



Accelerating Adoption of Advanced Manufacturing Technologies



Canadian
Manufacturers &
Exporters

Manufacturiers et
Exportateurs du
Canada



About Industrie 2030

Industrie 2030 is a national strategy developed by Canadian Manufacturers & Exporters (CME) and our strategic partners to leverage the opportunities presented by the Fourth Industrial Revolution and usher in a new era of manufacturing growth in Canada.

Manufacturing is the largest and most important business sector in Canada, directly and indirectly accounting for 28 per cent of all economic activity and 27 per cent of all employment. However, the sector has been struggling in recent years and along with it, so too has the Canadian economy. Output and employment have stagnated, investment and innovation have declined, and trade deficits have ballooned.

Industrie 2030 began with a simple question: What would it take to double Canadian manufacturing output and value-added exports by the year 2030? This question was the beginning of a months-long research and consultation process that formed the heart of the exercise. We heard about the issues, challenges and opportunities manufacturers see every day while running their businesses, and what would help them grow their operations, output and sales. CME and our strategic partners held 55 community consultations across Canada that were attended by more than 750 business leaders. In addition, we received over 550 responses to our bi-annual *Management Issues Survey* to add qualitative depth to our analysis.

From these consultations emerged five major themes – areas where specific and direct action are needed if we are to achieve our goal of doubling manufacturing output and exports by 2030 and to reverse recent trends in manufacturing and in the Canadian economy as a whole. These are:

- *Building a Strong and Skilled Workforce for Growth;*
- *Accelerating Adoption of Advanced Manufacturing Technologies;*
- *Fostering Innovation, Commercialization and New Product Development in Canadian Markets;*
- *Manufacturing a Competitive Business Environment in Canada;* and
- *Increasing Sales in Domestic and Foreign Markets.*

The Industrie 2030 summary report, *Manufacturing Growth, Innovation and Prosperity for Canada* provides an overview of the issues, challenges and opportunities in each of these five priority areas and offers specific recommendations for action in each. In addition to this strategic report, additional research reports published in 2016 included *Roadmap to 2030: A path towards doubling manufacturing output and exports* (April); *Management Issues Survey 2016* (October); *Industrie 2030: A National Strategy for Canadian Manufacturing in the Digital Age* (October) and *Manufacturing and Exporting in Canada* (October).

This document, *Accelerating Adoption of Advanced Manufacturing Technologies*, is one of five reports that provide detailed analysis and recommendations in each of the priority action areas. It is itself a stand-alone strategic blueprint: it identifies the specific challenges manufacturers face; it examines the factors contributing to these challenges; it highlights the impacts that these challenges pose to manufacturing in Canada; and it proposes detailed solutions.

These reports and recommendations reflect the realities of Canadian manufacturing as heard during our research and consultation process throughout the summer of 2016. We understand that these priorities can change as economic and political realities shift. However, this is not an excuse for inaction. Given the importance of manufacturing to the Canadian economy, we can and must act immediately to address the challenges and opportunities the sector faces today. The core recommendations in this report are the beginning of that process. We will adjust our priorities and actions as the changing business context requires, keeping long-term growth in manufacturing as our overarching focus.

The Industrie 2030 objective is to double manufacturing output and exports by 2030. Working together with our strategic partners, members, and all levels of government across Canada, CME is firmly committed to reaching this goal. All recommendations, reports, background information and analysis from the Industrie 2030 initiative are available at: **www.industrie2030.ca**.

Partner Summary



Neil McLaughlin
Executive Vice President,
Business Financial Services
RBC

Canada is at an exciting and critical point when it comes to manufacturing. The industry is a significant driver of the Canadian economy in terms of its contribution to GDP, employment, private sector R&D, exports and even indirectly through its impact on other sectors like technology and services. However, the future sustainability and growth of the industry will be impacted by manufacturing companies' ability to pivot and compete in an increasingly digital, integrated and volatile global market.

Technology has changed the playing field creating the need for Canadian manufacturers to innovate and leverage advanced technologies, robust data and advanced materials to remain relevant. These innovations provide great opportunities, allowing companies of all sizes to be more agile and efficient in product development, speed to market and scaling-up operations.

As highlighted in this report, Canadian companies face some obstacles—including high costs of advanced technologies and the significant investment of time and resources to integrate them into the existing production environment.

RBC recognizes the opportunities and challenges that Canadian manufacturers are facing. We've advised manufacturers of all sizes in Canada on managing financial risks and have provided access to capital for investments including advanced machinery and equipment. We believe that innovation in products, process and technology will give Canadian manufacturers a strong competitive edge globally, improving productivity and creating differentiated value for sustainable long-term growth.

RBC has partnered with the CME in developing the Industrie 2030 roadmap for future growth of the manufacturing industry. We applaud and support the efforts of industry partners, government agencies and leading companies working together to propel the adoption of advanced manufacturing.

We're excited and remain committed to working with the Canadian manufacturing industry on this innovation journey.

Executive Summary



Mathew Wilson
Senior Vice President
Canadian Manufacturers & Exporters

A wide range of advanced technologies are changing the face of modern manufacturing and creating new opportunities and challenges for manufacturers in Canada and around the world. Technologies such as 3-D printers are changing how products are prototyped, how original equipment manufacturers are interacting with their supply chains, and the speed of new product development and commercialization. The Internet of Things is allowing manufacturers to control and monitor their operations from anywhere in the world to ensure maximum efficiency, and to connect with and serve their customers continuously. Advanced robots are working side by side with people to assist in the assembly process. These are on top of a range of what are now commonplace advanced technologies such as multi-axis computer numerical control (CNC) machines and a wide range of automated processes and robotics.

These new technologies are driving modern manufacturing by lowering production costs, increasing productivity, quality and agility, while allowing for the creation of new innovative products. Technology is also changing the necessary skill sets and capabilities of the workforce and their role in modern manufacturing. It is also driving a manufacturing renaissance in many jurisdictions around the world which were once thought to be too high-cost to be competitive.

For Canadian manufacturers to prosper, they need to be at the forefront of this change, investing in new machinery and equipment, and incorporating new digital technologies and advanced manufacturing capabilities into their operations. Unfortunately, Canadian manufacturers are moving in the wrong direction.

Manufacturing investment in machinery and equipment in Canada has fallen by nearly five per cent between 2009 and 2014, hitting a 30-year low in that year. In the US investment has risen by 58 per cent over the same time period. In fact, few industrialized countries have a worse record than Canada.

According to the results of the 2016 *Management Issues Survey*, more than 60 per cent of businesses do not presently use advanced manufacturing technologies in their operations. Based on the Industrie 2030 consultations, there are several significant factors that impact this reality. First, the cost of purchasing new machinery and equipment is the single biggest obstacle that Canadian manufacturers face in their efforts to adopt new technologies. Compounding this challenge, drop in the value of the Canadian dollar since 2014 has dramatically increased the price of these goods. Second, there is significant risk in adoption given the quick change in technologies, the length of time required for integration, and the uncertainty of the impact. Finally, financial support is not always available from the public or private sector.

These trends are having a predictable effect on productivity and overall manufacturing competitiveness. Manufacturing productivity in Canada has risen by 18 per cent since 2002. In the US, it has risen by 49 per cent. In South Korea: 94 per cent. Advanced technologies are the present and future of manufacturing. Canadian manufacturers need to improve their record on capital investment and technological adoption if they are to grow and remain globally competitive. In addition to these economic impacts, adopting advanced technologies have the added benefit of reducing energy costs and the environmental footprint of manufacturing operations.

Given the importance of technology adoption for the long-term competitiveness of Canadian manufacturing, for increasing output and productivity, for reducing our environmental footprint, and considering how far Canadian firms generally lag their competitors in this area, it is critical that government and the private sector work together to accelerate the adoption of a range of advanced manufacturing technologies. In fact, without reversing our investment and productivity growth trends, Canada will not see any substantial increase in manufacturing output and our share of global manufacturing activities will continue to shrink. To that end, the Industrie 20303 recommendations are:

1. Enhance depreciation rates and provide tax credits to encourage investment in advanced manufacturing technologies.

- a. The Government of Canada introduce a permanent accelerated capital cost allowance tax structure for advanced manufacturing technologies that allows manufacturers to claim an immediate first-year write-off of all qualifying capital expenditures on advanced technologies, including software.
- b. The federal government's Atlantic Investment Tax Credit program should be expanded nation-wide.

2. Establish manufacturing hubs and technology demonstration centres to showcase and test new advanced manufacturing technologies.

- a. Canada should create a network of advanced manufacturing technology demonstration centres across Canada that:
 - Focus on cross-cutting technologies, as well as areas where Canada has an existing technology advantage, including the Internet of Things, 3-D printers, and advanced robotics;

- Be private-sector driven, not led by governments, universities or think tanks; and
- Showcase Canadian technologies as well as educate businesses about those technologies.

3. Expand all regional manufacturing technology investment support programs across the country.

- a. The SMART program currently available only to manufacturers in Southern Ontario should be expanded nation-wide. Similar to the existing program, this expanded SMART initiative should be administered by the private sector.
- b. The Advanced Manufacturing Fund available only in Southern Ontario should be simplified, recapitalized, and expanded nation-wide. It should also be enhanced to support a wider range of manufacturing investment for all sizes of companies.
- c. LEAN training programs available in Atlantic Canada and the western provinces should be expanded outside those regions.

4. Reinvest all federal and provincial carbon-pricing revenues back into offsetting the cost of purchasing new technologies and machinery & equipment.

- a. Federal and provincial governments should create a new program to assist manufacturers investing in new technologies that have environmental benefits. The initiative should be modelled after Ontario's SMART Green Program and be financed by 100 per cent of carbon pricing revenues collected from manufacturers. Manufacturers should be eligible for funding in direct proportion to how much they pay into the pricing scheme.

How technological adoption ties into the Industrie 2030 Strategic Goals:

- New technologies lower the cost of production, improving manufacturing productivity, agility and competitiveness
- Technology improves business' ability to adapt to customer demands and develop innovative new products
- Investing in new technologies lowers the environmental footprint of manufacturing, giving domestic companies an edge in a world that prices carbon
- Manufacturers that invest in new technologies create a market for Canadian companies that develop and sell innovative new products
- Adopting more new advanced manufacturing technologies lowers the cost of developing and commercializing new products in Canada

The Problem: Canadian manufacturers underinvest in advanced technologies

For Canadian manufacturers to prosper, they need to be at the forefront of change, incorporating new digital technologies and advanced manufacturing capabilities into their operations. However, investment in capital and technological adoption are declining, slowing productivity gains and putting the industry at a competitive disadvantage.

Advanced technologies like 3-D printers and advanced robotics are revolutionizing manufacturing. Not only are they transforming the products we consume and how they are made, they are changing manufacturing business models as we know them. As product and information systems become increasingly commoditized, manufacturers are focusing more on design, materials, data feedback and services to differentiate themselves from their competitors and generate customer value and profit. Customers themselves are demanding shorter product cycles, new innovation, higher quality, and lower costs. Technology is helping manufacturers meet these demands.

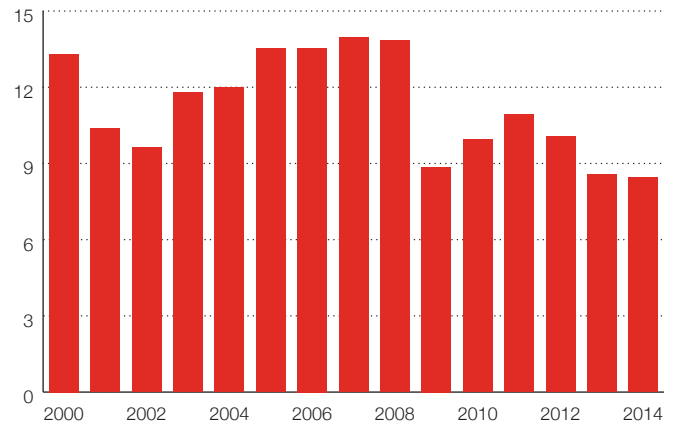
Investing in these advanced technologies is critical to developing a strong, innovative, global and cutting-edge manufacturing sector in Canada. Unfortunately, Canadian manufacturers are, generally speaking, slow adopters. According to the results of the 2016 *Management Issues Survey*, more than 60 per cent of businesses do not presently use advanced manufacturing technologies.

Moreover, investments in these, and other, types of machinery and equipment are heading in the wrong direction. In 2014, machinery and equipment expenditures fell to \$8.4 billion (in inflation-adjusted dollars) – their lowest level in 30 years.

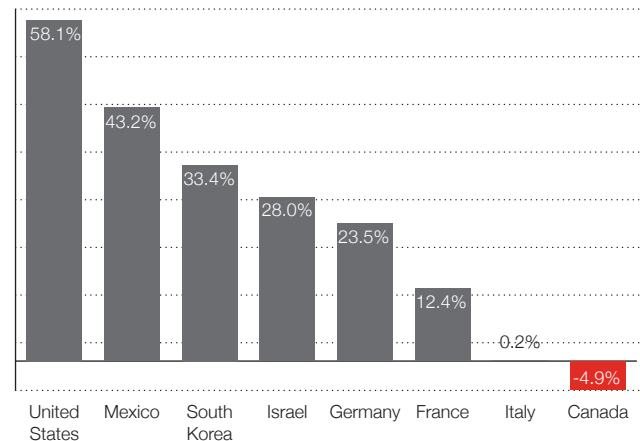
As a result, other countries are leaving Canada behind in terms of advanced manufacturing. While countries like the United States witnessed manufacturing investment in machinery and equipment rise by 58 per cent from 2009 to 2014, investment by Canadian manufacturers fell by nearly five per cent, making Canada one of the worst performances in the OECD. Only the hardest-hit European sovereign debt crisis countries (Greece, Spain, Portugal) and a few others had a worse record than Canada.

MANUFACTURING INVESTMENT IN MACHINERY AND EQUIPMENT IS FALLING

(in billions of 2007 dollars)



GLOBAL GROWTH IN MANUFACTURING MACHINERY AND EQUIPMENT INVESTMENT 2009-2014



Source: OECD. Note: Data for Mexico is for 2009 to 2012

This global comparison is directly linked to the stagnation that has hit the manufacturing sector over the past several years. Simply put, if Canada is going to grow its manufacturing sector, Canadian companies must invest in new machinery and equipment and in advanced manufacturing technologies.

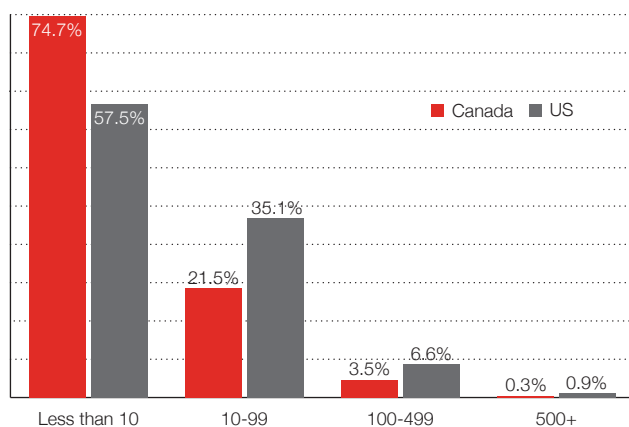
Contributing Factors

There are a number of factors behind Canada's lagging performance in technology adoption. One relates specifically to domestic industrial structure: compared to many other countries, Canadian manufacturers tend to be small businesses. In mid-2016, there were approximately 90,000 business establishments in manufacturing across Canada. Of that total, nearly 75 per cent had fewer than 10 employees or no permanent payroll. Only 279 manufacturing operations qualified as being "large" – employing more than 500 people.

In the United States, by contrast, there are far fewer small manufacturing operations (proportionately speaking) and a much greater number of large establishments. Only about 58 per cent of US-based manufacturing facilities employ fewer than 10 people. On the opposite end of the spectrum, just under one per cent of US manufacturing operations have more than 500 employees. While that figure is not large, it is significantly higher than it is in Canada. US manufacturing establishments are three times as likely to be large operations compared to those in Canada.

CANADA'S MANUFACTURING BASE SKEWS TOWARDS SMALLER BUSINESSES

(% of mfg establishments, by number of employees)



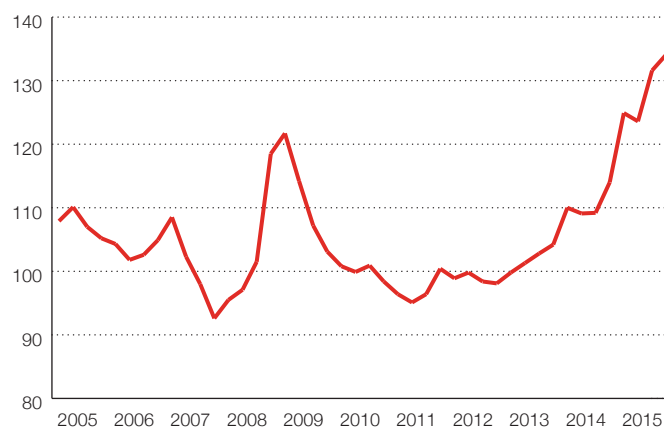
The larger average size of US-based manufacturing operations creates an advantage for businesses in that country. Larger businesses tend to invest proportionately more in machinery and equipment compared to their smaller counterparts. Large businesses have more internal resources available to research new technologies, to develop a purchase and implementation plan, and to finance the purchase. They also are more likely to have the skilled workforce in place to operate the new technology and maximize its full potential.

In other words, larger businesses – which tend to use more advanced technology, and invest in machinery and equipment and the skills of their employees – are more productive. Research from the Bank of Canada suggests that differences in business size are an important factor behind the persistent productivity gap between Canada and the United States.

The recent decline in the value of the Canadian dollar is also impacting the affordability of new machinery and technologies. Much of the machinery and equipment used by manufacturers is imported from the United States and elsewhere. As the exchange rate has declined, import costs have risen. Over the past three years, the price of imported machinery and equipment for manufacturing has risen by 37 per cent.

COST OF IMPORTED MANUFACTURING MACHINERY AND EQUIPMENT IN CANADA

(Price index: 2010=100)

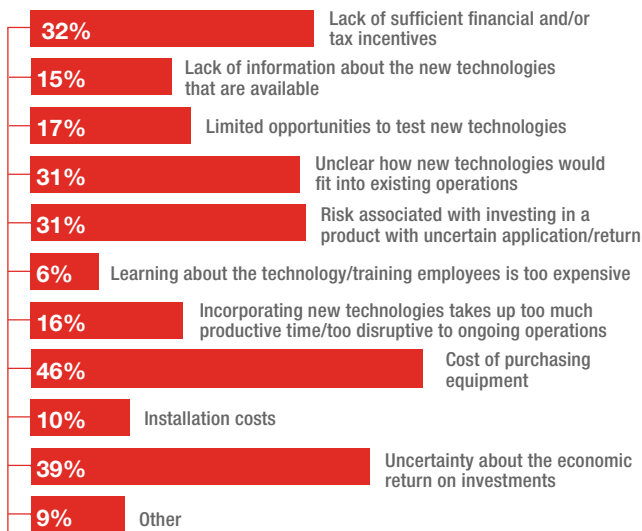


This trend was confirmed by the results of the 2016 *Management Issues Survey*. When asked about the main obstacles to adopting new technologies, the number one response was the cost of purchasing that equipment.

Another concern that manufacturers raised in the Industrie 2030 consultations is uncertainty about the economic return on investment (ROI) in new technologies. This response speaks to two issues. One is the relatively large number of small manufacturing firms in Canada, as described above. Small firms have fewer resources at their disposal to research and test new technologies. The implementation process is also far more disruptive to ongoing operations.

The second issue is that businesses have relatively few opportunities to examine and test new technologies before buying them. Canada does have a network of technology demonstration centres at technical schools and manufacturing centres of excellence in some locations, but this network is underdeveloped compared to what can be found many other advanced manufacturing countries.

WHAT ARE THE MAIN OBSTACLES YOUR COMPANY FACES IN ADOPTING NEW TECHNOLOGIES IN YOUR OPERATIONS?



Related to the ROI issue, manufacturers believe that the government supports available to help them offset the cost (and risk) of investing in new technologies are insufficient. While manufacturers often look for support from existing financial services providers, those traditional lenders, while supportive of general business expansion and investment, are less likely to support new technology adoption, especially if it is considered risky with potentially unknown outcomes. As such, manufacturers are looking to governments to help them de-risk this process and acceleration adoption rates.

One final critical contributing factor that directly impacts investment in new advanced manufacturing technologies and machinery and equipment is the business and operating conditions within which manufacturers operate – especially the tax and regulatory environment. This issue, along with corresponding recommendations are covered extensively in the Industrie 2030 paper *Manufacturing a Competitive Business Environment in Canada*. In short, manufacturers in Canada overwhelmingly believe that governments are not supporting investment in, and the growth of, their companies. A wide range of tax and regulatory changes are needed to make Canada a more competitive location for investment.

Impact of under-investment in advanced technologies: lagging productivity growth

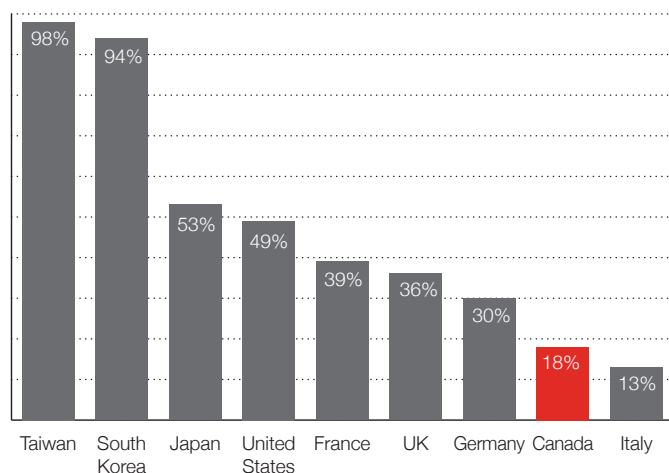
At the end of the day, the Fourth Industrial Revolution and adoption of new technologies is about productivity, agility and competitiveness. New technologies help manufacturers to lower production costs; to increase capacity to develop and build new products; to adapt to changing customer demands; and to gain an edge over their competitors in domestic and foreign markets. Productive firms are profitable. They innovate. They grow.

Chronic under-investment in machinery and equipment and slow adoption of these technologies is arresting this process and undercutting Canada's international manufacturing competitiveness. From 2002 to 2014, labour productivity in manufacturing in Canada increased by 18 per cent. Meanwhile, productivity in the US increased by 49 per cent, and it nearly doubled in Taiwan and South Korea. As a result, Canadian manufacturers have had to rely on other factors – such as a low exchange rate – to remain competitive. This is not a sustainable growth strategy.

This productivity gap deters manufacturing growth and investment in Canada. Businesses invest in locations where the ROI is highest. While ROI is affected by many factors – including taxes, land and labour costs, access to markets and infrastructure – at the end of the day, nothing matters more than productivity. A productive manufacturing sector can afford higher taxes and higher wages and still be a magnet for investment.

Failure to integrate new technologies at a faster pace will have other negative impacts on Canadian manufacturers as well. Manufacturers will attract fewer production mandates; their products will become relatively more expensive and less innovative; and they will lose business to countries where advanced technologies are more enthusiastically embraced.

LABOUR PRODUCTIVITY GROWTH IN MANUFACTURING: 2002-2014



Solutions

Adopting more new advanced technologies – and boosting machinery and equipment investment generally – is a vital step towards building a more competitive, innovative and advanced manufacturing sector in Canada. Industrie 2030 participants offered a number of specific ideas for how to turn around Canada's lagging performance in this area. An obvious first step in getting companies to adopt more advanced technologies is helping ensure they are profitable in the first place. Profitability allows capital to be reinvested in productive assets, including people, products, and processes.

In addition to that general requirement for profitability, participants provided several concrete actions that would support accelerate their adoption of advanced manufacturing technologies, including:

1. Enhance depreciation rates and provide tax credits to encourage investment in advanced manufacturing technologies.

One of the biggest obstacles manufacturers face in adopting new advanced technologies is that there is a significant cost and risk to making those investments, and the economic return is often uncertain. This issue is all the more relevant in the wake of the recent decline in the Canadian dollar. As noted above, the cost of importing new machinery and equipment has soared in the past two years.

Manufacturers need help from governments to reduce this risk. This message came through clearly both from the Industrie 2030 hearings as well as the results from the 2016 *Management Issues Survey*. When asked about the main obstacles to adopting new technologies, survey respondents pointed to the cost of purchasing new equipment and to the uncertain economic return of making those investments. They argued that tax credits, accelerated capital write-off programs or other government incentives were the most effective way to address those challenges and reduce that uncertainty.

The need is especially acute for small businesses. Canada's industrial structure in manufacturing is weighted towards smaller companies and these have a more difficult time adopting new technologies because they often do not have access to the cash, financing, research and strategic planning needed to make the adoption process as smooth and beneficial as possible. If we want our small businesses to adopt new technologies, become more competitive and grow, government support is required.

To help support capital equipment investment, the federal government introduced a two year write-off program for all physical machinery and equipment for manufacturing. This incentive has been an important tool for manufacturers over the past several years, but it has also had significant limitations. First, until the 2015 federal budget, the accelerated capital cost allowance (ACCA) benefit was a two-year program subject to bi-annual renewal. This meant that companies could not count on the program being available to them beyond that two-year window. Second, the measure did not cover software, which, in modern advanced manufacturing, is a critical component of capital investment. Finally, on some advanced technologies such as 3-D printers, the lifespan of the technology could be shorter than the tax write-down period of two years under the current rules.

As such, there are several important improvements to the capital cost depreciation rates that would support investment in new advanced manufacturing technologies and improve the long-term performance of Canada's manufacturing sector. Specifically, Industrie 2030 participants recommend:

Recommendation 1a: The Government of Canada introduce a permanent accelerated capital cost allowance tax structure for advanced manufacturing technologies that allows manufacturers to claim an immediate first-year write-off of all qualifying capital expenditures on advanced technologies, including software.

While accelerated depreciation helps businesses write off new technologies at a faster rate, it does not address the fundamental issue of the up-front cost of making those investments in the first place. Industrie 2030 participants identified these up-front costs, and associated risks, to be a major impediment to adopting new technologies.

A program already exists that helps manufacturers offset those costs and risks. The Atlantic Investment Tax Credit is a federal initiative that provides businesses with a 10 per cent investment tax credit to encourage investment in manufacturing equipment in Atlantic Canada. Such a program would be beneficial to all Canadians and should not be limited to those doing business in just one region.

Recommendation 1b: The federal government's Atlantic Investment Tax Credit program should be expanded nation-wide.

2. Establish manufacturing hubs and technology demonstration centres to showcase and test new advanced manufacturing technologies.

Given the structural small size of Canadian manufacturers, one of the major obstacles identified through consultation was the lack of awareness of the types of technologies available and how they could be effectively implemented. As noted earlier, mid-sized and larger companies have the internal resources available to them to determine what technologies are applicable to their operations and how those technologies could be applied to support or expand output. Smaller companies often lack an opportunity to examine, showcase and test new technologies. With the rapid pace of technological advancement, it is critical that manufacturers of all sizes have as much information as possible before making investment decisions.

One way to accomplish this is to establish a network of advanced manufacturing technology demonstration centres across Canada. These manufacturing hubs could provide a range of distinct services to support advanced technology adoption, including demonstration of the range of existing technologies and expert third-party technical advisory services to ensure effective technology purchases.

These centres could also be a testing ground for new and emerging Canadian-made technologies.

While some technical schools and private-sector vendors already offer this kind of service to local manufacturers, an expanded network would give businesses a greater opportunity to field test new technologies to better assess if and how they might be effectively deployed on the shop floor before committing to a purchase.

Specifically, we recommend:

Recommendation 2a: Canada should create a network of advanced manufacturing technology demonstration centres across Canada that:

- **Focus on cross-cutting technologies, as well as areas where Canada has an existing technology advantage, including the Internet of Things, 3-D printers, and advanced robotics;**
- **Be private-sector driven, not led by governments, universities or think tanks; and**
- **Showcase Canadian technologies as well as educate businesses about those technologies.**

The federal government is currently developing a cluster strategy as part of its broader innovation agenda. We believe this proposed network of demonstration centres is perfectly suited to that strategy and will help build knowledge and understanding about technologies, while also capitalizing on existing industrial strengths.

3. Expand all regional manufacturing technology investment support programs across the country.

Federal and regional economic development agencies have long offered a range of programs that support advanced manufacturing operations, efficiency, operational assessments and productivity. These programs have been critical to business development across the country, and to investment in manufacturing operations.

However, program availability can vary significantly from one part of Canada to the next. While some degree of variation is normal in the case of local or regional agencies, it is also the case that federal economic development agencies have differing scopes and mandates. As a result, federal programs developed in one part of Canada are not available in other parts of the country.

Industrie 2030 participants strongly believe that federal government policy should not discriminate against Canadian manufacturers on the basis of their location. A federal program available to manufacturers in one part of the country should be available in all other parts of the country. At the same time, this cannot mean a withdrawal or scale back of these programs. Rather, given the challenges of investment and productivity in manufacturing, now is the time to expand and enhance these programs to drive economic growth.

Given the recent political restructuring of federal economic development agencies, we believe there is a significant opportunity to change this discriminatory practice and expand regional programs across the country.

Manufacturers across the country identified three specific national investment support programs that should be expanded: Southern Ontario's SMART program and Advanced Manufacturing Fund; and LEAN Manufacturing support programs in Atlantic Canada and the Prairies.

SMART

The Federal Economic Development Agency for Southern Ontario has partnered with Canadian Manufacturers & Exporters to deliver SMART programs in that province for the past eight years. While the primary focus of the program changes every two years when it is renewed, one constant has been that it supports SME investment in advanced technologies through small grants and technology assessments. Specifically, the SMART Advanced Technologies for Global Growth program – the current incarnation – is designed to assist Southern Ontario manufacturers adopt new technologies that have the potential to improve productivity and global competitiveness. Through this fund, manufacturers are eligible for financial support to offset a percentage of eligible costs up to a certain threshold. In addition, firms are also eligible for funding for advanced technology assessments that allows those companies to understand which technologies will have the biggest impact on innovation, productivity and overall competitiveness prior to making any purchase.

Recommendation 3a: The SMART program currently available only to manufacturers in Southern Ontario should be expanded nation-wide. Similar to the existing program, this expanded SMART initiative should be administered by the private sector.

Program funding should be allocated on an objective basis to projects that focus on the adoption of technologies that improve productivity and competitiveness.

Advanced Manufacturing Fund

The Advanced Manufacturing Fund is a second program that is available only to manufacturers in Southern Ontario. While it has significant challenges in design and execution and should be modernized based on the lessons from early implementation, this type of fund should be helpful in supporting investment in advanced manufacturing technologies across Canada.

Recommendation 3b: The Advanced Manufacturing Fund available only in Southern Ontario should be simplified, recapitalized and expanded nation-wide. It should also be enhanced to support a wider range of manufacturing investment for all sizes of companies.

In addition, to ensure fund effectiveness, application processes must be simplified and sped up, and the fund must be recapitalized to allow national rollout.

LEAN Training

Finally, in Atlantic Canada and the Prairies, the federal economic development agencies successfully support a range of LEAN Manufacturing training programs. These programs ensure companies are operating as efficiently as possible using existing technologies through process improvements with the ultimate objective of boosting productivity. An expansion of this type of program funding outside these regions could substantially increase productivity rates of Canadian manufacturing.

Recommendation 3c: LEAN manufacturing training programs available in Atlantic Canada and the western provinces should be expanded outside those regions.

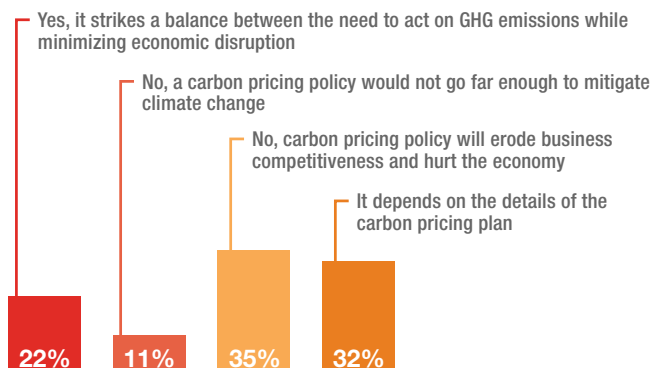
In addition to the specific need to expand regional manufacturing investment and productivity support programs across the country – and better align them to the needs of business – there is also a need to improve alignment and coordination between the regional, provincial and federal agencies that offer these programs. Programs should all be designed to increase investment, productivity, and innovation with the ultimate goal of increasing output, wealth creation, prosperity, jobs, and exports.

4. Re-invest all federal and provincial carbon-pricing revenues back into offsetting the cost of purchasing new technologies and machinery and equipment

The subject of climate change and carbon pricing was raised throughout the Industrie 2030 consultations. Participants had mixed views on whether the federal and provincial governments were doing the right thing when it comes to their respective carbon-pricing policies.

Most Industrie 2030 hearings preceded the federal government's October 2016 announcement of a \$10/tonne carbon tax beginning in 2018, rising to \$50/tonne by 2022. However, the messages we heard from manufacturers from before this announcement were consistent with those we heard after. Participants were well-informed on the issue, in part because of their experience with provincial climate mitigation plans, as well as their involvement with national consultations.

DO YOU SUPPORT CARBON PRICING AS A MEANS TO REDUCE EMISSIONS FROM THE INDUSTRIAL SECTOR?



Several participants expressed deep concerns that carbon-pricing schemes will undercut the competitiveness of Canadian manufacturing. Instead of locating in Canada where environmental standards are relatively high, efforts to price carbon – unless carefully designed – could drive investment out of the country to jurisdictions where environmental standards were lower. The end result would be the worst of all worlds: global GHG emissions would rise and Canada would lose billions of dollars in investment – not to mention thousands of good-quality, middle-class jobs.

At the same time, manufacturers recognize that Canada must do its part to mitigate climate change. To overcome a potential cost disadvantage, Industrie 2030 participants strongly encouraged the federal and provincial governments to re-invest carbon-pricing revenues collected from manufacturers directly back into the sector to help offset the cost of purchasing new machinery and equipment and decrease emissions from manufacturing operations. Research from CME has pointed to a well-established relationship between capital investment and lower GHG emissions. New technologies are key to improving efficiency and reducing environmental impacts. When businesses have the resources to invest in these technologies, emissions levels tend to fall.

It was suggested that the Ontario government's SMART Green Program was a useful model to follow. The SMART Green Program is a \$25 million fund that offers 50:50 matching grant funding (up to \$200,000) to manufacturers across Ontario to implement capital investment projects that will deliver emission reductions, energy efficiency technologies, and best practices through process and/or product improvement.

This program should be expanded significantly. It should be delivered nation-wide by the federal government and financed by 100 per cent of the proceeds from carbon tax revenues collected from manufacturers. In this way, the federal government can work towards achieving its climate change goals while also taking steps to build a more productive, prosperous, and technologically-advanced manufacturing sector in Canada.

As a caveat, it is important that any such plan be designed so that companies receive access to funds directly in proportion to how much they pay in carbon taxes or cap-and-trade expenses. Otherwise, businesses and even entire industries will be penalized simply because they are more energy-intensive than others. Chasing away energy-intensive manufacturers to relocate elsewhere does nothing to achieve global climate change goals.

Recommendation 4a: Federal and provincial governments should create a new program to assist manufacturers investing in new technologies that have environmental benefits. The initiative should be modelled after Ontario's SMART Green Program and be financed by 100 per cent of carbon pricing revenues collected from manufacturers. Manufacturers should be eligible for funding in direct proportion to how much they pay into the pricing scheme.

Conclusion – Tracking Progress

Accelerating the adoption of advanced manufacturing technologies is of critical importance if Canada is to capitalize on the opportunities created by the Fourth Industrial Revolution. If strategically leveraged, the Fourth Industrial Revolution offers an unparalleled opportunity for Canada. It makes the most of our existing strengths – our high-quality education system, skilled labour force, and ingenuity – while compensating for our weaknesses – high production costs and weak productivity levels. To get there, however, we need to reverse the recent trend of declining capital investment in manufacturing and remove some of the risk and uncertainty associated with investing in new technologies. This paper sets out a path to achieve that goal.

However, success is not measured by whether or not the recommendations set out in this report are implemented; it is measured by the results that they achieve. For this reason, the Industrie 2030 strategic plan has outlined seven KPIs that we will track over the next 15 years to monitor our progress. Two of these seven relate directly to increasing investment in advanced manufacturing technologies:

- **Annual investment in manufacturing machinery and equipment in Canada will rise by five per cent per year to reach \$24.5 billion by 2030.** Advanced manufacturing technologies are included within the broader range of machinery and equipment investment that is critically needed in Canadian manufacturing. While not all machinery and equipment purchases are necessarily advanced technologies, a reversal of the recent decline in M&E investments would undoubtedly signal an improvement in technological advancement in manufacturing.
- **Canada will be among the top two G7 countries for manufacturing productivity growth in every five-year period ending in 2020, 2025, and 2030.** Increasing the capital intensity of manufacturing production is one of the most effective ways to boost productivity. New advanced manufacturing technologies will lower production costs, improve efficiency and raise the value of labour.

- **The share of manufacturers reporting that governments support the growth of their company in the biannual *Management Issues Survey* will improve at each level of government by four percentage points every two years. By 2030, it will rise to 62 per cent for the federal government, 58 per cent for provincial governments and 47 per cent for municipal governments.** Canadian manufacturers need governments to actively support their growth by helping to reduce the uncertainty and risk of expensive capital outlays on new equipment and technologies. Better government programs to mitigate these risks will be reflected in improved rates of business satisfaction.
- **Canada's trade deficit in manufactured goods will fall by an average of \$5 billion per year to reach \$47 billion by 2030.** By investing in new technologies, manufacturers will become more productive and therefore more competitive in domestic and foreign markets. Exports will increase and local manufacturers will be better positioned to compete with foreign imports in the domestic market.

Canadian manufacturers need to invest more in new technologies in order to compete globally. However, given the rapid pace of technological change, not to mention the constantly-shifting social, economic, political and environmental context in which businesses operate, new challenges are certain to emerge. These will require new responses. A commitment to results rather than process ensures that we maintain an unwavering focus on increasing technology investment in Canada and, by so doing, pave the way to double manufacturing output and exports by 2030.

Who We Are

Since 1871, Canadian Manufacturers & Exporters has been fighting for the future of Canada's manufacturing and exporting communities and helping them grow.

The association directly represents more than 2,500 leading companies nationwide. More than 85 per cent of CME's members are small and medium-sized enterprises. As Canada's leading business network, CME, through various initiatives including the establishment of the Canadian Manufacturing Coalition, touches more than 100,000 companies from coast to coast, engaged in manufacturing, global business and service-related industries.

CME's membership network accounts for an estimated 82 per cent of total manufacturing production and 90 per cent of Canada's exports.

www.cme-mec.ca | www.industrie2030.ca

Strategic Partners

CME's strategic partners have helped us throughout this process by defining the agenda and supporting the research and consultation exercise. Like CME, they believe that a strong Canada can and must have a strong manufacturing sector at its heart. From business associations to manufacturers to key service providers, these groups have been instrumental in creating this action plan and in supporting the growth of manufacturing in Canada.

A special thanks to:



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