

APEC Research Report

Digital Technology Firms: Their Importance and Role in Atlantic Canada's Economy



September 2019



on behalf of

TECH IMPACT

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Digital Technology Firms: Their Importance and Role in Atlantic Canada's Economy

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Acknowledgements

This project was commissioned by TechImpact, who also provided research support for the study. APEC would like to thank the individuals who took the time to be interviewed for this report, the Industry Advisory Group who provided valuable feedback during the study and those who provided valuable information, insights and feedback. The opinions expressed in this report are not necessarily those of APEC's directors, members, or TechImpact. APEC staff are responsible for the accuracy and reliability of the information presented which is current up to August 2019.

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Executive Summary

The digital economy in Atlantic Canada is evolving rapidly but its size and impact have been largely unknown until now. This is why APEC and TechImpact undertook this research to better understand the importance and role of digital technology firms in Atlantic Canada. Digital technologies are key to emerging technology industries but also permeate established sectors of the Atlantic economy.

As part of its research, APEC collected primary data on digital technology firms in the region and conducted an online survey, supplemented with numerous interviews with digital technology firms and other stakeholders. APEC identified 463 digital technology firms in the region. Over half of these firms have a focus on data analytics, with a high proportion also involved in the Internet of Things, automation and artificial intelligence. These firms are facing significant headwinds and are small compared to digital technology firms in the rest of Canada.

APEC found that the digital technology industry is a large and growing contributor to the Atlantic economy, accounting for \$6.1 billion of revenue in 2017 up from \$5.2 billion in 2014. However, Atlantic Canada's digital economy as a share of GDP is smaller than in Canada and the US. Over 60% of revenues from surveyed firms come from international sales. APEC estimates that Atlantic digital technology exports totalled \$1.6 billion in 2017.

APEC estimates there were 43,000 people in Atlantic Canada's digital industry labour force in 2016. About two-thirds of digital employees are in industries outside the core digital sector. Cities dominate digital technology activity in Atlantic Canada. Over 90% of Atlantic digital technology firms are located in the larger cities. Halifax and Fredericton have the highest rates of digital workers in Atlantic Canada.

The digital technology industry is very innovative with digital technology firms driving the recent surge in research and development in Atlantic Canada where they dominate business spending on R&D in Atlantic Canada. Digital technology firms also attract a majority of the region's venture capital with increasing success in acquiring such funding. However, obtaining financing is a significant obstacle to growth for about 40% of Atlantic digital technology firms, especially as businesses are scaling up.

Significant growth in the digital labour force is needed to sustain progress in this industry. The region is not producing enough graduates to fill the current demand for new workers with labour identified as the number one challenge for digital technology firms in APEC's survey. Over half of survey respondents are having difficulty finding software developers. Increasing participation by women, immigrants and Indigenous workers should all be part of the solution. Responsive post-secondary institutions, effective immigration and a commitment by firms to train employees are also critical for future growth.

The importance of the digital technology industry has often been understated, as it goes beyond the core group of firms that is creating digital products in Atlantic Canada. It transcends across all sectors of the economy. Many of the region's digital technology firms, led by larger local and international companies, are creating new products and technologies that will drive the region's productivity in the future. However, larger digital firms are needed. Small firms are less resilient to the challenges of global competition than large companies with resources for research and acquiring skilled talent.

And in terms of broader adoption of digital technologies, APEC found that Atlantic Canadian firms in all industries trail in adoption in every one of the emerging digital technologies. This is partly due to the small size of firms in Atlantic Canada. Firms in Atlantic Canada are also hesitant to invest in technologies they do not understand. This creates challenges for digital technology firms looking to test or sell their products in the local market. Weak technology adoption also poses a risk to Atlantic Canada's future growth and competitiveness.

Introduction

APEC has been commissioned by TechImpact to provide a research report with a goal of improving the understanding of the importance and role of digital technology firms in Atlantic Canada.

TechImpact is a private sector led organization focused on building a vibrant and growing Atlantic Canadian economy by using technology to unlock the region's potential. Its membership is comprised of CEO's and regional leaders from the largest technology companies and CIO's from the largest IT consumers of technology in the region. www.techimpact.it

The digital economy in Atlantic Canada is evolving rapidly but its size and impact are largely unknown. Existing national studies on the information and communications technology (ICT) sector typically fail to provide much detail at the Atlantic level. While aggregate data on the GDP of the ICT sector by province are available, these data shed no light on the dynamics within the sector.

Moreover, the grouping of industries within the traditional definition of ICT includes a segment of manufacturing and wholesaling that is not as important to Atlantic Canada's economy and does not clearly define or capture firms in emerging digital technology industries. There are several sub-segments of Atlantic Canada's digital economy that are growing rapidly, such as data analytics, the internet of things, automation and cyber security.

Digital technologies are key to emerging technology industries but also permeate established sectors of the Atlantic economy. Large Atlantic firms such as McCain Foods, J.D. Irving and Sobeys are among the leaders in research and development, innovation and technology use in the region. Yet the way in which digital technologies are transforming traditional industries is not well understood.

In addition, national and international firms, such as IBM, CGI and Salesforce, have established a sizeable presence in the region, either through direct investment or the acquisition of local firms. The contributions and relative success of ICT start-ups and scale-ups, small and large established firms, and foreign-owned companies operating in Atlantic Canada is lacking in information.

This report defines the digital economy and digital technology firms in Atlantic Canada; collects quantitative and qualitative data based upon these definitions, with a focus on digital technology firms; analyzes the data to draw out key features and trends, emphasizing the scope and growth of the sector; and highlights some of the key issues and potential policy implications that may need further study.

A key objective during this research is to identify a methodology that would allow key metrics on the size and scope of the digital technology sector and digital economy to be updated on a regular basis.

With a better understanding of the size, characteristics and growth dynamics of digital technology firms, stakeholders can ensure support services and policies are of sufficient scale and appropriate design and scope. An improved understanding of the opportunities and challenges digital technology companies are facing will help governments, training and education institutions, incubators and accelerators, and financing organizations improve their effectiveness.

Survey of Digital Technology Firms

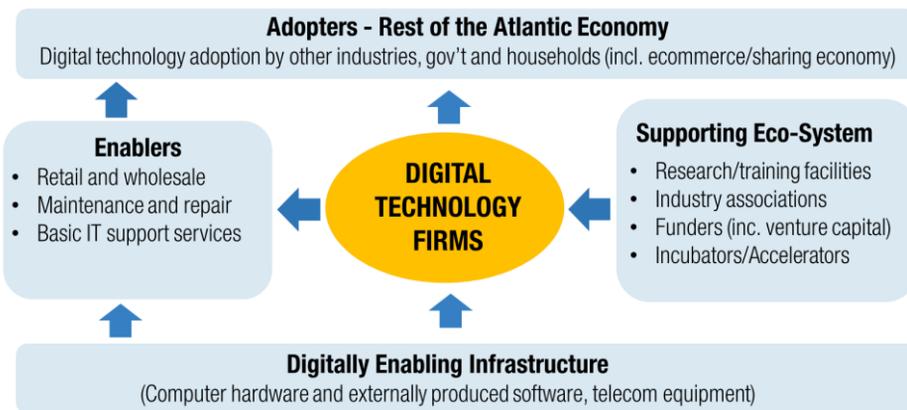
APEC and several partners distributed an online survey in the spring of 2019 to collect baseline information on the industry. APEC received 69 fully completed surveys and another 20 partially completed surveys. APEC also conducted 9 interviews with digital technology firms and 13 interviews with stakeholders in the sector to supplement the survey data.

Digital Technology Firms in Atlantic Canada: Definition

The challenge of defining and measuring digital technology firms and the broader digital economy has been discussed for many years. One of the key issues is the lack of a detailed and universal definition that states which activities should be included. Another challenge is that the components of the digital economy are rapidly changing. New technologies are constantly emerging as businesses and consumers adopt digital products to perform tasks, monitor their business, understand their customers and communicate. APEC's approach has built on emerging definitions of the digital economy led by the US Bureau of Economic Analysis¹ and Statistics Canada².

The focus of this report is to describe the size, nature and contribution of digital technology firms in Atlantic Canada. It only briefly describes the broader digital economy (see diagram).

Fig. 1 - The Digital Economy in Atlantic Canada



Digital Technology Firms

For this report a digital technology firm is one that is creating and providing proprietary digital technology in or from Atlantic Canada. This includes Atlantic headquartered digital technology firms. International or Canadian firms that are headquartered outside the region are also included if their Atlantic operations are developing digital technologies. If a company is re-selling or providing supporting services developed outside of the region they are not included. Digital business lines of firms in other industries are included such as a large manufacturing firm that has its own specialized IT division that creates digital solutions in this region or a consulting firm that is adding proprietary value to a digital product or service. A company that is adopting a digital product without adding any value or proprietary technology is not included.

Digital technologies – Digital describes electronic technology that generates, stores, and processes data in terms of two states: positive and non-positive or binary states. Data transmitted or stored with digital technology is expressed as a string of 0's and 1's. Digital technology refers to the key digital or Information and Communications Technologies (ICT) underlying the digitization of the economy.

Digital economy - describes the broader role that digital technologies have on the economy (see diagram). These can include: “adopters” and users of digital technologies, “enablers” that wholesale, retail, install, repair and provide basic maintenance services for digital technologies, the “supporting eco-system” that helps support digital technology firms and “digitally enabling infrastructure”

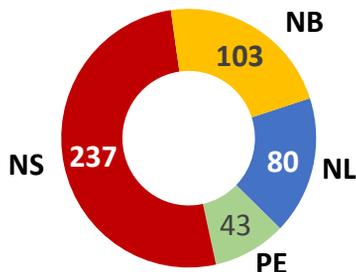
Digital Technology Firms in Atlantic Canada: Number and Revenues

APEC estimates that Atlantic digital technology firms' revenues totalled \$6.1 billion in 2017 and the industry accounted for 3% of the overall economy

The Digital Firm Database

APEC compiled a list of firms with a high-tech focus from around the region and used its digital technology definition to create a database of 463 companies that APEC considers to be pure digital technology firms. See Appendix page A1 for methodology details.

Fig. 3 - Number of Digital Technology Firms by Province

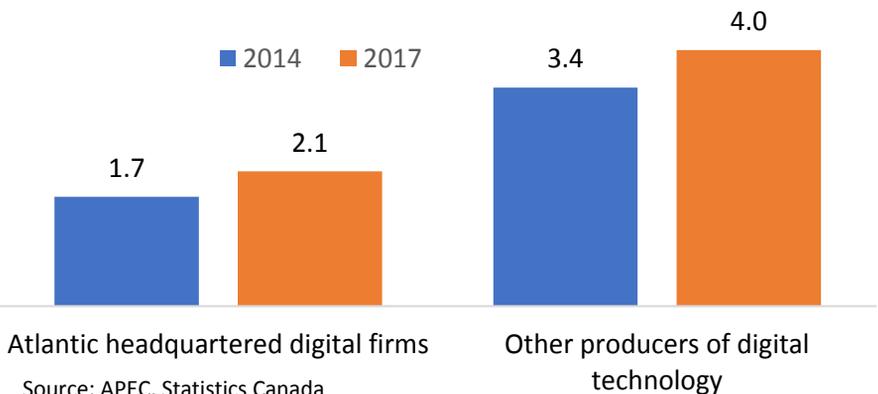


Source: APEC Digital Technology Firm Database

Atlantic Canada's digital economy as a share of GDP is smaller than in Canada and the US

The digital industry is an important contributor to Atlantic Canada's economy and has grown strongly over the last three years. APEC estimates that digital technology firms in Atlantic Canada generated \$6.1 billion of revenues in 2017 up from \$5.2 billion in 2014. Of this total, APEC estimates that locally-headquartered firms generated \$2.1 billion of revenue in 2017, up from \$1.7 billion in 2014.

Fig. 2 - Digital Industry Revenues in Atlantic Canada, \$billions



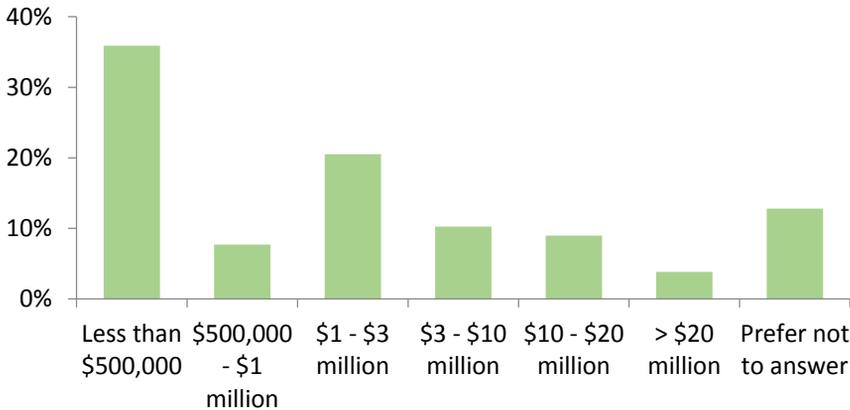
Other firms producing proprietary digital technology products include national and international headquartered firms that operate in Atlantic Canada (e.g. IBM, Bell, Salesforce, energy firms, banks and consulting firms) and locally headquartered firms in other industries that create digital technologies (e.g. McCain Foods, J.D. Irving, Cooke Aquaculture and Sobeys). These firms generated an estimated \$4 billion in digital revenue in Atlantic Canada in 2017, up from \$3.4 billion in 2014.

Based on Statistics Canada's recent estimates of the digital economy the nominal GDP of digital technology firms in Atlantic Canada totalled \$3.4 billion in 2017 which accounts for about 3% of the overall Atlantic economy. The broader digital economy accounts for about 3.5%. This is well below the Canadian rate where the digital economy accounts for 5.1% (2017) of GDP and the US contribution of 6.5%.

Digital Technology Firms in Atlantic Canada: Size and Growth

Most of the firms surveyed are small with revenues under \$1 million and less than 20 employees

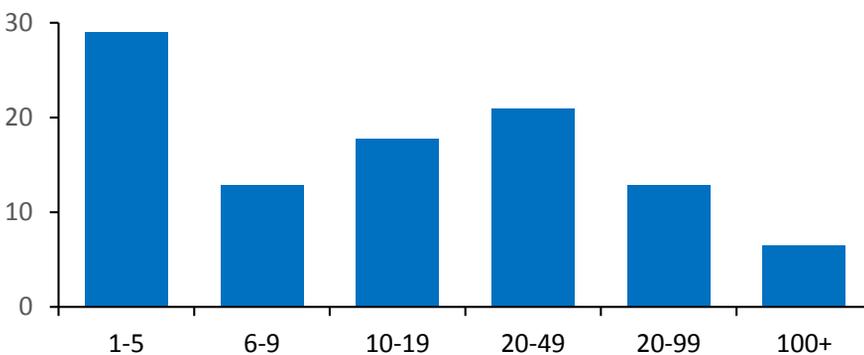
Fig. 4 - Firms, by Revenue (% of firms)



Source: APEC Survey of Digital Technology Firms

Almost half (44%) of the surveyed Atlantic digital technology firms have less than \$1 million in revenue. About one-third (30%) are mid-sized firms with \$1-10 million in revenue. Only 13% are large firms with over \$10 million in revenue. Similarly, 60% have fewer than 20 employees and only 6% have over 100 employees.

Fig. 5 – Firms, by # of employees (% of firms)

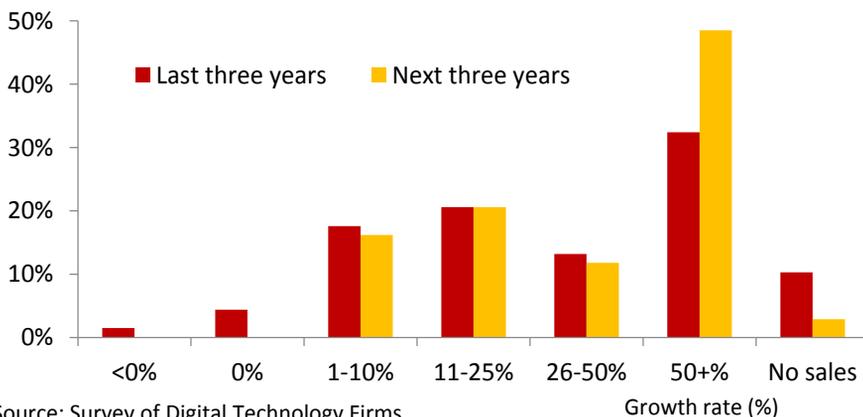


Source: Survey of Digital Technology Firms

Most of the digital technology firms in Atlantic Canada have been growing rapidly and expect to continue to grow rapidly over the next three years. Over 60% of the firms have grown by more than 10% per year over the last three years.

One of the factors behind the rapid growth is the small size of firms. About half of the firms that have grown at 50% per year over the last three years are small (<\$1 million in revenue).

Fig. 6 - Firms, by Average Annual Revenue Growth (% of firms)



Source: Survey of Digital Technology Firms

Two-thirds of the surveyed firms have grown by more than 10% per year over the last three years.

Digital Technology Firms in Atlantic Canada: Specialties

Technological innovation has been shifting to digital products led by software and data. These technologies are having a transformational impact on the global economy. In many cases, these technologies are improving productivity of industries and replacing some jobs while at the same time creating new jobs. Emerging technologies create new business opportunities but also disrupt traditional firms who are forced to adjust, often losing market share the longer they wait to adapt.

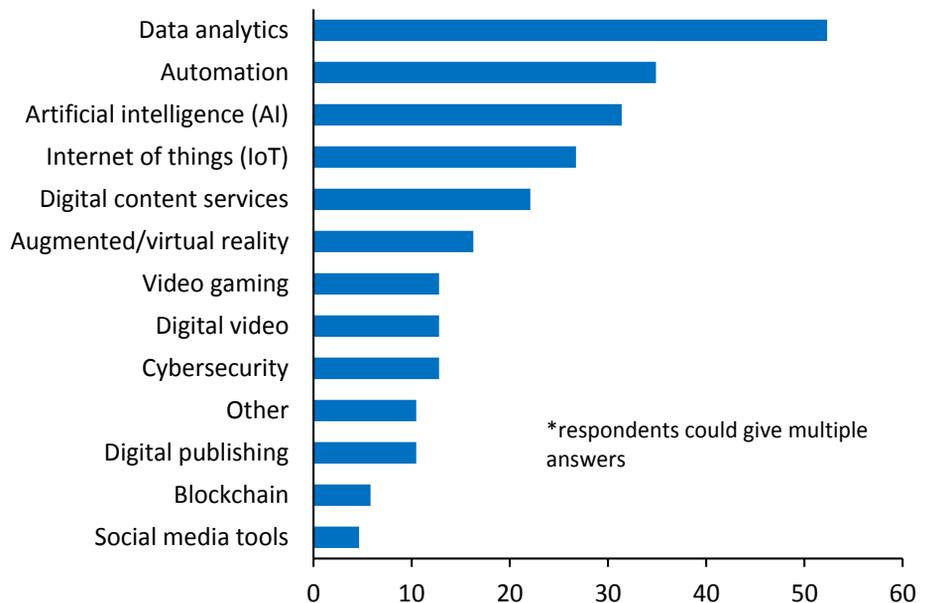
Over half of Atlantic digital technology firms have a focus on data analytics

There are several emerging specialties in the digital industry that are creating new sub-industries within the economy. Some are more prevalent within Atlantic digital technology firms. Many of these technologies are being adopted by existing firms, creating local demand for these services. However, the main market for these technologies is outside of Atlantic Canada.

The most common digital specialties where Atlantic firms provide proprietary products or services are data analytics (52%), automation (35%) and artificial intelligence (AI) (31%).

Many digital technology firms are using multiple specialties to develop products. The most common pairings are automation and data analytics (26% of firms), AI and data analytics (24%) and Internet of Things and data analytics (19%). The most common triplet for digital specialties was data analytics, automation and AI which was prevalent in 15% of firms.

Fig. 7 - Atlantic Digital Technology Specialty, (% of respondents*)



*respondents could give multiple answers

Source: Survey of Digital Technology Firms

See page P7-P12 of the profiles section for more information on digital technology specialties

Digital Technology Firms in Atlantic Canada: Location – Urban and Rural

Over 90% of Atlantic digital technology firms are located in the larger cities

Cities dominate digital technology activity in Atlantic Canada. Of the 463 firms in APEC's database, 432 are in the region's seven largest cities. Halifax leads the way with 205 companies (44%). St. John's and Charlottetown dominate in their provinces and the three New Brunswick cities all have clusters of firms with Fredericton slightly ahead.

Fredericton and Halifax have the highest shares of their labour force in digital occupations* at 6.3% and 5.9% respectively. These rates are among the highest in Canada. The higher rates of digital workers leaves them well placed to expand their digital industries. Rural areas (outside the seven major cities) have a much lower incidence of digital workers ranging from 1.4% in rural Newfoundland and Labrador to 2.2% in rural Nova Scotia.

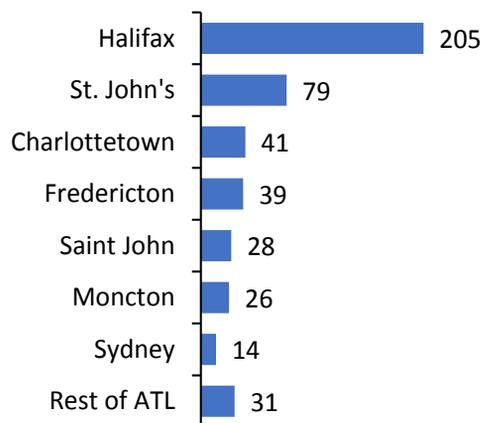
Growth rates in the digital labour force between 2011 and 2016 are strong in most cities led by Charlottetown and Halifax. Sydney and Moncton had declines in their labour force.

Halifax and Fredericton have the highest rates of digital workers in Atlantic Canada

Governments and telecommunications providers have done a good job of getting Atlantic Canada's cities wired with high speed internet access. However, the same cannot be said for rural areas. To fully participate in the digital economy, rural firms and workers need access to high-speed internet. Federal and provincial strategies to address the issues are supportive but are being rolled out much more slowly than originally planned.

*A list of digital occupations and their descriptions is on page A2 of the Appendix

Fig. 8 - Firms in APEC Database by Location



Source: APEC Database of Digital Technology Firms

See page P5-P6 of the profiles section for more detailed city profiles

Table 1 - Digital Labour Force, by City

	Share of Labour Force, 2016 (%)	Change 2011-16 (%)
Ottawa	9.4	4.4
Toronto	7.6	13.7
Kitchener-Waterloo	6.7	9.1
Vancouver	6.4	21.5
Fredericton	6.3	7.1
Calgary	6.3	11.5
Montréal	6.3	10.9
Halifax	5.9	10.6
Victoria	5.5	3.9
Saint John	5.2	6.6
St. John's	4.8	8.0
Moncton	4.7	-3.0
Charlottetown	4.7	21.0
Winnipeg	4.5	8.8
Edmonton	4.3	7.5
Saskatoon	3.6	17.4
Sydney	2.2	-3.5

Source: Statistics Canada, Census

Digital Technology Firms in Atlantic Canada: Markets

Atlantic Canada, along with the rest of the world, is in the midst of a digital revolution that has led to innovative products, new industries and new companies. In some cases these digital technology companies partner with local firms to test and develop their products. However, Atlantic Canadian companies in other industries tend to be slow at adopting digital technologies (see page 22).

Over 60% of revenues of surveyed firms come from international sales

Atlantic digital technology companies will need to focus on larger markets beyond Atlantic Canada as they scale up. According to the survey that is what many are doing.

Atlantic digital technology firms responded that a majority (62%) of all revenues come from international markets, with 41% coming from the US. The international share of revenues exported by all Atlantic firms is about 30%. This high share of exports points to the innovative and risk taking nature of digital firms. In addition, higher technology adoption rates in US and other countries are more attractive to companies.

Using data from the survey, Statistics Canada's LFE analysis and supply and use tables, APEC estimates that digital technology product exports from Atlantic Canada totalled \$1.6 billion in 2017, which are approaching lobster exports and above iron ore.

Digital products and services are much easier to trade than traditional commodities and are expected to continue to grow rapidly.

APEC estimates that Atlantic digital technology exports totalled \$1.6 billion in 2017

Fig. 9 - Atlantic Canada's Digital Firm Revenues by Geographic Market (%)



Source: Survey of Digital Technology Firms

Table 2 - Exports From Atlantic Canada, 2017

Product	\$ billions
Refined oil	9.3
Crude oil	4.0
Lobster	2.0
Digital products*	1.6
Iron ore	1.4
Tires	1.1
Crab	1.0
Paper products	0.9
Lumber	0.7
Frozen potatoes	0.5
Aerospace	0.4

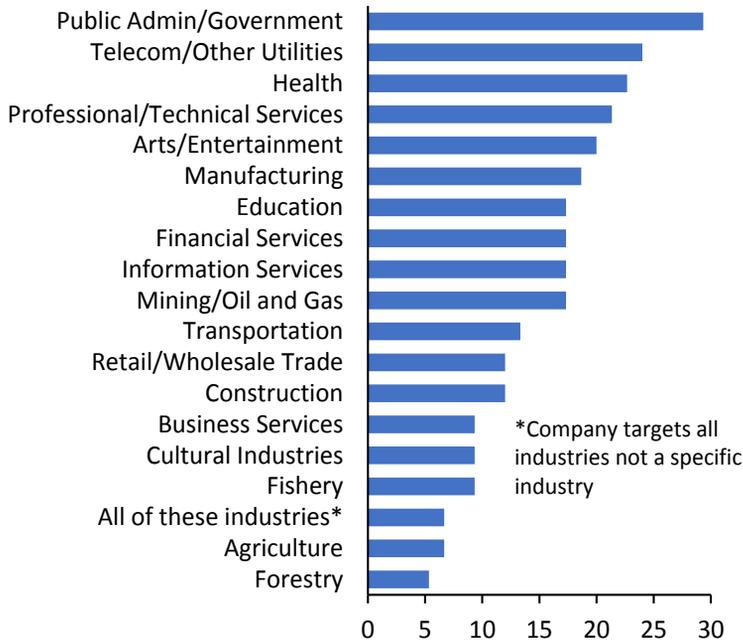
Trade Data Online

*data based on APEC estimate. See methodology section on page A1 for details.

Digital Technology Firms in Atlantic Canada: Markets

Governments are important customers but most revenues come from other businesses

Fig. 10 - Atlantic Digital Technology Firms Customers by Industry (% of respondents)



For Atlantic digital technology firms, government (including health and education) is the most common market buying products and services followed by the telecommunications/utilities industry. Professional services and the arts and entertainment industry are also key markets. Despite the importance of resource industries to Atlantic Canada’s economy, only a small share of Atlantic firms sell to industries such as fishing, forestry and agriculture.

Most companies sell to other businesses (B2B) across a wide range of industries. About half sell to consumers but it only accounts for 16% of revenues. About 30% target government customers but they only account for 7% of revenues.

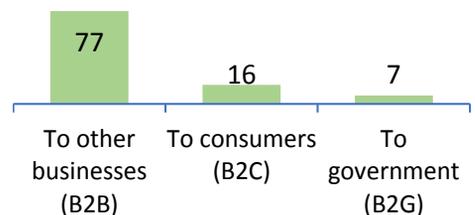
Most Atlantic digital technology firms are seeking to grow through incremental product improvements (86%) and growth in existing markets (85%). Fewer, (63%) focussed on new products and services or new markets.

Fig. 11 - Key Strategies for Market Growth

% of firms responding extremely or very important



Fig. 12 - Estimated revenues shares (% of total surveyed)



Source: Survey of Digital Technology Firms

Digital Technology Firms in Atlantic Canada: National and International Companies



Several large national and international firms are playing a transformative role in bringing Atlantic Canadian firms further into the digital economy. Companies like IBM, Salesforce and CGI employ and train a large share of the local digital workforce. IBM is one of the largest digital employers in the region with major offices in Bedford, Saint John, Fredericton and Florenceville.

Some national and international firms enter or expand in the region after acquiring local firms as in the case of Salesforce with its purchases of Fredericton-based Radian 6 in 2011 and Halifax-based Go Instant in 2012. Others enter the region as a market opportunity and expand based on the strengths of the region. Governments have an important role in partnering with anchor firms which can have a positive long-term impact on the region.

International consulting firms like EY, Deloitte and KPMG are working with clients to provide them with advice on how to pivot their business and prosper in the digital economy. EY opened its Canadian Centre for Advanced Analytics in Halifax in 2014 that provides services for clients in Canada and around the world. EY added a Centre for Excellence in Halifax in 2018 that will focus on robotic process automation.

Canadian companies with a strong local presence are also creating jobs in the region and supporting clients across the country. Telecommunications firms like Bell and Rogers provide digital services for their Canadian clients and have expanded in the region to take advantage of the educated workforce. Similarly, many of the major banks are expanding operations in the region. RBC in Halifax and more recently TD in Dieppe are growing their higher value contact centre and finance operations in the region.

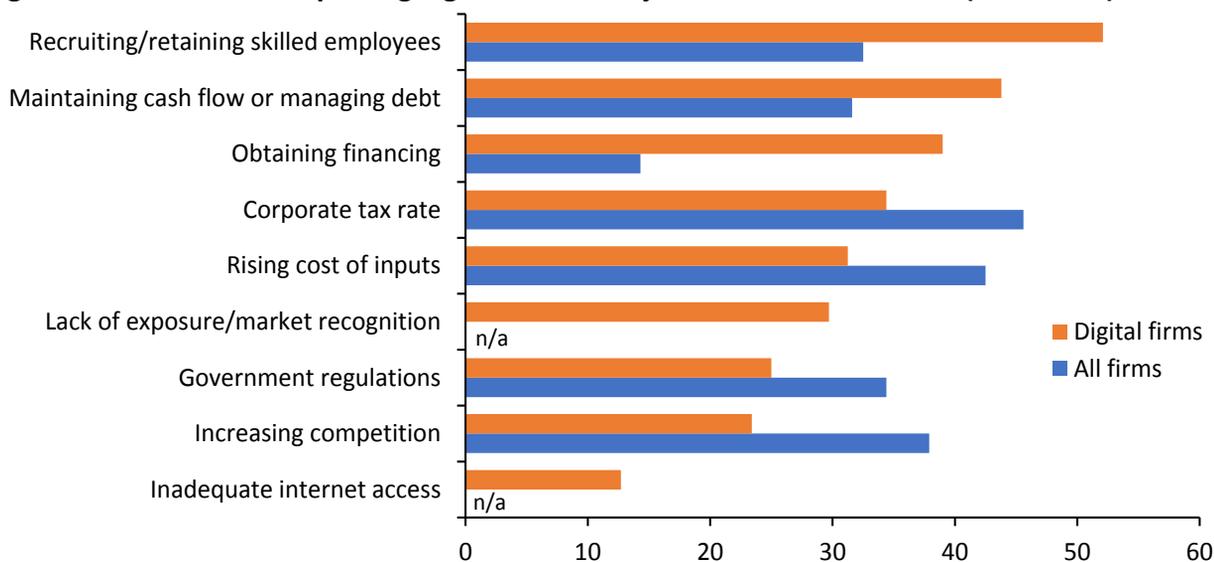
Whether the firms enter or expand through acquisition, incentives or organically, it is clear that they are important contributors to Atlantic Canada's digital economy. They are creating jobs, training workers and providing support services for businesses in the region. These firms are an important part of the critical mass that is required to have a thriving digital economy.

Digital Technology Firms in Atlantic Canada: Overview of Challenges

Labour was identified as the number one challenge for digital technology firms

APEC's survey provides specific data highlighting the challenges facing digital technology firms in Atlantic Canada. Below, those results are compared to other companies in Atlantic Canada under 500 employees.

Fig. 13 - Atlantic Firms Reporting Significant or Major Obstacles to Growth (% of firms)



Sources: APEC Survey of Digital Technology Firms, Statistics Canada Survey on Financing and Growth of SMEs, 2017

n/a – not available

Digital technology firms also struggle with managing finances and obtaining financing

Digital technology firms struggle more with finding talent than most firms. 52% of digital firms identified recruiting/retaining labour as a significant/major obstacle to growth compared to 33% of all firms.

Obtaining financing is the area with the biggest discrepancy between digital and all firms. 39% of digital technology firms find obtaining financing a significant or major obstacle to growth compared to 14% of all firms. Not surprisingly, maintaining cash flow or managing debt is also a larger obstacle for digital firms due to their small size.

Other factors including competition, government regulations, taxes and costs of inputs are less of an obstacle to digital technology firms surveyed.

Digital Labour Force: The Challenge

A talented labour force fuels the digital technology industry. Building that foundation of human capital is critical to the success of the industry. Competition for talent is intensifying, not only in Atlantic Canada but across the country and the world. In addition to the needs of digital technology firms, traditional industries are becoming more digitally focused requiring employees to train to meet those needs or requiring firms to hire trained digital workers to fill those needs. Labour was identified as the number one issue for digital technology firms in the APEC survey. Ensuring that quality labour is available should be a priority for firms, government and post-secondary institutions.

Ensuring that quality labour is available should be a priority for firms, government and post-secondary institutions

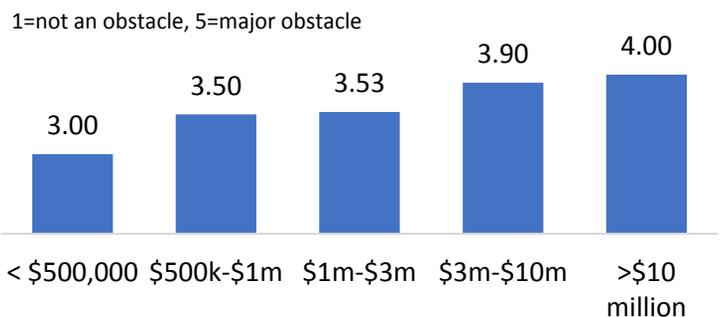
The survey results show that talent issues grow as firms scale up. Early stage firms have enough talent in their small team to establish a product. As a firm grows the challenges intensify. New specialized skills are needed and companies that are scaling-up may find it challenging to acquire the exact employee they need or to take the time to train a new employee to those specifications.

However, there may be a tipping point. Several of the biggest firms in the region that were interviewed stated they can find the labour they need because they have the resources to train them to their specifications even if they do not have all the skills initially.

The labour challenge is consistently an issue across head office locations except for Nova Scotia where the score is notably lower at 2.84 on average. This is likely due to the larger labour supply coming out of post-secondary institutions in Nova Scotia and the larger number of digital technology firms already present, allowing for employee turnover. New Brunswick's average score was the highest at 3.87.

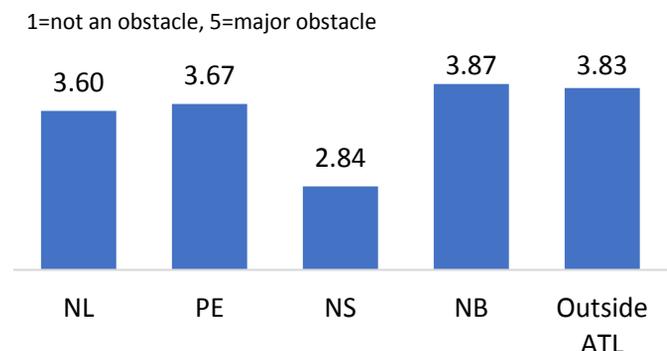
These latter two paragraphs point to the importance of size and density of firms in retaining labour in the region.

Fig. 14 - Average Score of Atlantic Firms Responding that Recruiting and Retaining Skilled Employees are an Obstacle to Growth, by Revenue of Firm



Source: Survey of Digital Technology Firms

Fig. 15 - Average Score of Firms Responding that Recruiting and Retaining Skilled Employees are an Obstacle to Growth, by Head Office Location

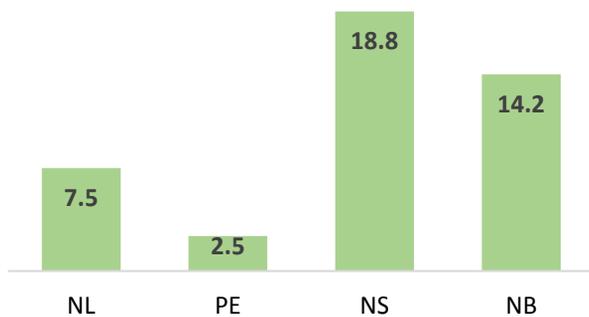


Source: Survey of Digital Technology Firms

Digital Labour Force: Occupations by Industry

There were 43,000 people in Atlantic Canada’s digital industry labour force in 2016

Fig. 16 - Digital Occupations Labour Force 2016, thousands



Source: Statistics Canada, Census

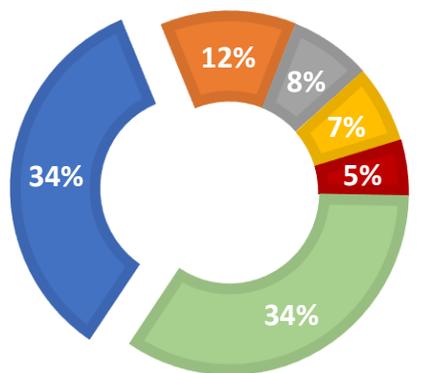
Note: these figures use the occupations listed in Appendix A2 and do not include non-digital ICT occupations.

There were 43,000 people in Atlantic Canada’s digital industry labour force in 2016, which was up 8% from 2011. This was slightly behind the national growth rate of 10%. The main reason for the slower rate of growth in Atlantic Canada was a decline in user support technicians (which includes the technical segment of call centre workers). Excluding that group, the rate of growth was 12% which is in line with the Canadian growth rate and above the all-industry growth rate of 11%.

Nova Scotia has the largest digital labour force in Atlantic Canada at 18,800 and the highest share of the total labour force at nearly 4%. Newfoundland and Labrador has the lowest proportion of digital workers at 2.9%.

About two-thirds of digital employees are in industries outside the core digital sector

Fig. 17 - Digital Occupations by Industry, 2016



- Core digital industries
- Public admin
- Wholesalers
- Manufacturing
- Education
- Other

Source: Statistics Canada, Census

Only 34% of the Atlantic Canada’s digital labour force is in the core digital industries (information and cultural industries and computer systems design). Most of the growth in Atlantic Canada’s digital labour force between 2011 and 2016 was in those core digital industries. The volume of digital workers is high in the public sector, wholesaling and manufacturing.

The unemployment rate for digital occupations is very low compared to other industries. The 2016 unemployment rate was 4.7% in Atlantic Canada for the digital labour force compared to 11.7% for all industries.

There is limited data available on wage rates in the digital industry but national data show that the computer systems design and information processing industry wages are 60-80% higher than the all-industry average.

A list of digital occupations is in the Appendix on page A2

Digital Labour Force: Demand for Labour

Over half of survey respondents are having difficulty finding software developers

In our sample, Atlantic digital technology firms surveyed expect to hire over 2,100 people, doubling their workforce over the next three years. While this estimate may turn out to be optimistic, it highlights that most of these firms expect to continue to grow rapidly over the next few years. It also points to the large demand for workers that Atlantic digital technology firms will need over the next three years.

Service Canada estimated, on a customized analysis for APEC, that there will be 4,700 job openings for digital occupations in Atlantic Canada between 2018 and 2020 with 3,240 coming from attrition (retirements and other) and 1,425 from new jobs created. This leads to a job openings rate of 3% for digital occupations compared to 2.5% for all industries. The new job growth is higher for digital occupations but attrition rates due to retirement will be lower due to a younger labour force.

The highest rates of growth are expected for software engineers and designers (3.2% per year) and computer programmers and developers (2.8%). The Information and Communications Technology Council (ICTC) has estimated³ that Atlantic Canada's ICT industry will require about 6,900 new employees between 2017 and 2021. That is about 3% of the 216,000 required nationally.

With unemployment rates falling to their lowest level since the early 1970s, job vacancies are rising across the country. Job vacancies for computer and information professionals (which is a large subset of the digital industry) increased 33% nationally in 2018 to 5,000 people. In Atlantic Canada there are also signs that pressures are intensifying. The number of job vacancies for the computer and information professional industry in Atlantic Canada has increased from 195 people in Q4 2015 to 480 in Q4 2018.

Software developers were the most frequently identified occupation that is a challenge to find in the APEC survey of digital technology firms (highlighted by over half of respondents). Roles required include senior developers, full stack and UX developers, C+ developers and machine learning. Other occupations with notable response rates were marketing/sales, software engineers and data scientists.



Software Developers - write, modify, test and support source code of a software application. This job usually requires a post-secondary degree or diploma and has significant math requirements.

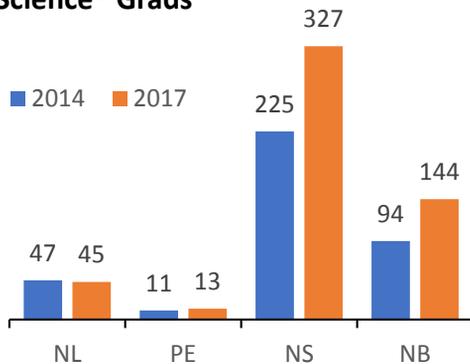
The average estimate is that about 2,000 new digital workers will be needed per year in Atlantic Canada

REDspace is a digital studio specializing in web, mobile, gaming, and video solutions. The company is actively recruiting staff for its operations in Bedford which currently has about 200 employees. REDspace has struggled to find enough labour in the local market and is strengthening its workforce in part through the Atlantic Immigration Pilot. www.youtube.com/watch?v=bAhuMcEQgzs. To attract labour the company also has a strong focus on its office environment, competitive compensation, and work-life balance.

Digital Labour Force: Supply of Labour

There were 1,358 graduates from digitally-focussed programs in 2017, well below the 2,000 required by industry

Fig. 18 - University Computer Science* Grads

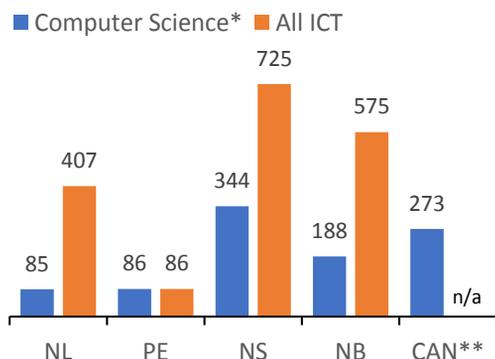


Source: MPHEC, Memorial

* Includes graduates of computer science, computer engineering and software engineering

A list of digitally-focussed post-secondary programs is on page P17 of the profiles section and university research & entrepreneurial support programs are on P16

Fig. 19 - Graduates per 100,000 people, 2017



** 2015 data

Source: MPHEC/Memorial/Community Colleges/Statcan

New entrants to Atlantic Canada’s digital industry labour force largely come from the region’s post-secondary education institutions but also through migration within Canada and immigration. The total number of digitally-focussed graduates from Atlantic Canada’s post-secondary institutions increased by 19% from 1,139 in 2015 to 1,358 in 2017. The strong growth is positive but the supply is well below the 2,000 required by industry.

The number of graduates in university computer science programs increased strongly in Nova Scotia and New Brunswick between 2014 and 2017. Enrollments in New Brunswick have leveled off suggesting slower growth ahead in that province. Graduates in PEI and Newfoundland and Labrador are unchanged. Universities struggle to ramp up programming quickly to meet the needs of a changing economy. University budgets are fairly fixed, with the complication of tenured professors and several layers within the university that need to be aligned in order to pivot resources. Increasing programming in one area often means reducing focus in another area.

Community colleges are increasing their focus on digital technology related programs. Graduates have increased from 388 in 2015 to 620 in 2018 with the fastest growth in New Brunswick. The colleges offer courses in web development, network and database administration, and electrical and electronic engineering. New programs are also being added to meet the changing needs of the sector. NBCC, CCNB and NSCC are now offering cybersecurity courses. Data analytics courses and programs in data, business and health analytics are offered at many of the universities and colleges. NSCC offers a course in oceans technology to support that growing sector. Private colleges are also providing workers with diplomas in network support, IT systems, programming, animation and video game design.

Nova Scotia has the highest per capita rate of graduates in computer science programs and in all ICT-related programs. Nova Scotia has a higher rate of graduates compared to Canada, although the Canadian data is from 2015. Canada's Economic Strategy Tables for Digital Industries has set a target of tripling the number of computer science graduates in Canada⁴.

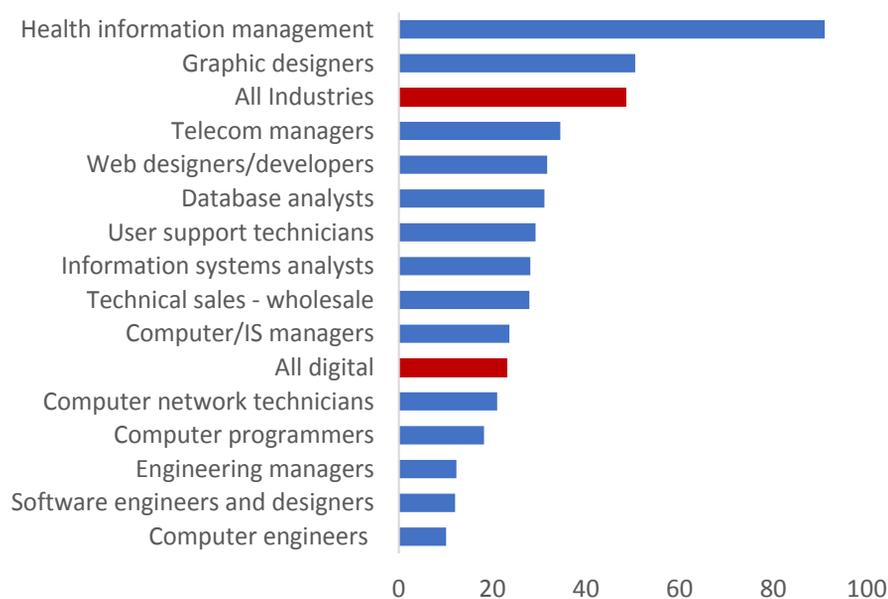
Digital Labour Force: Women

Only 23% of the digital industry labour force is female, a figure that did not improve between 2011 and 2016.

Females comprise 23% of the digital labour force in Atlantic Canada and Canada, about half the rate for all occupations. That rate did not improve between 2011 and 2016. APEC's survey found a similar share for digital technology firms (26%).

Most occupations in digital technology have low rates of female participation – software engineers, computer engineers and computer programmers are all under 20% female. Graphic designers and health information managers are the only occupations with over 50% women.

Fig. 20 - Females as a share of the labour force by Occupation, 2016 (%)



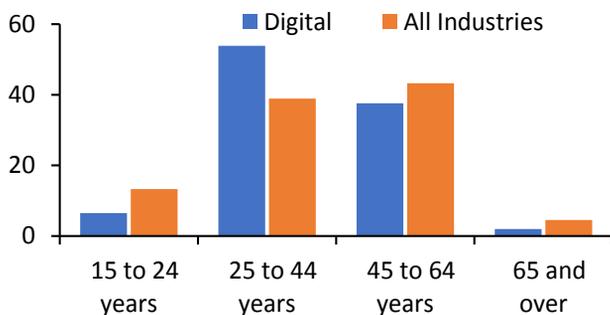
Source: Statistics Canada, Census

Gender diversity has been shown in several studies to improve firm performance. Harbr.com is a data driven company based in Halifax that is working to improve construction productivity. One of its core principles is diversity including a target of 50% women in its workforce.

Only 14% of the Atlantic digital technology firms reported that women make up 50% or more of their employees. Female entrepreneurs are also missing out on the growth in the digital economy. Females are the primary decision-makers for only 9% of the firms surveyed by APEC. This is consistent with a recent Organisation for Economic Co-operation and Development (OECD) study⁵ on the share of women leading digital start-ups in OECD countries.

Digital Labour Force: Age, Immigration and Indigenous

Fig. 21 - Age Distribution of the Labour Force, 2016



Source: Statistics Canada, Census

The digital labour force in Atlantic Canada is younger than most industries. About 61% of the labour force is under 45 in digital technology occupations compared to 52% for all industries. However, there is a lower rate of people in the 15-24 age group in digital technology occupations. Likely because most digital occupations require a post-secondary education.

Recent immigrants account for 11% of the employees in the firms surveyed

Immigration is often suggested as part of the labour force solution for the digital technology industries. Atlantic digital technology firms report on average 11% of employees were recent immigrants (immigrated in the last five years). That is well above the share in all industries in Atlantic Canada which was 2% in the 2016 Census. The higher rate in the APEC survey may be because many of the firms are smaller and are scaling up with recent immigrants as part of the founding team. The immigration strategy seems to be helping and will continue to be a focus as the number of international students at post-secondary institutions continues to grow and immigration levels remain elevated.

The Indigenous share of workers in Atlantic digital technology firms was 1.5% of the total. This may be underrepresented as 10% of the respondents did not know if they had any Indigenous workers. The share of Indigenous workers in the Atlantic labour force was 5.2% in 2016. Digital technology is a growing focus within the Indigenous community and within government funding programs to support increased engagement by Indigenous workers and firms in digital technology industries. There are several digital technology firms owned or largely staffed by Indigenous employees. SmartICE from St. John's works closely with Inuit communities in Labrador to provide climate change adaptation tools using advanced data acquisition and remote monitoring technology. PQA testing from Fredericton is an Indigenous employer providing quality assurance and software testing services. Their PLATO Testing program is graduating Indigenous software testers across Canada.

Indigenous workers account for 1.5% of the employees in Atlantic digital technology firms

Finance and Investment :

Financing

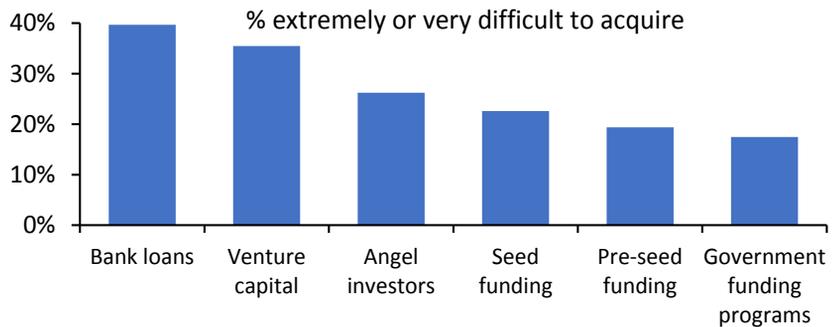
Firms surveyed by APEC found bank loans the most difficult to acquire among the various financing options followed by venture capital. Government funding programs are the easiest to acquire. Firms interviewed found there are adequate financing options available in the early stages but challenges remain as they scale-up.

Venture capital is vital for growth in the ICT sector. Of the \$3.5 billion of venture capital provided in Canada in 2018 about \$2.6 billion or 74% was for the ICT industry. Atlantic Canada has experienced strong growth in venture capital deals in recent years but the rate is still low by national standards. Atlantic-based venture capital is growing but much of the increase is coming from the local firms attracting venture capital from outside the region. Several of the recent larger deals have included venture firms in Toronto, Montreal, Boston, New York and California.

In 2018 there were 64 deals totalling \$158 million in Atlantic Canada⁶. New Brunswick and Nova Scotia led the way with deals totalling \$78 million and \$67 million respectively. New Brunswick's total rose significantly in 2018 led by three large deals. The average deal total over the last five years was \$55 million in Nova Scotia and \$29 million in New Brunswick. In 2018, New Brunswick's rate of venture capital is near the Canadian average while other Atlantic provinces trail. The scale of deals in Atlantic Canada are smaller. The average deal size in Atlantic Canada was \$2.5 million in 2018 compared to \$6.1 million nationally.

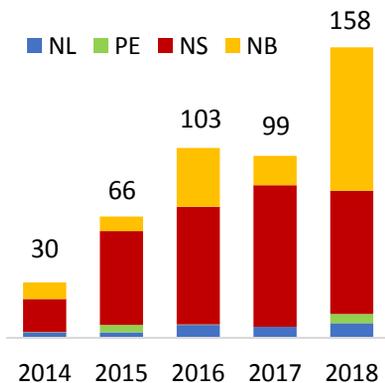
Obtaining financing is a significant obstacle to growth for 39% of Atlantic digital technology firms

Fig. 22 - Atlantic Firms Reporting Difficulty Acquiring Financing



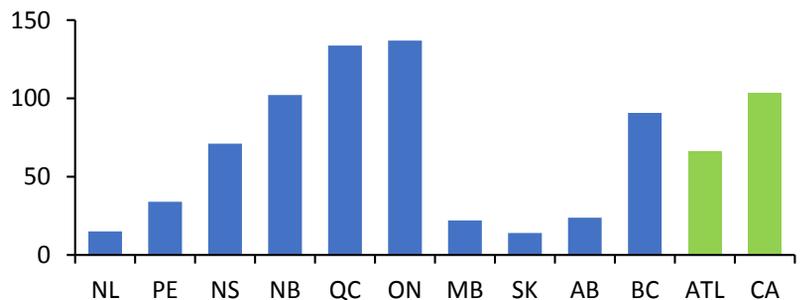
Source: Survey of Digital Technology Firms

Fig. 23 - Atlantic Venture Capital Deals (\$millions)



Source: CVCA

Fig. 24 - Venture Capital by Province, 2018 (\$ per capita)



Source: Canadian Venture Capital Association (CVCA)

Research and Development (R&D)

Digital technology firms are driving the recent surge in research and development in Atlantic Canada

Atlantic Canada’s investment in R&D by the ICT business sector grew strongly between 2014 and 2016 in step with significant growth in venture capital funding in the region. There has been a strong improvement in ICT industry investment in R&D across Atlantic Canada but it is still well behind national levels. New Brunswick leads the region in growth between 2010 and 2016 at 27% per year and relative spending by business on ICT R&D at \$97 per capita. However, in 2016 it was still only 57% of the national average.

Universities in the region are keeping pace with R&D at national levels. Newfoundland and Labrador and Nova Scotia lead the country in university R&D per capita while New Brunswick and Prince Edward Island have the weakest in Canada. Overall R&D in Atlantic Canada (1.2% relative to GDP) trails Canada (1.6%) and is well behind the US (2.7%) and the OECD average (2.4%).

About 58% of digital technology firms surveyed are spending over 20% of their revenues on research and development (R&D). A majority of firms are innovating rapidly. Many are in the early stages and using venture capital and other financing to continue to develop digital products.

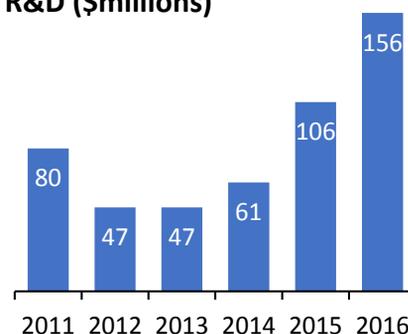
The share that companies spend on R&D declines based on size of company. Firms with under \$1 million in revenue spend about 22% on R&D while those with over \$20 million in revenue spend only 4%.

Table 3 - R&D Spending by ICT Businesses and Universities

	Business ICT R&D		University R&D	
	Avg. change 2010-2016 (%)	\$ per capita 2016	Avg. % change 2010-2016	\$ per capita 2016
NL	7.1	38	9.5	488
PE	25.0	34	-1.0	270
NS	17.3	60	2.1	442
NB	27.4	97	3.7	245
QC	5.1	147	3.9	420
ON	3.9	255	3.9	408
MB	3.7	62	3.1	306
SK	0.7	23	0.2	292
AB	-0.7	51	3.3	348
BC	13.9	178	4.6	330
ATL	19.4	65	3.9	378
CA	5.1	169	3.8	382

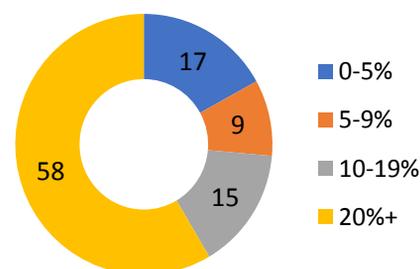
Source: Statistics Canada

Fig. 25 - Atlantic Business ICT R&D (\$millions)



Source: Statistics Canada

Fig. 26 - % of firms responding by share of revenues invested in R&D



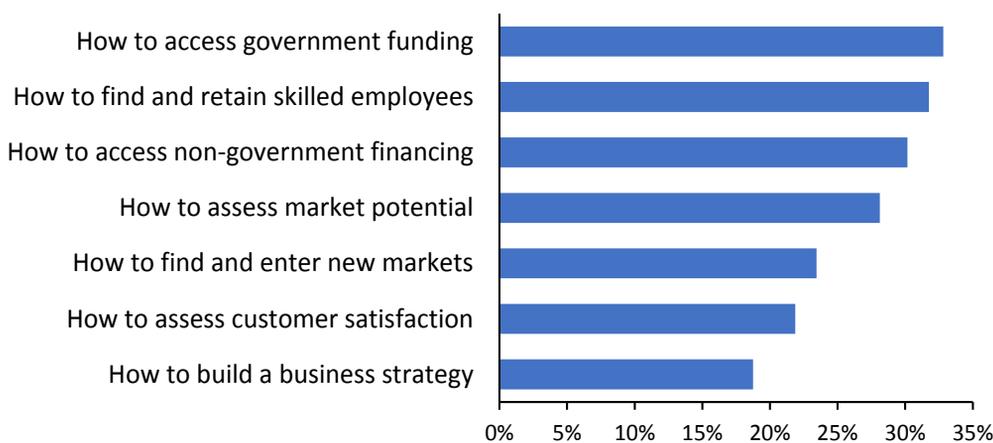
Source: Survey of Digital Technology Firms

Finance and Investment : Government

There is a broad suite of government programs for digital companies but firms have difficulty understanding which ones are right for them

In the survey of digital technology firms, APEC asked in what areas firms could use advice. The top area is how to access government funding. Governments play an important role in many aspects of the creation, growth and success of digital technology firms in the Atlantic region. There are a multitude of programs available to provide financing, support hiring and training, expand research and aid market development. While there is a broad suite of programs for digital companies, many have difficulty understanding which ones are right for them.

Fig. 27 - Digital Technology Firms who Definitely or Could use Advice (% of respondents)



Source: Survey of Digital Technology Firms

A summary of government support programs for digital and other technology firms is on page P15 of the profiles section

For a small firm with a limited pool of funds - and a large share of it focused on research and development - it is challenging to find the time to investigate and identify the appropriate government support programs. It often takes too long to get approved for funding, which makes investment decisions harder.

The federal Scientific Research and Experimental Development (SR&ED) Program is an important program that is a challenge to access for many digital technology firms. The report from Canada's Economic Digital Strategy Table suggests a modernization of SR&ED should focus more on firms scaling up. This includes prioritizing credits for commercialization, not just the creation of research, and ensuring that the type of R&D done by digitally-based firms is eligible.

Companies also need advice on finding and retaining skilled employees. There is a role for government to play to support companies in their search for labour. The Atlantic Immigration Pilot is an important step forward on immigration and finding international workers that meet the needs of local companies.

Government also can lead by example. Early adoption of digital technologies not only improves its efficiency but supports the growth of local firms.

Digital Economy: Early Adoption

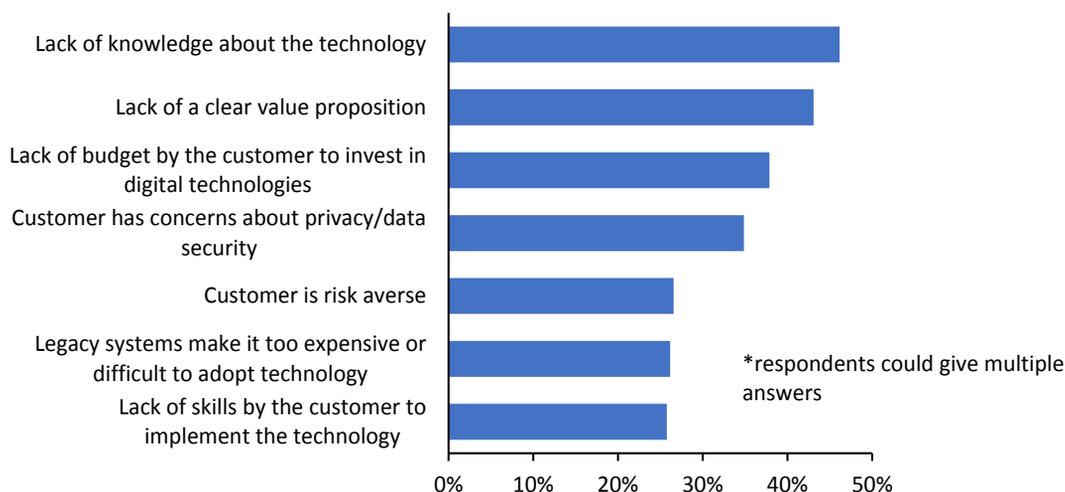
Atlantic digital technology firms may partner with local firms or organizations in the early stages of their product development. For example, Beauceron worked closely with the City of Fredericton as it advanced its cyber software product. Resson, a data-driven agriculture technology company from Fredericton connected with McCain Foods of Florenceville in its early stages. McCain along with several partners invested \$14 million in Resson and is now a strategic partner. SpryPoint, a software company from Charlottetown providing products for the utilities market, has been working with the Summerside electrical utility as it scales up.

However, many other digital technology companies go into international markets because of the higher rates of adoption of digital technologies. Dash Hudson of Halifax found a market niche and went after the world's top brands and publishers. The company has worked with Amazon, Vanity Fair, Condé Nast and Kate Spade.

Atlantic firms report that a lack of knowledge of digital products and their value proposition are the biggest barriers to selling their products. Limited understanding of digital technologies by adopting firms allows existing technologies to continue despite some understanding that digital technologies could help the company. From the perspective of the provider of the technology, finding sales and marketing people that can articulate how the technology can make a difference is crucial. Lack of a digital budget points to how firms have yet to commit enough resources to digital products as part of their overall strategic plan.

Firms are hesitant to adopt new technologies due to their lack of knowledge of the technology and a clear value proposition

Fig. 28 - Share of the firms that rate the following barriers to selling digital products/services to customers as extremely or very important?



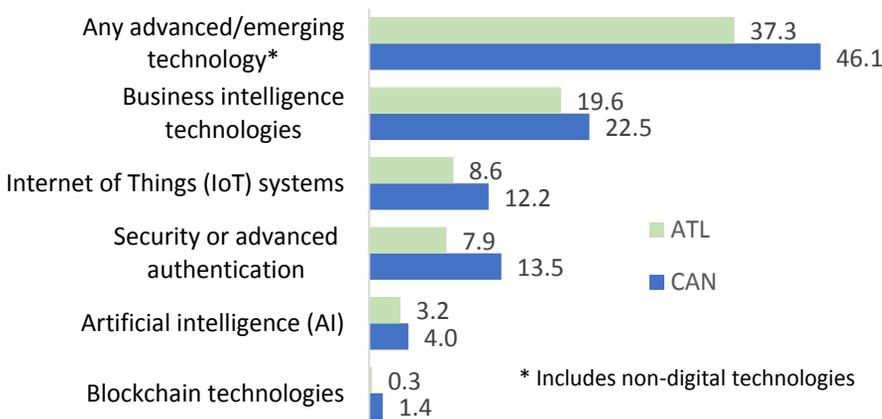
Source: Survey of Digital Technology Firms

Digital Economy: Technology Adoption

Atlantic Canadian firms trail in terms of adoption of technologies generally and in every one of the digital technologies

The adoption and dissemination of technologies drive innovation and productivity in business. Technology adoption rates are low in Canada compared to other innovative economies, especially the US. In Atlantic Canada the picture is more bleak. The data shows that Atlantic Canadian firms trail in terms of adoption of technologies generally and in every one of the specific digital technologies. About 46% of firms nationally are using some form of advanced technology in their business compared to 37% in Atlantic Canada. That includes the technologies listed below but also non-digital technologies like advanced manufacturing, clean technology, nanotechnology or supply chain/logistics technologies. This low rate is partly due to the small size of firms in Atlantic Canada.

Fig. 29 - Share of Firms Using Advanced or Emerging Technologies, 2017



Source: Statistics Canada, Survey of Innovation and Business Strategy

Table 4 - Share of Firms Using Advanced or Emerging Technologies, 2017 (%)

	CAN	ATL
Information and cultural	63	64
Transportation	48	52
Professional services	64	47
Financial services	57	44
Manufacturing	54	43
Wholesale trade	57	39
All Industries	46	37
Retail trade	30	34
Agriculture, forestry, fishing	44	33
Mining and oil & gas	46	31
Construction	40	27

Source: Statistics Canada, Survey of Innovation and Business Strategy

The national figures show that the rate of adoption of these technologies increases along with firm size. The use of these technologies by firms with 20-99 employees was 44% compared to 63% for firms with over 250 employees.

Atlantic firms have 13% lower adoption rates for business intelligence technologies like cloud computing or data analytics products and are 41% behind in security or advance authentication technologies.

Certain industries in Atlantic Canada are better than others at adopting technologies. The transportation and the information and cultural industries are among the leading adopters and are above the national average. The resource and construction industries are the weakest adopters and are well behind the rest of Canada.

Digital Economy: Growth Clusters

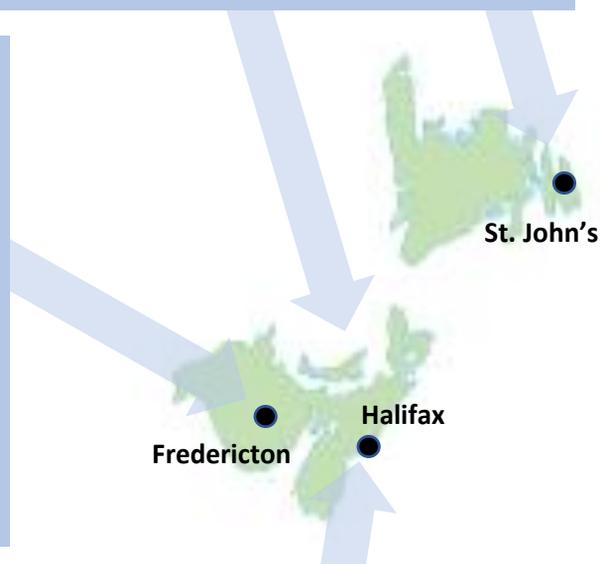
Clusters of firms are widely regarded as a key to success in firm growth and the attraction of labour.

Atlantic Canada's digital technology firms are typically small but are finding traction in international markets, especially in the US. The firms are responding not only to the needs of the Atlantic region but the global marketplace. Clusters of firms are widely regarded as a key to success in firm growth and the attraction of labour. There are clusters of firms emerging in Atlantic Canada in oceans tech and digital health and in specialty areas like data analytics, cybersecurity, sensor technology and automation. As noted earlier, the major cities in the region are also building clusters of firms, especially in Halifax, St. John's, Fredericton and Charlottetown. National and international firms have noticed and are expanding their presence in the region.

Oceans Cluster – Atlantic Canada has a wide range of firms, many of them digitally focused, that are creating innovative products in oceans industries including in oil and gas, fisheries, shipbuilding and defence, aquaculture, transportation, marine renewables and ocean and remote sensing. Several firms active in the region use remote sensor technology, robotic vehicles and data analytics to support activities in harsh environments. In 2018, Canada's Ocean Supercluster initiative was announced that will see \$306 million invested by the federal government and private sector partners in Atlantic Canada. The project will expand on resources already in place including the Oceans Frontier Institute, the Centre for Ocean Ventures and Entrepreneurship and Petroleum Research Newfoundland and Labrador among others. Kraken Robotics received \$20 million in the first project under the Oceans Supercluster funding in June 2019. Significant funding for research at the region's universities along with support for innovation and commercialization of firms is expected to create and support the scaling up of oceans-related firms in Atlantic Canada over the next decade. Entrevestor⁷ has estimated there were 35 Oceantech start-ups in Atlantic Canada as of October 2018.

New Brunswick Cybersecurity Cluster – In 2011 IBM paid a reported \$600 million for Fredericton-based Q1 Labs. Since that time IBM along with UNB, the province and other stakeholders have been supporting a growing cluster of cybersecurity activity in the Fredericton area. In 2016, Opportunities NB, launched Cyber NB and subsequently invested jointly with ACOA in the creation of the Canadian Institute for Cybersecurity (CIC) at UNB and in the development and roll out of specially designed K-12 and post secondary curriculum. Building on this momentum, the Fredericton area is now seeing incremental investments from Siemens, Canadian Nuclear Laboratories, Difenda, Bulletproof and Global Intelligence as they expand their cyber presence in the area. New cyber start-ups, such as Sonrai Security, Beauceron and others, are attracting global interest and venture capital as they begin to scale their operations.

The Halifax Innovation District is a corridor of firms and supporting organizations in Halifax that is being championed by the Halifax Partnership and others in the community. The District includes Dalhousie, St. Mary's and NSCC, the Centre for Ocean Ventures and Entrepreneurship, Volta, Digital NS, Build Ventures and other public sector partners like the National Research Council, NSBI and Innovacorp all clustered with many of the established and rising stars of innovation. APEC has identified 205 digital technology firms in the Halifax area ranging from start-ups to firms like IBM and CGI who have realized the potential of the city. The Halifax Innovation District is a growing critical mass of ideas where companies can get support and mentorship along their entrepreneurial journey.



Conclusions

Atlantic digital technology firms are small but are growing strongly. The industry is very innovative, attracts a majority of the region's venture capital and dominates business spending on research and development in Atlantic Canada. Firms are very export focussed at twice the rate of the overall economy in the region. However, they are facing significant headwinds and are small compared to digital technology firms in the rest of Canada.

Significant growth in the digital labour force is needed to sustain its progress. Forecasts suggest that annual demand for digital workers in Atlantic Canada will be about 2,000 per year over the next few years while supply was about 1,350 from Atlantic post-secondary institutions in 2017. Immigration could close some of that gap but there is also no guarantee that those coming out of post-secondary programs will stay in the region. Density of firms is also seen as important to retaining labour in the region. If employees have more options for employment they can progress through their career without leaving Atlantic Canada. Responsive post-secondary institutions, effective immigration and a commitment by firms to train employees is critical for future growth.

Several programs are currently available to support or finance firm start-ups in the digital sector. However, funding to support firms as they scale-up is more difficult to find. Mentoring and advisory services are also crucial during the growth phase. Finding the right pace of growth based on the skills and financial resources available is a difficult balancing act that only someone that has been through it can understand. Training new employees is difficult for small firms that are in a rapid growth phase.

Atlantic Canadian firms are falling behind in technology adoption. This creates challenges for digital technology firms looking to test or sell their products in the local market. This is partly due to the small size of firms in Atlantic Canada. Firms in Atlantic Canada are also hesitant to invest in technologies they do not understand. Atlantic Canada's connections to the national ecosystem also need to improve to ensure the region's companies and stakeholders are taking full advantage of national strategies.

Firms need help navigating the broad suite of programs offered by government. There are a wide variety of program options between the federal and provincial governments, but firms have difficulty understanding which ones are right for them and which ones yield funds quickly. Although government financing programs are ranked as the easiest to acquire once identified.

Atlantic digital technology firms can support technology adoption and improve productivity of other firms in Atlantic Canada. The importance of this industry has often been understated, as it goes beyond the core group of firms that is creating digital products in Atlantic Canada. It transcends across all sectors of the economy. Many of the region's firms, led by larger local and international companies are creating new products and technologies that will drive the region's productivity in the future. However, larger digital firms are needed. Small firms are less resilient to the challenges of global competition than large companies with resources for research and acquiring skilled talent.

Areas of Further Research

This study provides a better understanding of the size, scope and growth dynamics of digital technology firms in Atlantic Canada. Additional knowledge has been gathered on the opportunities and challenges they are facing so that governments and other organizations that support their growth, including training and education institutions, incubators and accelerators, and financing organizations, can make better decisions and ensure support services are of sufficient scale and appropriate design and scope.

To remain valuable, this information needs to be updated regularly. The methodology and baseline data allow for a more frequent analysis of digital technology firms in Atlantic Canada to better monitor the sector and to assess how existing and new policies are doing to support the growth of this transformative segment of the economy.

Digital technology adoption by Atlantic firms is lagging in every digital technology. How can firms in Atlantic Canada be incentivized to adopt digital technologies? Factors such as a lack of understanding of technologies and firm size are holding back Atlantic companies. Helping firms to understand the benefits of digital technology adoption would encourage them to move ahead. Atlantic companies need to understand the importance of a digital strategy and a cybersecurity strategy. **More research is needed to identify the specific barriers to adoption and what policies would support increased adoption** of digital technologies in Atlantic Canada.

The demand for digital workers will continue at above average rates. **What is the right balance for labour supply?** Universities would like to expand enrollments but need resources to do it. Are colleges a better portal for the future workforce? Collaboration between all stakeholders is needed to ensure the region is producing the right workers for the digital economy. Where can efficiencies be created between post-secondary institutions and industry needs?

Support is needed for training workers in their early stages with firms. Firms scaling-up do not have the resources or time to train. **What is the most efficient way to provide more support for early workplace training in digital technology firms?** Finding ways to increase the level of participation of women in digital occupations and support the growth of more female-led start-ups in the digital sector is an important path to future growth.

There appear to be adequate avenues for early stage firms to acquire financing to establish their products in Atlantic Canada. Financing and support programs need to be expanded to support high-growth potential firms in the scaling-up phase. **More analysis is needed to understand what financing and support programs are most effective for high-growth firms** and how firms can lure more venture capital from outside the region.

Based on firm interviews and APEC's previous research it is likely that more regional collaboration would help reduce inefficiencies and duplication in government programs, training and support organizations. If stakeholders think regionally it could improve the efficiency of support programs. **More research is needed to understand what benefits could come from reducing the overlap of services which may be hindering growth.**

Endnotes

1. US Bureau of Economic Analysis - <https://www.bea.gov/data/special-topics/digital-economy>
2. Statistics Canada - <https://www150.statcan.gc.ca/n1/pub/13-605-x/2019001/article/00002-eng.htm>
3. ICTC - https://www.ictc-ctic.ca/wp-content/uploads/2017/04/ICTC_Outlook-2021.pdf
4. ISED - <https://www.ic.gc.ca/eic/site/098.nsf/eng/00024.html>
5. OECD - <http://www.oecd.org/internet/bridging-the-digital-gender-divide.pdf>
6. CVCA - <https://www.cvca.ca/reports/vc-pe-canadian-market-overview-q4-2018/>
7. Entrevestor - <http://entrevestor.com/ac/blog/ocean-startups-beginning-to-surface>

Digital Technology Firms: Their Importance and Role in Atlantic Canada's Economy

Appendices

Appendix - Methodology

Selection of Digital Technology Firms for the Database

APEC collected a database of technology based firms from various sources including lists from provincial agencies and industry associations. This initial list of nearly 1000 firms included many non-digital firms in other areas of technology and supporting organizations that are not providing proprietary technology.

Firms from the following sectors were not included in the analysis unless they have a core proprietary digital focus:

- Clean Tech (environmental tech, energy storage, alternative energy, renewables, etc.)
- Life Sciences (biotech, diagnostics, medical devices, etc.)
- ICT manufacturing (computers, communications equipment, semiconductors etc.)
- ICT wholesalers (computer and electronic equipment wholesalers)
- ICT retailers (retailers of digital products, ecommerce)
- Chemical manufacturing
- Peer-to-peer economy (sharing economy) – these transactions are part of the broader digital economy.

The APEC definition of digital technology firms (see page 3 for details) was applied to the list by reviewing information about the firms products and services on their website. The analysis did not focus on very early stage start-ups. The list was focussed on more established firms even though many are still small in size.

Survey of Digital Technology Firms

APEC developed a survey early in 2019 for the project. Initial questions were validated by the Industry Advisory Group and included some questions that aligned with Statistics Canada surveys to provide comparable results.

APEC and several partners distributed the online survey in the spring of 2019. APEC received 69 fully completed surveys and another 20 partially completed surveys. APEC also conducted 9 interviews with digital technology firms and 13 interviews with stakeholders in the sector to supplement the survey data.

Revenue and Export Estimates

APEC estimated total **revenues** (output) in the Atlantic digital technology sector, including all businesses (domestic, multi-jurisdictional and international) based on two methodologies. The first used Statistics Canada's estimates of output for the Atlantic digital economy, but deducted digitally-delivered products, e-commerce and hardware infrastructure to align with APEC's definition of digital technology firms.

The second methodology estimated output for the Atlantic digital technology sector using Statistics Canada's Supply and Use Tables, including what APEC determined to be digital industries. The difference between the two valuations was 0.5%. APEC's calculation of the revenues of local digital firms was based on the data from the LFE, the revenues for other firms was the residual between the overall revenues from the above methods less the revenues for local firms from the LFE.

Atlantic digital technology **exports** were derived based on two methodologies. The first used the results from Statistics Canada's LFE, which provided estimates of mean export values for a select number of firms. The second methodology was based on international exports by Atlantic digital technology industry by digital technology product from Statistics Canada's Supply and Use Tables. The two methodologies produced similar results for locally headquartered firms that were then scaled-up to include multi-jurisdictional and international firms with Atlantic operations. The result was also consistent with the scaled-up results from APEC's Survey of Digital Technology.

About the Linked File Environment

APEC developed a database of 463 Atlantic Canada digital technology firms, which was cross-matched with Statistics Canada's Linked File Environment (LFE) to find administrative and Statistics Canada survey data. Statistics Canada conducted the LFE analysis for Atlantic-based businesses only. The LFE analysis produced a custom table for APEC that contained aggregated information. APEC used this information and other data to estimate the overall revenue of digital technology firms based in Atlantic Canada.

Appendix – List of Digital Occupations

The following occupations are included in the analysis of digital occupations in Atlantic Canada. The occupations were selected based on result of a literature review with minor adjustments made by APEC.

More details on individual occupations can be found at noc.esdc.gc.ca/english/noc/welcome.aspx?ver=16

- 0131 - Telecommunication carrier managers
- 0211 - Engineering managers
- 0213 - Computer and information systems managers
- 1252 - Health information management occupations
- 2133 - Electrical and electronics engineers
- 2147 - Computer engineers
- 2171 - Information systems analysts and consultants
- 2172 - Database analysts and data administrators
- 2173 - Software engineers and designers
- 2174 - Computer programmers and interactive media developers
- 2175 - Web designers and developers
- 2241 - Electrical and electronics engineering technologists and technicians
- 2242 - Electronic service technicians
- 2243 - Industrial instrument technicians and mechanics
- 2255 - Technical occupations in geomatics and meteorology
- 2281 - Computer network technicians
- 2282 - User support technicians
- 2283 - Information systems testing technicians
- 5222 - Film and video camera operators
- 5223 - Graphic arts technicians
- 5241 - Graphic designers and illustrators
- 6221 - Technical sales specialists - wholesale trade

Digital Technology Firms: Their Importance and Role in Atlantic Canada's Economy

Profiles and Additional Resources

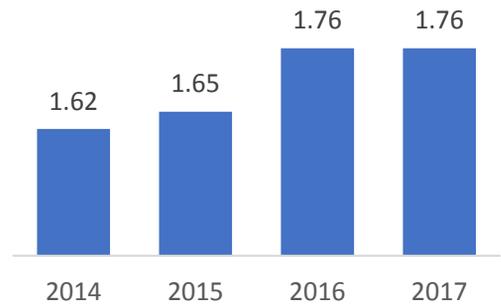
September 2019





Digital firm revenues in New Brunswick totalled \$1.8 billion in 2017. Revenues increased by 2.7% per year between 2014 and 2017, lower than national rate of 5%

Fig. P1 – New Brunswick Digital Industry Revenues, (\$bn)



Source: Statistics Canada

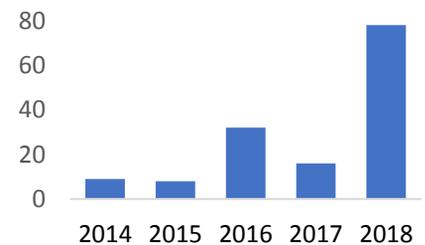
APEC identified 103 digital technology firms in New Brunswick

There are 14,200 people in digital technology occupations in New Brunswick (3.8% of the labour force)

Digital occupations account for 6.3% of Fredericton's labour force which leads Atlantic cities

NB firms landed a record \$78 million in venture capital in 2018, including a large share for digital firms. Sonrai Security (\$24m), Introhive (\$20m), Resson (\$14m) are among the larger deals.

Fig. P2 - NB Venture Capital Deals (\$m)



Source: CVCA

NB leads the region in business sector ICT R&D per capita, but still trails national levels

University R&D per capita is the weakest in the country

144 people graduated from NB university computer science programs in 2017. A further 297 graduated from other ICT related programs at universities and colleges in the province.

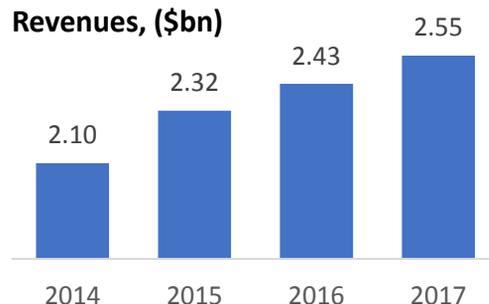
Nova Scotia Digital Industry Profile



Revenues from Nova Scotia digital firms totalled \$2.5 billion in 2017. Revenues increased by 7.1% per year between 2014 and 2017, above the national rate of 5%

APEC identified 237 digital technology firms in Nova Scotia

Fig. P3 - Nova Scotia Digital Industry Revenues, (\$bn)



Source: Statistics Canada

There are 18,800 people in digital technology occupations in Nova Scotia (4% of the labour force)

Nova Scotia's rate of computer science graduates per capita is the highest in Atlantic Canada and above the national average

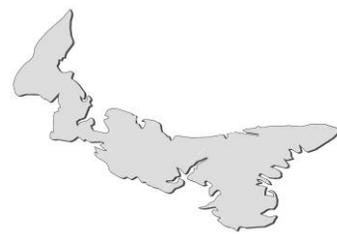
Nova Scotia graduated 689 people from ICT related programs at universities and colleges in 2017

Nova Scotia business sector ICT R&D is growing but is still only 35% of national levels

University R&D per capita is the second highest in Canada

Halifax dominates digital firm activity with 86% of firms and 71% of employment

Prince Edward Island Digital Industry Profile



Revenues from Prince Edward Island digital firms totalled \$330 million in 2017. Revenues increased by 6% per year between 2014 and 2017, above the national rate of 5%

Fig. P4 – Prince Edward Island Digital Industry Revenues, (\$mn)



Source: Statistics Canada

APEC identified 43 digital technology firms in Prince Edward Island

There are 2,500 people in digital technology occupations in Prince Edward Island (3.3% of the labour force)

The digital labour force increased by 14% between 2011 and 2016, the fastest rate of growth in Atlantic Canada and above the national average

Prince Edward Island business sector ICT R&D is growing but is lowest per capita in the country

University R&D is the second lowest per capita in Canada

Charlottetown dominates digital firm activity with 70% of the province's digital employees

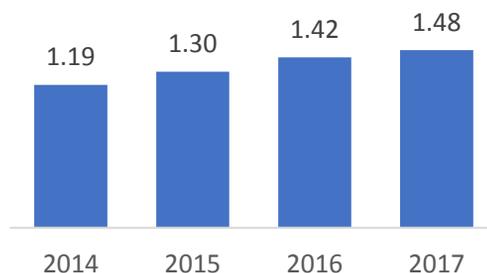
Newfoundland and Labrador Digital Industry Profile



Revenues from Newfoundland and Labrador digital firms totalled \$1.5 billion in 2017.

Revenues increased by 8% per year between 2014 and 2017, above the national rate of 5%

Fig. P5 – Newfoundland and Labrador Digital Industry Revenues, (\$bn)



Source: Statistics Canada

APEC identified 80 digital technology firms in Newfoundland and Labrador

There are 7,450 people in digital technology occupations (2.9% of the labour force). The share of the labour force in digital occupations is the lowest in Atlantic Canada

The digital labour force increased by 11% between 2011 and 2016

Newfoundland and Labrador venture capital totaled a record \$8 million in 2017

Business sector ICT R&D rates are the second lowest per capita in Canada

University R&D per capita is the highest in Canada

St. John's dominates digital firm activity with 73% of the province's digital employees

City Digital Industry Profiles

Halifax

- APEC identified 206 digital technology firms in Halifax – 44% of the Atlantic total
- Digital occupations make up 5.9% of the labour force
- The digital labour force grew by 10.6% between 2011 and 2016
- In 2016 there were 13,300 people in the digital workforce – 71% of the provincial total
- The top digital occupations were information systems analysts (2,505) and computer programmers (1,420)
- Dalhousie, St. Mary's, the NSCC, Digital NS, several funding and support agencies, oceans research, NSBI and other public sector agencies are clustered in the city. See page 23 for a summary of the Halifax Innovation District

Local HQ digital firms include...

Dash Hudson, Manifold, Kinduct, Affinio, Mobia Technology, Athletigen, Eastlink, Proposify, Simplycast, Squiggle Park, Bluelight Analytics, REDspace

Other producers of digital technologies include...

IBM, CGI, Bell, Rogers, Telus, NTT Data, Ubisoft, EY, Savormetrics, Secure State Cyber

* Please note the selected firms are examples of firms in each city

St. John's

- APEC identified 79 digital technology firms in St. John's
- Digital occupations make up 4.8% of the labour force
- The digital labour force grew by 8% between 2011 and 2016
- In 2016 there were 5,465 people in the digital workforce – 73% of the provincial total
- The top digital occupations were information systems analysts (790) and computer network technicians (550)
- Memorial University, College of the North Atlantic, the Genesis Centre, the Newfoundland and Labrador Association of Technology Industries, Oceans Advance, Pelorous Venture, Killick Capital, Bounce Innovation and provincial and federal government departments are clustered in St. John's

Local HQ digital firms include...

Verafin, Genoa Design, Bluedrop Performance Learning, Hey Orca, Kraken Robotics, Sequence Bio, Celtx, Radient360, Best Boy Entertainment

Other producers of digital technologies include...

Hatch, Bell, Imperva Canada, Inmarsat, Integrated Informatics

Charlottetown

- APEC identified 41 digital technology firms in Charlottetown
- Digital occupations make up 4.7% of the labour force
- The digital labour force grew by 21% between 2011 and 2016, one of the strongest rates of growth in the country
- In 2016 there were 1,760 people in the digital workforce – 70% of the provincial total
- The top digital occupations were information systems analysts (300) and computer programmers (275)
- UPEI, Holland College, Atlantic Technology Centre, Island Capital Partners, Start-up Zone, Launch Pad PEI, Innovation PEI and federal departments are part of the digital ecosystem in Charlottetown

Local HQ digital firms include...

Sprypoint, ReviQ, Stepscan, Timeless Medical, Screenscape Discoverygarden, forestry.io

Other producers of digital technologies include...

EA Games, Buchanan, Deltaware, Mphasis, Carta Worldwide

City Digital Industry Profiles

Fredericton

- APEC identified 39 digital technology firms in Fredericton
- Digital occupations make up 6.3% of the labour force, the highest rate in Atlantic Canada
- The digital labour force grew by 7% between 2011 and 2016
- In 2016 there were 3,485 people in the digital workforce – 24% of the provincial total
- The top digital occupations were information systems analysts (635) and computer programmers (555)
- UNB, NBCC, NBIF, Planet Hatch, Energia Ventures, CyberNB, SmartGrid Innovation Network, Ignite Fredericton are clustered in the city

Local HQ digital firms include...

Resson, Remsoft, Routinify, Bulletproof, Sonrai Security, Beauceron, Eigen Innovations, Hotspot, Introhive, Simptek, Smart Skin

Other producers of digital technologies include...

IBM, Siemens, Difenda, Salesforce, Global Intelligence

Saint John

- APEC identified 28 digital technology firms in Saint John
- Digital occupations make up 5.2% of the labour force
- The digital labour force grew by 6.6% between 2011 and 2016
- In 2016 there were 3,385 people in the digital workforce
- The top digital occupations were information systems analysts (530) and computer network technicians (305)
- UNBSJ, NBCC, East Valley Ventures, TechImpact are supportive environments for digital firms in Saint John

Local HQ digital firms include...

Innovatia, Mariner Partners, ProcedureFlow,

Other producers of digital technologies include...

IBM, T4G, Bell, Patriot Technologies (Eh Eye)

Moncton

- APEC identified 26 digital technology firms in Moncton
- Digital occupations make up 4.7% of the labour force
- The digital labour force declined by 3% between 2011 and 2016
- In 2016 there were 3,730 people in the digital workforce –The top digital occupations were information systems analysts (720) and computer programmers (420)
- NBCC, CCNB and Venn Centre are among the supportive partners

Local HQ digital firms include...

Atlantic Lottery, Alongside, Fiddlehead Technologies, Gogii Games, RtTech Software Masitek, Repable,

Other producers of digital technologies include...

TD Bank, IGT, Tayana Solutions

Sydney

- APEC identified 14 digital technology firms in Sydney
- Digital occupations make up 2.2% of the labour force
- The digital labour force declined by 3.5% between 2011 and 2016
- In 2016 there were 960 people in the digital workforce –The top digital occupations were user support technicians (120) and computer network technicians (110)
- Cape Breton University, NSCC and Navigate are part of the local digital ecosystem

Local HQ digital firms include...

Swarmio (Ubique Networks), Orenda Solutions, Health Outcomes Worldwide

Other producers of digital technologies include...

Patron Technologies (Marcato)

Digital Technology Specialties: Big Data Analytics

The OECD refers to big data analytics (BDA) as data-driven innovation - “the generation and use of huge volumes of data are redefining our “intelligence” capacity and our social and economic landscapes, spurring new industries, processes and products, and creating significant competitive advantages.”

Good data are essential to making the right business and policy decisions. Businesses understand that they need to unlock the information in their customer databases and universities and governments are working to utilize the vast amounts of data at their fingertips. Leveraging these data can help organizations make predictive decisions, rather than reactive ones and help determine future behaviors and trends.

BDA is the most pervasive and growing digital technology in the region. Atlantic Canada’s BDA firms are targeting health care and life sciences, marine/oceans, primary industries, manufacturing, energy, transportation and social media.

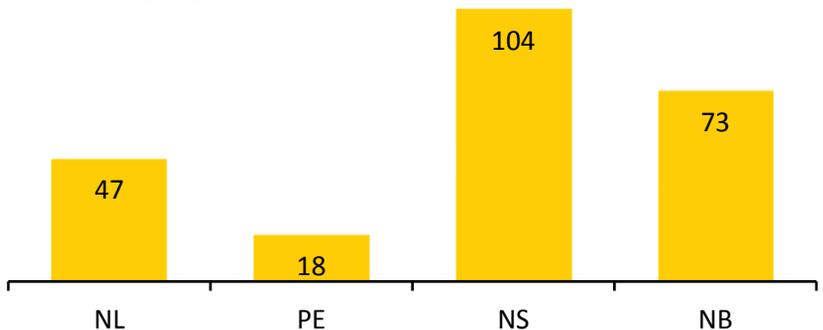
Established local firms like McCain, J.D. Irving and Emera are adopting BDA to create new value within their companies. National and International firms like Bell, IBM, T4G, EY and others are offering services to their clients to support their growth in areas utilizing their own and other data.

52% of digital firms surveyed are active in big data

In the survey of digital firms, big data was identified by 52% of firms as an area where they provide a proprietary service. This was the highest specialty area of focus in the Atlantic region. It is often paired with automation, artificial intelligence and Internet of Things technologies to provide a proprietary product.

Sequence Bio is a data-driven biotechnology company based in St. John’s that is analyzing vast sets of data from gene pools to get a deeper understanding of human biology and use the information to improve the development of drugs.

Fig. P6 - Estimated Number of Digital Technology Firms Providing Big Data Services by Province



Source: APEC Digital Technology Firm Database

The numbers in the chart above are from the APEC digital firm database and are based on how firms publicly describe themselves. These are not necessarily all big data firms but big data is a core component of their business and they offer a proprietary technology. Many leverage big data along with automation, sensor technology or other digital specialties to provide a service. Some provide consulting services to help firms better manage and find value in their data. These numbers do not include the established firms in the region that are increasingly using big data to support business decisions.

Kinduct Technologies of Halifax uses a cloud-based platform that allows human performance, health and wellness organizations to spend less time managing their data and more time using it to inform decisions. The company’s software integrates with emerging technologies and data sources to help produce a more accurate picture of an organization’s current and future predicted state.

Digital Technology Specialties: Internet of Things (IoT)

Internet of Things (IoT) is capturing data from everyday devices that are connected to the internet. The Industrial Internet of Things (IIoT), which includes the use of networked sensors on machinery or remote locations, is helping companies to better understand and improve operations.

The IoT is expected to grow exponentially, connecting many billions of devices in a relatively short time (OECD, 2015). The rapid increase in connectivity will also place demands on communications networks.

Consumer adoption of IoT is increasing including smart devices for controlling temperature, lighting, TV's and smart speakers.

The industrial applications of IoT have wide ranging potential and many of the firms developing sensor and other IoT technologies in Atlantic Canada have been active in the marine, utility and manufacturing industries.

Adoption of IIoT created outside the region is accelerating as well. For example the region's utilities are increasingly using IIoT to monitor performance of assets as well as tracking customer usage (smart meters).

27% of digital firms surveyed are active in IoT

In the survey of digital firms, IoT technology was identified by 27% of firms as an area where they provide a proprietary service. It is often paired with data analytics, automation and artificial intelligence to provide a proprietary product.

RtTech, based in Moncton, uses the Industrial Internet of Things (IIoT) and big data to deliver real-time information to help manufacturers improve asset and utilities usage. Their devices connect to sensors that collect information from assets to pinpoint when and where any part of a system is using more energy than it should be.

Table P1 - Share of Companies Using Internet of Things (IoT) Systems in Their Business, 2017 (%)

	CAN	ATL
All Industries	12.2	8.6
Information and cultural	21.3	26.8
Utilities	18.8	25.8
Transportation	11.9	13.8
Finance services	20.6	13.4
Professional services	17	12
Manufacturing	9.6	8.8
Construction	16	8
Retail trade	7.8	7.7
Mining, oil & gas	11.1	6.8
Agriculture, forestry, fishing	13.8	2.5

Source: Statistics Canada, Survey of Innovation and Business Strategy

Atlantic Canadian firms are trailing in the adoption of IoT technologies in their business. Adoption rates are about 70% of the national average overall. The information and cultural, utilities and transportation industries are the highest adopters of IoT technology and outpace the national average. The primary industries and construction are lagging well behind other industries and national rates of adoption.

St. John's-based **Kraken** is a marine technology company engaged in the design, development and marketing of advanced sonar and acoustic velocity sensors for unmanned underwater vehicles (ocean drones) used in military and commercial applications.

Digital Technology Specialties: Artificial Intelligence

31% of digital firms surveyed are active in artificial intelligence

Artificial Intelligence (AI) uses intelligent systems that exhibit characteristics of human activity. Areas emerging from AI include prediction, problem solving, audience segmentation and speech recognition. AI is often used with data analytics to help companies understand their data and gain insights from the information. Machine learning and robotics are major fields related to AI.

Eigen Innovations from Fredericton helps manufacturers optimize productivity using machine learning and advanced data analytics technologies. Their platform provides vision systems, sensors, and software that automatically detect, learn, and correct defects found inside complex manufacturing systems.

Atlantic firms are slightly behind the national rate of adoption of AI technologies. Use in the information and cultural sector is strong. Professional and financial services are well behind national rates of adoption.

Table P2 - Share of Companies Using Artificial Intelligence in Their Business, 2017 (%)

	CAN	ATL
All Industries	4.0	3.2
Information and cultural	16.8	22.3
Professional services	11.5	6.5
Agriculture, forestry, fishing	1.8	5.0
Retail trade	2.1	4.7
Transportation	1.7	4.2
Financial services	19.1	4.1
Mining, oil & gas	3.7	3.3
Construction	0.8	1.5
Manufacturing	2.8	1.3

Source: Statistics Canada, Survey of Innovation and Business Strategy

Digital Technology Specialties: Automation

Automation - is a process that minimizes human assistance in a task. Increasingly digital technologies are being used in conjunction with mechanical technologies to automate tasks. In other cases, the technology is completely digital.

Shift Energy from Saint John uses automated technologies to help companies improve energy efficiency in their buildings. Their technology uses facility data to optimize output from heating and cooling systems.

35% of digital firms surveyed are active in automation

In the survey of digital firms, automation was identified by 35% of firms as an area where they provide a proprietary service. This was the second highest specialty area of focus in the Atlantic region. It is often paired with data analytics and AI in proprietary products.

Swell Advantage from Halifax offers an enterprise management software that automates communication and management of marinas, boat clubs and waterfronts.

Digital Technology Specialties: Cybersecurity

Cybersecurity - is the protection of internet-connected systems from cyber attacks. New Brunswick has become a leader in cybersecurity research and several firms are emerging in the sector. See profile on page 23. UNB established the Canadian Institute for Cybersecurity in 2017. Ali Ghorbani was appointed Canada Research Chair in Cybersecurity at UNB in 2015.

The growing importance of cybersecurity as a part of business strategy is leading to new firms entering Atlantic Canada. It is also leading to a pivoting of resources from firms in consulting and IT into cybersecurity to support their clients.

Sonrai Security of Fredericton delivers cloud data control and compliance solutions for global customers. The company is growing fast and closed a nearly \$25 million venture capital round at the end of 2018.

Atlantic firms are laggards in the adoption of cybersecurity technologies, at about 58% of the national rate. Information and culture firms and mining, oil & gas firms are keeping pace but financial services and construction firms are well behind.

13% of digital firms surveyed are active in cybersecurity

Cybersecurity is most commonly paired with data analytics or automation in proprietary products.

Table P3 - Share of Companies Using Cybersecurity Technologies in Their Business, 2017 (%)

	CAN	ATL
All Industries	13.5	7.9
Information and cultural	30.9	34.7
Financial services	34.8	22.3
Professional services	21.1	15.7
Transportation	13.1	12.5
Mining, oil & gas	7.9	10.7
Retail trade	10.3	8.5
Manufacturing	9.8	6.8
Construction	8.1	1.7

Source: Statistics Canada, Survey of Innovation and Business Strategy

Digital Technology Specialties: Blockchain

Blockchain – is a technology originally used for digital currencies but is now also being developed as a security measure for financial transactions, sensor technologies (IoT), and other flows that require secure transactions. The Port of Halifax is using a blockchain technology called TradeLens that is expected to reduce costs and improve productivity in the shipping industry.

Only 6% of digital firms surveyed are active in blockchain technologies

Blockchain has low rates of adoption in Canada (1.4% of firms) and even lower rates in Atlantic Canada (0.3% of firms). The highest rates of adoption in Atlantic Canada are in the information and culture (4.3%), professional services (1.9%) and financial services industries (1%).

Swarmio (formerly Ubique Networks) of Sydney delivers a blockchain-powered computing grid, and fully automated esports solution for the gaming world.

Digital Technology Specialties:

Video Gaming

Video Gaming - includes companies that are developing software for handheld devices, computers and gaming consoles. Several of Atlantic Canada's community colleges and private colleges offer training programs to support the video game sector. Each of the Atlantic provinces offers digital media tax credits to support video gaming firms.

HB Studios began producing video games from Lunenburg in 2000 and added a Halifax office in 2016. The company employs about 80 people producing console games for the international market. HB Studios has shipped 50 titles selling more than 27 million units.

13% of digital firms surveyed are active in video gaming

Video gaming is most commonly paired with AI and digital video technologies

Electronic Arts entered the Charlottetown market in 2011 with the purchase of Bight Games and has grown to 100 employees. The Charlottetown office leads the company's successful mobile games division. The company hires game designers, developers and artists from across the Maritime provinces.

The Halifax office of **Ubisoft** has about 40 people and is its first studio completely focused on mobile gaming. The Halifax office has also been using the Atlantic Immigration Pilot program to fill labour shortages.

Digital Technology Specialties:

Augmented and Virtual Reality

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by digitally enhanced information.

Virtual reality (VR) is a computer-generated experience that takes place in a simulated environment where users can interact with the virtual environment.

Virtual Marine Technology of St. John's provides virtual simulation and training solutions for the marine industry including for defence contractors, oil & gas operators, maritime training institutions and Coast Guards.

16% of digital firms surveyed are active in augmented or virtual reality technologies

AR/VR is most commonly paired with digital video and digital content services.

Halifax-based **Current Studios** is a global leader in augmented reality. The company has built over 150 AR applications over the last nine years including projects for Acura, Marvel Studios and Mercedes Benz.

Kognitiv Spark from Fredericton provides a product that delivers a mixed and augmented reality solution for maintenance, repair, and remote support targeting the aerospace and defence, energy and industrial engineering sectors.

Digital Technology Specialties:

Digital Video

Digital Video - includes digital animation and digital film production. Atlantic Canada is home to several film and television production companies and Nova Scotia has been a regional leader in this area. Digital video production is also happening in tandem with other technologies to support training products, advertising and produce online content.

Saint John-based **Hemmings House** is a film production company that specializes in social change-making. It is a certified B Corp whose works includes television, film & video production and advertising.

13% of digital firms surveyed are active in digital video services

Digital video services are most commonly paired with data analytics, AR/VR and digital content services.

DHX Media of Halifax owns the world's largest independent library of children's content including properties such as Peanuts, Teletubbies, Strawberry Shortcake, Inspector Gadget and the Degrossi franchise. The company also runs the popular Wild Brain video service on YouTube which has 76 million subscribers.

Digital Technology Specialties:

Digital Content Services

Digital Content Services - includes companies that are creating digital content for various sub-sectors of the economy using e-learning, knowledge management, digital training and documentation etc.

Halifax-based **Squiggle Park** produces education based games to help students improve literacy. The games keep students engaged and the data about each student is collected and shared with educators helping them to make decisions about literacy programs.

22% of digital firms surveyed are active in digital content services

Digital content services are most commonly paired with data analytics, AR/VR and digital video technologies.

Innovatia from Saint John delivers knowledge management services in three areas including learning solutions, documentation, and technical support. The company's 650 employees bring the latest innovations in knowledge management to their clients around the world.

New Glasgow-based **Velsoft** provides customizable, innovative training solutions for companies like Microsoft, NASA, United Nations, Dell, Lockheed Martin and Fedex. The company offers technologies that are changing the way trainers use and manage their training programs.

Supporting Ecosystem: Venture and Equity Capital

Atlantic Canadian Based Venture Capital and Equity Capital

InnovaCorp - innovacorp.ca/

New Brunswick Innovation Foundation (NBIF) nbif.ca/

Build Ventures buildventures.ca/

East Valley Ventures www.eastvalleyventures.com/

Pelorus Venture www.pelorusventure.com/

GrowthWorks Atlantic www.growthworks.ca/

Island Capital Partners peislandcapitalpartners.com/

Concrete Ventures www.concrete.vc/

Killick Capital killickcapital.com/

Numus Financial numusfinancial.com/

CFFI Ventures

BDC - www.bdc.ca/en/bdc-capital/venture-capital/pages/venture-capital.aspx

Recent Venture Capital Investments in Atlantic Digital Firms from Outside the Region

Rho Canada Ventures (Montreal, New York) - www.rhocanada.com/

Hub Angels (Boston) - www.hubangels.com/

CIC Capital Ventures (Montreal) - ciccapital.fund/ca/en/home/

Inovia (Montreal) - www.inovia.vc/

Round13 Capital (Toronto) – www.round13capital.com

Whitecap Venture Partners (Toronto) - <https://whitecapvp.com/>

Ramen Ventures (Toronto) - www.ramen.vc/

Celtic House Venture Partners (Ottawa) - www.celtic-house.com/

Vahalla Angels (Calgary) - valhallaangels.com/

Panache Ventures - www.panache.vc/

Conconi Growth Partners (Vancouver) - conconi.ca/

OMERS Ventures (Toronto) - www.omersventures.com/

Leaders Fund (Toronto/Atlanta) - leaders-fund.com/

Boldstart Ventures (New York) - www.boldstart.vc/

Amplify Partners (California) - amplifypartners.com

Polaris Partners (Boston) - www.polarispartners.com/

TenEleven Ventures (Boston) - www.1011vc.com/contact/

Mahinda (India) - www.mahindra.com/

Monsanto Growth Ventures (St. Louis) - monsanto.com/company/monsanto-growth-ventures/

A-Fore Capital (San Francisco) - afore.vc/

Intel Capital – (Santa Clara) - www.intel.com/content/www/us/en/intel-capital/overview.html

Supporting Ecosystem: Accelerators, Incubators and Associations

Associations and Supportive Environments

Springboard Atlantic - springboardatlantic.ca/
Digital Nova Scotia - digitalnovascotia.com/
Creative Destruction Lab (Halifax) - www.creativedestructionlab.com/
TechImpact - www.techimpact.it/
Entrevestor - entrevestor.com/ac/
Information Technology Association of Canada - itac.ca/
Ignite Fredericton - www.ignitefredericton.com
Economic Development Greater Saint John – <https://edgsj.com/en>
Halifax Partnership - <https://halifaxpartnership.com/>
CyberNB - cybernb.ca/en/
Smart Grid Innovation Network - www.sgin.ca/
New Brunswick Institute for Research, Data and Training (NB-IRDT) - www.unb.ca/nbirdt/
Atlantic Technology Centre (PEI) - atlantictechologycentre.ca/
Newfoundland and Labrador Association of Technology Industries (NATI) - www.nati.net/
Oceans Advance (NL) - oceansadvance.net/
Centre for Ocean Ventures & Entrepreneurship (COVE) coveocean.com/
Mitacs - www.mitacs.ca/en
Atlantic Facilities and Research Equipment Database - www.afred.ca/
Connexionworks - www.connexionworks.ca/

Incubator and Accelerator Programs

Volta www.voltaeffect.com/
PropelICT www.propelict.com/
Innovacorp - <https://innovacorp.ca/>
Genesis Centre (St. John's) www.genesiscentre.ca/
Excite Corporation (Grand Falls/Windsor) www.excitecorp.nf.ca/
Bounce Innovation bounceinnovation.ca/
Venn Centre (Moncton) <http://venncentre.ca/>
Pond Deshpande Centre (NB) www.ponddeshpande.ca/
Start-up Zone (PEI) <https://startupzone.ca/>
Planet Hatch (Fredericton) <http://planethatch.com>
LaunchPad (PEI) <http://launchpadpei.com/>
Navigate (Cape Breton) <http://navigatestartup.com/>
Futurepreneur Canada - <https://www.futurpreneur.ca/en/>
Energia Ventures (Fredericton) - <https://www.energiaventures.com/>
Emera Idea Hub - www.dal.ca/faculty/engineering/idea-project/emera-idea-building.html

Partnerships at Work

Digital Nova Scotia is partnering with Bluedrop Performance Learning on the “Skills for Hire” program which will target the ICT sector skills gap in Nova Scotia and Newfoundland and Labrador. The project will develop an online blended ICT skills program and carve out career pathways for recent graduates, incumbent workers, as well as unemployed and under-served populations. The project received \$2.5 million from Employment and Social Development Canada.

Supporting Ecosystem: Select Government Programs for Digital Firms

National Programs

[Scientific Research and Experimental Development \(SR&ED\) Program](#)

[National Research Council Canada Programs](#)

[NRC-IRAP Programs](#)

[Build in Canada Innovation Program](#)

[ACOA - Business scale-up and productivity stream](#)

[ACOA - Regional Innovation Ecosystem stream](#)

[ACOA – Atlantic innovation Fund](#)

[ACOA – Business Development Program](#)

[BDC – Venture Capital Funds](#)

[Canada's Ocean Supercluster](#)

[Canadian Film or Video Production Tax Credit Program](#)

[Venture for Canada program](#)

[NSERC Programs](#)

Newfoundland and Labrador

[Interactive Digital Media Tax Credit](#)

[Film and Video Tax Credit](#)

[Economic Diversification and Growth Enterprises Program](#)

[Labour-Sponsored Venture Capital Tax Credit](#)

[Venture Capital Tax Credit](#)

[Direct Equity Tax Credit](#)

Nova Scotia

[Innovation Equity Tax Credit](#)

[Innovation Rebate Program](#)

[Labour-Sponsored Venture-Capital Tax Credit](#)

[Digital Media Tax Credit](#)

[Digital Animation Tax Credit](#)

[Nova Scotia Film & Television Production Incentive Fund](#)

[Productivity and Innovation Voucher Program](#)

[NS R&D Tax Credit](#)

[Export Growth Program](#)

[Small Business Development Program](#)

Prince Edward Island

[Advanced Marine Technology Tax Rebate](#)

[Specialized Labour Tax Credit](#)

[Labour Rebate](#)

[Ignition Fund](#)

[PEI Film Media Fund](#)

[Development and Commercialization Fund](#)

[Productivity Improvement Assistance](#)

[Innovation and Development Labour Rebate](#)

[Information Technology Planning Assistance](#)

[Information Technology Implementation Assistance](#)

New Brunswick

[NB R&D Tax Credit](#)

[NB Film, Television & New Media Industry Support](#)

[Small Business Investor Tax Credit Program](#)

[The NB Labour Sponsored Venture Capital Tax Credit](#)

[NBIF Startup Investment Fund](#)

[NBIF Innovation Voucher](#)

[Export NB](#)

Regional

[Scale Up Hub Cambridge](#)

Partnerships at Work

Smart Skin Technologies from Fredericton received a \$4.5 million from various government sources to support a new product line for its innovative quality assurance technology and for market development. NRC-IRAP will provide a \$3 million grant, ACOA will provide a \$1 million loan and NBIF will make a \$500,000 equity investment in the company. The company is targeting the pharmaceutical and beverage industries and hopes to expand in Asian markets.

Supporting Ecosystem:

University Research & Entrepreneurial Support

The following research and entrepreneurship centres have a digital focus or support the digital ecosystem. There are many other research areas at Atlantic Universities that may have some digital activities but this initial scan provides an overview of some of the key digital or digitally-related focus areas and support centres.

Dalhousie - Ocean Frontier Institute, Institute for Big Data Analytics, Norman Newman Centre for Entrepreneurship, Centre for Innovation in Infrastructure, Centre for Research in Sustainable Supply Chain Analytics, Canadian Institute of Fisheries Technology

Saint Mary's - David Sobey Centre for Innovation in Retailing and Services, Saint Mary's University Entrepreneurship Centre, Maritime Provinces Spatial Analysis Research Centre

Acadia - Acadia Institute for Data Analytics, Acadia Entrepreneurship Centre, Acadia Centre for Mathematical Modelling and Computation

St. FX - Innovation and Enterprise Centre

Mount Saint Vincent University - Women in Science and Engineering (WISE) Atlantic, Centre for Women in Business

Cape Breton University - The Cape Breton University Innovation and Entrepreneurship Centre, Verschuren Centre

University of Prince Edward Island - Ocean Frontier Institute, The Hostetter Centre for Enterprise & Entrepreneurship, Centre for Health and Community Research

University of New Brunswick - Canadian Institute for Cybersecurity (CIC), IBM Centre for Advanced Studies - Atlantic (CASA), Wallace McCain Institute, Pond-Deshpande Centre, J Herbert Smith Centre for Technology Management & Entrepreneurship, International Business & Entrepreneurship Centre, NB Institute for Research, Data and Training (NB-IRDT), Emera & NB Power Research Centre for Smart Grid Technologies, Marine Additive Manufacturing Centre of Excellence (MAMCE), Off-site Construction Research Centre (OCRC),

Mount Allison - Ron Joyce Centre for Business Studies, Geospatial Modelling Lab

Université de Moncton - Centre Assomption de recherche et de développement en entrepreneuriat (CARDE)

Memorial University - Ocean Frontier Institute (OFI), Ocean Sciences Centre, Memorial Centre for Entrepreneurship, Centre for Applied Ocean Technology, Centre for Marine Simulation (CMS), Centre for Sustainable Aquatic Resources (CSAR), eHealth Research Unit

Regional – Springboard Atlantic, Collaboration for Analytics Research Education & Technology (CARET), ACENET

Research Chairs

Dalhousie - David Barclay (Ocean Technology Systems), Stan Matwin (Visual Text Analytics), Robert Beiko (Bioinformatics), Keith Thompson (Marine Prediction and Environmental Statistics), Fernando Paulovich (Data Visualization), Doug Wallace (Ocean Science and Technology), Luis Torgo (Spatiotemporal Ocean Data Analytics)

University of New Brunswick - Ali-Akbar Ghorbani (Cybersecurity), Monica Wachowicz (Big Data)

Université de Moncton - Habib Hamam (Optics in Information and Communication Technologies)

University of Prince Edward Island - Crawford Revie (Population Health: Epi-Informatics)

Memorial University - Touati Benoukraf (Bioinformatics for Personalized Medicine), Katleen Robert (Ocean Mapping)

Supporting Ecosystem: Atlantic Canadian Post-Secondary Digital Education Programs

Nova Scotia

Dalhousie University

- Undergraduate (Applied Computer Science, Computer Science, Electrical & Computer Engineering)
- Graduate (Applied Computer Science, Computer Science, Electrical & Computer Engineering, Computational Biology & Bioinformatics, Health Informatics, Information Management)

Saint Mary's University

- Undergraduate (Computing and Information Systems, Computing Science, Engineering)
- Graduate (Technology Entrepreneurship & Innovation, Computing & Data Analytics)

Acadia University

- Undergraduate (Computer Science, Engineering)
- Graduate (Computer Science)

St. Francis Xavier University

- Undergraduate (Computer Science, Engineering, Enterprise Systems)
- Graduate (Computer Science)

Mount Saint Vincent University

- Undergraduate (Information Technology)

Cape Breton University

- Undergraduate (Electronics and Controls)

Nova Scotia Community College

Oceans Technology, Business Intelligence Analytics, Cyber Security, Game Development, IT Data Analytics, Database Administration, IT Generalist, IT Programming, IT Systems Management & Security, IT Web Programming, Library & Information Technology, Geospatial Data Analytics, Health Information Management, Engineering Technology Programs

Success College - I.T. Specialist, Maritime Business College - 2D/3D Animation, Information Systems Administrator, Eastern College - IT Systems Administrator, Network Support Specialist, Information Systems Administrator, DaVinci College - Network Administrator Specialist, Centre for Distance Education - Graphic Design, Health Information Management, Academy of Learning Career College - Blockchain Technology, PC Support Specialist, Web Designer

Prince Edward Island

University of Prince Edward Island

- Undergraduate (Computer Science)

Holland College - Computer Information Systems, Computer Networking Technology, Electronics Engineering Technology, Energy Systems Engineering Technology, Graphic Design

Eastern Academy - Information Systems Specialist, Keyin College - Business Information Technology (BIT), Computer Business Applications, Computer Service Technician, Multimedia Design, Information System Specialist, Information Systems Administrator, Network Design & Management, Academy of Learning Career College - Blockchain Technology, Computer Service Technician, Graphics and Web Design, Network System Administrator, Academy Canada - IT Network Professional

Technology Advantage Program,

A pilot program will begin this year in a collaboration between the Province of Nova Scotia, IBM, and the Nova Scotia Community College (NSCC). The program is modeled after IBM's Pathways in Technology Early College High School, known as the P-TECH model that will be in 200 schools in 14 countries by the end of 2019. Students will be able to participate in the program from grades 9 to 12, and then attend NSCC, where they will work towards a two-year technology diploma. The government will be covering tuition costs.

<https://www.ibm.com/news/ca/en/2019/03/12/k029774I91980c69.html>

Supporting Ecosystem: Atlantic Canadian Post-Secondary Digital Education Programs (cont.)

New Brunswick

University of New Brunswick

- Undergraduate (Computer Science, Electrical and Computer Engineering, Information Sciences, Technology, Management and Entrepreneurship)
- Graduate (Computer Science, Electrical Engineering)

Université de Moncton

- Undergraduate (Computer Science, Technology, Information and Leadership)

Mount Allison University

- Undergraduate (Computer Science)

New Brunswick Community College

- Diploma (IT: Cybersecurity, IT: Electronic Game Development, IT: Network Support, IT: Programmer-Analyst, IT: Business Analysis, IT: Gaming Experience Development, IT: Network Administration, IT: Quality Assurance Testing, IT: Web and Mobile Application Development, Graphic and Communications Design, Electronics Engineering Technology, Electrical Engineering Technology)
- Post-Graduate, IT: Business Analysis, IT: Cybersecurity
- Professional Development (Cybersecurity: Legal and Ethics, Cybersecurity: Risk Analysis, Cybersecurity: Security Concepts, User Experience (UX) Design Certificate)

Collège communautaire du Nouveau-Brunswick (Électromécanique de systèmes automatisés, Technologies de l'information et des communications, Cybersécurité, Intelligence informatique (Big Data), Internet des objets, Programmation et applications mobiles, Programmation et développement de jeux, Réseautique et sécurité informatique, Technologie du génie électronique, Vérification de logiciels)

Mackenzie College - Graphic Design, TV & Game Animation, Video Game Art, Software Testing, Eastern College - Applications Developer, IT Systems Administrator, Network Support Specialist, Video Game Development, Information Systems Administrator, Academy of Learning Career College - Blockchain Technology, Computer Service Technician, Oulton College - System Management and Cyber Security, Web and Mobile Development

Newfoundland and Labrador

Memorial University of Newfoundland

- Undergraduate (Computer Engineering, Computer Science, Electrical Engineering, Technology)
- Graduate (Computer Engineering, Computer Science, Electrical Engineering, Technology Management, Scientific Computing)
- Diploma (Geographic Information Sciences)

College of the North Atlantic

- Diploma (Computer Systems and Networking, Programmer Analyst, Software Development, Web Development, Electrical Engineering Technology Electronic Systems Engineering Technology, Electronics Engineering Technology, Engineering Technology)
- Post Diploma (Information Management)

Eastern College - Information Systems Specialist



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