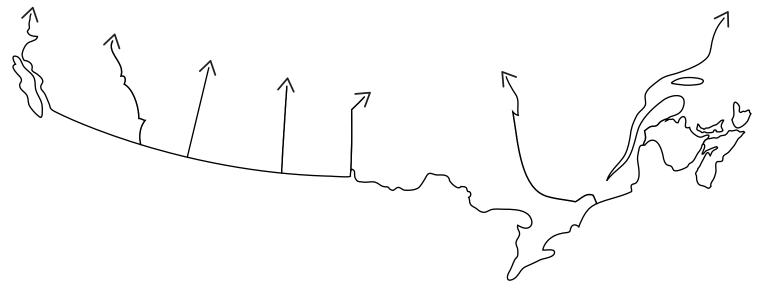


IBM investments in Canada







IBM: 100 Years of investing in innovation

03





Why investing in Canadian R&D matters

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How we invest in Canada's future

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Fostering innovation from coast to coast

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- and global reinvention from Canada.

- Dino Trevisani, President, IBM Canada Ltd.

Innovate with IBM

A Canadian Perspective

According to the World Economic Forum, which studies and benchmarks over 100 global economies, Canada is improving its overall competitiveness ranking, but its ability to innovate continues to lag behind that of many of the world's wealthiest developed countries.

In the Forum's most recent 2015/2016 Global Competitiveness Index (GCI), Canada was ranked 13th out of 140 countries, which represents a three-point drop since the 2008/2009 report when it ranked among the top ten most competitive countries. Now, some would argue that 13th out of a field of 140 isn't bad; we score good marks for our solid institutions, our infrastructure and technological readiness, our macroeconomic environment, and our healthcare and education systems — but of concern are the reports finding that Canada remains a below-average performer on its capacity to innovate.

Similarly, while the Conference Board of Canada shows we are decreasing the innovation gap, Canada's 'A' in entrepreneurial ambition is offset by a 'D' in business R&D.

At IBM we have always believed that investment in research and development is an important driver for Canadian competitiveness and growth. Every day for the past 100 years, IBM has invested in growth, progress and reinvention in Canada – and global reinvention from Canada. We believe one of the best ways to address our innovation gap is for academia, industry and government to work more collaboratively on common initiatives

that can help incubate, innovate, accelerate and commercialize Canadian innovation and export it onto the world stage. Since we first adopted the name "IBM" in 1917, IBM Canada has continued to evolve to meet the needs of its clients and Canadian citizens, underpinned by smart people and strong values.

As one of Canada's top ten private R&D investors, we are constantly developing new ways to solve the world's biggest problems. In the past 15 years, we've invested over \$6 billion in Canadian research initiatives. Last year alone we invested over \$478 million.

IBM is now a cognitive solutions and cloud platform company that lives at the intersection of technology and business.

This position enables us to change the way the world works, and to make investments that contribute to Canada's future competitiveness and our society at large.



The following pages outline many of the investment initiatives IBM Canada currently has underway — all focused on setting the standard for driving a collaborative innovation ecosystem in Canada, for improving our commercialization prospects, and creating more "made in Canada" products and services.



An investment in smarter research and development is an investment in Canada...

IBM Canada made a substantial investment in collaborative innovation by creating the IBM Canada Research and Development Centre (CRDC) back in 2012. Since that time it has served as the focal point for coordinating and leading IBM research in Canada. The CRDC, together with the Government of Ontario, the Government of Canada, and seven founding universities, went on to form a consortium called SOSCIP, which focuses on "made in Canada" disruptive technologies.

Once established, SOSCIP put in place Canada's fastest supercomputer network as well as the largest analytics research cloud and multi-platform agile environment to speed research and tackle some of the toughest and most complex challenges in the areas of advanced manufacturing,

urbanization, cybersecurity, digital media, energy, health, mining and water. The research projects it executes drive intellectual property and innovation that has a direct impact on Canada's economy and future growth.

Current consortium members include: Carleton University, Wilfrid Laurier University, University of Guelph, McMaster University, OCAD University, the University of Ontario Institution of Technology, University of Ottawa, Queen's University, Ryerson University, Seneca College, University of Toronto, University of Waterloo, Western University, University of Windsor, York University, the Ontario Centres of Excellence and the IBM Canada Research and Development Centre.



Since its inception SOSCIP has driven significant results.

Launched

80⁺RESEARCH PROJECTS

which have engaged or —— created more than—

40 SMALL BUSINESSES

Enhanced

SKILLS 300 OF OVER 300

students & post-doctoral — fellows who are the —

DISRUPTORSOF TOMORROW

Leveraged

\$16.5M

in provincial, federal and industry ———— funding to direct ————

FUNDING FOR PROJECTS

Enabled

PARTNER COMPANIES TO SECURE THE MILLIONS

IN VENTURE CAPITAL ESSENTIAL FOR GROWTH

More specifically, some of SOSCIP's 80 projects are:



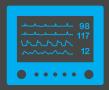
Creating software that will make the discovery of new medicines faster, cheaper and more efficient.



Accurately tracking and predicting climate change in Southern Ontario's Grand River Watershed.



Using advanced analytics software to help predict and identify prospective mineral deposits.



Developing a medical device that translates physiological signals from the heart to better understand and diagnose heart conditions.

All SOSCIP projects and research collaborations benefit Canadians and significantly enhance Canada's data mining and analytics capacity, which in turn helps drive additional new product development required to ensure our global competiveness and prosperity.

Smart computing for innovation



















What is SOSCIP?

Researchers at SOSCIP's partner universities and colleges, SMEs and IBM collaborate on research, development, innovation and commercialization projects to:

- > Adopt advanced technologies
- Create jobs
- > Solve industrial problems
- > Contribute highly skilled personnel to the work force
- Bring "Made in Canada" products and services to market quickly and more efficiently

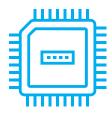
What can SOSCIP do for you?

If you're an academic or industry researcher with a collaborative research project, our team of experts will help you gain access to:

- Canada's most powerful advanced computing platforms
- Expert technical help
- > Dedicated funding for postdoctoral fellows and graduate students
- > SOSCIP's partership network to find the right collaborators for your project

Got a big data or advanced computing problem? Talk to us. Email info@soscip.org to schedule an appointment.

Advanced computing platforms



IBM Blue Gene/Q Supercomputer

Canada's fastest supercomputer is suited for large-scale, distributed applications that require massively parallel processing power, such as molecular modelling, drug discovery, climate change forecasting, and computational fluid dynamics.



Cloud Analytics

Canada's first research-dedicated cloud environment hosts a broad array of IBM software tools for application development and data analytics. The Cloud Analytics platform is ideal for complex data analysis, streaming and managing large data volumes, and data mining applications.



Agile Computing

Canada's first multi-platform agile research environment uses Field-Programmable Gate Array (FPGA) technology to accelerate hardware performance. FPGA cards can accomplish numerically complex tasks more efficiently and at lower cost than a traditional CPU could do alone.



Large Memory System

The LMS platform is a single 64-core virtual system with 4.5TB of RAM. Outfitted with the latest IBM analytics software, the LMS is ideal for data-intensive projects with huge active memory requirements.



CANADIAN R&D INVESTMENT \$478M \$6.3B IN 2016

FROM 2001-2015

\$1.3BIN **EXPORTS** IN **2016**

RANKED CANADIAN **TOP 5 EMPLOYER 6 YEARS** RUNNING

Over the past 100 years, IBM has transformed from making scales, clocks, PCs into a 100-year old cognitive solutions and cloud platform company in Canada.

Year after year, we've been a top-10 private sector investor in Canadian R&D — \$478-million in 2016. Over the last 15 years, we've invested nearly \$6.3 Billion (2001-2015), ranking 5th overall during this time. (Research Infosource)

- More than a third of Canadian IBM-ers are solving business and social problems in other parts of the world, finding new ways to use data and technology to improve healthcare, use natural resources, and help businesses to better compete.
- For six years running, IBM has been ranked one of Canada's top five employers (Randstad).
- Year after year we are one of Canada's largest technology exporters and importers (\$1.3B in exports in 2016).
- The IBM Canada Lab is the largest software development organization in Canada with key sites in Markham, Fredericton and Ottawa.

IBM Canada's National Data Centre Investments

To meet Canada's needs to grow and be competitive and to align with some client preferences for keeping data in country, IBM Canada continues to make significant investments in new data centre capacity and cloud capability.

IBM Cloud Centres

In 2015, IBM opened its second cloud centre in Canada, located in Drummondville, Quebec, following the opening of the first Toronto centre in August 2014. Both centres allow clients to capitalize on our IBM Cloud infrastructure that's optimized for born-on-the-cloud applications at Internet scale.

Our other flagship investment in IT infrastructure is the IBM Canada Leadership Data Centre located in Barrie, Ontario, and we recently opened another centre—the IBM Western Canada Leadership Data Centre—in Acheson, Alberta. Both of these state-of-the-art data centres are part of a national network of more than 17 fully managed data centres that together provide over 300,000 ft² of raised floor space.

With the explosion of data, and the rise of cloud, analytics, mobile and social computing, IT infrastructure has become the engine of innovation—fundamental for delivering IT services that Canadian businesses value and demand.

Highlights of IBM Leadership Data Centres:

- > High availability for continuous operations
- High density configurations for current and future technologies
- Scalable, modular design to support growth non-disruptively
- Sites selected for geographical diversity and low risk
- Highly restricted physical access
- > Designed for high levels of energy efficiency
- Infrastructure specifically designed for cloud, big data, social and mobile technologies

To learn more about any of IBM Canada's data centres: Please contact your IBM Representative or visit: ibm.com/smarterdatacentre/ca



IBM Cloud hosts 30% more top websites than any other cloud provider in the world.



Virtualized and dedicated bare metal servers, self-service or managed; public, private and hybrid.



A single-pane portal to control and tune all services — and a single API with a broad set of function calls.



Ever since IBM started operating in Canada, 100 years ago, IBM has an enduring commitment in Canada to meaningful progress – to finding better ways to do things that matter. That means continuous investment and invention for enduring impact.

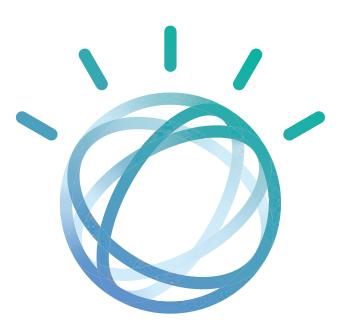
Today, the company plays an important role in the social fabric and economy of the country. We continue to attract and develop highly skilled Canadians; engaging them in meaningful work and encouraging them to create disruptive innovations that impact Canada and the world.

Over the past 12 years in particular, IBM has invested more than half a billion dollars of in-kind expertise and related analytics, cloud, mobile, security and social technologies to establish a series of collaborative innovation hubs across Canada. This commitment to growing a thriving Canadian innovation ecosystem represents a deep partnership with industry, academia and all levels of government. Together, we are making progress —particularly in the areas of healthcare, natural resources and urbanization—fuelling innovation right here at home.



Our Investments in Research and Development Span Canada

With our partners, we will continue to help build a strong Canadian economy as we move into an era where cognitive systems like Watson are helping us outthink the limits of what's possible.



IBM Canadian innovation and cognitive ecosystems

Western Canada



- > Ocean Networks Canada
- > BC Cancer Agency
- > Purple Forge
- ➤ District Ventures and IBM Innovation Space
- > Goldcorp Inc.
- > IBM Alberta Centre for Advanced Studies (CAS)
- > Westgrid
- > University of Calgary

Eastern Canada



- > IBM Atlantic Centre for Advanced Studies (CAS)
- > Canadian Institute for Cybersecurity
- > Opportunities New Brunswick
- > Collaboration for Analytics Research, Education, and Technology (CARET)
- > Centre for Health Informatics and Analytics (CHIA)





- > IBM Cloud Data Centre Drummondville
- ➤ MiQro Innovation Collaborative Centre (C2Mi)
- > NSERC/IBM Canada Industrial Research Chair: Research in Smarter Microelectronics Packaging for Performance Scaling

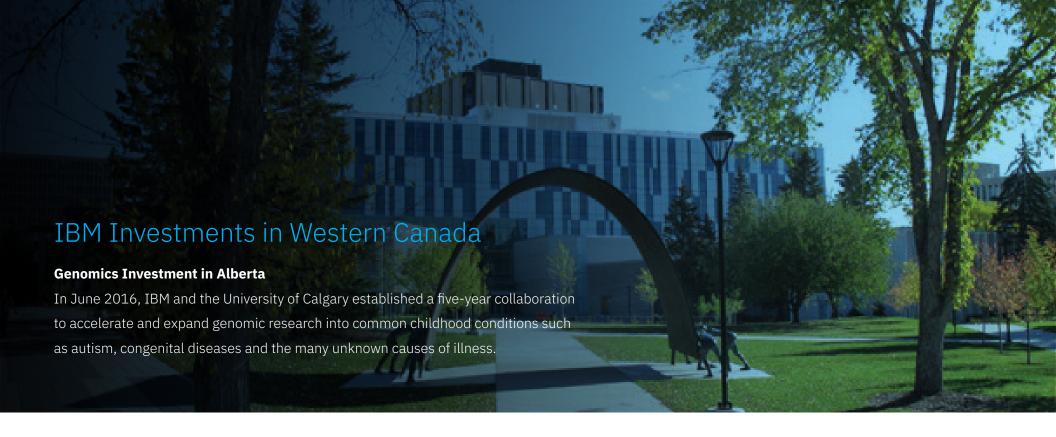
Ontario



- > IBM Innovation Incubator Project (I³)
- > Southern Ontario Smart Computing Innovation Platform. (SOSCIP)
- > LifeLearn Sofie
- > Ross The University of Toronto
- > Hamilton Health Sciences
- > IBM Cloud Data Centre Toronto

- > Bluemix Garage Ryerson University
- > IBM Toronto Innovation Space
- > IBM Sports Insights Central
- > IBM Innovation Space Markham Convergence Centre
- > IBM Performance Management at the University of Ottawa





Researchers have investigated hundreds of genetic cases at the Alberta Children's Hospital, contributing to the identification of 30 new genes.

However, one in four children admitted to the Alberta Children's Hospital has an unknown or undiagnosed illness. With access to new analytics and cognitive computing tools, scientists can better generate, store and analyze complex clinical, genetic and imaging data, and expect to reduce from months to days the time required for investigations into how genes and environmental factors impact child health. This precision-medicine approach will lead to opportunities for better diagnostics, prevention and more personalized treatment protocols.

Natural Resources Solution Centre

In Alberta, IBM has also made a significant investment into the Canadian Petroleum sector – expanding its team of experts at its Natural Resources Solutions Centre in Calgary to add Chemical Engineers and Engineering Upstream Managers, Oil Sands Operators, Mine and Refinery Managers, and Asset Experts, to help clients with capital projects, operations and maintenance, pipeline management, or research.

IBM Alberta Centre for Advanced Studies (CAS)

The IBM Alberta Centre for Advanced Studies (CAS) was formed in 2005 in partnership with the Government of Alberta, the University of Alberta, and more recently the University of Calgary. It is one of more than 20 centres for advanced studies that IBM operates globally. The centre uses a novel public/private research collaboration model that engages Alberta university professors and students with IBM research and development staff and new technologies to drive innovation, accelerate commercialization and support diversification in the province.

To date, IBM Alberta CAS has supported more than 40 independent research projects and has also provided hundreds of post-secondary students with the opportunity to develop new skills in technologies such as cloud, high performance computing, machine learning and big data analytics, and exposed them to emerging industries solutions.

Research themes focus on the environment, healthcare and natural resource management. For example:

- Researchers at the University of Alberta are using advanced streaming analytics software to monitor climate change in some of the world's most vulnerable ecosystems to more accurately forecast how boreal and tropical dry forests recover from deforestation, natural resource development and climate change.
- Other University of Alberta researchers have used an IBM high-performance computing cluster to create a computer model that predicts toxicity of drugs and will help to significantly speed time-to-market for new cancer and hepatitis therapies, which affect more than 170 million people worldwide.
- University of Calgary researchers are using IBM software to create a dashboard of insights gleaned from a project studying waste water contaminants. The research has implications for a variety of industries.
- An NSERC award-winning University of Calgary researcher is also using IBM's high-performance computing platform and working with IBM experts in modelling to create and use dynamic simulations to test new operations in the oil and gas sector that produce more while using less. With a broader group of partners from the petroleum industry, this research group is constructing computer simulations of reservoir layers and drilling sites, and users interact with them in real time. Powerful modelling tools assess issues with oil composition, temperature, water usage and geomechanics, adjusting and adapting simulations until they find an optimal way of operating while minimizing environmental impact.

IBM Alberta Centre for Advanced Studies

12
YEARS

45
PROJECTS

200+
RESEARCH PAPERS

PUBLISHED BY CAS COLLABORATORS

CAS Innovation framework

IBM Alberta CAS has been a **tremendous success** in all areas.



Health & Bio-Systems



Energy & Environment Systems



Service Systems



Data, Analytics & Other Areas

District Ventures and IBM Innovation Space - Calgary

In March 2017, IBM and Calgary-based incubator District Ventures will launch the District Ventures and IBM Innovation Space – Calgary. The initiative extends the IBM incubator innovation system into Western Canada and enables entrepreneurs at various stages of their business development to excel through mentorships, exposure to clients, collaboration, and the use of new technologies such as development platform IBM Bluemix and cognitive system IBM Watson.

Leveraging the success of District Ventures and IBM in accelerating growth- stage companies, entrepreneurs will engage with high-level executives, investors, mentors and each other to further innovate and tackle challenges identified by many of Canada's leading industries, such as natural resources, healthcare, clean tech, fintech and agriculture.



Carman Allison, VP of Consumer Insights for Nielsen Canada, speaking at District Ventures Accelerator on Canadian consumer buying behaviours and attitudes.



\$54M PROJECT

500+ STARTUPS

\$22.7M CONTRIBUTED TECHNOLOGY

The mandate of the \$54 million project is to help 500+ startups, small and medium sized businesses (SMEs) fast-track the incubation and development of new technologies and products that can compete in the global marketplace. IBM contributed \$22.7 million of in-kind cloud and IBM Watson cognitive technologies, along with

associated technical expertise that will help firms accelerate their innovation cycles. To begin, the initiative will focus on priorities in the Financial Services, Healthcare and Cybersecurity fields.

This initiative has four main priorities:

- Provide SMEs with the skills and resources to conduct business more efficiently; quickly adopt new disruptive technologies; develop and demonstrate new products and services; accelerate time to market; and grow in scale to better compete in the global market.
- Help further commercialize innovation to deliver positive impact to Canada's economy.

- Enhance critical skill development in areas such as big data and analytics.
- ➤ Establish an innovation ecosystem with the Ontario Network of Entrepreneurs (ONE), which includes several other Ontario-based innovation hubs.

As an extension of this project, in March 2016, IBM launched a collaborative innovation initiative with Hamilton Health Sciences to help researchers, clinicians, practitioners and private industry explore,

collaborate and test real healthcare solutions using new technologies such as cognitive computing and advanced analytics.

BM Innovation Space - Toronto opened, opportunities and integrate new mobile, social, analytics and cloud

In September 2016, the **IBM Innovation Space – Toronto** opened, establishing another collaborative innovation hub within the Province. The innovation space is designed for collaboration and co-creation - with startups and developers working side-by-side with IBM consultants, researchers and experts to analyze business

technologies. This network of collaborators will offer mentoring, support services, education and even legal counsel to assist startups as they tackle some of Canada's biggest challenges in areas such as healthcare, natural resources and financial services.

IBM Innovation Garage

As part of the overall Canadian innovation ecosystem, IBM has established an Innovation Garage on the Ryerson University campus.

Acting as a technology consultant with a startup DNA, the Garage helps companies, large and small, design and build engaging cloud applications using IBM Design Thinking, Lean Startup and Agile DevOps.

With access to IBM experts, tools and technologies, members gain a core set of skills in agile practices focused on cloud integration, systems of record, scalability and security to quickly build out new cloud applications and services on IBM's cloud platform as-a-service.

The Toronto Innovation Garage also offers enterprise clients—who increasingly turn to startups for fresh approaches to industry challenges—with greater access to the most talented entrepreneurs and developers. This accessibility helps these groups connect and build more functional applications, better apply technology across various industries and deploy their solutions into the marketplace.

IBM is the lead industry partner with the Southern Ontario Water Consortium (SOWC) to develop and deploy a new data integration platform for watershed management. The platform is helping researchers, urban planners and others develop more sophisticated tools to predict floods, safeguard the drinking water supply and forecast the impact of growth and urbanization on vital ecosystems. This first-in-Canada platform assimilates 600 data points per hour, streaming from more than 120 sensors installed within 80 square kilometers of watershed that nourishes urban, agriculture and forested land along the Grand River, the largest inland river system in southern Ontario.



IBM Investments in Quebec MiQro Innovation Collaborative Centre The MiQro Innovation Collaborative Centre (C2MI), is located in Bromont, Quebec. It provides the fundamental link between applied research and the rapid commercialization of microelectronic products. IBM donated the 40 acres of land where the C2MI facility was built, and provided the expertise for the construction of the infrastructure, a sizable contribution of lab equipment that is used for research and development, and access to its technical expertise.

Embedded electronics are becoming more pervasive in all sectors of the economy and society, and C2MI is the largest electronics systems research and development centre in Canada. It provides a unique model of collaboration where the synergy between industrial and academia partners is necessary, even essential, to the development of new-generation, market-driven products. With only a few years of activity, C2MI is propelling innovation through a variety of leading-edge microelectronic projects that are contributing to Canada's economic strength.

In April of 2017, IBM deepened its collaboration with the Montreal Institute for Learning Algorithms (MILA) of the University of Montreal to establish a new Artificial Intelligence Lab that will enable IBM researchers working on core AI technologies to work on a daily basis alongside faculty, staff and students at MILA. Led by Professor Yoshua Bengio, MILA is one of the premiere academic research groups working on deep learning.

The new lab helps IBM build on its existing relationship and participate more fully in Montreal's growing deep learning ecosystem. Working with academic groups is an important investment in the future and senior researchers from the AI Foundations team at IBM Research will also help to train the next generation of researchers in Montreal.

The combined IBM Research–MILA team will conduct groundbreaking, fundamental research on artificial intelligence, machine learning and deep learning, exploring areas such as generative modeling, unsupervised learning, learning to learn, reinforcement learning, representation and transfer learning, optimization and interpretable AI. In a sense, using AI to further develop AI.

IBM Client Innovation Centre - Montreal

In November 2016, IBM invested in a new Client Innovation Centre (CIC) in Montreal to fast-track the digital transformation of both public and private Canadian organizations. As part of IBM's global network of IBM delivery centres worldwide, this second global delivery centre in Canada is expected to create up to 500 new jobs over the next five years to meet clients' growing and evolving technology and innovative business needs.

The Centre is modelled after the existing IBM Client Innovation Centre in Halifax, Nova Scotia. It provides industry-focused services such as

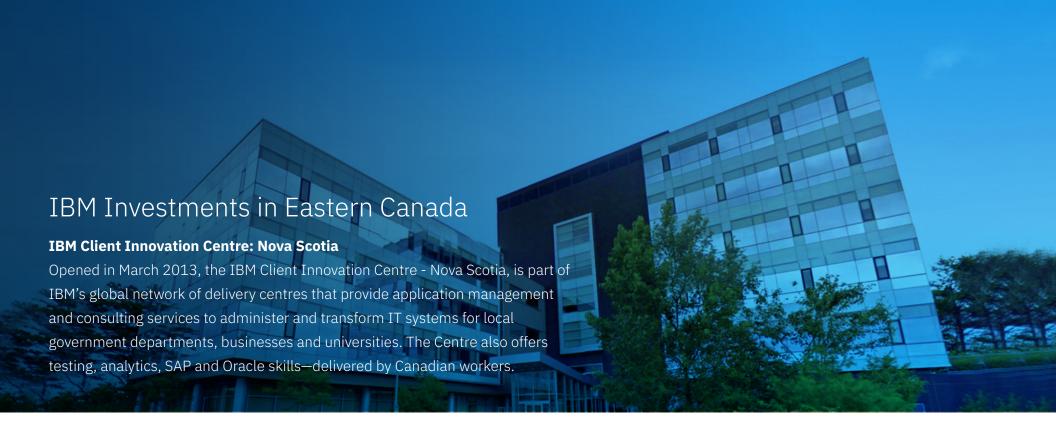
integrated software packages – for SAP, Oracle, Microsoft, and Workday – Java and .Net development and testing, as well as specialized industry software including analytics, data management, enterprise content management, and order management.

The Client Innovation Centres in Quebec and Nova Scotia are part of a network of IBM delivery centres located in more than 30 countries to serve customers worldwide. IBM has an integrated set of specialized tools, processes and expertise that will be transplanted into this new centre in order to provide applications of superior quality to clients.

AquaHacking

For the past two years, IBM has been a core partner of the annual AquaHacking initiative run by the de Gaspé Beaubien Foundation. The initiative focuses on putting sustainable governance and technological innovation to work for water.

Each year focuses on a different waterway. Through annual summits and associated hacking challenges which produce web or mobile applications to solve water-related issues, panels of water experts, young digital designers and technologists address: climate change adaptation, spills and overflows, and access to major outlets like the Ottawa and the St. Lawrence River, as well as the contributions to water conservation made possible through innovation, technology and creativity. Participants receive access to IBM expertise and mentorship as well as the latest cognitive and cloud technologies.



500⁺ PEOPLE HIRED

30 INSTITUTIONS SERVICED

To date, the centre has hired over 500 people, servicing more than 30 public and private sector institutions across key industries such as financial services, insurance and telecommunications.

In conjunction with the opening of the centre, IBM also entered into an innovative partnership with seven Atlantic Canada higher-education

institutions to build analytics curriculum so that students have the high-demand skills needed to help Canada grow and compete in a global marketplace.

Centre for Health Informatics and Analytics (CHIA)

IBM made another multi-million-dollar investment in 2014 to support over eighteen healthcare related projects at Memorial University in Newfoundland. CHIA will facilitate research into patient outcomes and offer insight into how services may be improved through the use of high-performance computational infrastructure and de-identified patient datasets.

New Brunswick IT Delivery Centre

In April 2015, IBM Canada established a new IT services delivery centre in Florenceville-Bristol, New Brunswick, that will provide McCain Foods' global operations with system infrastructure support, resiliency, security and mobility services. The facility will also provide security compliance and tools services to other IBM clients. The partnership is yet another way IBM is driving business value, regional employment

and economic development in Atlantic Canada and beyond. IBM continued to expand its operations in 2016, expanding its existing security centre and IT operations to create a hub of IT and security technology expertise and high-value jobs within the Province. The security expansion was based around the 2011 acquisition of Q1 Labs whose QRadar Security Intelligence Platform was developed in partnership with the University of New Brunswick.

This acquisition served as a catalyst for IBM to form its security division, which is now a \$2 billion business employing 7,500 researchers, developers and security experts across 36 locations worldwide. IBM continues to invest in and maintain a research development and customer support centre in Fredericton, which provides support for more than 5,000 customers around the globe.

CARET (Collaboration for Analytics Research, Education and Technology) Partnership

In November 2013, IBM further expanded its investment in Atlantic Canada by contributing a multi-million-dollar private cloud to a consortium of post-secondary institutions in Nova Scotia. The system, the first of its kind in Atlantic Canada, provides a shared computing platform that enables the participating schools (Dalhousie University, Acadia University,

Cape Breton University, Mount Saint Vincent University, Nova Scotia Community College, Saint Mary's University and St. Francis Xavier University) to jointly create new curriculum and conduct research, all aimed at better equipping graduates with analytics skills to drive Nova Scotia's economy.

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