



## EMERGING TRADE TRENDS

# New Technologies.

### Snapshot

- In recent years, companies and governments around the world have accelerated their investments in new technologies such as machine learning, yielding major breakthroughs in their capabilities.
- Companies that adopt and integrate emerging technologies successfully can better differentiate themselves in global markets, boost productivity and efficiency across their global value chains, and augment human creativity and output.
- New technologies can be costly and have limited application, so companies should take a targeted approach.
- Adopting these technologies can also disrupt employment and traditional processes, so companies need to train employees to collaborate with machines and develop flexibility in their roles.

## Background

In 2017, DeepMind's AlphaGo Zero software taught itself to be world champion at the game of Go—without using any training data from human games. Typically, for machines to learn, they need huge amounts of reliable data, making this an important breakthrough. Then in January 2018, both Microsoft's and Alibaba's **deep learning** software did better than humans on reading and comprehension tests, opening the door to artificial intelligence (AI)-based customer service, medical inquiries, museum tutorials, and many other applications.<sup>1</sup> These examples are just some of the many global advancements and investments made in machine intelligence and other new technologies in recent years.

New technologies such as machine learning, advanced robotics, 3D printing, and virtual and augmented reality are transforming the global business landscape across industries. The United States is the global leader in many of these technologies, but advancements and investments are not strictly limited to U.S. technology giants.

**China** has major ambitions to be the world leader in AI by 2030.<sup>2</sup> China appears to be making progress: two of its universities are in the top 10 sources of most frequently cited AI research papers.<sup>3</sup> It has the advantage of access to large volumes of consumer data due to its large population, and state-controlled institutions, and a strong research talent pool in AI. China is also disrupting the AI **intellectual property** landscape. For example, while many U.S. and European firms guard their self-driving car data, Baidu—the leading Chinese self-driving car researcher—plans to open-source it all.<sup>4</sup>

**Canada** is also recognized as a global pioneer in deep learning—a type of machine learning that can be applied to computer vision and speech recognition, for example—and has numerous start-ups at the forefront of developing AI, blockchain, and quantum machine learning technologies. Tech multinationals are investing in research centres across the country to leverage the expertise of Canadian AI researchers, with Google's AI research arm, DeepMind, opening its first international office in Edmonton and the launch of the Facebook AI Lab (FAIR) in Montreal.<sup>5</sup>

1 Robert Fenner, "Alibaba's AI Outguns Humans in Reading Test," *Bloomberg Technology*, January 15, 2018, <https://www.bloomberg.com/news/articles/2018-01-15/alibaba-s-ai-outgunned-humans-in-key-stanford-reading-test>.

2 Will Knight, "China's AI Awakening," *MIT Technology Review*, October 10, 2017, <https://www.technologyreview.com/s/609038/chinas-ai-awakening/>.

3 Shigenori Arai, "China's AI ambitions Revealed by Most Cited Research Papers," *Financial Times*, November 6, 2018, <https://www.ft.com/content/daf53474-c21c-11e7-a1d2-6786f39ef675>.

4 Rachel Metz, "Baidu Could Beat Google in Self-Driving Cars with a Totally Google Move," *MIT Technology Review*, January 8, 2018, <https://www.technologyreview.com/s/609885/baidu-could-beat-google-in-self-driving-cars-with-a-totally-google-move/>.

5 DeepMind, "DeepMind Expands to Canada With New Research Office in Edmonton, Alberta," announcement, July 5, 2017, <https://deepmind.com/blog/deepmind-office-canada-edmonton/>; McGill Reporter Staff, "Joëlle Pineau to Head New Facebook AI (FAIR) Lab in Montreal," McGill Reporter, September 15, 2017, <http://publications.mcgill.ca/reporter/2017/09/joelle-pineau-to-head-new-facebook-ai-fair-lab-in-montreal/>.

## Challenges and Opportunities

Adopting emerging technologies can pose both major opportunities and challenges for Canadian businesses that are active globally or have global aspirations.

### **Challenge: The Uncertainty and Risks Associated With New Technologies**

New technologies can be extremely costly to develop and implement, and identifying which one of them to bet on can be difficult. Many new technologies still have serious limitations and often their application is quite narrow. There is, for example, no generalized AI that can be applied to any question or problem. And many activities still cannot be automated: Even self-driving car companies require humans to take notes on hours of driving footage.

Moreover, new technologies can displace traditional employee roles and processes, and employees may therefore fear them. While it is not clear exactly how many existing types of jobs will be lost in the short term (studies range widely in their assessments of job loss from AI and new technologies), what is clear is that the pace of change is phenomenal and there will be disruption.

### **Opportunities**

**Boost productivity.** New technologies can boost productivity and efficiency, not just in one aspect of production but across companies' entire global value chains. For example, the use of self-driving vehicles could leverage off-hours shipping, many warehouse activities can be automated and optimized using robotics and machine learning, and advances in translation technologies can help coordinate across global operations.

**Innovate and create new products and services.** The potential of new technologies goes beyond optimizing existing processes and products. Machine learning could lead to breakthrough products such as new medications, and companies could also use machine learning and other machine technologies as new service offerings.

## Navigating the Trend

What should businesses do to incorporate these new technologies into Canadian companies' global offerings, while mitigating the related challenges? Out of the four keys to international business success, skilled executives and innovation capabilities are the most important ones to navigate this trend. We recommend the following strategies:

### Use New Technologies Strategically

- Companies that adopt machine learning, robotics, and other new technologies can use them to carve out a global niche. For example, both the companies profiled below have used robotics to set themselves apart from their global competition—Signifi for automated vending machines and MHICA for robotic drilling, fastening, and sealing of large complex aerospace assemblies. Companies can also use these technologies strategically across the global value chain to boost productivity and efficiency, and be better able to compete globally.
- Given the cost of buying technology and the uncertainty around which technologies have legs, companies need to pick and choose. This means targeting automation and machine learning to certain questions and processes where it can do as well as or better than humans, and taking a wait-and-see approach for others. Companies also need to plan to re-skill employees frequently and help them develop flexibility in their roles.

### Use Machines to Augment Human Ingenuity

- Canadian firms can differentiate themselves globally if they leverage technologies *to augment human ingenuity*. The current “techlash” or backlash against new technologies is driven by fear that humans will lose their jobs to machines. But the best uses of machines augment rather than replace human intelligence and creativity. As aerospace wing and fuselage maker MHICA notes, “We view robots as human assist.” Human employees need to be trained to collaborate with machines and create additional value for customers.
- Companies should draw on the global market for talent, technologies, and capital. This is a global phenomenon, and Canada’s companies should access the best global technologies and people to maximize success in global markets. Canada’s reputation as a relatively more open country than the United States under President Trump provides a window to attract global talent. Global capital is also keen to invest in emerging technologies, including in Canada’s AI start-ups, providing another window of opportunity.

## Canadian Exporter Experiences

**Company Name:** Mitsubishi Heavy Industries Canada Aerospace Inc. (MHICA)

**Location:** Mississauga, Ontario

**Website:** [mhi.com](http://mhi.com)

**Product:** Tier-one aircraft parts supplier to Original Equipment Manufacturers connected to global value chains

**Year Established:** 2006

**Employees:** 725

**Total Revenues:** \$165 million

**Export Plans:** Currently looking to sell to other Tier 1 manufacturers globally.

### Description

MHICA designs and builds complex wing and fuselage assemblies.

### Competitive Advantage

The company's use of robotic tooling on large complex wing and fuselage assemblies and robotic-assisted sealing is unique globally.

Through automation, MHICA has:

- achieved production efficiencies from eliminating secondary manual operations and cleanup;
- boosted flexibility through using the same equipment for different products;
- increased quality;
- improved health and safety through reducing fatigue from repetitive tasks;
- positioned the company for export growth.

### Dealing With the Challenges of Adopting New Technologies

#### Retaining talent

The main challenges of using robotics have been customizing equipment, delivering on time, and training and retaining talent. To meet its delivery schedules in the face of a transition to automation, MHICA perseveres in finding a solution when it runs into implementation problems.

To retain talent, MHICA engages staff in the automation journey by emphasizing that innovation is everyone's job and that the reward is getting more work, rather than being replaced by machines. This is introduced in new employee orientation sessions (in which the CEO participates) and reinforced through on-the-floor exchanges. To attract technical talent, in 2013, the company began establishing relationships with universities and colleges, creating a network and pipeline, and opened a training school and apprenticeship program.

The company teaches employees to be multi-talented and flexible, which makes it easier to ramp up rapidly for complex aerostructures. For example, MHICA sent a large group of assembly workers and tooling staff to Japan for on-the-job training, and then Japanese workers came to the Canadian facility and built alongside Canadian workers, using new tools and processes. As a result, "we can quickly

absorb complex structure (wings and fuselage) and have ramped up rapidly,” says **Mike McCarthy**, President. By ensuring broad, flexible job classifications and internal promotions, employees are keen to embrace more complex systems.

To build support for its strategy, MHICA also invites government representatives into its factory for tours and displays of its automation capabilities.

### **Future Growth Plan**

Having demonstrated its heavy aerospace capability in Canada, MHICA has its eyes set on the export market. The company’s goal is to actively participate in the US\$6-trillion, 20-year commercial aircraft market segment and the US\$250-billion, 10-year business aircraft market segment. MHICA is well positioned. “Boeing and Airbus have a 10-year backlog, so there is a huge opportunity to partner with them since there are only two U.S. Tier 1 suppliers and they are saturated,” explains McCarthy. “In particular, Airbus needs a supply chain to support its final assembly line in Mobile, Alabama.”

Another opportunity for MHICA stems from offset obligations that Airbus, Boeing, and Lockheed must fulfill as a result of Canada’s defence purchases from them. According to McCarthy, “Airbus is looking to create a North American supply chain, has offset obligations to Canada, and is impressed with our use of robots and innovation. It’s almost a perfect storm for us.” Based on the packages it is targeting to Airbus, Boeing, and Lockheed, MHICA could see its revenues double.

**Company Name:** Signifi Solutions Inc.

**Location:** Mississauga, Ontario

**Website:** [signifi.com](http://signifi.com)

**Product:** Automated retail vending machines

**Year Established / Started Exporting:** 2005 / 2010

**Employees:** 26

**Total Revenues:** \$5 million

**Export Share of Sales:** 40%

**Export Markets:** U.S., U.K., United Arab Emirates, Africa, China

## Description

Signifi Solutions builds sophisticated vending machines used by Canada Post, BMW, eBay, PayPal, and others.

## Competitive Advantage

Signifi designs and builds automated retail kiosks. The company provides the entire solution—from hardware engineering and customer software development to deployment and post-installation support. The units can be anywhere, including in train stations, airports, and universities.

## Dealing With the Challenges of Adopting New Technologies

Signifi has adopted robotics, along with the associated costs and opportunities. Unlike vending machines where products are pushed and dropped, Signifi uses robotics to pick up and present the product to the customer, replicating an in-store experience. The company devotes considerable effort to the look and feel of the robots. A server in each machine guides the robot's speed and look (e.g., logo colour), allowing control over how it all feels to the customer. "We really believe that making the user experience unique is where the future is headed," says **Shamira Jaffer**, President. "That's why we have put a lot of effort into trying to make machines that are exciting and don't just look like a box.

Signifi's use of robotics has resulted in production efficiencies and has allowed the company to better meet the challenging lead times of retailers. Signifi's strong software also allows staff to provide after-sales support remotely—and the use of robotics provides a strong selling point for retailers. "Because bricks and mortar are expensive, retailers can have an online presence and then leverage express stores using automated retail units," says Jaffer. By doing so, they can expand their brand less expensively to new locations and demographics.

Automation also opens up opportunities for Signifi to create mechanisms to reduce theft and manage assets. "We will be pushing the boundaries looking for transformational ways to leverage automated technologies in retail settings which include theft reduction," says Jaffer.

## Future Growth Plan

The company has an aggressive export plan, seeking to double its export business over the next three years. Its goal is to capture 80 per cent of international sales. Signifi also has a strategic alliance with a U.K. company that has a presence in over 100 countries.

## Acknowledgements

This research series is funded by HSBC Bank Canada, and is researched and written by The Conference Board of Canada.

Insights. Understanding. Impact.



The Conference Board  
of Canada

255 Smyth Road, Ottawa ON

K1H 8M7 Canada

Tel. 613-526-3280

Fax 613-526-4857

Inquiries 1-866-711-2262

[conferenceboard.ca](http://conferenceboard.ca)

