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Labour Education Applied Research North (LEARN)

Information Technology Related Skills and Training Needs in Northern Alberta

Final Report

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Executive Summary

Given rapid technological changes and advancements, the goal of this project was to understand Northern Alberta's evolving information technology (IT) related skills and training needs in order to strengthen the ability of northern postsecondary institutions to prepare for the future needs of their students, communities, and industries. To achieve this goal, there were two main project objectives:

1. Assess the magnitude and scope of employment opportunities in the IT field within Northern Alberta.
2. Provide indications of trends in the use and adoption of IT in key industries in Northern Alberta.

The research design included both primary and secondary data collection to provide a comprehensive understanding of IT-related needs in Northern Alberta. Primary data was collected through semi-structured interviews with stakeholders in major Northern Alberta industries, while secondary data was collected through a literature and program review, labour market analysis, and job posting analysis.

Ultimately, the information contained in this report may be used by Labour Education Applied Research North (LEARN) members to help determine what IT courses and programs should be offered, as well as the IT applications that are best aligned to current and emerging business and industry requirements. The findings may also be used by postsecondary institutions in concert with industry, business, and government to inform joint efforts to address IT-related workforce issues and opportunities.

KEY FINDINGS

Technology is disrupting key sectors in Northern Alberta, increasing the need for IT skills across nearly all industries.

- Broad technological trends such as automation, artificial intelligence, the shift to cloud technologies, and an increase in available data are disrupting some of Northern Alberta's key economic industries such as oil and gas, health care, education, agriculture, and forestry.
- The demand for IT-related occupations in Northern Alberta has been increasing in recent years. The mining, quarrying, and oil and gas sector had the largest share of IT-related job postings in 2019. Sectors that have experienced significant growth in terms of share of IT-related job postings are manufacturing, education services, and transportation and warehousing.
- Representatives from all industries interviewed indicated a growing demand for IT skills in the workforce within the last five years and expect this to continue looking to the future.

Employers expect basic information technology skills among workers.

- The Internet of Things (IoT) has created a working environment where digital technologies are used on a daily basis in many workplaces and employees need to be either skilled in using them or willing to learn.

- The speed with which technology changes is another reason that basic understanding of technology is an important skill to have; as new technologies are introduced or are updated, workers need to be able to easily and quickly adapt.
- While digital literacy is common among younger workers, the older workforce is less familiar with the array of platforms and interfaces used in many day-to-day business activities. Interviewees stressed the importance of providing training for employees at all levels. This was particularly relevant for older tradesmen who received training when electronic devices were not essential tools.

Cloud technologies are the most common IT shift across all industries.

- For at least three years, cloud technologies have been identified as major disruptors in the realm of IT (ICTC, 2017).
- Employers in Alberta rated cloud computing among the top three in-demand digital skills needs in 2019 (Cutean & McLaughin,2019). Roles related to cloud technology include information systems analysts and consultants and computer network technicians, both of which had positive outlooks in Northern Alberta.
- All industry representatives interviewed noted the shift to the cloud as one of the key IT trends occurring in Northern Alberta.

Cyber-security and data analytics skillsets will see an increase in demand.

- As a result of hyper-connectivity, issues such as privacy and cyber-security have become prevalent and are being prioritized by companies of all sizes. Cyber-security was listed among the top five in-demand digital skills by a survey of Alberta employers in 2019 (Cutean & McLaughin, 2019), and cyber-security analysts were identified by a PetroLMI representative as one of the key technology-related roles within the oil and gas sector.
- A focus on cyber-security was noted as a key trend across all industries during the interviews, and representatives noted that cyber-security skillsets are not currently widely taught but need to be.
- Data analytics is another sought after skillset in the IoT economy; with ubiquitous connectivity comes a large amount of digital data being collected. This role is adaptable across all industries. Data analytics was listed as the top in-demand digital skill in IT in Alberta in 2019, with data management also among the top five skills (Cutean & McLaughlin, 2019).
- Data analysts and cyber-security analysts fall under the occupational umbrella of information systems analysts which, according to both the labour market and the job posting analyses, has a positive outlook in Northern Alberta.

Solutions are required in order for curricula to maintain relevance among quickly changing technologies.

- The demand for IT-related skillsets changes quickly. It is difficult to predict which software or platforms will be used by various industries, and new or updated versions are regularly released.

Skills that are learned in IT-related programming just five years ago may be irrelevant today. An example is the number of in-demand skills among IT occupations in 2019 which did not appear in online job postings at all in 2013.

- Current IT training typically happens either on-the-job or through online or vendor-specific training modules. This is due to both cost and convenience for employers and allows workers to be quickly trained in new technologies without removing them from the workplace for long periods of time. This solution is working for those interviewed, but there was also interest expressed in offerings being made available through local postsecondary institutions.
- Northern Alberta students are already learning advanced technology skills in high school, so postsecondary institutions need to be ready to provide valuable learning experiences at a higher level. Interviewees from the school board stressed the importance of ensuring educational offerings in the north expand students' already rich knowledge.
- The pace at which technology changes requires frequent skills updates and the need for programs to be kept timely and relevant.

RECOMMENDATIONS

Building on the research findings, the following seven recommendations focus on open communication between industry and postsecondary institutions, exploring short-term learning opportunities, and further incorporating technology into the learning process in order to meet growing demands.

1. **Collaborate with industry in real-time to ensure programming meets employer needs.** Given the rapid pace of technological change, fostering close connections with industry representatives is vital to keeping postsecondary programming up-to-date and relevant to local employers and learners.
2. **Plan for emergent occupations, not just current occupations.** While predicting the future of occupations is fraught with challenges, continued industry consultation and job posting analyses can help institutions keep their finger on the pulse of change and identify occupations and skills that are growing most rapidly.
3. **Provide micro-credentials, modularized training, or short-term learning opportunities.** Employers and learners are seeking non-traditional educational models that can deliver specialized technological training in a condensed time frame and at a lower cost compared to full postsecondary programs.
4. **Make updates to current programs to include both broad digital literacy skills as well as specific technologies used by key industries.** As new technologies are introduced or are updated, workers need to be able to easily and quickly adapt. This requires that students be trained not only in the latest technologies and techniques, but also in broader digital literacy skills that will allow them to continue learning new skills throughout their career.
5. **Incorporate more technology into the learning process.** Current elementary and high school students interact daily with digital devices and are being taught advanced technical skills in high school. For these students, technology is the norm and postsecondary institutions need to provide them with appropriate learning technologies.

6. **Draw on existing training resources to keep up in the fast-paced technological environment.** Developing postsecondary programming is time and resource intensive. Looking to open source resources, such as the open source data science starter kit from IBM, the University of Pennsylvania, and the Linux Foundation, may help postsecondary institutions develop programs faster and with less upfront investment.
7. **Conduct further research into industry needs and explore demand for modular or short-term training**. While this study provides a broad overview of IT-related skill and training needs in Northern Alberta, deeper analysis could provide greater direction on specific needs that could be met through new or updated postsecondary programming. It is also recommended that employer and learner demand for modular or short-term training be explored to determine whether this is a viable opportunity for Northern Alberta postsecondary institutions.

Introduction

An increasing proportion of jobs in Canada are related to information technology[1]. According to a 2017 report from the Information and Communications Technology Council of Canada (ICTC), there were approximately 1,220,000 information and communications technology (ICT) professionals working in Canada in 2016, which made up approximately 6.3% of the labour force. By 2021, ICTC expects this number to grow to approximately 1,438,000 (ICTC, 2017). Due to the overall advancement of technology and the increasing technologization of our world, ICT jobs are increasingly required across a broad range of industries, including manufacturing, finance, health care, and retail.

In Alberta, growth in IT-related occupations is also expected to be strong. Demand for digital occupations is projected to increase by 9,000 workers between 2019 and 2023 reaching a total of 77,500 individuals employed in these occupations (Cutean & McLaughlin, 2019, p.15). According to Alberta employers, a lack of digitally-skilled talent is the most widespread barrier to business growth in the province. While Alberta's economy has traditionally been tied to the oil and gas industry, past slumps in this sector have led to talk about the importance of economic diversification. With the current downturn in oil and gas, this has included technologically-driven and green economic growth. ICTC notes that the healthcare, advanced manufacturing, cleantech, and interactive digital media sectors will lead the way in driving employment demand in what they term 'digital occupations' in Alberta (Cutean & McLaughlin, 2019, p.26). While this information provides helpful context to this project, the focus of much of the existing research on IT-related skills and training needs in Alberta has focused on the province as a whole or larger centres (such as Calgary and Edmonton). Research into the unique needs of Northern Alberta has been lacking.

The overarching goal of this project is to understand Northern Alberta's information technology (IT) related skills and training needs in light of recent rapid changes and advancements in the IT field, thereby strengthening the ability of northern postsecondary institutions to prepare for the future needs of their students, communities, and industries. Ultimately, this information will be used by Labour Education Applied Research North (LEARN)[2] members to help determine what IT courses and programs should be offered, as well as the IT applications that are best aligned to current and emerging business and industry requirements. The findings may also be used by postsecondary institutions in concert with industry, business, and government to inform joint efforts to address IT-related workforce issues and opportunities.

To achieve these goals, there were two main project objectives:

[1] A note on defining information technology (IT): For the purposes of this report, an operational definition of information technology has been developed as anything related to the development, maintenance, and use of computer systems, hardware, software and networks for the processing and distribution of data. The terms information technology, digital technology, information and communications technology will all be used throughout the report interchangeably to refer to this overarching concept.

[2] LEARN is a joint initiative created in 1995 between the Northern Alberta Development Council (NADC) and a group of the northern Alberta post-secondary institutions. Currently, the partner institutions in this initiative are: Grande Prairie Regional College, Keyano College, Northern Lakes College and Portage College. The role of LEARN is to provide the partners with labour force and economic information to help them identify new training programs, or to modify or cancel existing ones. The information also assists in making decisions regarding student funding, and other related matters.

1. Assess the magnitude and scope of employment opportunities in the IT field within Northern Alberta.
2. Provide indications of trends in the use and adoption of IT in key industries in Northern Alberta.

METHOD

The research design included both primary and secondary data collection to provide a comprehensive understanding of IT-related needs in Northern Alberta. Primary data was collected through interviews with stakeholders in major Northern Alberta industries, while secondary data was collected through a literature and program review, labour market analysis, and job posting analysis.

Literature Review

The literature review drew mainly on industry association reports and other studies on IT-related workforce trends and needs. The focus was on overall trends related to information technology at the national and provincial level, and how these trends are making an impact on key industries in Northern Alberta. The program review included a scan of major funding programs related to supporting companies in Alberta in their efforts to innovate using advanced technologies.

Labour Market and Job Posting Analysis

The labour market analysis and job posting analysis was conducted using a list of 25 IT-related NOC codes. The list was compiled based on work done by ICTC, but also included three codes requested by LEARN.

Detailed labour market information was obtained from two main sources: the 2016 Canadian census and Burning Glass' Labour Insight tool. The 2016 census was used due to the ability to access data at the 4-digit National Occupational Classification (NOC) level as well as at the census division level. This makes it possible to target specific IT-related occupations in the Northern Alberta Development Council's (NADC) mandate area. However, when examining data from Statistics Canada, the geographical frame of reference for Northern Alberta includes six census divisions: 12, 13, 16, 17, 18, and 19. In reality, only portions of census divisions 12 and 13 are part of the Northern Alberta Development Council's region, but the required census data is not available at geographical levels lower than this.

Labour Insight, a tool from Burning Glass Technologies, is made up of current and historical job postings collected from over 40,000 online job sites worldwide, resulting in a comprehensive real-time portrait of labour market demand. This software uses patented technology, based on advanced natural language analytics, to mine and code detailed data from each posting describing the specific skills, education, and experience required for the job. Labour Insight provides researchers with two strong advantages over traditional labour market data sources: first, the data is compiled in real-time, allowing for timely analysis in quickly-evolving labour markets; secondly, in addition to standard industry codes (National Occupation Codes, North American Industry Classification System, etc.), all aspects of the indexed job postings—including industry, employer, occupation, location, skills, education, salary, and job title—are compiled using natural language analytics, enabling labour market researchers to paint the clearest possible picture of what jobs are in demand, where they are located, and what skills and qualifications they require. Within Labour Insight a custom geographic region was built that aligns with NADC's definition of Northern Alberta.

Industry Consultations

Interviews were conducted with stakeholders in major industries in Northern Alberta. Industries were selected based on preliminary research into the NADC region and were based on the top industries by employment according to the 2016 Census, and regional economic development websites, many of which listed key economic sectors for their respective areas. The selected industries were agriculture, forestry, oil and gas/energy services, information and communications technology, and the public sector, including education and health care. A list of relevant companies and organizations by industry was then compiled by Academica Group in consultation with LEARN. Representatives were contacted first via email, with a follow-up email or phone call. A semi-structured interview guide was created with questions related to the supply and demand of IT-related positions and programs, trends shaping the use and adoption of IT in existing and emerging Northern Alberta industries, and specific skills gaps and training needs in the north. Interviewees were provided with an interview guide prior to the interviews. The interview guide can be found in Appendix D.

In total, 26 organizations agreed to be interviewed. The interviews were conducted between November 12 and November 29, 2019, and each lasted approximately 30 minutes. Each interview was recorded and then transcribed for analysis. The analysis focused on examining interviewees' perceptions of technology trends within their industry, as well as specific IT-related skills needs.

The organizations interviewed are listed below. For the industry and location of each organization, please see Appendix C.

- Alberta Health Services – North Zone
- Alberta Health Services – Rural East Zone
- Alberta Health Services – Rural West Zone
- Axiom Agronomy
- Birch Mountain Enterprises
- Canadian Agricultural Human Resources Council
- Canterra Seeds
- Fort McMurray Public Schools
- ICT Solutions
- Jacknife Oilfield Services & Trucking
- Lakeside Computers
- MidWest Communications
- Millar Western
- Norbord Inc. Northern Lights Regional Health Centre
- Northern Lights School District
- Nutrien
- PetroLMI (A division of Energy Safety Canada)
- Peyasaw Oilfield Services
- Prodigy Tech Group
- Queen Elizabeth II Regional Hospital
- Regional Municipality of Wood Buffalo
- Seven Generations Energy
- Slave Lake Pulp
- Town of Slave Lake
- Vantage Canada

LIMITATIONS

It is important to note the key limitations of this study. First, Northern Alberta is a large, geographically and economically diverse region. While every effort was made to reflect this geographic and economic diversity, given the project scope related to the number of interviews conducted, not all sectors and communities were represented and the research does not speak to the differences between various areas in the North.

A second limitation is that the labour market information in this study that is drawn from Statistics Canada data does not perfectly align with the NADC region and must be considered an approximation. Specifically, the geographic frame of reference for Northern Alberta includes six census divisions: 12, 13, 16, 17, 18, and 19. In reality, only portions of census divisions 12 and 13 are part of the Northern Alberta region, but the required census data is not publicly available at geographic levels lower than this.

Literature Review

NATIONAL AND PROVINCIAL IT TRENDS

Information and communication technologies are rapidly being integrated into all industries of the economy, causing a disruption in day-to-day business activities and changes to skills needs. The importance of arming today's workforce with digital skills is apparent as we see a major shift in the types of jobs that are now requiring technological proficiency (Cutean & Ivus, 2017). The key driver of technological growth is the concept of the Internet of Things (IoT), defined as "the extension of the internet to the physical world through embedded technology" (ICTC, 2016a, p. 8). This ubiquitous connectivity is one of the key trends in IT that is being felt across all industries and is ultimately increasing the level of digital literacy required of today's workforce. Within the scope of the IoT are specific technologies that contribute to its pervasiveness: Social, mobile, apps, analytics and cloud technologies (ICTC, 2017, p. 3; Asliturk, Cameron & Faisal, 2016, p. 12). As a result of hyper-connectivity, issues such as privacy and cyber-security have become prevalent and are being prioritized by companies of all sizes (Innovation, Science and Economic Development Canada, 2018, p. 7). As companies also prioritize cost savings, efficiency and productivity, a shift towards automation has been widespread. Automation has been adapted primarily in industries such as manufacturing, construction, natural resources, and trades and is creating an even larger need for technological fluencies in workers today (ICTC, 2016b). In Alberta, over one-third of the workforce is employed in jobs that are "highly susceptible to automation" (Kachulis & McKean, 2018, p. 8).

The ICTC has declared there to be five major "disruptors", meaning technologies that will change the way industries function as a whole, that will create massive change to skills demand across industries (Cutean & Ivus, 2017, pp. 9-10). These disruptors are:

- **5G technology**, which enhances the internet of things by increasing the bandwidth – data volume per unit time. Moving more data will allow distributed data and compute intensive applications such as tele-presence and are necessary for more advanced cloud computing and application capability.
- **3D printing** (or additive manufacturing), while mostly used in manufacturing, will also be seen in other industries like health care and medical devices, allowing for the creation of prototypes and highly customized products.
- **Artificial/virtual reality** is being used in sectors such as health care and transportation in order to simulate scenarios for training, safety and testing purposes.
- **Artificial intelligence** is the main disruptor that will work to automate routine tasks and will play a role in things like customer service, predictive analytics, and machine-learned decision making.
- **Blockchain technology** was first introduced as a security for bitcoin currency and within financial institutions but has since been implemented in areas like record keeping and tracking, as it allows for extremely high levels of security when storing and transferring data.

In Alberta, as elsewhere in the country, there are expected to be several technological factors that disrupt many of the province's sectors by replacing human labour with robotics and automation,

creating a major skills shift (Kachulis & McKean, 2018). In this changing reality, digital literacy will be a foundational skill key to occupational mobility, and there will be a growing need for both digital and soft skills in addition to standard occupation-related skills (Royal Bank of Canada, 2018; Asliturk, Cameron & Faisal, 2016).

ICTC produced a report about the IT landscape in Alberta, asking employers to weigh in on in-demand digital skills and occupations. The top 10 digital jobs were: software developer (63% of employers ranked this as in-demand); data scientist (46%); UX/UI designer (40%); full stack developer (36%); backend developer (30%); machine learning engineer (29%); front-end developer (26%); cyber-security analyst (20%); IT support (15%); and graphic designer (14%) (Cutean & McLaughin, 2019, p. 13). Employers in this study also noted 10 general and 10 specific digital skills that are most in demand in 2019:

General Digital Skills

1. Data analytics
2. Machine learning
3. Cloud computing
4. Database management
5. Cyber-security
6. Graphic design
7. Build automation
8. Blockchain
9. AR/VR
10. Natural language processes

Specific Digital Skills

1. JavaScript
2. Python
3. SQL
4. Node.js
5. C#
6. Java
7. C++
8. Ruby on Rails
9. HTML5
10. PHP

From an employer's perspective, advancements in technology are creating a need to "future proof" businesses in order to leverage the key benefits of technology. Trends to prepare for include the growth of online businesses, automation of business activities, and the growth of the data economy (Business Development Bank of Canada, 2017). Alberta's key growth sectors that are being driven by these technologies include health care, advanced manufacturing, clean technology, and interactive digital media (Cutean & McLaughlin, 2019, p. 18). Professional services, financial services, maintenance and repair services also seem to be making the digital shift, with IT-related jobs making up a significant portion of jobs in non-IT sectors (Markow, Coutinho, & Brundy, 2019, p. 15).

Several funding projects and programs aimed at increasing the use of technology in various sectors have been implemented in Alberta. Many of the programs are focused on research and development and commercialization and are available for small and medium-sized enterprises (SMEs) as a means of encouraging them to invest in technology. For many SMEs, initial investment into advanced technology can be a barrier to adoption. Alberta Innovates is a key funder for such programs and currently funds at least nine different programs for companies at various stages of innovation. Other key organizations that offer funding programs are the Government of Canada and Government of Alberta. A full list of funding programs found in the scan is located in Appendix B.

IT TRENDS IN KEY NORTHERN ALBERTA INDUSTRIES

Northern Alberta is widespread, covering 60% of the province's total land area. Home to about 9% of Alberta's total population, it is made up of 18 municipal districts, 22 towns, 9 villages, 11 summer

villages, 103 hamlets, two cities, three specialized municipalities and two improvement districts, as well as eight Métis settlements, 32 First Nations and three treaty areas (NADC, 2019, p. 9).

Northern Alberta's economy is largely resource-based, with high levels of activity in the agriculture, forestry, and oil and gas sectors (NADC, 2016, p. 18). In 2018, this group of sectors made up about 15% of the total businesses and about 23% of total employment in Northern Alberta. Other key sectors work as support industries, such as construction, transportation and warehousing, professional, scientific and technical, and other services. Retail trade, real estate and health care also contribute significantly to the economy both in number of businesses and by employment. The province's economy is dependent on investment into its key sectors and global demand for its resources, two factors that are often cyclical in nature, which has created a volatile economic environment in recent years (Kachulis & McKean, 2018, p. 2).

The top industries in Northern Alberta by employment according to the 2016 census are shown in Table 1 below.

Table 1. Employment in Northern Alberta by Industry, Census Divisions 12, 13, 16, 17, 18, and 19 (Statistics Canada, n.d.-a)[3]

Industry (NAICS)	Employment	Percent
21 Mining, quarrying, and oil and gas extraction	29,670	17.5%
44-45 Retail trade	20,805	12.3%
23 Construction	19,540	11.5%
62 Health care and social assistance	18,005	10.6%
11 Agriculture, forestry, fishing and hunting	13,540	8.0%
61 Educational services	13,410	7.9%
91 Public administration	12,720	7.5%
72 Accommodation and food services	11,265	6.7%
48-49 Transportation and warehousing	10,925	6.5%
81 Other services (except public administration)	10,140	6.0%
31-33 Manufacturing	9,340	5.5%
54 Professional, scientific and technical services	7,960	4.7%
56 Administrative and support, waste management and remediation services	7,155	4.2%
41 Wholesale trade	5,960	3.5%
52 Finance and insurance	3,750	2.2%
53 Real estate and rental and leasing	3,305	2.0%
71 Arts, entertainment and recreation	2,560	1.5%
22 Utilities	1,665	1.0%
51 Information and cultural industries	1,505	0.9%
55 Management of companies and enterprises	175	0.1%

[3] When examining data from Statistics Canada, the geographical frame of reference for Northern Alberta includes six census divisions: 12, 13, 16, 17, 18, and 19. In reality, only portions of divisions 12 and 13 are part of the Northern Alberta Development Council's region, but the required census data is not available at geographical levels lower than this.

Northern Alberta's economy is unique in that it relies heavily on natural resources and supporting industries. These types of economies will see a skills shift as technology takes on a more prominent role in all industries across the region.

Agriculture

Agriculture is referred to as a vital industry across Northern Alberta's economic regions. Agricultural operations in Northern Alberta consist of crop farms (primarily wheat, oats, barley, fall rye, alfalfa, canola, flaxseed and dry field peas), cattle, and various agricultural support services, as well as agri-food research and development facilities (NADC, 2016, p. 21). The sector is experiencing labour shortages due to the seasonality of the work, difficulty attracting and retaining young people in rural locations, competitive wages in the oil and gas industry, and an aging workforce (Canadian Agricultural Human Resources Council, 2019, p. 8). These labour shortages are expected to grow between now and 2029 (p. 14). According to a survey conducted by the Canadian Agricultural Human Resources Council, 47% of the province's farm operators stated they were not able to find enough workers in 2018 (p.29). This is expected to continue on over the next 10 years. Alberta's agriculture sector is set to see the third highest labour gap among provinces by 2029, following Ontario and Quebec, with a risk of 19,600 jobs going unfilled (p. 15). The industries that will see the greatest labour shortages in Alberta are the beef industry (expected to see 5,600 jobs unfilled by the domestic labour pool), grain and oilseed (shortage of 2,500) and greenhouse, nursery and floriculture (shortage of 2,800) (p. 15). The greenhouse, nursery and floriculture sector are heavily reliant on foreign workers, though Alberta's agricultural workforce was only made up of 4.3% foreign workers, compared to 17% for all of Canada (p. 8).

There are several trends occurring within the agriculture sector that are creating a demand for more high-tech skills, including: the rise of smart farming; an aging agricultural workforce; and the application of various IT tools and technologies that are being incorporated into all stages of the agricultural supply chain. Some refer to these changes as the fourth agricultural "revolution" or Farmer 4.0, noting that investment into the sector's tech needs is essential in order for Canada to keep up in the global market (RBC, 2019; Tunney, 2017). Previous revolutions that created massive change in agriculture were the domestication of plants and animals, the rise of machines used on farms, and genetic/chemical farming (RBC, 2019, p. 3). This new wave of change includes advanced tools and processes such as precision equipment, advanced variable rate technology, sensors and actuators, GPS, big data collection, drones, and robotics (RBC, 2019; Callum, 2018, p. 15). Farm operators are able to leverage the Internet of Things in day-to-day farming activities such as sensors to monitor soil quality, GPS to guide combines, autonomous precision seeding systems to make the most efficient use of fields, and automated milking systems to increase productivity. Data collected from the connected devices can be analyzed in order to improve the function of the business (Kachulis, Howard & McKean, 2019). In general, farm operators will require at least a working knowledge of the interface of the technology and software in order to benefit from its use (RBC, 2019, p. 24). Examples of technology companies active in the agriculture industry include DOT Technology Corp.[4], Trimble, and Farmers Edge.

[4] DOT Technology Corp. is the developer of the DOT autonomous power platform, a mobile diesel-powered platform designed to handle a variety of agricultural tasks. The platform allows machines to perform tasks autonomously and make decisions based on data input through the use of artificial intelligence.

The agricultural workforce is aging; by 2025, one-quarter of Canadian farmers will be over the age of 65, and 37% will retire within the next decade (RBC, 2019, p. 7). The agriculture sector struggles to attract and retain young farmers due to the nature of the work, rural location, and a general lack of interest from young people (p. 7). It is important to note, though, that younger farmers are the ones more likely to adapt and make use of advanced technologies on the farm, and enrolment in postsecondary agriculture programs has increased by 29% in the past 10 years (p. 7). Statistics Canada reports that in 2015 the percentage of younger farmers incorporating technology in their operations was higher among younger generations: over 80% for farmers aged 25-34, with a steady decline down to under 60% among farmers over the age of 65 (Callum, 2018, p. 13). The Royal Bank of Canada released a report that profiles a new generation of farmers that will be "innovative, highly skilled, data-driven and diverse". RBC notes that technology may open up agriculture to those not previously interested in the field by offering these more tech-focused opportunities, and the agricultural workforce will require new and different skillsets due to advancing technology (RBC, 2019; Keena, 2019).

The need is high for workers with multifaceted skillsets that combine traditional agricultural knowledge with more advanced technological skills including engineering, big data, and coding (Kachulis, Howard, & McKean, 2019, p. 18). Not only do workers need the basic skills to work with technology, they may even require more advanced skills to understand and make use of the abundance of data being collected (p. 18). There is also growth in demand for skills in software and user interface, leadership and business acumen, the ability to install and repair equipment, as well as specialists in data analytics, precision agriculture, and knowledge of blockchain and AI (RBC, 2019, p. 13).

The adoption of technology on Canadian farms varies. As mentioned, larger farms and younger farm operators with higher levels of education are more likely to implement major technological changes. Other factors include ease of implementation, funding for investment, and the type of farm operation (RBC, 2019, p. 17). As of 2018, 14% of Canadian farmers made the switch to improved technologies when faced with labour shortages, while 8% opted to eliminate jobs (p. 18). Farm operations that have almost entirely made the switch to technology over physical labour are beef cattle and feedlots, as well as oilseed and grain. Those who are in the transition but face barriers include dairy cattle, pig, poultry and egg, aquaculture and potato farms. Operations that have not yet adopted significant levels of technology include fruit and tree nut and greenhouse and nursery (p. 18).

It is evident that Canada needs to adapt when it comes to agricultural innovation. Technological disruptors are potentially giving way to a new agricultural landscape, and many feel that Canada can be at the forefront of the revolution, benefitting from investment and innovation (Martens & McInnis, 2017).

Forestry

Forestry is a significant contributor to Alberta's economy, as the Boreal forest makes up much of the province's natural land area (NADC, 2016, p. 24). The three main products made in Northern Alberta are panels and engineered wood products, sawn wood products, and pulp and newsprint (p. 24). This sector is vulnerable to domestic and global demand, trends such as a move away from traditional print media towards digital, as well as natural disturbances including forest fires and infestations that may affect supply (p. 24). Recent years have been a struggle for the sector in Alberta as lumber prices have dropped, demand has decreased and retention becomes an issue for major companies in the region.

Forestry has been a relatively late adopter of technologies compared to other key industries in Northern Alberta (Bochnak & Rossi, 2018, p. 2). This is caused, perhaps, by several challenges that face the forestry and forest management sectors. These challenges include low levels of corporate involvement, lack of buy-in from many companies, and lack of capital and expertise to support investment in advanced technologies (Choudhry & O'Kelly, 2018, p. 2). The last few years, however, have seen changes in the industry's adoption of digital technologies, leading to benefits like higher yields and lowered costs (p. 2). Key technologies that are being used in the forestry sector include drones, GIS (geographic information systems), and LiDAR (Light detection and ranging) technology. These technologies are being used for monitoring, mapping, planning and harvesting purposes (TimberWest, 2018). Some other advanced technologies that are expected to see investment in the coming years include data analytics, artificial intelligence, precision forestry, blockchain technology and advanced process control (Bochnak & Rossi, 2018, p. 3). However, forest companies are still slow to make the digital switch due to large investment required up front and uncertainty about practical uses (p. 4).

Technologies are being incorporated at different rates across the various streams of a forestry organization. In the woodlands division, monitoring systems like GPS, drones and LiDAR, and mechanized log harvesting are used by technicians in the field; in the mill, there are improvements to data collection and advanced quality control devices (Cools, 2019). Some mills in Alberta, including Millar Western, West Fraser Mills, and Alberta-Pacific Forest Industries (Al-Pac), have also invested in technology to turn liquid waste into energy

The forestry sector is being transformed by innovation that is expanding the reach of forestry products as well as by a growing demand for non-traditional products (Forest Product Association of Canada, n.d., p.3). While traditional paper demand may be decreasing, areas where forestry products can be used are increasing and wood fibres are being used in a vast array of products, made possible by innovative manufacturing technologies (Forest Product Association of Canada, n.d.).

Forestry faces a similar challenge as the agriculture sector in that its workforce is aging and recruiting young people to the field is challenging. The Forest Products Association of Canada initiated a website called The Greenest Workforce that provides information, job matching, and other resources with the aim at getting more people interested in jobs in the forestry and forest product sector. Job trends shown on this site show that in Alberta in 2019, out of approximately 19,000 jobs in the forest industry, over half were in mill operations, 18% in woodlands, 16% in skilled trades, and 11% were in administration. 3% of jobs were in science and engineering. Looking ahead, job openings in Alberta are expected to steadily increase between now and 2026 (The Greenest Workforce, n.d.).

Oil and Gas Services

Oil and gas extraction, production, and transport is another key economic activity for the province and the northern region in particular. This sector also includes oil and gas services. Not only is Alberta Canada's largest oil and natural gas producer, but the Northern Alberta region itself houses all three of Canada's oil sands deposits: Athabasca, Peace River, and Cold Lake as well as natural gas and condensate in the Grande Prairie region (Canada's Oil and Natural Gas Producers, n.d.). This sector is particularly susceptible to external drivers such as domestic and global demand for natural resources and can experience extreme fluctuations that affect the local economy (PetroLMI, 2018a, p. 3). The recent decline in oil prices has meant a high level of job losses in this sector in the province, with

Petroleum Labour Market Information projecting 7,600 positions to be lost in 2019 (Subramanium, 2019).

Unstable conditions and a questionable future has led companies in the sector to implement technologies that will increase productivity, create efficiencies and cut costs (PetroLMI, 2018a, p. 3). Automation and data analytics are the two major digital advancements being used in Canada's oil and gas services industry (PetroLMI, 2018b, p. 11). They are used for things like remote monitoring, remote operations, predictive maintenance, production optimization, remote inspection, fleet management, and field productivity. Sensors in the equipment collect data for analysis, and it is expected that within three to five years, artificial intelligence and machine learning will become the norm for many operations (p. 12). Some effects that these technologies are expected to have on skills and occupations in the sector include: an increased need for data collection/analysis skills and database building and maintenance; technological literacy for field workers; and technology-based competencies and problem solving (p. 10). Occupations that are expected to see an increase in demand in the sector due to technological shifts include software engineers, data management and analytics specialists, instrumentation technologists, and IT support roles (p. 15).

Reports produced by PetroLMI highlight shifts in occupations and skillsets across the oil and gas subsectors:

- In exploration and production, a more technical environment is creating a need for engineers, and field technologists are taking the place of workers with mechanical backgrounds. Automation of manual tasks will increase and data analytics will create a need for data scientists and technologists who manage and interpret data (PetroLMI, 2015, p. 6).
- In the oil sands, there has been an increase in demand for occupations such as power and reservoir engineers. Here, driverless automated vehicles like heavy haulers are being used by some major companies, and are expected to be in use by others in the next three to five years. This could create job losses among heavy haulers, but also create demand for instrumentation technicians in order to maintain and update vehicles (PetroLMI, 2015, p. 6).
- Oil and gas services are experiencing growth in demand for occupations with both mechanical and technical training, as many companies are beginning to use increasingly specialized equipment (PetroLMI, 2015, p. 9). Automation of drilling rigs require skills to repair and maintain automated systems, and software development, sensor installation, and IT infrastructure development is increasing in demand (PetroLMI, 2019, p. 12). Skills in interpreting data and using it to improve systems will also be required.
- The pipeline and midstream subsectors are already seeing changes through the use of automation in terms of both safety and efficiency. Again, data scientist skills are required, and IT and instrumentation technologies will be needed to install and maintain sensors on equipment (PetroLMI, 2018b, p. 14).

PetroLMI is also in the process of categorizing career profiles in oil and gas related to information technology. Below is a sample of some that are currently on the list[5]:

- Automated Systems Technologist
- Barge Operator
- Computer Network Administrator
- Cyber-security Analyst
- Data Scientist
- Database Administrator
- Driller and Offshore Installation Manager
- IT Architect
- Laboratory Technician
- LNG Operator
- Maintenance/reliability engineer
- Offshore Production Operator/Technician
- Offshore Radio Operator
- Operations Research Analyst (Efficiency Analyst)
- Pipeline Inspector
- Pipeline integrity specialist
- Pipeline Scheduler
- Process Engineering Technician
- Records Management Technician
- Remote Operated Vehicle (ROV) Operator

Public Sector

According to the Canadian Medical Association, three of the main ways that technology is changing the state of health care across Canada are virtual care, big health data, and advanced technologies. This includes the major disruptors like 3D printing, virtual and augmented reality, blockchain technology, the IoT, in addition to health-specific tech such as nano-technology (Canadian Medical Association, 2018, p. 2). A report produced from the 2017 Health Summit in Northern Alberta made six recommendations, one of which was to leverage technology in order to improve services for northern residents (NADC, 2017, p. 2). Virtual healthcare increases access to health care services and minimizes travel time for those living in Northern, rural and remote areas. Some programs in Northern Alberta that use forms of virtual care include Eating Disorder Support Network of Alberta, Telemental Health, and Telehealth Services (p. 5). Remote services are also integral for the aging population and those living with chronic illnesses to be able to have access to healthcare in an emergency.

In November 2019, Alberta Health Services launched Connect Care – a clinical health information system that stores patient data in one streamlined database. The goal is to improve health care delivery across Alberta (Alberta Health Services, 2019).

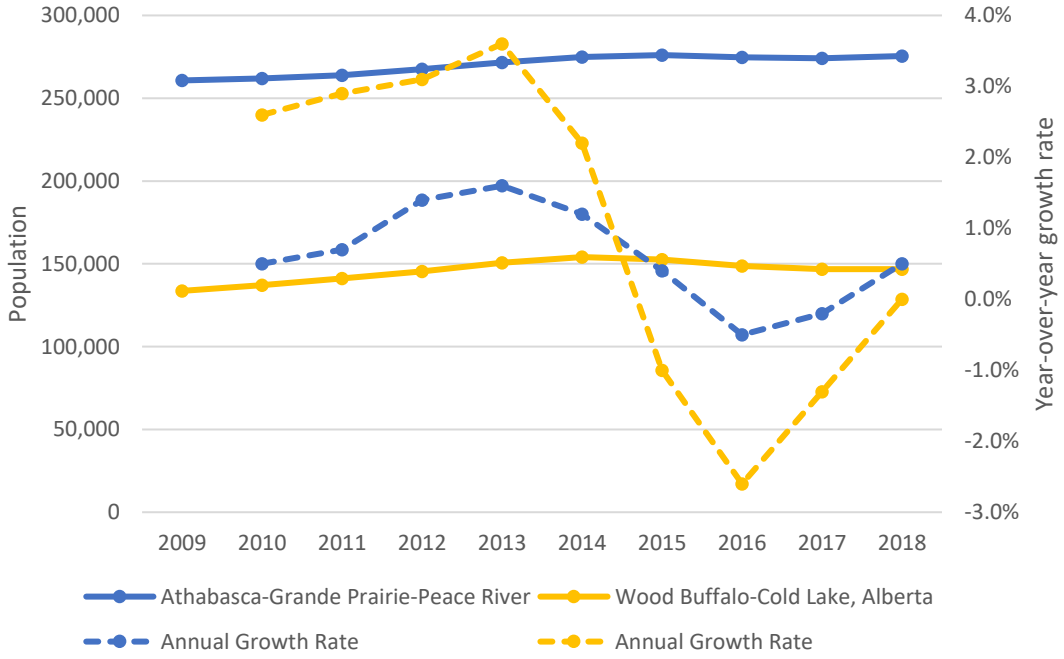
ICTC reports that the top in-demand digital roles in health care are data scientists (61% of Alberta health care employers state this as in-demand); software developer (43%); lab technician (42%); machine learning engineer (42%); and chemical engineer (29%) (Cutean & McLaughlin, 2019, p. 20).

[5] List provided by interviewee during industry consultation phase. Some are not yet mapped to NOC codes.

Labour Market Analysis

In 2018, the population estimate for the economic regions of Northern Alberta was 422,155 (Statistics Canada, n.d.-c). This was down from a high of 428,904 in 2014. Economic factors in Alberta, combined with the lasting impact of the 2016 fires in Fort McMurray, have negatively impacted the region's population in the last several years, especially in the economic region of Wood Buffalo – Cold Lake (Regional Municipality of Wood Buffalo, 2019). The population of Wood Buffalo – Cold Lake decreased by 2.7% over the period 2013-2018, while the population of Athabasca-Grande Prairie-Peace River grew by 1.4% over the same period.

Figure 1. Annual population estimates and annual growth rates for Northern Alberta ERs, 2009-2018 (Statistics Canada, n.d.-c)



According to the 2016 Canadian census, the total labour force in the six census divisions that make up Northern Alberta was 222,785 (Statistics Canada, n.d.-b).

In 2016, there were 5,175 people employed in selected IT-related occupations in Northern Alberta, out of a total workforce of 5,475. The overall unemployment rate among these occupations was 5.5% (Statistics Canada, n.d.-b). The complete list of these National Occupational Classification (NOC) codes as well as employment and unemployment figures is found in Table 2. These NOC codes were chosen based on use by the Information and Communications Technology Council (ICTC) of Canada. Three additional codes not typically used by ICTC were included due to input from the LEARN research committee. These additional codes were 1253, 1422, and 1423 (descriptions in Table 2 below).

Table 2. Employment Statistics for selected IT-related NOCs in Northern Alberta (Statistics Canada, n.d.-b)

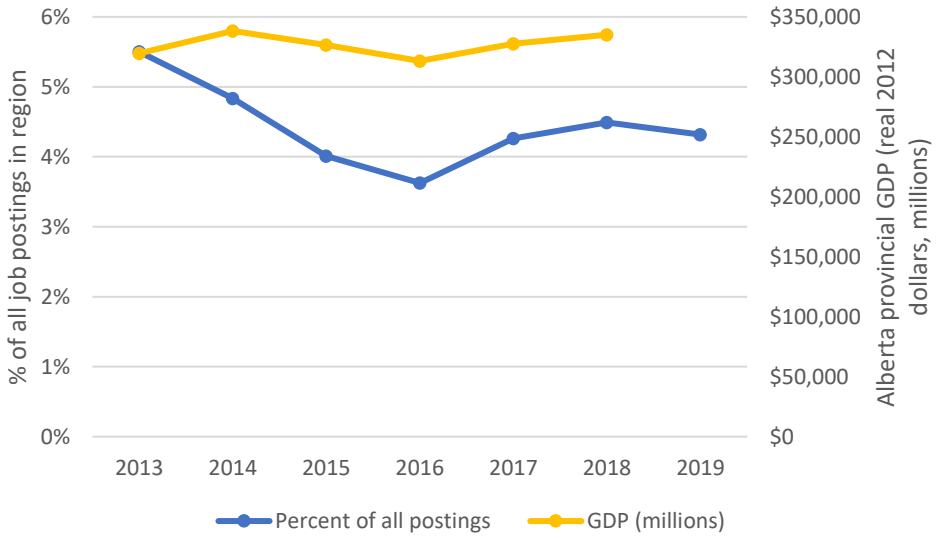
NOC Code	NOC Title	Total Employment	Total Unemployment	Unemployment Rate
2243	Industrial instrument technicians and mechanics	750	40	5.1%
6221	Technical sales specialists - wholesale trade	645	30	4.4%
2242	Electronic service technicians (household and business equipment)	515	30	5.5%
0911	Manufacturing managers	470	50	9.6%
2171	Information systems analysts and consultants	385	0	0.0%
2281	Computer network technicians	335	20	5.6%
2241	Electrical and electronics engineering technologists and technicians	330	20	5.7%
1422	Data entry clerks	310	40	11.4%
2133	Electrical and electronics engineers	270	0	0.0%
0213	Computer and information systems managers	180	0	0.0%
5241	Graphic designers and illustrators	175	10	5.4%
0211	Engineering managers	165	10	5.7%
2282	User support technicians	145	20	12.1%
1252	Health information management occupations	90	0	0.0%
2174	Computer programmers and interactive media developers	75	10	11.8%
0131	Telecommunication carriers managers	70	0	0.0%
2147	Computer engineers (except software engineers and designers)	50	0	0.0%
2175	Web designers and developers	50	0	0.0%
2172	Database analysts and data administrators	40	0	0.0%
5223	Graphic arts technicians	30	0	0.0%
1253	Records management technicians	25	0	0.0%
2173	Software engineers and designers	25	0	0.0%
5225	Audio and video recording technicians	25	0	0.0%
2283	Information systems testing technicians	10	10	50.0%
9222	Supervisors, electronics manufacturing	10	0	0.0%
1423	Desktop publishing operators and related occupations	0	0	N/A
5222	Film and video camera operators	0	0	N/A
9523	Electronics assemblers, fabricators, inspectors and testers	0	10	100.0%
Overall		5175	300	5.5%

Among non-IT-related occupations, the total workforce size was 217,310 with 198,390 employed, for an unemployment rate of 8.7%.

IT occupations with the highest levels of overall employment in Northern Alberta were Industrial instrument technicians and mechanics (750), Technical sales specialists (wholesale trade) (645), Electronic service technicians (household and business equipment) (515), Manufacturing managers (470), Information systems analysts and consultants (385), and Computer network technicians (335).

The relative demand for IT-related occupations, as measured by the share of IT job postings as a percentage of all postings within a given region, has been increasing since 2016 and has generally tracked with trends in provincial GDP in Alberta. This trend is illustrated in Figure 2 below.

Figure 2. Relative labour market demand, IT roles in Northern Alberta (Labour Insight)



Three-year employment outlook forecasts are produced by Employment and Social Development Canada (ESDC) at the 4-digit NOC level and Economic Region (ER) level. There are two ERs in the Northern Alberta Development Council (NADC) region, comprising Athabasca-Grande Prairie-Peace River (Census Divisions 13, 17, 18, and 19) and Wood Buffalo-Cold Lake (Census Divisions 12 and 16). As previously noted, there are portions of Census Divisions 12 and 13 that are not part of the Northern Alberta Development Council region, but cannot be separated out of existing reports from Statistics Canada. Due to low sample sizes, outlooks are not available for all NOC codes at the ER level.

Outlooks are classified into one of four following categories, as per ESDC's methodology (Economic and Social Development Canada, 2019):

- "Good: This outlook is attributed to occupations where the short- to medium-term potential for employment is better than average in the region, when compared with other occupations. This situation is most favourable for job seekers and may be associated with a lack of qualified or experienced labour, high turnover, low unemployment rates, above average employment growth, high projected retirement rates, very specific job requirements, and/or a lack of interest by the available labour force, etc.
- Fair: This outlook is attributed to occupations where the short- to medium-term potential for employment is comparable to the average for all occupations in the region. This situation is often associated with an average or greater demand for labour and a supply of qualified labour that is very similar to estimated needs.
- Limited: This outlook is attributed to occupations where the short- to medium-term potential for employment is below average in the region, when compared with other occupations. This situation is often associated with slow or declining projected employment growth, weakness in

related industry activity, and/or higher levels of unemployment, etc. This is a more challenging situation for job seekers, especially new entrants such as school-leavers and immigrants, and may indicate that the labour supply in the region exceeds the estimated number of employment opportunities for the outlook period.

- Undetermined: This indicates that employment outlooks were not determined for this occupation. In some cases, employment outlooks may not have been determined for occupations where there was insufficient data or too few workers in the occupation within a specific region to determine an outlook, where employment opportunities in the occupations are often dependent on other factors such as appointment, election, talent or entrepreneurship, or where the types of jobs included within the occupation vary greatly from each other making it challenging to determine outlooks (for example: some occupations that begin with "Other").”

The full text of available employment outlooks for the NOC codes in the table where the outlook is not “undetermined” are presented in Appendix A.

Table 3. Employment and Social Development Canada 2018-2020 Outlooks for selected IT-related NOCs, by Northern Alberta Economic Region

NOC Code	NOC Title	Athabasca-Grande Prairie-Peace River	Wood Buffalo-Cold Lake
2243	Industrial instrument technicians and mechanics	Limited	Limited
6221	Technical sales specialists - wholesale trade	Fair	Fair
2242	Electronic service technicians (household and business equipment)	Limited	Limited
0911	Manufacturing managers	Fair	Undetermined
2171	Information systems analysts and consultants	Fair	Good
2281	Computer network technicians	Good	Fair
2241	Electrical and electronics engineering technologists and technicians	Fair	Undetermined
1422	Data entry clerks	Limited	Limited
2133	Electrical and electronics engineers	Undetermined	Limited
0213	Computer and information systems managers	Fair	Undetermined
5241	Graphic designers and illustrators	Fair	Fair
0211	Engineering managers	Limited	Fair
2282	User support technicians	Fair	Fair
1252	Health information management occupations	Undetermined	Undetermined
2174	Computer programmers and interactive media developers	Fair	Undetermined
0131	Telecommunication carriers managers	Undetermined	Undetermined
2147	Computer engineers (except software engineers and designers)	Undetermined	Undetermined
2175	Web designers and developers	Undetermined	Undetermined
2172	Database analysts and data administrators	Undetermined	Undetermined
5223	Graphic arts technicians	Undetermined	Undetermined
1253	Records management technicians	Undetermined	Undetermined
2173	Software engineers and designers	Undetermined	Undetermined
5225	Audio and video recording technicians	Undetermined	Undetermined
2283	Information systems testing technicians	Undetermined	Undetermined
9222	Supervisors, electronics manufacturing	Undetermined	Undetermined
1423	Desktop publishing operators and related occupations	Undetermined	Undetermined
5222	Film and video camera operators	Undetermined	Undetermined
9523	Electronics assemblers, fabricators, inspectors and testers	Undetermined	Undetermined

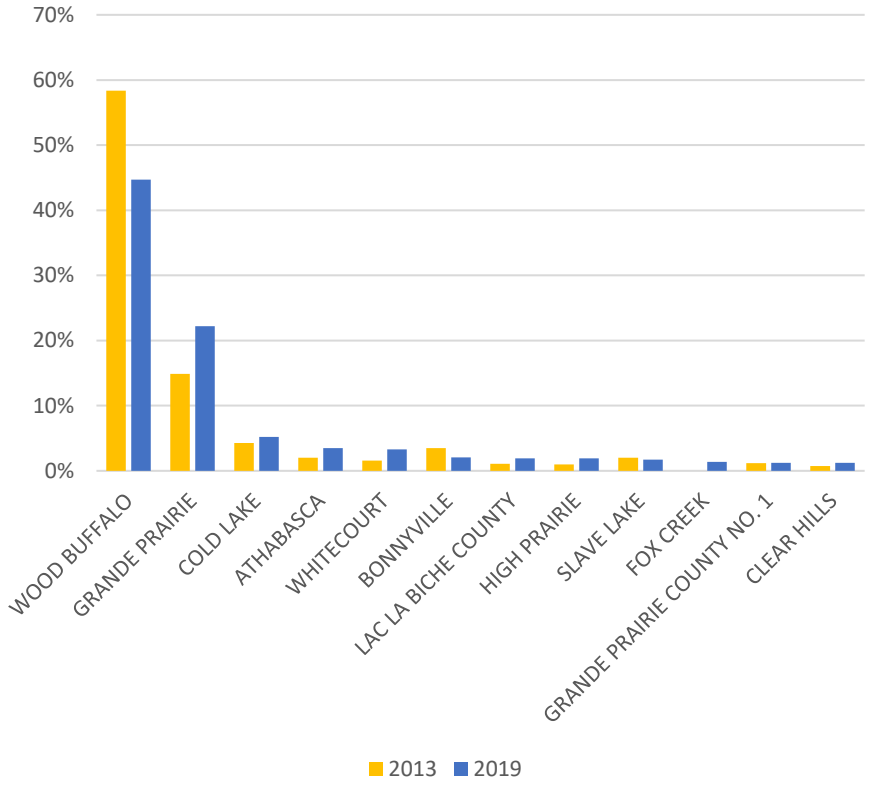
The demand for IT-related occupations in Northern Alberta depends on the specific occupation and location in question. The NOC codes with the most optimistic outlooks through 2020 according to ESDC are 2171 (Information systems analysts and consultants) with an outlook of “fair” in Athabasca - Grande Prairie – Peace River and an outlook of “good” in Wood Buffalo – Cold Lake; and 2281 (Computer network technicians) with an outlook of “good” in Athabasca - Grande Prairie – Peace River, and “fair” in Wood Buffalo – Cold Lake). Other NOC codes with “fair” outlooks in both regions are 6221 (Technical sales specialists - wholesale trade); 5241 (Graphic designers and illustrators); and 2282 (User support technicians).

In the medium- to long-term, demand for IT-related occupations more generally can be expected to track with provincial GDP. Furthermore, lower overall unemployment among IT-related occupations suggests that demand for these occupations and their associated skill sets is greater than for other non-IT-related occupations.

Job Posting Analysis

Although the regional municipality of Wood Buffalo still accounts for the largest part of online IT job postings in Northern Alberta, its share has decreased slightly over the period 2013-2019, with more representation from Grande Prairie and Athabasca. This is in line with the regional population numbers discussed earlier, which show a net decrease in population for Wood Buffalo – Cold Lake and a net increase for Athabasca – Grand Prairie – Peace River.

Figure 3. Percentage of online job postings by municipality in Northern Alberta (top 12), 2013 and 2019 (Labour Insight)



The majority of online job postings for IT-related jobs in Northern Alberta are found in the mining, quarrying, and oil and gas extraction industries (23%). This industry also accounts for the largest share of overall employment in Northern Alberta, with about 14.8% of employed workers in the 2016 census. Although not a large sector overall in Northern Alberta (accounting for only 3.7% of overall employment in the 2016 census), professional, scientific, and technical services accounted for 15% of all IT-related postings in the region in 2019. This industry grouping includes a wide variety of sub-industries, including legal and accounting firms, architecture and engineering, computer systems design, consulting services, scientific research, and advertising firms.

Table 4. Industry (NAICS) share of online job postings, 2013-2019, descending order by 2019 % (Labour Insight)

Industry	2013	2014	2015	2016	2017	2018	2019
n	*1095*	*1564*	*638*	*445*	*725*	*513*	*577*
Mining, Quarrying, and Oil and Gas Extraction	33.6%	21.9%	12.9%	18.3%	24.8%	34.9%	23.4%
Professional, Scientific, and Technical Services	17.7%	19.4%	29.2%	14.5%	19.4%	15.2%	15.4%
Manufacturing	10.9%	7.8%	13.2%	13.5%	12.7%	13.3%	13.7%
Educational Services	2.3%	3.8%	4.1%	5.1%	3.1%	7.5%	7.7%
Transportation and Warehousing	3.0%	2.4%	2.5%	2.9%	3.1%	1.7%	6.3%
Construction	9.8%	10.1%	5.3%	6.1%	7.3%	7.8%	5.4%
Health Care and Social Assistance	3.6%	2.9%	8.9%	16.1%	4.8%	1.1%	4.3%
Utilities	3.9%	2.8%	1.8%	0.3%	1.0%	2.5%	4.3%
Retail Trade	1.1%	1.3%	1.5%	4.2%	1.5%	0.6%	3.4%
Information	1.2%	1.4%	1.0%	2.6%	1.9%	0.6%	2.6%
Administrative and Support and Waste Management and Remediation Services	4.2%	6.4%	8.6%	7.7%	4.4%	3.6%	2.3%
Wholesale Trade	3.3%	3.3%	2.8%	2.6%	4.2%	1.1%	2.0%
Finance and Insurance	1.1%	1.2%	1.0%	0.6%	0.4%	0.3%	1.7%
Real Estate and Rental and Leasing	0.4%	0.9%	1.3%	0.6%	5.8%	1.7%	1.7%
Accommodation and Food Services	0.4%	0.7%	1.5%	0.6%	1.0%	0.6%	1.4%
Other Services (except Public Administration)	0.4%	0.6%	1.3%	0.6%	0.4%	0.6%	1.4%
Public Administration	3.0%	11.9%	0.8%	1.9%	3.5%	5.5%	1.4%
Agriculture, Forestry, Fishing and Hunting	0.2%	0.5%	2.3%	1.0%	0.6%	1.1%	1.1%
Arts, Entertainment, and Recreation	0.0%	0.3%	0.0%	0.0%	0.0%	0.6%	0.3%

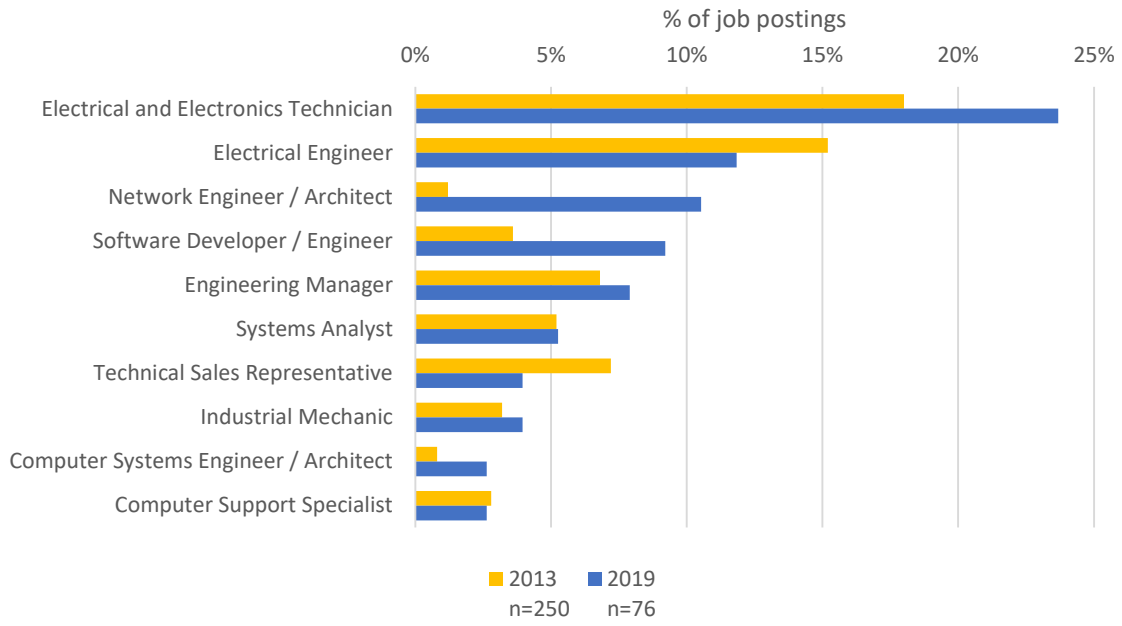
Of the IT NOCs identified, NOC 2282 (User support technicians) was the most common among online job postings in 2019, followed by 2241 (Electrical and electronics engineering technologists and technicians) and 2171 (Information systems analysts and consultants). Of these, 2282 and 2171 have seen their share of IT-related postings generally increase over the period 2013-2019. Of the 28 NOCs identified earlier, five (0131, 5222, 5223, 9222, and 1423) saw no online job postings during the period in question (as classified by Labour Insight).

Table 5. IT job postings in Northern Alberta by NOC classification, 2013-2019, descending order by 2019 % (Labour Insight)

NOC Code	NOC Description	2013	2014	2015	2016	2017	2018	2019
	n	*1095*	*1564*	*638*	*445*	*725*	*513*	*577*
2282	User support technicians	5.3%	9.0%	8.0%	11.2%	8.3%	10.1%	14.2%
2241	Electrical and electronics engineering technologists and technicians	14.2%	11.6%	12.1%	10.3%	13.4%	13.1%	11.6%
2171	Information systems analysts and consultants	7.9%	8.4%	8.2%	9.0%	8.6%	10.5%	11.4%
2133	Electrical and electronics engineers	8.5%	9.6%	3.8%	5.6%	12.7%	9.0%	7.1%
6221	Technical sales specialists - wholesale trade	8.8%	8.3%	11.0%	10.3%	8.0%	8.6%	6.9%
1253	Records management technicians	4.3%	3.5%	1.7%	2.2%	3.3%	4.5%	6.8%
2147	Computer engineers (except software engineers and designers)	2.9%	3.6%	3.8%	4.7%	1.9%	4.7%	4.7%
2173	Software engineers and designers	2.2%	2.6%	2.0%	2.2%	4.6%	3.7%	4.7%
2242	Electronic service technicians (household and business equipment)	1.9%	2.4%	4.4%	2.5%	3.6%	2.3%	4.5%
0911	Manufacturing managers	11.4%	11.1%	8.5%	10.1%	7.2%	5.5%	3.8%
1252	Health information management occupations	6.0%	5.4%	4.1%	9.2%	3.9%	4.5%	3.8%
0211	Engineering managers	5.8%	5.3%	5.2%	3.1%	5.4%	2.1%	3.6%
2281	Computer network technicians	3.0%	2.6%	4.9%	3.8%	3.4%	2.3%	3.5%
1422	Data entry clerks	1.2%	1.2%	2.8%	3.4%	2.3%	4.7%	3.1%
2243	Industrial instrument technicians and mechanics	3.9%	5.2%	5.3%	2.9%	4.3%	3.9%	2.1%
0213	Computer and information systems managers	2.5%	2.1%	3.9%	2.2%	2.3%	1.8%	1.7%
2172	Database analysts and data administrators	3.2%	1.6%	1.7%	2.7%	1.2%	2.7%	1.6%
2174	Computer programmers and interactive media developers	0.9%	1.3%	1.4%	2.0%	2.1%	1.6%	1.6%
2283	Information systems testing technicians	4.6%	3.3%	3.8%	0.4%	1.2%	1.8%	1.4%
2175	Web designers and developers	0.4%	0.8%	1.4%	0.7%	1.0%	0.8%	0.7%
5225	Audio and video recording technicians	0.3%	0.3%	1.1%	0.7%	0.4%	1.8%	0.5%
5241	Graphic designers and illustrators	0.8%	0.5%	0.9%	0.4%	0.8%	0.2%	0.3%
9523	Electronics assemblers, fabricators, inspectors and testers	0.2%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%

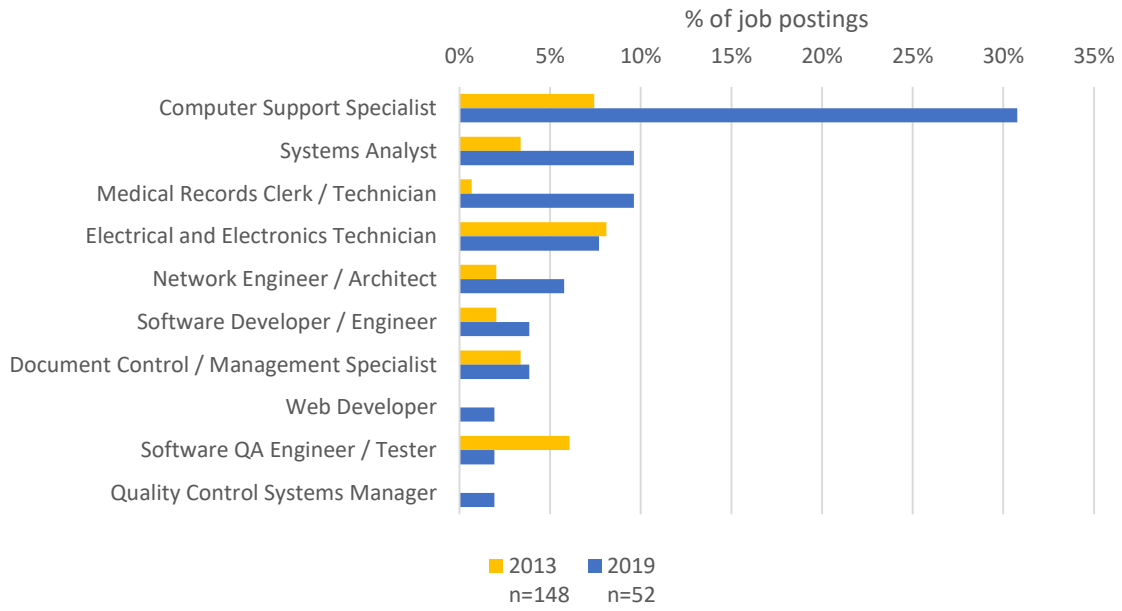
In the mining, quarrying, and oil and gas extraction industry, electrical technician and network engineer roles have increased in demand over the period 2013-2019. Electrical engineers and software developers are also in high demand. Computer systems engineers also saw a significant increase during this time.

Figure 4. Top 10 (2019) IT Occupations in Mining, Quarrying, and Oil and Gas Extraction Job Postings (Labour Insight)



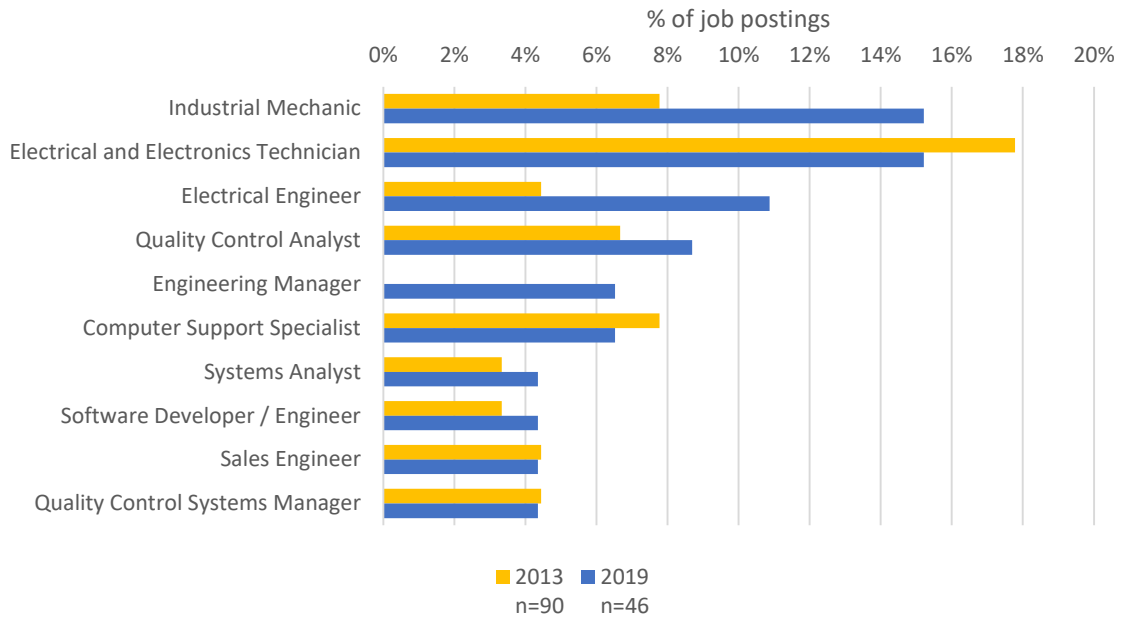
In the professional, scientific, and technical services industry, computer support specialists, systems analysts, and medical records clerks are in high demand.

Figure 5. Top 10 (2019) IT Occupations in Professional, Scientific, and Technical Services Job Postings (Labour Insight)



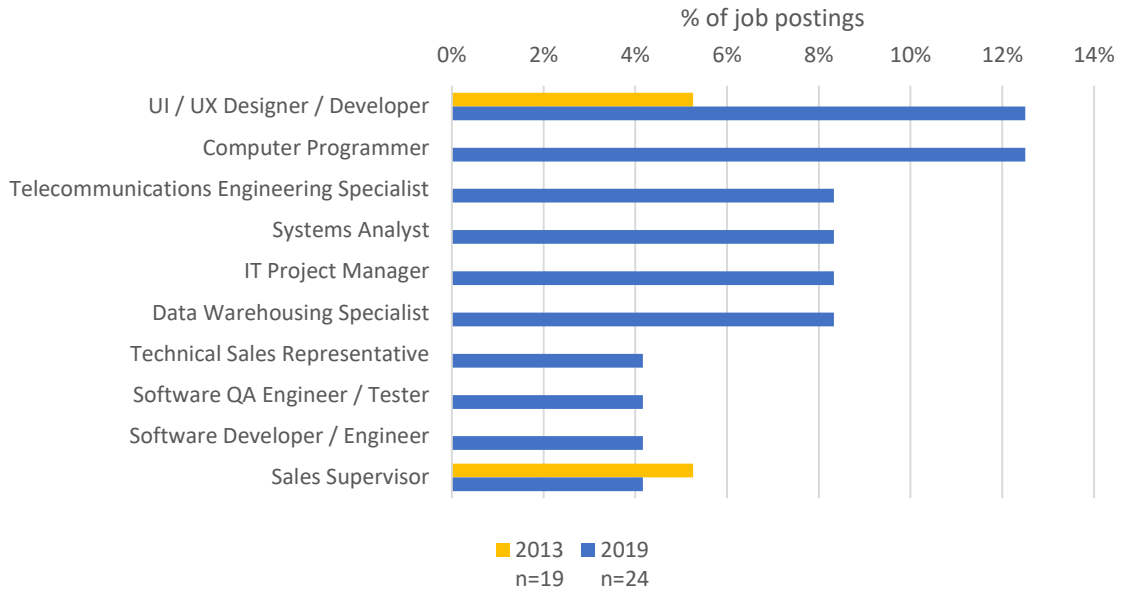
In the manufacturing industry, industrial mechanics, electrical technicians, and electrical engineers are in high demand (Figure 6).

Figure 6. Top 10 (2019) IT Occupations in Manufacturing Job Postings (Labour Insight)



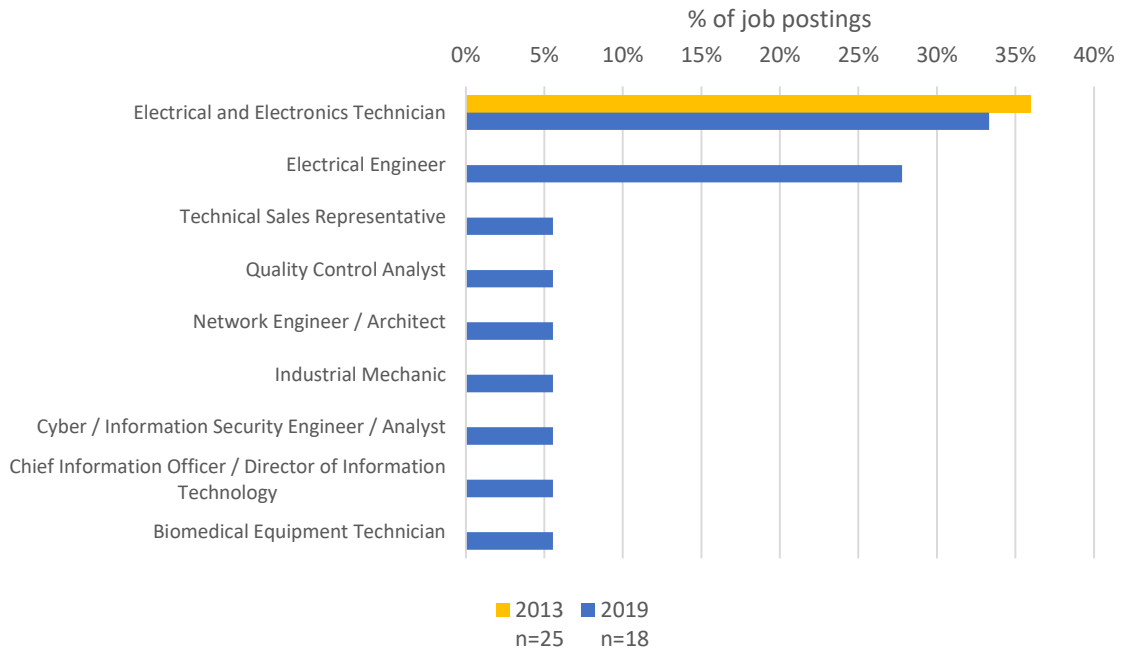
In the educational services industry, IT occupations with the highest demand in 2018 were UI/UX developers and computer programmers. Telecommunications engineering specialists, systems analysts, IT project managers, and Data warehousing specialists are also in demand (Figure 7).

Figure 7. Top 10 (2019) IT Occupations in Educational Services Job Postings (Labour Insight)



In the transportation and warehousing industry, electrical and electronics technicians and electrical engineers are in highest demand (Figure 8).

Figure 8. Top 10 (2019) IT Occupations in Transportation and Warehousing Job Postings (Labour Insight)



SKILLS DEMAND

Using Labour Insight, Northern Alberta job postings were analyzed to determine which skills are most in demand among employers. This was done by looking at the frequency with which certain skills keywords are mentioned in online job postings. For the tables in this section, "skills demand" is expressed as the percentage of job postings which mention a particular skill.

Among all of the IT job postings examined, skills related to Repair, Scheduling, Sales, Technical Support, Customer Service, Project Management, Budgeting, SAP, and Data Entry are among the most in-demand; of these, all but Project Management and Budgeting have shown growth in demand over the period 2013-2019.

Table 6. Skills Demand for all IT-related roles in Northern Alberta, 2013 to 2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	1080	1466	608	426	691	495	562	
Repair	19.7%	22.0%	24.2%	18.5%	27.1%	20.8%	25.4%	29%
Scheduling	14.3%	12.9%	13.3%	11.7%	12.6%	12.1%	16.7%	17%
Sales	13.6%	15.1%	15.6%	15.5%	12.0%	11.7%	14.9%	10%
Technical Support	9.6%	9.5%	12.7%	12.9%	11.0%	10.5%	12.8%	33%
Customer Service	8.4%	7.4%	12.5%	13.8%	8.2%	7.9%	11.7%	39%
Project Management	14.2%	10.8%	11.7%	9.6%	8.4%	14.1%	11.6%	-18%
Budgeting	12.3%	9.1%	12.3%	9.2%	11.6%	11.7%	10.1%	-18%
SAP	8.1%	4.6%	5.3%	4.9%	7.1%	15.2%	9.1%	13%
Data Entry	3.6%	3.8%	4.3%	5.9%	3.9%	7.5%	8.4%	132%
Quality Assurance and Control	19.3%	15.5%	13.2%	13.1%	10.1%	13.7%	7.8%	-59%
Commissioning	9.2%	8.0%	4.9%	7.5%	10.4%	8.1%	7.5%	-18%
Predictive / Preventative Maintenance	5.9%	2.9%	4.4%	5.6%	7.4%	9.3%	6.0%	2%
Telecommunications	2.0%	3.4%	3.1%	5.2%	4.1%	2.0%	5.9%	188%
Industrial Engineering Industry Expertise	4.3%	4.3%	3.9%	3.8%	6.2%	6.1%	5.7%	34%
Electrical Work	2.4%	4.1%	2.1%	3.3%	4.1%	4.4%	5.5%	129%
Printers	2.2%	2.5%	2.8%	4.0%	2.2%	1.6%	5.3%	140%
Natural Gas	4.2%	1.8%	3.3%	-	1.9%	2.0%	5.0%	20%
Teaching	-	-	-	-	-	-	5.0%	-
Brand Experience	-	-	-	-	-	-	4.6%	-
Information Technology Industry Knowledge	-	2.0%	1.3%	2.6%	2.0%	1.4%	4.6%	-
Natural Resources	5.9%	4.0%	-	-	6.9%	2.0%	4.6%	-22%
Product Management	-	-	-	-	-	-	4.6%	-
Audio Recording	-	-	-	-	-	-	4.4%	-
Consumer Behavior	-	-	-	-	-	-	4.4%	-
Customer Contact	4.1%	2.9%	3.5%	4.9%	4.3%	4.2%	4.4%	9%

Looking at some specific IT-related skills provides some greater detail on how demand has changed over time. Table 7 below shows the relative demand for selected IT-related skills over the period 2013 to 2019 across all industries and occupations, not just IT-related occupations.

SAP, Data Entry, and Data Management have seen significant growth, but others have increased as well. SAP is a global software company which offers a wide range of products, from enterprise resource planning to data management. Primavera is a suite of products for the construction and engineering industry offered by Oracle, and includes tools to support planning, building, and operation of assets. It is also used in advanced manufacturing, oil and gas sectors.

Table 7. Skills demand for selected IT-related skills among all occupations in Northern Alberta, 2013-2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	*19,907*	*32,356*	*15,899*	*12,275*	*17,007*	*11,422*	*13,361*	
SAP	3.0%	1.9%	2.1%	3.3%	3.2%	6.5%	3.7%	23%
Data Entry	2.5%	2.0%	2.0%	2.9%	3.3%	2.9%	2.7%	8%
Data Management	2.1%	1.7%	1.7%	1.9%	2.1%	2.5%	2.5%	19%
Data Analysis	0.9%	0.6%	0.5%	0.6%	0.9%	0.9%	0.7%	-22%
Primavera	1.1%	0.7%	0.5%	0.2%	0.6%	1.0%	0.6%	-45%
Microsoft Sharepoint	0.1%	0.1%	0.1%	0.3%	0.2%	0.7%	0.5%	400%
SQL	0.2%	0.2%	0.2%	0.1%	0.2%	0.2%	0.3%	50%
Cybersecurity	0.0%	0.1%	0.1%	0.3%	0.1%	0.1%	0.1%	-
Javascript	0.0%	0.0%	0.0%	0.0%	0.1%	0.4%	0.1%	-
Python	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	-

Skills Demand by Occupation

For NOC 2282 roles (User support technicians), technical support, repair, and printers are the most commonly-mentioned skills in online job postings. ITIL (Information Technology Infrastructure Library) is notable for its increase in popularity over the period 2013 to 2019. ITIL is a best-practices framework for IT service delivery. Some of the skills listed below in Table 8, such as Cision, refer generally to a specific company's suite of products.

Table 8. Skills Demand for NOC 2282 (User support technicians) roles in Northern Alberta, 2013 to 2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	*58*	*136*	*48*	*49*	*59*	*50*	*82*	
Technical Support	34.5%	33.8%	43.8%	59.2%	40.7%	26.0%	45.1%	31%
Repair	22.4%	30.1%	22.9%	14.3%	35.6%	24.0%	39.0%	74%
Printers	20.7%	21.3%	18.8%	16.3%	15.3%	14.0%	30.5%	47%
Customer Service	10.3%	12.5%	12.5%	26.5%	20.3%	12.0%	20.7%	100%
Computer Hardware/ Software Knowledge	29.3%	15.4%	22.9%	6.1%	8.5%	8.0%	18.3%	-38%
Computer Installation and Setup	5.2%	4.4%	12.5%	16.3%	15.3%	6.0%	18.3%	254%
Hardware and Software Installation	34.5%	15.4%	33.3%	20.4%	23.7%	18.0%	17.1%	-50%
ITIL	1.7%	6.6%	-	6.1%	3.4%	8.0%	13.4%	678%
Information Technology Industry Knowledge	3.4%	14.7%	4.2%	8.2%	5.1%	2.0%	13.4%	289%
Hardware and Software Configuration	8.6%	2.9%	-	8.2%	22.0%	4.0%	11.0%	27%
Transmission Control Protocol / Internet Protocol (TCP / IP)	-	1.5%	8.3%	2.0%	-	2.0%	11.0%	-
Scheduling	12.1%	11.0%	29.2%	8.2%	5.1%	6.0%	9.8%	-19%
Budgeting	-	6.6%	4.2%	4.1%	3.4%	8.0%	8.5%	-
Client Base Retention	1.7%	0.7%	-	2.0%	1.7%	8.0%	8.5%	395%
Training Programs	10.3%	-	2.1%	4.1%	1.7%	-	8.5%	-17%
Business Systems Analysis	1.7%	-	2.1%	-	1.7%	6.0%	7.3%	324%
Help Desk Support	6.9%	7.4%	6.3%	6.1%	15.3%	4.0%	7.3%	6%
It Support	3.4%	9.6%	12.5%	10.2%	15.3%	2.0%	7.3%	112%
Microsoft Operating Systems	3.4%	-	-	12.2%	16.9%	2.0%	7.3%	112%
Mobility Devices	-	-	-	-	-	-	7.3%	-
Software Installation	15.5%	11.0%	27.1%	14.3%	18.6%	12.0%	7.3%	-53%
Telecommunications	3.4%	5.1%	-	10.2%	13.6%	-	7.3%	112%
Cision	-	-	-	-	-	-	6.1%	-
Commissioning	5.2%	-	4.2%	4.1%	1.7%	2.0%	6.1%	18%
Hardware Experience	1.7%	15.4%	4.2%	4.1%	5.1%	2.0%	6.1%	254%

Among NOC 2241-categorized roles (Electrical and electronics engineering technologists and technicians), skills related to repair, electrical work, and commissioning are among the most in-demand, and these skills are increasing in demand when compared with 2013 (Table 9).

Table 9. Skills Demand for NOC 2241 (Electrical and electronics engineering technologists and technicians) roles in Northern Alberta, 2013 to 2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	*150*	*155*	*74*	*44*	*93*	*60*	*61*	
Repair	54.0%	51.6%	70.3%	59.1%	67.7%	65.0%	62.3%	15%
Electrical Work	10.7%	14.8%	9.5%	11.4%	15.1%	23.3%	24.6%	131%
Commissioning	10.0%	18.7%	13.5%	15.9%	18.3%	21.7%	21.3%	113%
Calibration	15.3%	14.2%	9.5%	13.6%	24.7%	15.0%	19.7%	28%
Test Equipment	8.7%	9.7%	2.7%	18.2%	19.4%	8.3%	19.7%	127%
Natural Gas	4.7%	3.9%	23.0%	2.3%	3.2%	5.0%	16.4%	251%
Predictive / Preventative Maintenance	20.7%	15.5%	13.5%	36.4%	25.8%	18.3%	14.8%	-29%
SAP	14.0%	6.5%	12.2%	4.5%	10.8%	15.0%	14.8%	5%
SCADA	14.7%	5.8%	5.4%	6.8%	6.5%	8.3%	13.1%	-11%
Budgeting	6.0%	8.4%	8.1%	18.2%	10.8%	8.3%	11.5%	91%
Process Control	11.3%	9.7%	8.1%	4.5%	2.2%	6.7%	11.5%	1%
Scheduling	6.7%	7.7%	5.4%	4.5%	6.5%	-	11.5%	72%
Fall Protection	10.0%	9.7%	4.1%	13.6%	11.8%	1.7%	9.8%	-2%
Medium Voltage	2.7%	0.6%	-	-	3.2%	6.7%	9.8%	269%
Programmable Logic Controller (PLC) Programming	8.0%	5.8%	1.4%	2.3%	3.2%	5.0%	9.8%	23%
Transformers	-	2.6%	1.4%	-	4.3%	8.3%	9.8%	-
Electrical Systems	5.3%	11.0%	6.8%	-	1.1%	15.0%	8.2%	54%
Equipment Repair	4.7%	1.9%	5.4%	13.6%	18.3%	8.3%	8.2%	76%
Industrial Engineering Industry Expertise	2.7%	8.4%	2.7%	6.8%	12.9%	5.0%	8.2%	207%
Project Management	1.3%	1.3%	-	2.3%	2.2%	5.0%	8.2%	515%
Schematic Diagrams	1.3%	3.9%	5.4%	11.4%	5.4%	6.7%	8.2%	515%
Wiring	-	1.9%	2.7%	4.5%	3.2%	13.3%	8.2%	-
Administrative Functions	-	1.9%	-	-	-	1.7%	6.6%	-
Automation Systems	10.0%	3.2%	2.7%	4.5%	3.2%	3.3%	6.6%	-34%
Customer Service	4.7%	1.3%	1.4%	2.3%	1.1%	1.7%	6.6%	41%

In NOC 2171 (Information systems analysts and consultants) roles, Scheduling, Technical Support, and Customer Service are the most in-demand skills. Of the specific technical skills, SAP and data analysis are among the most frequently mentioned in online job postings.

Table 10. Skills Demand for NOC 2171 (Information systems analysts and consultants) roles in Northern Alberta, 2013 to 2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	*81*	*124*	*51*	*39*	*61*	*53*	*64*	
Scheduling	33.3%	18.5%	21.6%	7.7%	23.0%	22.6%	20.3%	-39%
Technical Support	16.0%	6.5%	17.6%	12.8%	16.4%	11.3%	20.3%	27%
Customer Service	14.8%	9.7%	13.7%	10.3%	8.2%	15.1%	18.8%	27%
Information Systems	11.1%	10.5%	11.8%	10.3%	8.2%	11.3%	14.1%	27%
Key Performance Indicators (KPIs)	7.4%	5.6%	-	5.1%	1.6%	13.2%	14.1%	90%
SAP	14.8%	8.9%	11.8%	25.6%	11.5%	30.2%	14.1%	-5%
Hardware and Software Installation	4.9%	8.9%	9.8%	7.7%	14.8%	9.4%	12.5%	153%
Project Management	34.6%	12.9%	13.7%	12.8%	11.5%	26.4%	12.5%	-64%
Budgeting	21.0%	15.3%	19.6%	5.1%	14.8%	28.3%	10.9%	-48%
Business Process	17.3%	8.1%	5.9%	2.6%	4.9%	15.1%	10.9%	-37%
Data Analysis	8.6%	4.0%	2.0%	2.6%	1.6%	11.3%	10.9%	27%
Data Transformation	-	0.8%	-	-	-	1.9%	9.4%	-
Global Positioning System (GPS)	-	-	-	2.6%	-	1.9%	9.4%	-
Industrial Engineering Industry Expertise	3.7%	9.7%	2.0%	-	3.3%	3.8%	9.4%	153%
Operations Management	2.5%	-	-	-	-	5.7%	9.4%	280%
SQL	7.4%	6.5%	-	7.7%	3.3%	7.5%	9.4%	27%
Big Data	-	-	-	-	-	1.9%	7.8%	-
Big Data Analytics	-	-	-	-	-	1.9%	7.8%	-
Business Development	1.2%	-	-	-	-	5.7%	7.8%	533%
Customer Contact	7.4%	2.4%	-	7.7%	-	9.4%	7.8%	5%
Farm Machinery	-	-	-	-	-	1.9%	7.8%	-
Geographic Information System (GIS)	-	-	-	-	-	1.9%	7.8%	-
Information Technology Industry Knowledge	-	-	-	12.8%	1.6%	1.9%	7.8%	-
Inventory Maintenance	-	-	-	-	-	1.9%	7.8%	-
Mapping Software	-	-	-	-	-	1.9%	7.8%	-

For NOC 2133 roles (Electrical and electronics engineers), repair, predictive maintenance, and Professional Engineer certification are the most commonly-mentioned skills in online job postings. SAP is also notable here for its increase in popularity over the period 2013 to 2019. Predictive maintenance could refer to the use of advanced technologies to determine maintenance needs (through data collection and machine learning). Trends for this NOC group should be interpreted with caution due to low numbers.

Table 11. Skills Demand for NOC 2133 (Electrical and electronics engineers) roles in Northern Alberta, 2013 to 2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	*92*	*133*	*19*	*20*	*84*	*46*	*37*	
Repair	27.2%	27.8%	21.1%	20.0%	29.8%	19.6%	51.4%	89%
Predictive / Preventative Maintenance	12.0%	2.3%	-	10.0%	8.3%	37.0%	35.1%	194%
Professional Engineer	19.6%	14.3%	21.1%	15.0%	31.0%	26.1%	35.1%	80%
Reliability Engineering Studies	3.3%	3.0%	5.3%	5.0%	6.0%	15.2%	29.7%	812%
Electrical Engineering	41.3%	42.9%	42.1%	20.0%	41.7%	34.8%	27.0%	-35%
SAP	10.9%	6.8%	-	-	8.3%	26.1%	27.0%	149%
Technical Assistance	3.3%	1.5%	-	-	2.4%	4.3%	27.0%	729%
Electrical Work	2.2%	9.8%	5.3%	5.0%	7.1%	17.4%	21.6%	895%
Technical Support	10.9%	6.0%	10.5%	20.0%	21.4%	21.7%	21.6%	99%
Risk and Mitigation Analysis	1.1%	-	-	-	2.4%	6.5%	18.9%	1641%
Scheduling	12.0%	11.3%	15.8%	15.0%	15.5%	26.1%	18.9%	58%
Commissioning	20.7%	15.0%	10.5%	35.0%	27.4%	19.6%	16.2%	-21%
Electrical Systems	9.8%	7.5%	-	-	19.0%	15.2%	16.2%	66%
Engineering Support	6.5%	0.8%	5.3%	5.0%	9.5%	8.7%	16.2%	149%
Permanent Placement	-	-	-	-	-	-	16.2%	-
Equipment Design	-	-	-	-	1.2%	4.3%	13.5%	-
Microstation	1.1%	-	-	-	7.1%	2.2%	13.5%	1143%
Project Management	10.9%	11.3%	15.8%	10.0%	8.3%	17.4%	13.5%	24%
Variable Frequency Drives (VFDs)	4.3%	2.3%	5.3%	15.0%	8.3%	10.9%	13.5%	211%
Budgeting	16.3%	8.3%	5.3%	-	19.0%	10.9%	10.8%	-34%
Calculation	3.3%	9.0%	15.8%	10.0%	15.5%	13.0%	10.8%	232%
Change Management	1.1%	0.8%	5.3%	-	6.0%	13.0%	10.8%	895%
Contract Preparation	4.3%	3.8%	-	-	7.1%	4.3%	10.8%	149%
Engineering, Procurement, and Construction Management	9.8%	2.3%	5.3%	5.0%	7.1%	-	10.8%	11%
Industrial Equipment Industry Knowledge	-	-	-	-	1.2%	15.2%	10.8%	-

For NOC 6221 roles (Technical sales specialists), sales, customer service, and merchandising are the most commonly-mentioned skills in online job postings. Trends for this NOC group should be interpreted with caution due to low numbers.

Table 12. Skills Demand for NOC 6221 roles in Northern Alberta, 2013 to 2019, descending order by 2019 % (Labour Insight)

Skill	2013	2014	2015	2016	2017	2018	2019	Growth 2013-2019
n	*96*	*127*	*68*	*46*	*58*	*42*	*39*	
Sales	66.7%	85.8%	85.3%	87.0%	79.3%	76.2%	84.6%	27%
Technical Sales	47.9%	53.5%	47.1%	60.9%	32.8%	40.5%	33.3%	-30%
Customer Service	14.6%	11.0%	33.8%	21.7%	19.0%	28.6%	25.6%	76%
Merchandising	1.0%	-	1.5%	6.5%	10.3%	9.5%	23.1%	2115%
Product Sales	12.5%	3.9%	1.5%	10.9%	5.2%	7.1%	17.9%	44%
Retail Industry Knowledge	2.1%	3.9%	2.9%	6.5%	6.9%	9.5%	12.8%	515%
Scheduling	8.3%	10.2%	2.9%	6.5%	15.5%	21.4%	12.8%	54%
Business Planning	7.3%	5.5%	1.5%	2.2%	-	-	10.3%	41%
Calculation	-	-	-	-	-	-	10.3%	-
Client Base Retention	7.3%	7.1%	10.3%	8.7%	6.9%	14.3%	10.3%	41%
Customer Contact	12.5%	9.4%	16.2%	10.9%	13.8%	19.0%	10.3%	-18%
Inventory Management	15.6%	4.7%	1.5%	-	13.8%	4.8%	10.3%	-34%
Operations Management	-	2.4%	1.5%	-	-	-	10.3%	-
Product Knowledge	6.3%	5.5%	2.9%	10.9%	6.9%	11.9%	10.3%	64%
Repair	4.2%	5.5%	7.4%	-	6.9%	4.8%	10.3%	146%
Sales Goals	13.5%	9.4%	5.9%	6.5%	8.6%	16.7%	10.3%	-24%
Sales Planning	-	1.6%	7.4%	2.2%	-	2.4%	10.3%	-
Business Communications	-	-	-	2.2%	-	-	7.7%	-
Business Development	18.8%	20.5%	7.4%	19.6%	10.3%	11.9%	7.7%	-59%
Complex Sales	1.0%	-	-	-	-	-	7.7%	638%
Construction Management	3.1%	0.8%	1.5%	-	-	-	7.7%	146%
Customer Accounts	12.5%	1.6%	1.5%	4.3%	6.9%	4.8%	7.7%	-38%
Empower	-	-	-	2.2%	-	2.4%	7.7%	-
Estimating	-	-	-	-	-	-	7.7%	-
Inventory Control	1.0%	1.6%	-	-	6.9%	7.1%	7.7%	638%

Industry Consultations

Representatives from all industries indicated a growing demand for information technology skills in the workforce within the last five years and looking to the future. This increase in demand was often attributed to companies' emphasis on efficiency through the use of new technologies and a new normal inherent in the age of the Internet of Things. Common themes throughout all industry interviews included a demand for digital literacy in general; a need for employees to be adaptable and willing to learn new technologies; a shift toward cloud-based applications, storage and services; and skills needs in data analysis and cyber-security given the heightened focus on data collection and the ubiquitous connectivity of devices.

> "The new norm is this idea of digital acumen… it's not that everyone has to know how to be a programmer, but you have to be comfortable and capable of picking up new technology and learning it and applying it in ways to be more effective in your role." – Oil and Gas Representative

One challenge is that with every industry adopting various technologies, it is difficult to pinpoint specific interfaces, software or programs that the workforce should be learning. This goes to further support the idea that workers need to have basic digital literacy in order to quickly learn new technologies when entering a job. Most often, companies purchase software from a vendor, and the vendor provides training and updates as a condition of the contract. This also makes it difficult for institutions to provide training in these areas, again making familiarity with technology more generally one of the most useful skills to be taught. A second challenge is actually retaining tech talent in the northern region. Interviewees from all industries noted the challenge of a lack of skilled IT professionals in the region, with many who are qualified moving to larger cities.

Interviewees also consistently emphasized the need for people in IT-related roles to have soft skills including communication, problem solving, critical thinking and collaboration. These are skills that can be incorporated in postsecondary programs, and can be reinforced by gaining practical experience through work-integrated learning.

> "I do think people are starting to realize more that you can have all the tech ability in the world but if the people you are serving don't understand you, don't want to work with you and you are unable to communicate effectively the message you are trying to convey, then a lot of your tech work will not matter. I cannot stress enough the need to be able to communicate well." – Information and Communications Technology Representative

AGRICULTURE

Representatives interviewed were from an agricultural human resources association as well as ag-tech, seed, and agronomy companies, as well as those involved directly in farming. It was noted that agriculture is experiencing a massive labour shortage at the moment with a large number of farm operators retiring and not enough young people entering the field. As farm operators aim to increase efficiencies and crop yields, some larger organizations are turning to using advanced technologies in the field. One interviewee alluded to the idea that Peace County farmers had to adapt quicker in terms of technologies on the farm, strictly due to their environment, soil quality and short growing season. This

trend is specific to Northern Alberta and was echoed by other interviewees with the sentiment "necessity is the mother of all invention".

> "Peace Region farmers did have to adapt technology faster… We have one of the shortest growing seasons in Western Canada so we have to make sure we're as efficient as possible… We have to adopt the latest technologies to make sure we're as efficient as possible up in this area."

Key trends mentioned by interviewees included automation (autonomous vehicles), increased use of precision agriculture technology, and the use of drones and sensors in order to collect data that will then serve to make better future decisions. Data collection and data analytics were seen as important to the future of agriculture. Recent years of poor yields have led many operators to invest in data collection technologies and agronomy services in order to ensure they are making the most efficient use of land and resources.

> "We have ways of reading the data… anything that that tractor and machine is monitoring. We're now in the phase of pulling all that information into a central location, into a platform to collect it, to interpret where more efficiencies can be gained. And so that is probably one of the biggest focuses and needs, I think as we move forward here in the very near future is getting technical specialists to have help process that data to interpret it."

Traditional farm operator and labourer roles are changing with the onset of new technologies. As farms become more mechanized, skills needs shift towards the digital.

> "Anecdotally we have been hearing that… qualified in the sense that driving a tractor right now, you need to be able not just to drive a tractor, but to be able to monitor four screens in your cab as you are doing so. The technological requirements of a general farm worker or a nursery greenhouse worker has increased greatly over the past few years as farms become more mechanized."

Some barriers to adoption of technology on the farm are a lack of reliable internet connection, initial start-up cost, and hesitation from farm operators who are unsure if technology is the solution that will increase their profits. Trust in the technology was also viewed as a barrier to adoption. A key challenge in the sector is finding employees with the right balance of technology and agriculture skills. A representative working in the agronomy space indicated that typically, candidates will have skills on the technology side but with no background in agriculture.

> "I think it's probably twofold in a sense. So there's all this interest in technology and autonomous technology, but well, once you've implemented it, who manages that? So you may have a farm manager that's already doing day to day stuff in terms of farm maintenance, but do they have the skillset to look after an autonomous fleet? So are there other types of people that we need to be bringing into the farm?"

As in other sectors, software and platforms vary from company to company, and many vendors provide support and training as part of a contract. With that said, it was noted that this is often insufficient and farm operators are left without knowing how to troubleshoot their machines. Skills needs on the farm include individuals who can run, maintain and repair autonomous and semi-autonomous vehicles. Beyond that, data analytics skills needs are also increasing in order to garner the value from these technologies at the farm level.

It is difficult to specify particular technical skills to teach at the institution level when employers clearly state that every company is different, every software comes with its own nuances and learning curves. One suggestion was to focus on the commonalities between the different platforms and systems and teach with the goal of understanding and adaptability.

FORESTRY

The sector has been using technologies like LiDAR and GPS for years, but new ways of collecting data are entering the field. Technological trends mentioned by representatives from this sector included new digital platforms and devices used to collect data in the field, advancements to manufacturing process technologies, the ability to work remotely, and a new focus on cyber-security.

> "There's new roles that are created. There used to be a time when it was more or less just sort of hardware setting up and showing people how to use Word and Excel… I think that probably the biggest area that I've seen growth in is in cyber-security. Now there's a whole group that's in charge of very high level cyber-security and very sophisticated training for identifying and avoiding cyber threats."

In terms of skills needs, similar to other industries, roles are changing and adapting to new technologies. For example, electricians on the shop floor of a pulp mill now require skills in instrumentation and computers. General labourers require training in programmable logic controls, which is not new to the industry, but it was noted that employees are able to upgrade skills when necessary. This is typically done at NAIT. In the field, foresters and technicians are still using traditional technology like GPS, GIS and UAV (drones), but have also moved to digital platforms such as tablets. Employers spoke of having a higher expectation of employees' digital literacy skills and the skills to adapt across different platforms: "Maybe it's in terms of making sure that you have the skills, learn those skills in schools so that when you get out working for a company that you have that adaptability to learn and move the tool forward."

Industry representatives stated there is not currently a labour shortage due to the recent economic downturn.

INFORMATION AND COMMUNICATIONS TECHNOLOGY SECTOR

Interviewees represented the support and services sub-sector, typically acting as third-party IT support for companies of all sizes. This is a trend in itself, with a growing number of companies switching to outsourced IT support, made possible largely by the shift to cloud computing. Other trends in this space include a need for higher bandwidth in the north with the growing reliance on the cloud, a skills shortage when it comes to cyber-security, and the challenge of finding qualified IT workers in the north. One interviewee stated, "There is nobody with training in IT up north. There's literally nobody, if I need anybody to actually hire, it has to be either Edmonton or Calgary," and another reiterated this point:

> "I think you're going to hear the same thing from everybody. It's a lack of people with experience or qualifications. I'm a small business and I'm not a fortune 500 company who's hiring the top talent. But I find that the people I get are lacking skills and qualifications."

When asked about specific skills needs, representatives had varying responses depending on the type of service they provide. One interviewee works only with Microsoft Certified Professionals, while the other noted lack of skills around cyber-security. One representative referenced the possibility of transitioning

to Edmonton since their services can be provided remotely and they would be able to find more qualified workers. Another said that workers simply do not have the right qualifications: “The really big one for us as managed service providers is cyber-security… the people we're getting don't have that. They don't get that.”

Much of the employer training happens either on the job or virtually. Suppliers include Global Knowledge and Millennium Micro Group. Representatives stated they would be very interested in courses or programs offered through one of the LEARN institutions, but given the fact that the organizations were small businesses, time and cost would be a factor. One interviewee expressed interest in IT programs related to general IT support and networking.

OIL AND GAS SERVICES

Oil and gas services are incorporating technologies into daily business practices as a means of creating efficiencies and cutting costs, a key concern in the sector at the moment given the recent downturn. Some major technological trends in the sector are data-driven services and data analytics, cloud-based technology and services, and field automation. The use of handheld electronic devices to track and monitor sites is also a major shift towards creating efficiencies and conveniences: “Even 10 years ago the most valuable tools were a crescent wrench and screwdriver and now it’s a laptop and electronic communicators that talk to devices.”

Representatives also mentioned traditional office software like QuickBooks and other more advanced enterprise resource planning (ERP) systems such as P2 Energy Solution’s Qbyte and Metrix. With the movement to the cloud, cyber-security is also a key issue, so training in this area would be beneficial to the sector.

> “I think the emphasis is going to continue to be on field automation. And so what that means is now that the internet is become prevalent and field locations have access to it, that opens a whole new world of cloud based services and opportunities to manage better both remotely and to optimize things.”

When asked about skills changes with the onset of new technologies, interviewees reiterated the idea that traditional roles are changing to include a need for digital skills. For the oil and gas sector in particular, field automation may usher in a decrease in technicians in the field, as machines can be monitored either by a computer or by a person in an office (usually Edmonton or Calgary).

> “We’ve started to see a push of automating the oil and gas or trucking industry or various components of the oil field. So previously everything was really manual. Even when I came up here five years or so ago, it was just paperwork... Now we start to see a trend where things are becoming more digital… tanks in the field of being checked by computers. An operator in head office would be checking levels.”

Interviewees noted the sheer speed with which technologies change industries. It was noted by one representative that there is a definite growing need for real-time collaboration with postsecondary institutions when it comes to information technology.

PUBLIC SECTOR

Representatives interviewed from the public sector came from school boards, municipal government, and health care sectors.

Education

For school boards, key trends were the shift to cloud-based software and servers, collaboration via technologies, more advanced technologies in the classroom, and highly skilled students. Teachers and staff are required to know at least foundationally how to access, use and manage information and documents on cloud-based servers and be able to troubleshoot and problem solve minor issues when it comes to technologies in the classroom.

"A big trend for us now in education from the staff is the increased use of collaboration software because we are remotely located roughly four and a half to five hours away from a major urban centre. We see our staff members kind of collaborating with other members of the Alberta Teachers' Association via collaboration software and communication software [such as Google Hangouts and Zoom]."

Interviewees from the school boards noted a skills shortage when it comes to IT-trained individuals. This was attributed to the fact that workers in the IT field typically want to live in larger cities, work for privately owned companies, and seek higher compensation than school boards offer. There was also an indication of a shortage of teachers who can teach courses such as coding, networking, and programming.

Skills needs looking to the future were heavily focused on understanding cloud technologies. The shift to cloud-based storage, services and programs/applications is taking place across the education sector in the north. Google and Microsoft cloud servers were mentioned, with one representative stating the importance of AWS (Amazon Web Services) cloud skillsets. Particularly in the north, cloud services are becoming a necessity due to the remoteness of many areas.

One takeaway from the school board interviews was that current elementary and high school students are used to interacting daily with digital devices and have therefore garnered almost intuitive skills for navigating new technologies. They are coming to expect that technology is the norm, so postsecondary institutions should be prepared to provide them with technology in the classroom as a means of learning. It was also noted that within the northern districts, students are already learning skills in the areas of robotics, engineering, crypto-currencies, and other advanced technologies, so postsecondary institutions also need to be prepared to provide valuable learning experiences at a higher level.

Health Care

Health care centres in Northern Alberta are thinking beyond "knee-to-knee, eye-to-eye" service and incorporating telemedicine, remote consultation, and virtual care models in order to meet the needs of the population. Interviewees indicated this was something that patients in the region have been asking for and health care centres are starting to deliver. Workers, too, are coming to expect more advanced technology in the workplace, causing health care centres to upgrade equipment. Arguably the biggest IT-related trend in the northern health care system is the movement towards electronic health records. Alberta Health Services in 2019 implemented Connect Care, an integrated electronic medical record that will ensure every patient interaction across the province with the health care system is charted and

available to other providers in the province. Interviewees noted a few things in regards to Connect Care. First, that the implementation of this electronic health records system would indeed create skills gaps and learning curves among current employees. It was emphasized that the hospitals plan to ensure all employees feel prepared and included in the shift by providing training. Second, it is expected that the implementation of Connect Care will create non-traditional jobs within health centres: "There's all kinds of unusual jobs that have to be created in order to support the new way of doing business with this type of comprehensive records system in place."

A skills shortage was also noted when it comes to digital literacy in the workforce. While the group interviewed could not speak to specific skills needs, they did note that technology skills are essential to all traditional health care roles, both clinical and non-clinical. They emphasized the importance of teaching documentation to health care students, especially given the move towards AHS-wide electronic records. It was recommended that, due to the inevitable need for digital literacy, postsecondary institutions should use digital platforms as often as possible and teach students basic technological skills.

> "I just think the more they can incorporate technology into the teaching environment so that our future clinicians and other supports in the health care system can become comfortable with that, I think that'll set all of our health care staff, whether clinicians or non-clinicians up for success."

When asked about health care trends like robotics, big health data, and artificial intelligence, interviewees reiterated that while there are numerous implications of technology on the health care sector, those larger, more advanced technologies have not quite made it to Northern Alberta to date.

Municipal Government

Employees at the municipal government level are also making the switch to integrating more and more technology into their daily tasks. Key trends in IT services at this level were the shift to cloud-based servers and programs, a subsequent need for enhanced cyber-security, and a focus on data collection and data analytics. Looking forward, artificial intelligence and automation was mentioned as potentially being helpful in providing first-tier tech support, filling skills gaps where humans are not available. Due to recent economic conditions, one municipal government official noted they currently underwent a downsizing exercise so hiring was not a priority at the moment. It was noted that roles are typically changing in terms of skillsets demands rather than actual human resources demands. The example of a systems analyst was given: while development skills needs are decreasing, the need for data analytics to help inform decision making is increasing. Again, familiarity with technology was mentioned as beneficial for roles at all levels.

> "Even outside of IT… every area, every role, if there's that common understanding of IT, that's an added value. Even for people working in the shop, like mechanics, we're deploying applications that use iPads. And so even just having that general IT familiarity and that level of comfort with using technology make things easier, makes the adoption much easier on different hardware that we're sending out."

One representative noted that training for technology needs is typically completed through certified partners for specific certifications, such as SAP. Other agencies that they have used in the past include online platforms such as Pluralsight and Global Knowledge Training.

All representatives from the public sector stated they would be interested in training options offered by LEARN member institutions, though pricing and timing would be two factors impacting this decision.

The table below provides a quick snapshot of overall trends, skills needs, and training opportunities that emerged from the industry consultations by sector.

Table 13. Industry Consultation Themes

	All Sectors	Agriculture / Forestry	Oil and Gas / Energy	Public Sector	Information and Communications Technology
Trends related to IT	✓ Increased need in general for IT skills ✓ Shift towards cloud technologies	✓ Some farm operators incorporating technology to increase efficiencies and crop yields ✓ Use of automated vehicles, precision agriculture, drones and sensors ✓ Increased data collection ✓ Barriers to adoption of technology: lack of internet connection, start-up cost, apprehension	✓ Data-driven services and data analytics ✓ Cloud-based technologies ✓ Field automation ✓ Enterprise resource planning systems (Qbyte, Metrix)	✓ Shift to cloud-based technologies ✓ Collaboration using technologies (education) ✓ Patients and professionals expecting more technology in healthcare facilities ✓ Movement to electronic records (health)	✓ Shift to cloud-based ✓ Need for higher bandwidth in the north ✓ Challenge finding skilled workers
IT skills needs	✓ Digital literacy ✓ Adaptability ✓ Cyber-security ✓ Data analytics	✓ Need for mix of IT and agricultural skills ✓ Data analytics and practical application of data	✓ General computer skills required to use devices in the field ✓ Skills related to field automation	✓ Understanding cloud technologies ✓ Database skills (health) ✓ Digital literacy skills shortage ✓ SAP (municipal government)	✓ Cyber-security ✓ Challenge finding skilled workers
Demand for IT training	✓ Has increased in past 5 years ✓ Overall skills shortage when it comes to IT	✓ Many farm operators do not know what to do with technologies	✓ Roles are changing to include digital skillsets	✓ IT skills shortage overall ✓ Understanding cloud technologies	✓ Skills shortage overall, lack of skilled workers remaining in the north
Current IT training model	✓ On-the-job or vendor-supplied	✓ Vendors provide training	✓ On-the-job ✓ Internal information services department	✓ On-the job or vendor-supplied ✓ Online training ✓ Global Knowledge and Pluralsight	✓ Virtual training or on-the-job ✓ Global Knowledge, Millennium Micro Group
Interest in LEARN member training	✓ Interested but cost and time are factors	✓ Interested in IT training but typically need agricultural background in order to be successful	✓ Interested in partnering with institutions; cost, relevance and timing would be factors	✓ Interested, but cost and time are factors	✓ Interested, but cost and time are factors ✓ Specific training in IT support and networking

Conclusions and Recommendations

IT skillsets are rising in demand across all major sectors at every job level in Northern Alberta. A literature review showed the ways in which broad technological trends are impacting day-to-day business activities in some of Northern Alberta's principal economic industries, while labour market and job posting analyses demonstrated clear growth in demand for IT skills and IT-related occupations. Industry consultations revealed that employers expect, at minimum, a basic knowledge and familiarity with digital technologies regardless of the industry or occupation, with some significant technological shifts increasing the need for more advanced IT training across industries.

Continuing the conversation and maintaining the connection between postsecondary institutions and industry is essential. Industry representatives commented on the importance of this research project and showed appreciation for the work that LEARN is undertaking.

Based on the research findings, seven recommendations are put forward:

1. **Collaborate with industry in real-time to ensure programming meets employer needs**. The pace of change in IT is so quick – some products and technologies have single release lifespans. Postsecondary institutions need to maintain a connection with local employers and industry representatives that can help them to keep programming up-to-date and relevant to today's employers and learners.

2. **Plan for emergent occupations, not just current occupations**. Postsecondary institutions need to continually have their pulse on emerging occupations. This can be done through continued industry consultation and job posting analyses, as these two methods provide timely insight into what employers are looking for.

3. **Provide micro-credentials, modularized training, or short-term learning opportunities.** The findings around industry-specific application familiarity, technology familiarization for senior workers, and soft skills development among younger workers all speak to the need for non-traditional educational models. Rather than full programs, institutions may benefit from implementing short-term credentials or certificates that meet employer needs as well as their time and cost constraints.

4. **Make updates to current programs to include both broad digital literacy skills as well as specific technologies used by key industries.** As new technologies are introduced or are updated, workers need to be able to easily and quickly adapt. This requires that students be trained not only in the latest technologies and techniques, but also in broader digital literacy skills that will allow them to continue learning new skills throughout their career.

5. **Incorporate more technology into the learning process.** Employers expect workers to have a basic comfort with using technology on a daily basis, and young people expect technology at their fingertips. Current elementary and high school students are used to interacting daily with digital devices and are adept at navigating new technologies. They are coming to expect that technology is the norm, so institutions should be prepared to provide them with technology in the classroom as a means of learning. Further to this, an opportunity exists for educators to help

older employees overcome any apprehension about technology, providing confidence in important foundational skills by incorporating technologies in daily learning.

6. **Draw on existing training resources to keep up in the fast-paced technological environment.** Introducing new, full-time postsecondary programming is a time and resource intensive undertaking that carries significant financial risks. Looking to open source resources may help to alleviate some of the efforts required to develop courses or programs. One potential resource is a new project being delivered by IBM, the University of Pennsylvania, and the Linux Foundation that will provide training materials for data scientist programs at the postsecondary level, in order to help institutions develop programs faster.

7. **Conduct further research into industry needs and explore demand for modular or short-term training**. While this study provides a broad overview of IT-related skill and training needs in Northern Alberta, deeper analysis into key sectors in the region, such as Oil and Gas, could provide greater direction on specific training needs. It is also recommended that employer and learner demand for modular or short-term training be explored to determine whether this is a viable opportunity for Northern Alberta postsecondary institutions.

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Appendix A. Employment and Social Development Canada 3-year Occupational Forecasts

Three-year employment outlook forecasts are produced by Employment and Social Development Canada at the 4-digit NOC level and Economic Region (ER) level. There are two ER's in the Northern Alberta Development Council (NADC) region, comprising Athabasca-Grande Prairie-Peace River (Census Divisions 13, 17, 18, and 19) and Wood Buffalo-Cold Lake (Census Divisions 12 and 16). As previously noted, there are portions of Census Divisions 12 and 13 that are not part of the Northern Alberta Development Council region, but cannot be separated out of existing reports from Statistics Canada.

NOC 2243: INDUSTRIAL INSTRUMENT TECHNICIANS AND MECHANICS

Athabasca-Grande Prairie-Peace River
The employment outlook will be limited for Industrial instrument technicians and mechanics (NOC 2243) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- Not many positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Industrial instrument technicians and mechanics in the Athabasca - Grande Prairie - Peace River region:

- Approximately 690 people work in this occupation.
- Industrial instrument technicians and mechanics mainly work in the following sectors:
    - Support activities for mining, oil and gas (NAICS 213): 25%
    - Oil and gas extraction (NAICS 211, 213): 20%
    - Other services (except public administration) (NAICS 81): 15%
    - Construction (NAICS 23): 11%
    - Paper manufacturing (NAICS 322): 8%

Wood Buffalo-Cold Lake
The employment outlook will be limited for Industrial instrument technicians and mechanics (NOC 2243) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- Not many positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Industrial instrument technicians and mechanics in the Wood Buffalo - Cold Lake region:

- Approximately 440 people work in this occupation.
- Industrial instrument technicians and mechanics mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 66%
    - Transportation and warehousing (NAICS 48-49): 12%
    - Construction (NAICS 23): 8%

NOC 6221: TECHNICAL SALES SPECIALISTS - WHOLESALE TRADE

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Technical sales specialists - wholesale trade (NOC 6221) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- A moderate number of positions will become available due to retirements.
- There are several unemployed workers with recent experience in this occupation.

Here are some key facts about Technical sales specialists - wholesale trade in the Athabasca - Grande Prairie - Peace River region:

- Approximately 1,050 people work in this occupation.
- Technical sales specialists - wholesale trade mainly work in the following sectors:
    - Wholesale trade (NAICS 41): 40%
    - Support activities for mining, oil and gas (NAICS 213): 14%
    - Construction (NAICS 23): 7%
    - Management and Administrative Services (NAICS 55-56): 7%
    - Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 6%

Wood Buffalo-Cold Lake
The employment outlook will be fair for Technical sales specialists - wholesale trade (NOC 6221) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to several new positions.
- A moderate number of positions will become available due to retirements.
- There are several unemployed workers with recent experience in this occupation.

Here are some key facts about Technical sales specialists - wholesale trade in the Wood Buffalo - Cold Lake region:

- Approximately 350 people work in this occupation.
- Technical sales specialists - wholesale trade mainly work in the following sectors:
    - Wholesale trade (NAICS 41): 52%
    - Oil and gas extraction (NAICS 211, 213): 12%
    - Transportation and warehousing (NAICS 48-49): 9%
    - Support activities for mining, oil and gas (NAICS 213): 7%
    - Professional, scientific and technical services (NAICS 54): 6%

NOC 2242: ELECTRONIC SERVICE TECHNICIANS (HOUSEHOLD AND BUSINESS EQUIPMENT)

Athabasca-Grande Prairie-Peace River
The employment outlook will be limited for Electronic service technicians (household and business equipment) (NOC 2242) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a few new positions.
- A moderate number of positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Electronic service technicians (household and business equipment) in the Athabasca - Grande Prairie - Peace River region:

- Approximately 500 people work in this occupation.
- Electronic service technicians (household and business equipment) mainly work in the following sectors:
    - Other services (except public administration) (NAICS 81): 21%

- Retail Trade (NAICS 44-45): 16%
- Wholesale trade (NAICS 41): 10%
- Construction (NAICS 23): 9%
- Professional, scientific and technical services (NAICS 54): 7%

Wood Buffalo-Cold Lake
The employment outlook will be limited for Electronic service technicians (household and business equipment) (NOC 2242) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- A moderate number of positions will become available due to retirements.
- There are several unemployed workers with recent experience in this occupation.

Here are some key facts about Electronic service technicians (household and business equipment) in the Wood Buffalo - Cold Lake region:

- Approximately 220 people work in this occupation.
- Electronic service technicians (household and business equipment) mainly work in the following sectors:
    - Construction (NAICS 23): 16%
    - Wholesale trade (NAICS 41): 15%
    - Management and Administrative Services (NAICS 55-56): 14%
    - Other services (except public administration) (NAICS 81): 12%
    - Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 10%

NOC 0911: MANUFACTURING MANAGERS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Manufacturing managers (NOC 0911) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a few new positions.
- Several positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Manufacturing managers in the Athabasca - Grande Prairie - Peace River region:

- Approximately 360 people work in this occupation.
- Manufacturing managers mainly work in the following sectors:
    - Paper manufacturing (NAICS 322): 21%
    - Wood product manufacturing (NAICS 321): 17%
    - Miscellaneous manufacturing (NAICS 339): 13%
    - Non-metallic mineral product manufacturing (NAICS 327): 9%
    - Food, beverage and tobacco product manufacturing (NAICS 311, 312): 9%

NOC 2171: INFORMATION SYSTEMS ANALYSTS AND CONSULTANTS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Information systems analysts and consultants (NOC 2171) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- A moderate number of positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Information systems analysts and consultants in the Athabasca - Grande Prairie - Peace River region:

- Approximately 240 people work in this occupation.
- Information systems analysts and consultants mainly work in the following sectors:
    - Professional, scientific and technical services (NAICS 54): 21%
    - Educational services (NAICS 61): 20%
    - Paper manufacturing (NAICS 322): 14%
    - Local, municipal, regional, aboriginal and other public administration (NAICS 913-919): 9%
    - Ambulatory health care services and hospitals (NAICS 621-622): 9%

Wood Buffalo-Cold Lake
The employment outlook will be good for Information systems analysts and consultants (NOC 2171) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to several new positions.
- Several positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Information systems analysts and consultants in the Wood Buffalo - Cold Lake region:

- Approximately 210 people work in this occupation.
- Information systems analysts and consultants mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 49%
    - Educational services (NAICS 61): 17%
    - Professional, scientific and technical services (NAICS 54): 14%
    - Local, municipal, regional, aboriginal and other public administration (NAICS 913-919): 7%
    - Machinery manufacturing (NAICS 333): 6%

NOC 2281: COMPUTER NETWORK TECHNICIANS

Athabasca-Grande Prairie-Peace River
The employment outlook will be good for Computer network technicians (NOC 2281) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- Several positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Computer network technicians in the Athabasca - Grande Prairie - Peace River region:

- Approximately 190 people work in this occupation.
- Computer network technicians mainly work in the following sectors:

- Educational services (NAICS 61): 26%
- Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 14%
- Ambulatory health care services and hospitals (NAICS 621-622): 10%
- Other services (except public administration) (NAICS 81): 8%
- Professional, scientific and technical services (NAICS 54): 7%

Wood Buffalo-Cold Lake
The employment outlook will be fair for Computer network technicians (NOC 2281) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- Several positions will become available due to retirements.
- There are several unemployed workers with recent experience in this occupation.

Here are some key facts about Computer network technicians in the Wood Buffalo - Cold Lake region:

- Approximately 110 people work in this occupation.
- Computer network technicians mainly work in the following sectors:
  - Oil and gas extraction (NAICS 211, 213): 39%
  - Professional, scientific and technical services (NAICS 54): 19%
  - Educational services (NAICS 61): 17%
  - Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 9%
  - Federal government public administration (NAICS 911): 8%

NOC 2241: ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGISTS AND TECHNICIANS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Electrical and electronics engineering technologists and technicians (NOC 2241) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of a few positions.
- Several positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Electrical and electronics engineering technologists and technicians in the Athabasca - Grande Prairie - Peace River region:

- Approximately 240 people work in this occupation.
- Electrical and electronics engineering technologists and technicians mainly work in the following sectors:
    - Support activities for mining, oil and gas (NAICS 213): 23%
    - Construction (NAICS 23): 19%
    - Ambulatory health care services and hospitals (NAICS 621-622): 10%
    - Paper manufacturing (NAICS 322): 9%
    - Oil and gas extraction (NAICS 211, 213): 5%

NOC 1422: DATA ENTRY CLERKS

Athabasca-Grande Prairie-Peace River
The employment outlook will be limited for Data entry clerks (NOC 1422) in the Athabasca - Grande Prairie - Peace River region for the 2019-2021 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of some positions.
- Several positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Data entry clerks in the Athabasca - Grande Prairie - Peace River region:

- Approximately 340 people work in this occupation.
- Data entry clerks mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 16%
    - Retail Trade (NAICS 44-45): 15%
    - Finance, insurance and Real estate and rental and leasing (NAICS 52-53): 12%
    - Educational services (NAICS 61): 8%
    - Professional, scientific and technical services (NAICS 54): 8%

Wood Buffalo-Cold Lake
The employment outlook will be limited for Data entry clerks (NOC 1422) in the Wood Buffalo - Cold Lake region for the 2019-2021 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of some positions.
- Several positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Data entry clerks in the Wood Buffalo - Cold Lake region:

- Approximately 110 people work in this occupation.
- Data entry clerks mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 26%
    - Retail Trade (NAICS 44-45): 20%
    - Federal government public administration (NAICS 911): 13%
    - Construction (NAICS 23): 11%
    - Management and Administrative Services (NAICS 55-56): 10%

NOC 2133: ELECTRICAL AND ELECTRONICS ENGINEERS

Wood Buffalo-Cold Lake
The employment outlook will be limited for Electrical and electronics engineers (NOC 2133) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment is expected to remain relatively stable.
- Not many positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Electrical and electronics engineers in the Wood Buffalo - Cold Lake region:

- Approximately 210 people work in this occupation.
- Electrical and electronics engineers mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 85%
    - Professional, scientific and technical services (NAICS 54): 9%

NOC 0213: COMPUTER AND INFORMATION SYSTEMS MANAGERS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Computer and information systems managers (NOC 0213) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of some positions.
- Several positions will become available due to retirements.
- There are several unemployed workers with recent experience in this occupation.

Here are some key facts about Computer and information systems managers in the Athabasca - Grande Prairie - Peace River region:

- Approximately 110 people work in this occupation.
- Computer and information systems managers mainly work in the following sectors:
    - Educational services (NAICS 61): 32%
    - Professional, scientific and technical services (NAICS 54): 19%
    - Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 16%
    - Local, municipal, regional, aboriginal and other public administration (NAICS 913-919): 10%
    - Wood product manufacturing (NAICS 321): 8%

NOC 5241: GRAPHIC DESIGNERS AND ILLUSTRATORS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Graphic designers and illustrators (NOC 5241) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of some positions.
- A moderate number of positions will become available due to retirements.
- There are a small number of unemployed workers with recent experience in this occupation.

Here are some key facts about Graphic designers and illustrators in the Athabasca - Grande Prairie - Peace River region:

- Approximately 220 people work in this occupation.
- Graphic designers and illustrators mainly work in the following sectors:

- Miscellaneous manufacturing (NAICS 339): 34%
- Professional, scientific and technical services (NAICS 54): 25%
- Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 20%
- Retail Trade (NAICS 44-45): 9%
- Printing and related support activities (NAICS 323): 5%

Wood Buffalo-Cold Lake
The employment outlook will be fair for Graphic designers and illustrators (NOC 5241) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a moderate number of new positions.
- Not many positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Graphic designers and illustrators in the Wood Buffalo - Cold Lake region:

- Approximately 130 people work in this occupation.
- Graphic designers and illustrators mainly work in the following sectors:
    - Professional, scientific and technical services (NAICS 54): 36%
    - Transportation and warehousing (NAICS 48-49): 26%
    - Management and Administrative Services (NAICS 55-56): 14%
    - Information, cultural, arts, entertainment and recreation services (NAICS 51, 71): 13%
    - Printing and related support activities (NAICS 323): 10%

NOC 0211: ENGINEERING MANAGERS

Athabasca-Grande Prairie-Peace River
The employment outlook will be limited for Engineering managers (NOC 0211) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment growth will lead to a few new positions.
- Not many positions will become available due to retirements.
- There are several unemployed workers with recent experience in this occupation.

Here are some key facts about Engineering managers in the Athabasca - Grande Prairie - Peace River region:

- Approximately 120 people work in this occupation.
- Engineering managers mainly work in the following sectors:
    - Paper manufacturing (NAICS 322): 29%
    - Forestry and logging: 15%
    - Local, municipal, regional, aboriginal and other public administration (NAICS 913-919): 13%
    - Construction (NAICS 23): 12%
    - Oil and gas extraction (NAICS 211, 213): 11%

Wood Buffalo-Cold Lake
The employment outlook will be fair for Engineering managers (NOC 0211) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment is expected to remain relatively stable.
- Not many positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about Engineering managers in the Wood Buffalo - Cold Lake region:

- Approximately 140 people work in this occupation.
- Engineering managers mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 73%
    - Construction (NAICS 23): 12%
    - Support activities for mining, oil and gas (NAICS 213): 11%

NOC 2282: USER SUPPORT TECHNICIANS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for User support technicians (NOC 2282) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of some positions.

- A moderate number of positions will become available due to retirements.
- There are a small number of unemployed workers with recent experience in this occupation.

Here are some key facts about User support technicians in the Athabasca - Grande Prairie - Peace River region:

- Approximately 130 people work in this occupation.
- User support technicians mainly work in the following sectors:
    - Mining and quarrying (NAICS 212): 24%
    - Nursing and residential care facilities and social assistance (NAICS 623-624): 20%
    - Educational services (NAICS 61): 17%
    - Professional, scientific and technical services (NAICS 54): 11%
    - Wholesale trade (NAICS 41): 11%

Wood Buffalo-Cold Lake

The employment outlook will be fair for User support technicians (NOC 2282) in the Wood Buffalo - Cold Lake region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment is expected to remain relatively stable.
- Not many positions will become available due to retirements.
- There are a moderate number of unemployed workers with recent experience in this occupation.

Here are some key facts about User support technicians in the Wood Buffalo - Cold Lake region:

- Approximately 160 people work in this occupation.
- User support technicians mainly work in the following sectors:
    - Oil and gas extraction (NAICS 211, 213): 31%
    - Transportation and warehousing (NAICS 48-49): 19%
    - Professional, scientific and technical services (NAICS 54): 19%
    - Ambulatory health care services and hospitals (NAICS 621-622): 13%
    - Local, municipal, regional, aboriginal and other public administration (NAICS 913-919): 12%

NOC 2174: COMPUTER PROGRAMMERS AND INTERACTIVE MEDIA DEVELOPERS

Athabasca-Grande Prairie-Peace River
The employment outlook will be fair for Computer programmers and interactive media developers (NOC 2174) in the Athabasca - Grande Prairie - Peace River region for the 2018-2020 period.

The following factors contributed to this outlook:

- Employment decline will lead to the loss of some positions.
- Several positions will become available due to retirements.
- There are a small number of unemployed workers with recent experience in this occupation.

Here are some key facts about Computer programmers and interactive media developers in the Athabasca - Grande Prairie - Peace River region:

- Approximately 140 people work in this occupation.
- Computer programmers and interactive media developers mainly work in the following sectors:
    - Professional, scientific and technical services (NAICS 54): 42%
    - Ambulatory health care services and hospitals (NAICS 621-622): 20%
    - Educational services (NAICS 61): 15%
    - Oil and gas extraction (NAICS 211, 213): 12%
    - Provincial and territorial public administration (NAICS 912): 6%

Appendix B. Funding Programs for Technology Innovation

Program Name	Details	Organization
Accelerate Fund	Accelerate Fund supports the growth of early-stage Alberta technology companies with a venture capital fund that matches angel investment.	Accelerate Fund
Accelerating Innovation into CarE Market Access (AICE)	Accelerating Innovations into CarE (AICE) is a program that provides funding support, system connections and business development expertise for SMEs and health system partners who require market access, clinical validation or technology assessment to facilitate adoption and diffusion of a novel technology.	Alberta Innovates
Alberta Small Business Innovation and Research Initiative	The intent of the ASBIRI is to enable the development of solutions to end-users through the engagement of market pull technology concepts developed by Alberta Small and Medium Enterprises ("SME"s).	Alberta Innovates
Commercialization Associates Program	For hiring employees to work on commercialization of technologies.	Alberta Innovates
Micro-Voucher Program	$10,000 grants to SMEs for commercialization of technologies	Alberta Innovates
Product Demonstration Program	Alberta Innovates offers the Product Demonstration Program to businesses located in Alberta that have commercialization-ready, innovative technology in the industries of: energy, environment, nanotechnology, information and communication services, health, and life sciences such as forestry, agriculture and biotechnology.	Alberta Innovates
R&D Associates	Alberta's high potential, high growth, technology and knowledge-based small- and medium-sized enterprises (SMEs) may be eligible for up to $74,500 per year for up to two years to enable them to employ in-house professional research and development capability, to advance the Technology Readiness Level and accelerate new product commercialization.	Alberta Innovates
Strategic Networking and Development Grants	Alberta Innovates supports Campus Alberta post-secondary institutions seeking to host or attend conferences, workshops and competitions in the areas of information and communications technology (ICT), nanotechnology and -omics through the Strategic Networking and Development Grants program.	Alberta Innovates
Accelerating the Advancement of Agricultural Innovation Program	The purpose of the Accelerating the Advancement of Agricultural Innovation Program is to support activities that demonstrate the feasibility and potential for real world application of innovations that are new to Alberta or new to the agriculture sector.	Canadian Agricultural Partnership

Program Name	Details	Organization
Adapting Innovative Solutions in Agriculture	The purpose of the Adapting Innovative Solutions in Agriculture Program is to support activities that take innovations that have proven to work outside of Alberta or in industries other than the agriculture industry, and adapt those Innovations so that they can be used under Alberta-specific conditions and/or in a specific Alberta Agriculture sector.	Canadian Agricultural Partnership
AgriScience Program	The program aims to accelerate the pace of innovation by providing funding and support for pre-commercial science activities and cutting-edge research that benefits the agriculture and agri-food sector and Canadians.	Canadian Agricultural Partnership
Experimental Stream	The Canada Media Fund: Experimental Stream supports software conceptualization, prototyping, production, and marketing projects. Through the program, software developers can turn ideas into functional products and repay project costs once the project's results can be commercialized. By offsetting a portion of upfront costs, companies can advance their platform's commercial readiness, launch their product, then repay the balance of Canada Media Fund's investment as product revenues are generated.	Canada Media Fund
Strategic Innovation Fund	Canadian government funding program that provides support for technology development and productivity-boosting projects. It promotes large-scale investments in Canada, while also encouraging technology transfer and development/commercialization of disruptive products and services.	Government of Canada (GoC)
Agricultural Clean Technology Program	The Agricultural Clean Technology (ACT) Program is a $25-million, three-year investment (2018 - 2021) which aims to support the research, development and adoption of clean technologies through investments in, and promotion of precision agriculture and agri-based bioproducts.	GoC - Agriculture and Agri-Food Canada
AgriInnovate	The AgriInnovate program aims to accelerate the demonstration, commercialization and/or adoption of innovative agri-based products, technologies, processes or services that increase agri-sector competitiveness and sustainability.	GoC - Agriculture and Agri-Food Canada
Dairy Processing Investment Fund	Dairy processors can apply for funding to increase productivity and competitiveness, and prepare for market changes resulting from Canada-European Union Comprehensive Economic and Trade Agreement CETA. Eligible activities include: the application of technologies to make use of surplus skim milk increasing the facility's capacity to use milk or milk components.	GoC - Agriculture and Agri-food Canada
College-Industry Innovation	The College-Industry Innovation (CII) streams support significant research infrastructure that will add to the existing applied research and	GoC - Economic Development and Trade

Program Name	Details	Organization
	technology development capacity of a college or technical institute.	
Accessible Technology Program	The Accessible Technology Program will co-fund innovative projects led by the private sector, not-for-profit organizations and research institutes to develop new assistive and adaptive digital devices and technologies in order to make it easier for Canadians with disabilities to more fully participate in the digital economy.	GoC - Innovation, Science and Economic Development Canada
Connecting Families	The Connecting Families initiative will help connect up hundreds of thousands of Canadians to the Internet and will distribute up to 50,000 computers to eligible households.	GoC - Innovation, Science and Economic Development Canada
Connect to Innovate	The Connect to Innovate program will invest $500 million by 2021, to bring high-speed Internet to 300 rural and remote communities in Canada.	GoC - Innovation, Science and Economic Development Canada
CyberSecure Canada	CyberSecure Canada is a federal cyber certification program that aims to raise the cyber security baseline among small and medium entreprises (SMEs) in Canada , increase consumer confidence in the digital economy, promote international standardization and better positions SMEs to compete globally.	GoC - Innovation, Science and Economic Development Canada
Digital Literacy Exchange Program	This program aims to equip Canadians with the necessary skills to engage with computers, mobile devices and the Internet safely, securely and effectively.	GoC - Innovation, Science and Economic Development Canada
Protein Industry Supercluster		GoC - Innovation, Science and Economic Development Canada
Investments in Forestry Industry Transformation	The Investments in Forest Industry Transformation (IFIT) program offers non-repayable contributions to successful applicants in the Canadian forestry industry to implement innovative, first-in-kind technologies in their facilities.	GoC - Natural Resources Canada
Industrial Research Assistance Program (IRAP)	Provides grants to small or medium sized businesses (ranging from $50,000 to $500,000) to support development and commercialization of innovative, technology-driven products or services. Funding provided before expenses incurred. One full-time employee needed to qualify.	National Research Council of Canada
Industrial Research Assistance Program (IRAP) Additional Funding	Additional funding for larger research and development projects. Small or medium sized businesses pursuing technology-driven innovation.	National Research Council of Canada

Program Name	Details	Organization
BUILD	Take your business to the next level and develop your technology with a non-dilutive, 0% interest loan, through the BUILD Program.	Tecterra
CLOUD	Leverage third party cloud services for the development of your geospatial software with grant funding through the CLOUD Program.	Tecterra
HIRE	Hire qualified business or technical personnel to grow your business, and we'll cover up to half of their salary with the HIRE Program.	Tecterra
LEAP	Commercialize your new, transformational technology with funding of up to 50% of your development costs through the LEAP Program.	Tecterra

Appendix C. List of Interview Participants

The list below is divided into key industry and sorted alphabetically.

Organization	Location
Agriculture	
Axiom Agronomy	Sturgeon County, AB
Canadian Agricultural Human Resources Council	Ottawa, ON
Canterra Seeds	Peace Country , AB
Nutrien	Rycroft , AB
Vantage Canada	Peace Country, AB
Forestry	
Millar Western	Whitecourt, AB
Norbord Inc.	Grande Prairie, AB
Slave Lake Pulp	Slave Lake, AB
Oil, Gas and Energy and related services	
Birch Mountain Enterprises	Fort McMurray, AB
Jacknife Oilfield Services & Trucking	Bonnyville, AB
PetroLMI (A division of Energy Safety Canada)	Edmonton, AB
Peyasaw Oilfield Services	Saddle Lake, AB
Prodigy Tech Group	Grande Prairie, AB
Seven Generations Energy	Edmonton, AB (with operations in Northern Alberta)
Public Sector	
Alberta Health Services – North Zone	Westlock, AB
Alberta Health Services – Rural East Zone	Slave Lake, AB
Alberta Health Services – Rural West Zone	Peace River, AB
Fort McMurray Public Schools	Fort McMurray, AB
Northern Lights Regional Health Centre	Fort McMurray, AB
Northern Lights School District	Bonnyville, AB
Queen Elizabeth II Regional Hospital	Grande Prairie, AB
Regional Municipality of Wood Buffalo	Wood Buffalo, AB
Town of Slave Lake	Slave Lake, AB
Information and Communications Technology	
ICT Solutions	Grande Prairie, AB
Lakeside Computers	Cold Lake, AB
MidWest Communications	Lloydminster, AB

Appendix D. Discussion Guide

Introduction and IT Skills Defined

This interview is part of a research project aimed at gaining insight into information technology (IT) skills needs in Northern Alberta in light of rapid changes and advancements in IT. The focus is on all sectors of the economy and the ways in which digital technologies are being incorporated at every level. Skills may range from fundamental technical skills to more advanced skills in automation and data analytics, for example. For the purposes of the interview we are defining "IT skills" as skills related to the use, administration, development, design and management of new technologies.

Background

1. Can you tell me about yourself and your experience within your industry?
    a. What is your role within your company?
2. Can you tell me a little more about your organization?
    a. Approximately how many people are employed?
    b. What industries do you work within?

IT Industry Trends

3. In general, what IT trends have you seen occurring in your industry in the past 5 years?
    a. Are these trends specific to the Northern Alberta region?
    b. How have these trends affected labour market demand or supply?
    c. What IT trends do you see occurring looking forward?

IT-Related Skills Needs

Next we'd like to focus on information technology (IT) related skills needs in Northern Alberta.

4. What types of IT or technology related skills are most in-demand at your organization or within your industry?
5. Has the demand for IT-related skillsets changed within the past five years?
    a. If yes, what do you think has caused this change in demand?
6. What roles, if any, currently require IT-related skillsets?
    a. Has this changed in the last five years?
    b. What roles do you think may require IT-related skillsets in the future?
7. Is your organization currently experiencing a skills shortage when it comes to IT?
8. Thinking about recent graduates that you have hired, have their skills met your needs?
    a. If no, what skills tend to be lacking?

IT Skills Training

9. Does your organization offer IT-related skills training to its current employees?
    a. If yes, is it out-sourced?
    b. If no, do you see this becoming a need in the near future?
    c. If IT-related skills training were offered within the LEARN member institutions, would this be of interest for you or your employees?
10. Are there any programs that you know of offered by institutions that graduate individuals with particularly strong IT-related skills?
11. Do you foresee a need for any new IT-related training programs in northern Alberta?
12. Do you offer any co-operative education or internship opportunities in the area of IT within your company?