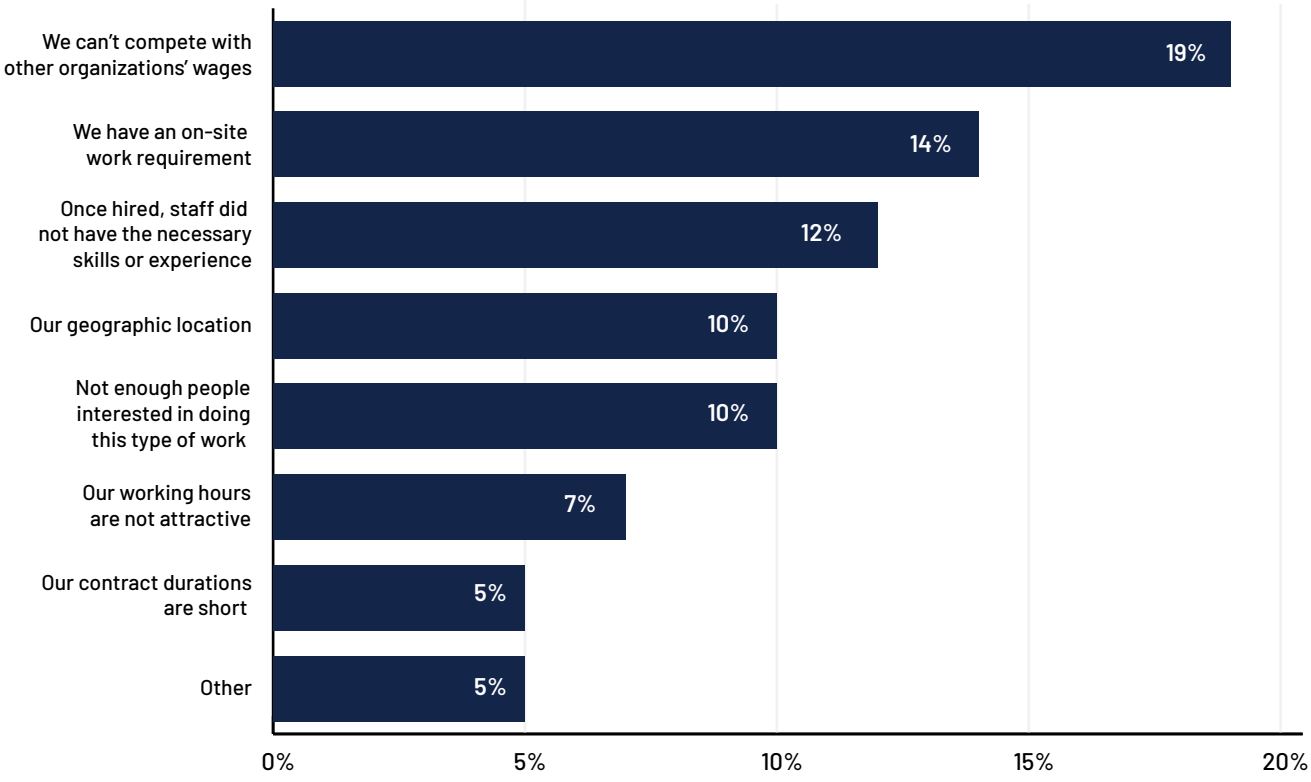


Figure 29: Challenges in Retaining Tech Employees over the Last 12 Months. Source: ICTC Alberta Digital Economy Employer Survey, December 2024.

STRATEGIES TO ADDRESS WORKFORCE CHALLENGES

When asked about their strategies to tackle workforce challenges in the coming year, 38% of respondents from ICTC's employer survey indicated plans to offer training to current technology employees, 34% intend to hire technically skilled staff, and 29% aim to recruit staff with management skills or engage contractors to address skills gaps (Figure 30).

Similar to survey respondents, interviewees reported a range of strategies to tackle workforce shortages, including focusing on training and upskilling their existing employees, hiring newcomers to Canada, collaborating with recruitment agencies, and partnering with local colleges and trade schools. Employers highlighted effective methods to attract and nurture talent, such as offering in-house training and internships or developing a robust employment brand.

To address the talent gap, one interviewee suggested increased collaboration between post-secondary institutions and industry, along with earlier exposure to STEM fields in education, particularly for young girls and women. Employers also suggested shifting hiring decisions toward general aptitude and soft skills while providing technical training to bridge specific knowledge gaps.

PLANNED STRATEGIES TO ADDRESS WORKFORCE CHALLENGES

Over the next 12 months (multiple select)

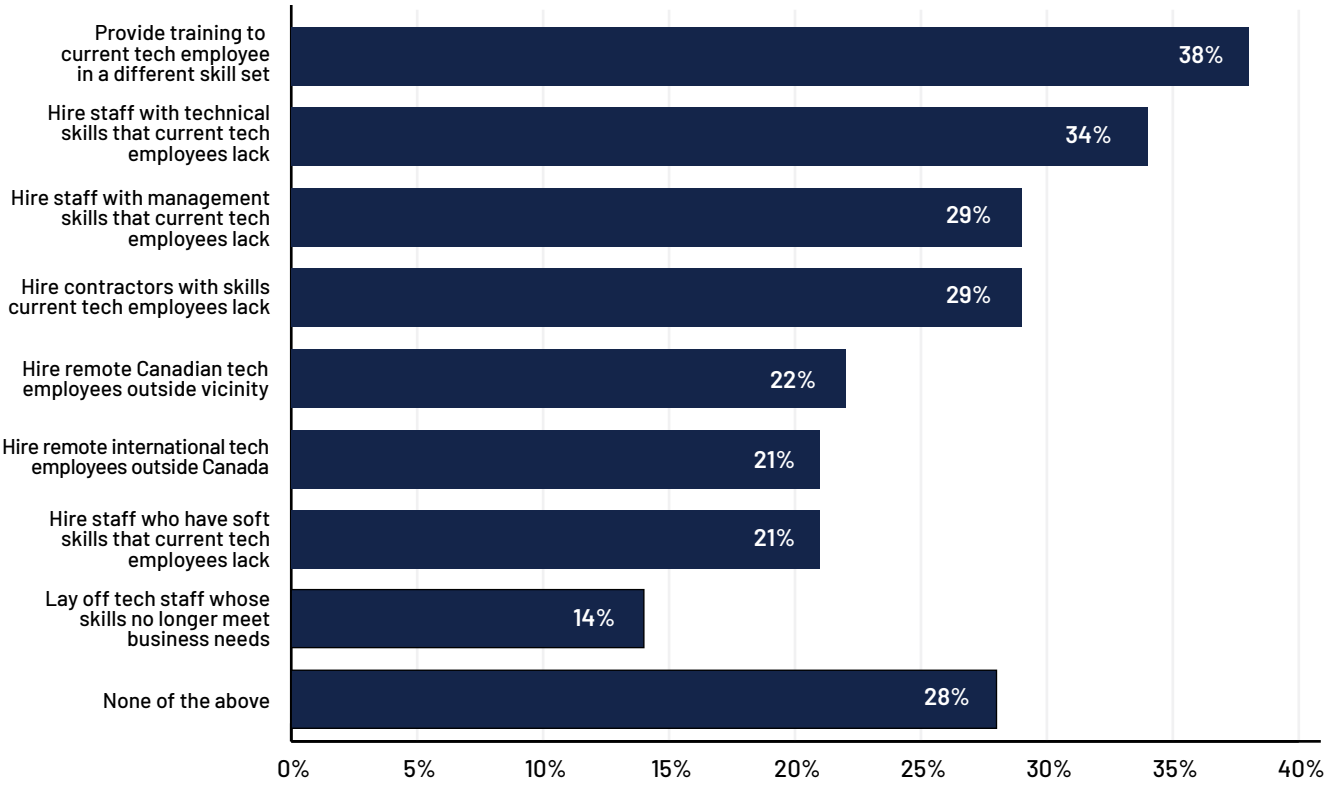


Figure 30: Planned Strategies to Address Workforce Challenges over the Next 12 Months. Source: ICTC Alberta Digital Economy Employer Survey, December 2024.

EMPLOYER-DRIVEN UPSKILLING

Workforce development plays a vital role in employers' talent strategies. Upskilling is essential to keep pace with the constant changes in tools, technologies, and industry standards. Employer-provided development and training opportunities are critical components in retaining skilled workers, especially for smaller businesses that cannot compete on salary. One interviewee from a software company remarked,

> I think, in a general sense, organizations need to make sure that their people have opportunities to continually upgrade their skills. The world that we live in, the advanced technology world, things change, and things change rapidly. And so if people don't have the ability to keep fresh, they will quickly lose their ability to be valuable within the marketplace. So employers need to have capabilities for people to continually refresh their skill sets and get better.

ICTC's survey findings indicate that 40% of respondents implemented training in classrooms, workshops, or online as a strategy to address technology skill deficiencies (Figure 31).

Upskilling also plays an important role in helping new entrants to the labour market move into roles that require more experience. Several interviewees argued that expecting to hire fully trained talent without the need for additional development is unrealistic. As one leader stated, organizations must allocate budgets for professional development and recognize that training employees is an essential component of business strategy.

STRATEGIES USED TO ADDRESS TECH STAFF SKILL DEFICIENCIES

In the last 12 months (multiple select)

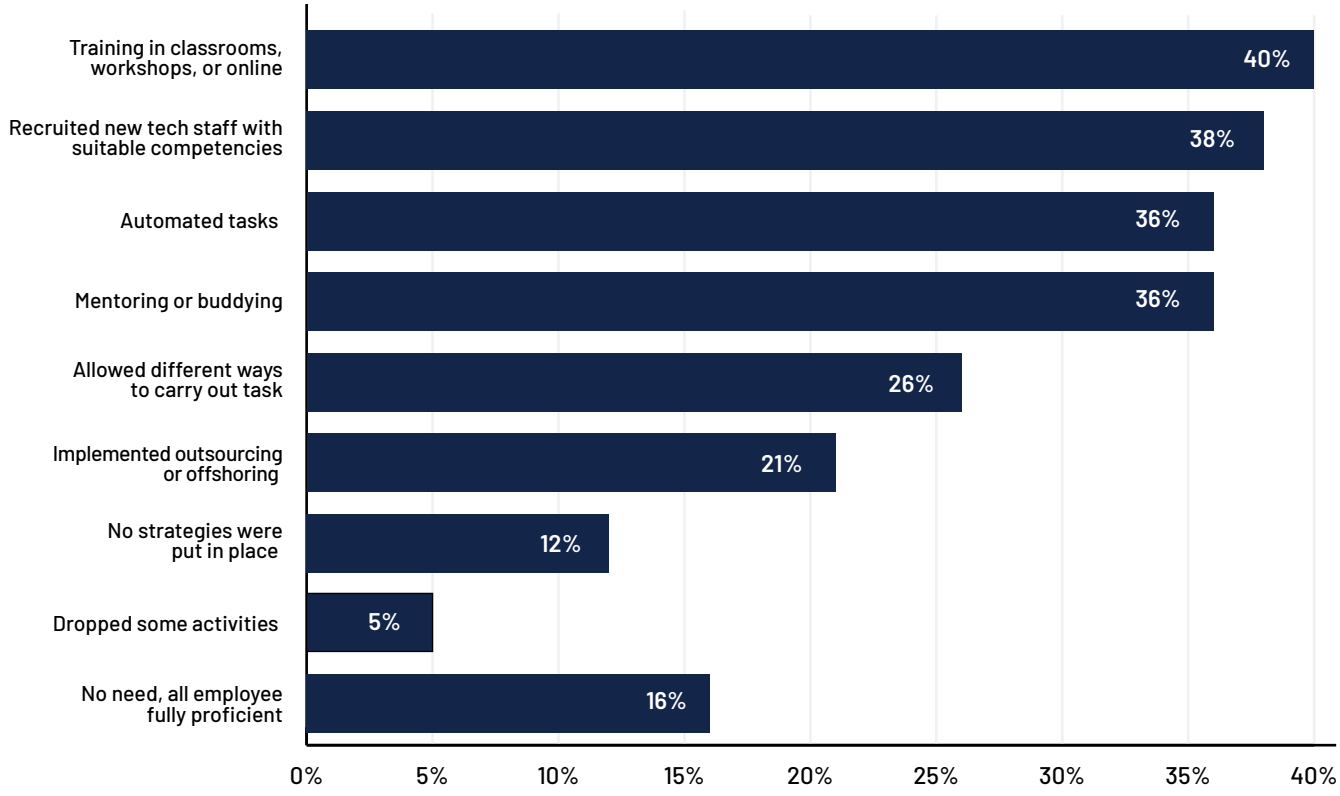


Figure 31: Strategies Used to Address Tech Staff Skill Deficiencies in the Last 12 Months. Source: ICTC Alberta Digital Economy Employer Survey, December 2024.

Employers often encounter significant challenges in providing upskilling opportunities, with capacity and resource constraints serving as major barriers. In many organizations, upskilling and reskilling efforts are treated as an additional task for an already overstretched HR team or leadership rather than being assigned a dedicated role. While training programs and partnerships with colleges exist, there is often no person specifically dedicated to engaging with these resources and implementing them effectively. Without dedicated personnel, upskilling initiatives can become fragmented or deprioritized in favour of more immediate business demands. One interviewee working in the field of AI argued,

> I think it's really challenging to give [employees] continuous learning. We're moving so fast, people are already stretched so thin, there's very little time for them to invest in learning and development.

Additionally, there is a financial burden linked to employee training. Employers acknowledge that investing in workforce development is crucial, especially in fields where universities and training institutions have not yet adapted to emerging skill requirements. However, the choice between this long-term investment and immediate operational priorities continues to pose a significant challenge for many businesses. Programs that facilitate employer-led upskilling, such as the Canada-Alberta Job Grant, which provided nearly $27 million to Alberta employers for training in 2023–2024,[148] or the Alberta Industry Skills Grant, which offers funding to employers in the technology sector for targeted training initiatives to tackle skill shortages,[149] are vital in ensuring that the Albertan digital workforce is properly trained and equipped. An interviewee from the aviation sector mentioned utilizing these programs:

> We focus heavily on training. We actually have a training budget for each employee. Technician level, admin people, manager level, director level, higher up. We use the fund very well. We used to work with Canada-Alberta Job Grant. They paid two-thirds of the training cost. But unfortunately, two months ago, after nine years, the program was closed. So right now, if we have to send somebody for training, we have to pay full amount, not just one-third.... We still need those qualified people, so we are paying everything from our pocket.

WORK-INTEGRATED LEARNING

Work-integrated learning (WIL) is a form of education that formally integrates a student's academic studies with experiences in a workplace or practical setting.[150] WIL provides mutual benefits to both students and employers.[151]

Interviewees commented that WIL helps bridge the gap between post-secondary education and technological and market changes. This sentiment is supported by a 2024 survey of 800 HR leaders and 800 recent graduates who were full-time employees about how well their college education prepared them for the workplace. The survey revealed that while 97% of HR leaders recognized the significance of possessing a strong foundational understanding of technology, only 20% of recent graduate respondents reported having that level of technological knowledge.[152] WIL integrates experiential learning directly into the workplace, enabling students to cultivate hands-on skills, problem-solving abilities, and industry-specific knowledge in real time. This approach ensures that graduates are not only familiar with theoretical concepts but also equipped with the practical competencies that employers demand. An interviewee from a research organization discussed the benefits of WIL:

> I'm a huge proponent of learning in an actual job situation versus just an academic situation because there's so much more to the work environment that I think is just ... there's a lot of things I think people just learn through osmosis. It's by being on

148 Matt Jones, "Statement on the Canada-Alberta Job Grant," Government of Alberta, August 7, 2024, https://www.alberta.ca/release.cfm?xID=90793C746CFF6-088D-7351-248E476155BC736F.

149 Government of Alberta, "Workforce Strategies Grant," accessed February 4, 2025, https://www.alberta.ca/workforce-strategies-grants.

150 "What is Work-Integrated Learning (WIL)?" CEWIL Canada, accessed February 7, 2025, https://cewilcanada.ca/CEWIL/CEWIL/About-Us/Work-Integrated-Learning.aspx#.

151 Alexandra Cutean, Letitia Henville, and Faun Rice, "The Impact of Work-Integrated Learning on Student Success and the Canadian Economy: A Case Study of Canada's Student Work Placement Program (SWPP)," Information and Communications Technology Council (ICTC), September 19, 2023, https://ictc-ctic.ca/reports/the-impact-of-workforce-integrated-learning-on-student-success-and-the-canadian-economy.

152 Erin Brown, "New Survey Reveals Traditional Undergraduate Education Is Not Preparing Students for the Workforce," Hult International Business School (blog), January 21, 2025, https://www.hult.edu/blog/wi_skills_survey/.

> teams, doing projects, having some responsibilities within that project, using the communication tools, understanding how organizations are structured and what works and what doesn't work, that kind of thing, which I think you can try to teach that in all kinds of ways, but it's not going to be the same as actually experiencing it.

Gaining diverse experiences early on is invaluable for students, as it allows them to apply what they are learning in real-world settings. The ability to connect classroom knowledge with practical application not only reinforces technical skills but also develops human skills such as problem solving and communication. WIL prepares students for the workforce and often assists them in securing their first job by facilitating connections with employers. [153]

Employer interviewees highlighted the benefits of WIL for their businesses. One technology employer shared that through their company's participation in a co-op program, they have successfully attracted the talent they need early and are better able to retain their employees once they join the organization. However, some noted a reluctance among employers to engage in experiential learning programs or even to hire juniors and invest in their training due to the associated costs and time commitment.

Public Consultation on ICT Apprenticeships

In November 2024, ICTC hosted an industry roundtable to discuss opportunities for apprenticeships in Alberta's ICT sector. Findings from this consultation revealed that integrating foundational education with on-the-job training through apprenticeship models is particularly beneficial for roles that require a unique blend of domain-specific expertise and interpersonal skills to adapt to changing and emerging technologies. Roundtable participants noted that ICT occupations such as DevOps, cybersecurity specialists, and software engineers, developers, and programmers may be better suited for formal apprenticeship programs because they possess the "knowledge, skills, and experience that are learned on the job as opposed to in an academic environment."[154] Overall, the consultation highlighted a strong demand for apprenticeship-style education, where programs for the ICT sector in Alberta "could address key industry challenges, including the need for specialized industry training, integration of academic and workplace experiences, and a stronger pipeline of skilled talent into diverse ICT roles."[155]

153 Alexandra Cutean, Letitia Henville, and Faun Rice, "The Impact of Work-Integrated Learning on Student Success and the Canadian Economy: A Case Study of Canada's Student Work Placement Program (SWPP)," Information and Communications Technology Council (ICTC), September 19, 2023, https://ictc-ctic.ca/reports/the-impact-of-workforce-integrated-learning-on-student-success-and-the-canadian-economy.

154 Mairead Matthews, "Briefing note: Industry roundtable on the opportunity for apprenticeships in Alberta's ICT sector," Information and Communications Technology Council (ICTC). December 2024.

155 Ibid.

CONCLUSION

The findings in this report offer a snapshot of the current state and outlook of Alberta's digital economy through 2030, compared against both provincial and national economic developments. It highlights the province's progress over the past decade, particularly in the post-COVID period, in diversifying its economy and establishing itself as a significant technology hub in the country. Federal and provincial strategies and initiatives since 2017 have effectively propelled investment momentum and stimulated the private sector within the innovation and technology ecosystem, enhancing the productive capacities of both innovative and traditional sectors.

ICTC projects that digital economy output will reach $13.093 billion by 2030 due to the integration of digital solutions across various industries, stabilization in macroeconomic conditions, and an uptick in population growth in recent years. Additionally, approximately 240,000 individuals are anticipated to be employed in the province's technology sector by that year.

Secondary sources and primary survey and interview data indicate that reaching these targets will depend on multi-stakeholder approaches to workforce development, ensuring that upskilling, education, and training programs align with industry gaps and needs. Mobilizing a skilled migrant labour supply and fostering collaboration between public and private sector institutions will be crucial for attracting, developing, and retaining human capital and investment within the province. Having already made significant strides, continued focus on talent development and strategic investments will drive Alberta's momentum toward becoming a global hub for innovation. Ensuring inclusive progress across regions and prioritizing ongoing collaboration throughout its efforts will secure a diversified future where Alberta's digital economy can act as a cornerstone for prosperity and technological leadership in Canada.

APPENDIX A:
ADDITIONAL TABLES AND FIGURES

Digital Economy NOCs

- 00014 Senior managers - trade, broadcasting and other services
- 10022 Advertising, marketing and public relations managers
- 10030 Telecommunication carriers managers
- 11202 Professional occupations in advertising, marketing and public relations
- 12111 Health information management workers
- 12112 Records management technicians
- 20010 Engineering managers
- 20012 Computer and information systems managers
- 21210 Mathematicians, statisticians and actuaries
- 21211 Data scientists
- 21220 Cybersecurity specialists
- 21221 Business systems specialists
- 21222 Information systems specialists
- 21223 Database analysts and data administrators
- 21230 Computer systems developers and programmers
- 21231 Software engineers and designers
- 21232 Software developers and programmers
- 21233 Web designers
- 21234 Web developers and programmers
- 21310 Electrical and electronics engineers
- 21311 Computer engineers (except software engineers and designers)
- 21399 Other professional engineers
- 22220 Computer network and web technicians
- 22221 User support technicians
- 22222 Information systems testing technicians
- 22302 Industrial engineering and manufacturing technologists and technicians
- 22310 Electrical and electronics engineering technologists and technicians
- 22311 Electronic service technicians (household and business equipment)
- 52110 Film and video camera operators
- 52111 Graphic arts technicians
- 52112 Broadcast technicians
- 52113 Audio and video recording technicians

- 52120 Graphic designers and illustrators
- 53111 Motion pictures, broadcasting, photography and performing arts assistants and operators
- 62100 Technical sales specialists - wholesale trade
- 72011 Contractors and supervisors, electrical trades and telecommunications occupations
- 72201 Industrial electricians
- 72202 Power system electricians
- 72203 Electrical power line and cable workers
- 72204 Telecommunications line and cable installers and repairers
- 72205 Telecommunications equipment installation and cable television service technicians
- 92021 Supervisors, electronics and electrical products manufacturing
- 94201 Electronics assemblers, fabricators, inspectors and testers

Digital Economy NAICS

- 3341 Computer and peripheral equipment manufacturing
- 3342 Communications equipment manufacturing
- 3343 Audio and video equipment manufacturing
- 3344 Semiconductor and other electronic component manufacturing
- 3345 Navigational, measuring, medical and control instruments manufacturing
- 3346 Manufacturing and reproducing magnetic and optical media
- 3359 Other electrical equipment and component manufacturing
- 4173 Computer and communications equipment and supplies merchant wholesalers
- 5121 Motion picture and video industries
- 5132 Software publishers
- 5162 Media streaming distribution services and other media networks and content providers
- 5173 Wired and wireless telecommunications carriers (except satellite)
- 5174 Satellite telecommunications
- 5179 Other telecommunications
- 5182 Computing infrastructure providers, data processing, web hosting, and related services
- 5192 Web search portals, libraries and archives, and all other information services
- 5415 Computer systems design and related services
- 54171 Research and development in the physical, engineering and life sciences
- 8112 Electronic and precision equipment repair and maintenance

Top 10 In-Demand ICT Occupations in the ICT Sector						
NOCs	**Occupational group**	**Number of job postings, 2024**	**Job postings annual growth, %**	**Job postings annual increase**	**Employment growth, %**	**Employment annual increase**
21221	Business systems specialists	179	10%	16	-66%	-315
21231	Software engineers and designers	121	-28%	-46	-50%	-3550
21223	Database analysts and data administrators	61	-5%	-3	-92%	-2193
20012	Computer and information systems managers	50	43%	15	50%	2408
21222	Information systems specialists	49	-44%	-39	28%	3792
21232	Software developers and programmers	45	-26%	-16	61%	5675
21220	Cybersecurity specialists	41	95%	20	77%	878
21211	Data scientists	28	17%	4	-27%	-445
21234	Web developers and programmers	20	300%	15	-59%	-717
21311	Computer engineers (except software engineers and designers)	14	40%	4	89%	1063

Table 4: Top 10 In-Demand ICT Jobs in the ICT Sector, December 1, 2022–November 30, 2024. Source: Vicinity Jobs Inc. Data generated on December 15, 2024.

APPENDIX B: RESEARCH METHODS AND TOOLS

Research Methodology

SECONDARY RESEARCH

Existing Literature
A literature review of relevant material informed the analysis presented in this paper. Previous work encompassed information on the digital economy in Alberta, labour challenges within the province and those affecting the ICT sector, as well as other topics discussed in this paper.

Job Posting Data
ICTC uses Vicinity Jobs' service to analyze job postings in the digital economy and ICT sector, using NOC and NAICS codes. Vicinity Jobs provides real-time labour market information (LMI) by leveraging advanced text-scraping and machine-learning technologies to extract and organize data from publicly available online job postings. This approach provides insights into in-demand jobs and skills, locations, and education and experience requirements of employers.

PRIMARY RESEARCH

Key Informant Interviews
ICTC conducted 30 key informant interviews with employers, investors, and workforce and business development agencies based in Alberta. The interviews took place from August to November 2024. Interviewees held influential positions in their organizations, including chief executive officer, chief of staff, business growth studio lead, and others. The interview questions were designed to gather insights on the interviewees' perspectives regarding the current state of Alberta's digital economy, technology trends and adoption, job and skills demand, and workforce development. The interviews were analyzed in NVivo using a mixed inductive and deductive approach.

Digital Economy Business Survey
In September 2024, ICTC designed and distributed a business survey targeting technology companies and other businesses in Alberta that hire technology talent. The survey included questions addressing the core themes of this report, such as general business conditions, business obstacles, technology workforce challenges, business outlook, growth trends and expectations, and AI adoption. The survey design drew upon Statistics Canada's Canadian Survey on Business Conditions, which offered insights into these topics across all sectors of the economy.[156] By using the StatsCan Survey as a control group and the ICTC survey as a treatment group representing the digital economy, ICTC was able to make meaningful comparisons between Alberta's general and digital economies, showcasing their distinct experiences within the broader Canadian economic landscape.

The response rate for the survey was low, resulting in a sample size of 58 companies. All respondents were senior executives with significant influence on key hiring and business strategies, as well as insight into their business operations and broader needs. Only companies that produce, design, manufacture, or sell digital technology goods and/or services, or employ technology professionals, were eligible for the survey, and respondents were screened based on this criterion.

Forecasts
ICTC used vector autoregressive (VAR) models to develop the forecasts presented in this report. VAR is a stochastic process (i.e., it relies on probability) used to identify the relationships among multiple variables over an extended period. This model calculates how the evolution of each variable is influenced by its own value in the previous period(s), the prior values of the other variables in the model, and the error term (i.e., the portion of the current period value that is not determined by the rest of the equation). The exogenous variables included in all models comprise oil prices, central bank interest rates, manufacturing

156 Statistics Canada, "Canadian Survey on Business Conditions (CSBC)," November 25, 2024, https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5318.

sales, population levels, and unemployment rates. This methodology relies on the statistical correlation between these variables and our endogenous variables (employment, GDP), and causality does not need to be established for the findings to hold significance.

The Akaike information criterion (AIC) and Bayesian information criterion (BIC) were employed to determine the optimal number of lags in these models, balancing goodness of fit (how well the model predicts the data) and complexity. This approach also ensured that the models effectively captured comprehensive correlation dynamics between endogenous and exogenous variables, reducing bias or incompleteness in the point estimates. Subsequently, further diagnostic tests were conducted to assess overall stability.

Employment Forecast
The monthly Labour Force Survey data from Statistics Canada was used to forecast employment levels for Alberta's general and digital economies, with the latter being determined through NAICS and NOC codes. Optimistic, baseline, and pessimistic scenarios were established by adjusting assumptions regarding the future progression of the unemployment rate. Values for the other variables were projected assuming baseline level growth rates.

GDP Forecast
Statistics Canada's GDP data (chained to 2017 dollars) was used to forecast Alberta's overall economy and the GDP of the ICT sector. Provincial GDP scenarios were developed by modifying assumptions for how unemployment rates will progress moving forward, while ICT GDP scenarios were determined by the lower and upper bounds of a 10% confidence interval – a range around the forecasted baseline values, which captures 90% of the likely outcomes. This enabled the model to encompass a broader range of potential variation. Values for other exogenous variables were held constant at baseline values and were interpolated.

Limitations of Research

LOW SURVEY RESPONSE RATE

Although the full responses collected from the survey were comprehensive and addressed a wide range of indicators, the overall sample size was limited. Consequently, the findings from this survey represent the surveyed sample of Alberta employers rather than the broader Alberta digital economy.

Furthermore, while ICTC's survey addresses technology workforce and talent challenges, skills gaps, and needs, these aspects are not part of Statistics Canada's Canadian Survey on Business Conditions. As these topics are a core focus of this study, ICTC incorporated these questions while recognizing that comparisons with businesses in the overall economy would not be possible. Although sentiments regarding the digital economy technology workforce cannot be contextualized against other industries, valuable descriptive statistics were produced.

THE LIMITS OF FORECASTS

Given that the forecasts are stochastic, the projected outcomes are based on probabilities informed by historical relationships between GDP and employment, their prior values, and other variables in the model. The VAR relies on these statistical relationships within the time series and generates future values under the assumption that these interactions remain stable and are not affected by significant external shocks. The various unemployment rates and confidence intervals throughout the models capture the type of variability that could reasonably occur over the near-term horizon and how that would translate into best- and worst-case GDP and employment scenarios. However, significant changes in domestic or provincial policies, shocks to the economy more generally (e.g., the COVID pandemic), or developments in the United States' policy landscape are examples of factors that introduce an element of uncertainty to the analysis that cannot be foreseen or incorporated into the model. Thus, while the point estimates in the baseline forecasts can be regarded as the most likely outcomes for Alberta's economy and labour force, economic outcomes outside this range are possible.

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