



CANADIAN  
MANUFACTURERS  
& EXPORTERS

CME 2023  
TECHNOLOGY  
ADOPTION  
SURVEY

MAY 2023



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## WHO WE ARE

Since 1871, we have made a difference for Canada's manufacturing and exporting communities. Fighting for their future. Saving them money. 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 Canadian Manufacturing Coalition, touches more than 100,000 companies from coast to 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.

**CME-MEC.CA**

### **ALAN ARCAND**

Alan Arcand is the Chief Economist at CME. In his role, he is responsible for developing and executing CME's major national research projects, conducting CME's macroeconomic analysis to support the organization across the country, and being a leading voice representing the interests of the association and members with government and with the public. Alan's background includes expertise in municipal, regional, and national economic matters including economic forecasting and analysis.

# EXECUTIVE SUMMARY



## ALAN ARCAND

Chief Economist

Canadian Manufacturers & Exporters

Technology is transforming all aspects of our lives. As the world becomes increasingly digitized, the manufacturing sector is not immune to the effects of this technological transformation. Relentless competitive pressures are driving manufacturers to adopt technology to lower operating costs, increase flexibility and responsiveness, reduce waste, and improve product quality. These technologies are opening new doors for innovative, risk-taking companies, but also threatening to leave slow adopters behind.

Unfortunately, as detailed and documented by CME and other organizations including the Government of Canada, Canadian industry is a global laggard in technology adoption. This has hindered growth in the manufacturing sector and in the economy overall. Slow technology adoption has also resulted in sluggish labour productivity growth, the single most important determinant of a country's standard of living. Canada's poor technology adoption record directly limits our ability to compete for and win investment and jobs in the intensely competitive manufacturing sector.

Data from the OECD show that, in recent years, Canada has ranked near the bottom of advanced economies in terms of non-residential capital investment growth. Over 2016-20, Canada recorded the second weakest business investment performance among 31 OECD countries, with non-residential investment falling at an average

annual pace of 1.8 per cent. While a collapse in energy investment has been fingered as the main culprit, sluggish manufacturing investment has not helped matters.

Given Canadian businesses' reluctance to invest in their operations, it should not come as a surprise that advanced technology adoption in manufacturing is still more the exception than the rule. This is evident from the findings of past surveys, including those conducted by Canadian Manufacturers & Exporters (CME) and Statistics Canada, among others.

It would be an understatement to say that a lot has happened since we last surveyed manufacturers about advanced technology. Trade conflicts, the COVID-19 pandemic, and geopolitical tensions have all profoundly affected global manufacturing supply chains. Of those events, the impact of the pandemic has been particularly eye opening, revealing an alarming lack of domestic capacity to produce critical goods. Meanwhile, at the same time as these events have unfolded, the global race to lead in the development and production of clean technologies has continued to accelerate, as achieving net-zero emissions by 2050 hinges on an unprecedented clean technology push.

Together, these trends have kickstarted a push to reshore manufacturing production to Canada, all in the hopes of revitalizing the sector, improving economic growth and productivity, and building resilience against future economic shocks. However, if we want to get serious about rebuilding Canada's industrial capacity, the first thing we need to do is dramatically improve our business investment performance, especially when it comes to technology. As such, this makes it an ideal time to reassess the current state of advanced technology adoption in Canada's manufacturing sector, explaining why CME dedicated its latest survey to this vital topic.

Survey participants represented a broad cross-section of the Canadian manufacturing sector, with 279 respondents spanning at least 18 industries. We heard from small businesses with only a handful of workers, all the way up to large, multinational corporations that boast over 500 employees. The survey also achieved broad geographic representation, with participation from companies from all regions of the country.





Given Canadian businesses' reluctance to invest in their operations, it should not come as a surprise that advanced technology adoption in manufacturing is still more the exception than the rule."



## EXECUTIVE SUMMARY (continued)

A few key conclusions can be drawn from the survey. First, while Canadian manufacturers have made progress in implementing technology, more work needs to be done to accelerate the pace of change. For example, when we asked manufacturers to self-assess their progress on digital transformation, the results were mixed. True, 13 per cent of survey participants reported that their company's digital transformation was at an advanced stage and another 47 per cent said it was at an intermediate stage, together representing more than half the respondents. But, at the same time, 28 per cent also said that their digital transformation process was just beginning and another 12 per cent said it had not even started yet.

Also, when we asked survey participants if they are currently using any one of nine different digital transformation software solutions available on the market, including Enterprise Resource Planning (ERP) and Electronic Data Interchange (EDI), there was both good news and bad news. On the one hand, we found that 76 per cent of manufacturers are using at least one solution, while 63 per cent are using at least two solutions. On the other hand, we also found that one-quarter of manufacturers have yet to adopt any of the nine software solutions outlined in the survey.

The same trends were observed when we asked manufacturers about their use of nine different advanced technologies, like cybersecurity and cloud computing, that are changing the face of manufacturing. On the positive side, our survey found that 66 per cent of manufacturers are using at least one of these technologies a lot, while 80 per cent are using at least one a little. But on a negative note, we also found that 10 per cent of manufacturers have yet to adopt any of the nine technologies.

To encourage investment in technology, CME has long advocated for a national 10 per cent investment tax credit (ITC) that is matched by all provinces. Manufacturers in some Atlantic Canadian provinces already have access

to a 20 per cent ITC, but there just isn't any good reason for manufacturers in the rest of the country to be denied access to such a worthwhile tax incentive too.

Another important conclusion that can be drawn from the survey is that firm size is a key driver of technology adoption, a finding that is consistent with the results of previous surveys and research studies. Indeed, compared to their larger corporate counterparts, small businesses reported lower confidence in their knowledge of the technology solutions available to them today, greater difficulty in obtaining financing for their digital transformation projects, lower rates of software and advanced technology adoption, and more muted near-term investment plans.

This is a major problem because Canada's manufacturing sector is predominantly composed of small businesses. In fact, of the roughly 52,000 manufacturing enterprises with employees, 47,750 or 93 per cent have fewer than 100 workers. Their tendency to be slow to adopt technology affects the wider industry as well because many small companies supply products and services to larger corporations. In other words, small companies rely on large companies for business and large companies rely on small companies for a range of components, parts, and services that allow them to remain competitive. In short, the health of the manufacturing sector is often driven by the health and the strength of this relationship within the supply chain.

Still, the fact of the matter is that manufacturers of all sizes face numerous barriers to technology adoption, explaining why they tend to underinvest in new technologies even when the benefits are so clear and the need so great. In our survey, respondents flagged four main barriers to technology adoption: difficulty in integrating advanced technologies with existing systems, standards and processes; high purchase costs and uncertain economic return; a lack of skilled workers needed to make the most of advanced technologies; and a lack of sufficient government financial and/or

tax incentives. At the same time, just 3 per cent of manufacturers felt that their company did not face any obstacles to technology adoption, pointing to barriers being a widespread issue in the sector.

The main barriers identified by respondents highlighted another key conclusion of this survey: the strong relationship between labour and skills shortages and slow technology adoption, two of the most pressing challenges facing manufacturers today. While labour shortages usually push companies to invest in automation technologies, skills shortages often work in the other direction by discouraging manufacturers from taking this critical step. The reason for this is simple: as advanced manufacturing technologies become more commonplace and as production processes grow ever more sophisticated, the skillsets that businesses need are changing rapidly. Not only do new entrants need up-to-date specialized training, but also the ability to adapt and evolve in time with future technological advancements. But without educational reform and increased government support for employer-led training, skills gaps will remain high and thus will reduce the propensity to invest.

These obstacles will need to be addressed if the problems of weak investment and slow technology adoption are to be reversed, and this will not be possible without a strong response from governments. What policies should governments prioritize? According to our survey, manufacturers favour one policy response above the rest: 61 per cent said they are looking for governments to provide more direct funding and/or tax credits to help lower costs. Three other policies were also relatively popular and selected by about one-third of respondents: providing more funding and support for technology assessment programs, providing more direct funding or tax credits to support employer-led workforce training, and increasing the skills of the workforce by developing more vocation-focused education streams at the secondary level.

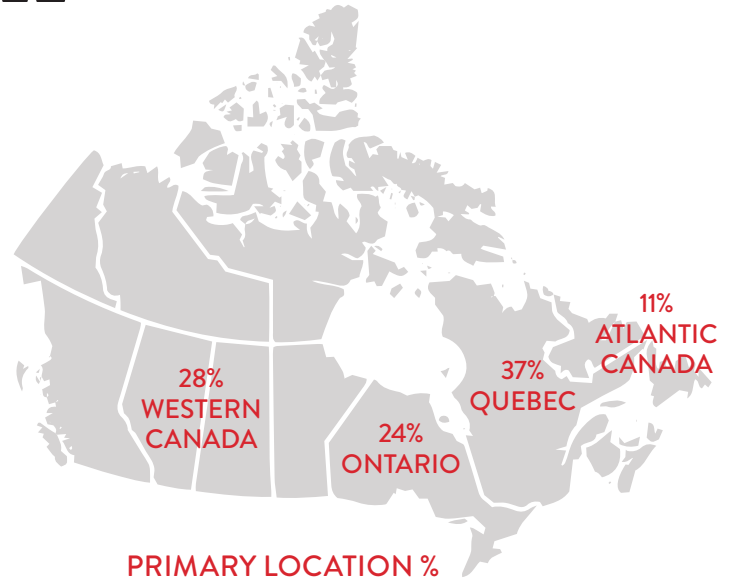
Thanks to the manufacturers that took the time and effort to respond to our survey, CME is in a better position to make its case to governments that more needs to be done to support innovation and technology adoption in the manufacturing industry. Indeed, the data gathered from this survey directly informed the 12 recommendations found at the end of this report. We are convinced that, if governments adopted these recommendations, it would strongly encourage manufacturers to invest in new technologies and grow their business, an outcome that is crucial to enhancing Canada's global competitiveness and supporting economic prosperity throughout the country.

# RESPONDENT PROFILE

## WHERE IS YOUR HEAD OFFICE OR PRIMARY LOCATION IN CANADA?

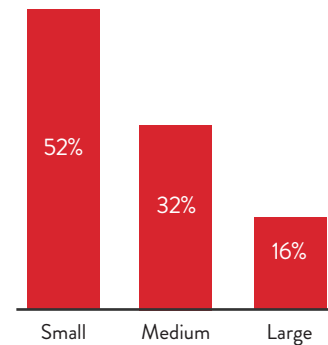
CME received 279 responses to our 2023 Technology Adoption Survey, representing all regions of Canada.

The largest share of responses – about 37 per cent – are headquartered in Quebec. About 28 per cent have their main operations in Western Canada, 24 per cent of survey participants primarily operate in Ontario, and 11 per cent come from Atlantic Canada.



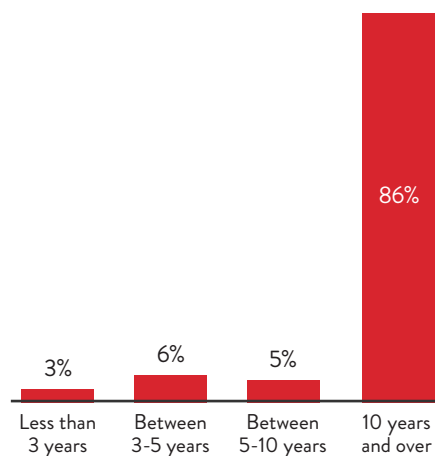
## HOW MANY PEOPLE WORK AT YOUR COMPANY?

Survey participants tend to be small and medium-sized businesses. A little over a half of all reporting companies have fewer than 100 employees, nearly one-third are mid-sized enterprises with 100 to 499 employees, and the remaining 16 per cent are large businesses with more than 500 employees. Compared to the actual structure of the sector, the survey sample has a significantly higher share of large companies. In fact, less than 1 per cent of Canadian manufacturing firms are large businesses.



## HOW LONG HAS YOUR COMPANY BEEN IN BUSINESS?



















Most of the companies that answered the survey have been around a long time. In fact, 86 per cent of responding companies have been operating for at least ten years. In contrast, very few start-ups are represented, as just 3 per cent of survey participants have been in business for less than three years. The remaining responses were from companies that have been operating between three to five years (6 per cent) and between five to ten years (5 per cent).





## WHICH CATEGORY BEST DESCRIBES THE GOODS YOUR COMPANY PRODUCES?

The survey results reflected the views of respondents from across the manufacturing spectrum. The largest representation was from companies in fabricated metal manufacturing, accounting for 22 per cent of total responses, followed by industrial and commercial machinery (9 per cent), food and beverage products (8 per cent), and plastics and rubber products (8 per cent). The remaining responses were spread across a wide range of other manufacturing activities.

 Fabricated metal products	<b>22%</b>	 Primary metals	<b>3%</b>
 Industrial and commercial machinery	<b>9%</b>	 Computers and electronic products	<b>3%</b>
 Food and beverage products	<b>8%</b>	 Furniture and related products	<b>3%</b>
 Plastics and rubber products	<b>8%</b>	 Paper products	<b>3%</b>
 Aerospace products and parts	<b>6%</b>	 Other transportation equipment	<b>3%</b>
 Electrical equipment appliances, and components	<b>6%</b>	 Printing	<b>1%</b>
 Motor vehicles and parts	<b>5%</b>	 Petroleum and coal products	<b>1%</b>
 Forestry and wood products	<b>5%</b>	 Textiles and apparel	<b>1%</b>
 Chemicals, fertilizers, and pharmaceuticals	<b>4%</b>	 Other	<b>11%</b>

# DIGITAL TRANSFORMATION

Global competitive forces are putting ever-increasing pressure on manufacturers to digitize their operations, so that they become more productive, create higher quality products, and generate greater profitability. Manufacturers that are undertaking digital transformation are turning to software solutions that cover all aspects of business operations, from the factory floor to the supply chain. As such, this section of the survey seeks to shed more light on digital transformation trends in Canada's manufacturing sector, including measuring the rate of software adoption.

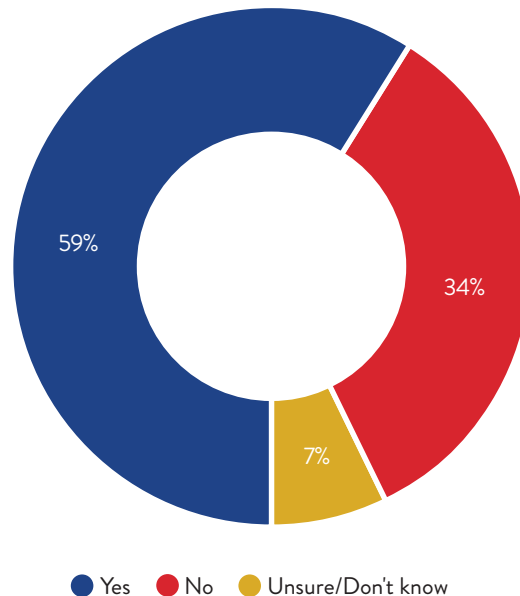
## WHAT STAGE WOULD YOU SAY YOUR COMPANY IS AT IN TERMS OF ITS PROGRESS IN DIGITAL TRANSFORMATION?

When asking manufacturers to self-assess their progress on digital transformation, the results were mixed. True, 13 per cent of survey participants reported that their company's digital transformation was at an advanced stage and another 47 per cent said it was at an intermediate stage, together representing more than half the respondents. However, 28 per cent also said that their digital transformation process was just beginning and another 12 per cent said it had not even started yet. If Canada's manufacturing sector is to remain globally competitive, more manufacturers will need to embrace digital transformation at a faster pace.



## DO YOU HAVE EMPLOYEES OR RETAIN THIRD-PARTY CONSULTANTS EXCLUSIVELY DEDICATED TO DIGITAL TRANSFORMATION WITHIN YOUR COMPANY? / HOW MANY EMPLOYEES OR CONSULTANTS ARE EXCLUSIVELY DEDICATED TO DIGITAL TRANSFORMATION WITHIN YOUR COMPANY?

Another way of assessing a company's progress in digitalization is to ask whether they have employees or retain third-party consultants to implement a digital transformation strategy. Once again, the results were mixed. While close to 60 per cent of Canadian manufacturers have staff or consultants working directly on digital transformation, these companies only have about an average of five people working on such initiatives. Moreover, this leaves more than one-third of manufacturers that do not have any employees or consultants directly involved in digital transformation within their company.



## IS YOUR BUSINESS CURRENTLY USING ANY OF THE FOLLOWING MANUFACTURING SOFTWARE SOLUTIONS?

A number of software solutions are available to facilitate digital transformation in the manufacturing industry. To measure the current rate of software adoption, we asked survey respondents if they are currently using nine software solutions that may be used in manufacturing today. (See Text Box 1 for their definitions).

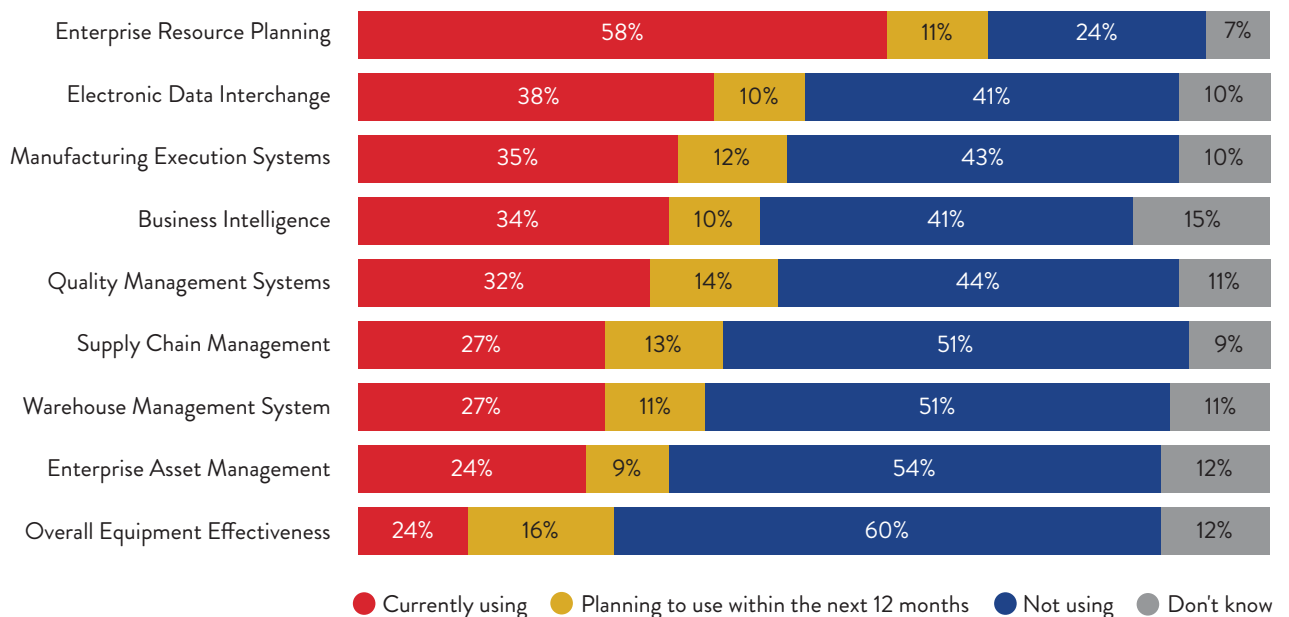
Our survey found that 76 per cent of manufacturers are currently using at least one of these software solutions in the running of their business, while 63 per cent are employing at least two of these platforms. The most prevalent use of a platform across the manufacturing sector was Enterprise Resource Planning (ERP) software, used by 58 per cent of firms. This was followed by the use of Electronic Data Interchange (EDI) tools that are employed by 38 per cent of manufacturers. At the other end of the spectrum, only 12 per cent of manufacturers reported using Overall Equipment Effectiveness (OEE) software, the least popular platform among respondents.

For the purpose of our analysis, manufacturers were grouped into four buckets:

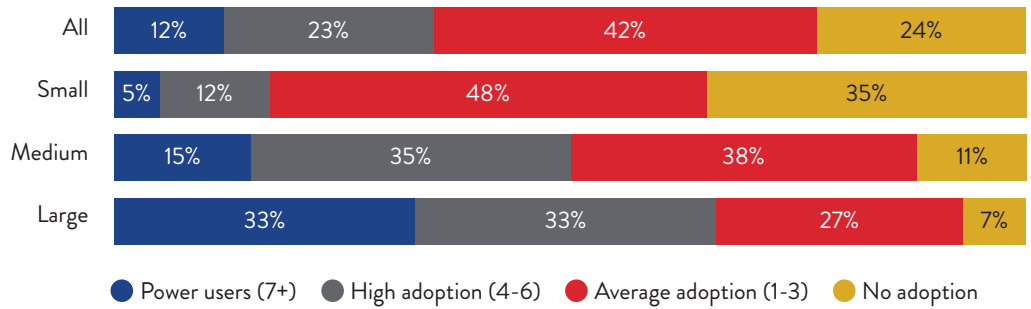
1. Power users—those that are using seven or more different software platforms
2. High adopters—businesses that are employing four to six platforms
3. Average adopters—those that are using one to three software tools
4. Non-adopters—companies that have yet to adopt any of the nine software solutions listed in the survey.

The typical manufacturer is an average adopter. In our survey, 42 per cent of respondents said they are currently using one to three software platforms. Unfortunately, non-adopters made up the second-largest group, with one-quarter of manufacturers having yet to adopt any of the nine software solutions outlined in the survey. A similar proportion are high adopters (23 per cent), leaving just 12 per cent as power users.

Notably, use of these advanced software tools was particularly low among small businesses, an unfortunate but expected result that corresponds with past research and survey results. In fact, over one-third of small businesses are non-adopters, compared to just 11 per cent of medium-sized companies and 7 per cent of large companies. Likewise, while more than one-third of large companies are power users, this share falls to 15 per cent for medium-sized manufacturers and to 5 per cent for small businesses.



## NUMBER OF SOFTWARE PLATFORMS USED BY MANUFACTURERS BY COMPANY SIZE



### TEXT BOX 1: MANUFACTURING SOFTWARE SOLUTIONS

**Business Intelligence (BI)** software combines business analytics, data mining, data visualization, and data tools to help companies make more data-driven decisions

**Electronic Data Interchange (EDI)** software exchanges documents electronically between companies over networks including purchase orders, shipment notices, and invoices

**Enterprise Asset Management (EAM)** software incorporates the management and maintenance of physical assets owned by a company throughout an asset's lifecycle

**Enterprise Resource Planning (ERP)** software centralizes the management of every aspect of facility operations and processes, from production to payroll

**Manufacturing Execution Systems (MES)** software monitors, tracks, documents, and controls the process of manufacturing goods from raw materials to finished products

**Overall Equipment Effectiveness (OEE)** software monitors the performance of manufacturing equipment and measures productivity

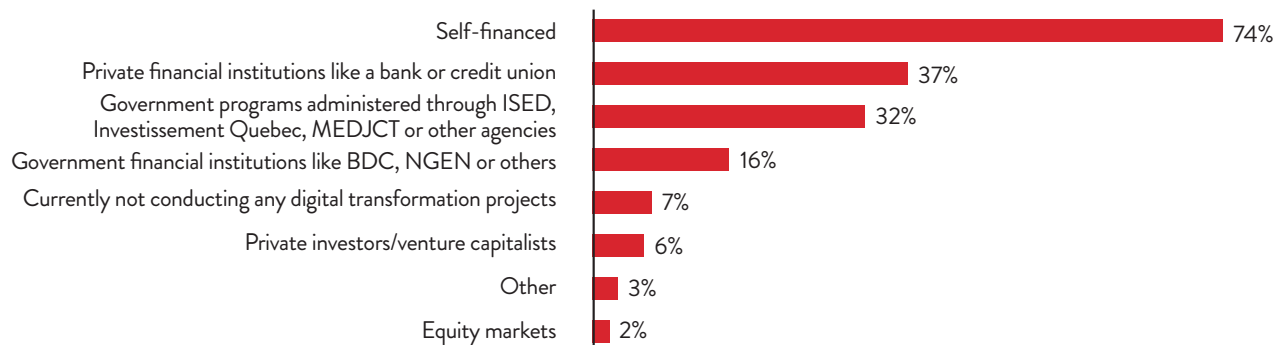
**Quality Management Systems (QMS)** software monitors, manages and documents quality processes to help companies continuously deliver the highest quality product

**Supply Chain Management (SCM)** software manages the flow of goods, data, and finances from the procurement of raw materials to the delivery of the product at its final destination

**Warehouse Management System (WMS)** software manages a company's supply chain fulfillment operations from the distribution centre to the store shelf

## HOW DO YOU TYPICALLY FINANCE YOUR DIGITAL TRANSFORMATION PROJECTS?

There are a number of different vehicles companies can use to finance investment projects, including equity financing, internal financing, venture capital, and government grants and subsidies. When we asked manufacturers how their company typically finances digital transformation projects, by far the most common vehicle is self-financing. This was selected by almost three-quarter of manufacturers that participated in the survey. The second most popular method, chosen by 37 per cent, is through private financial institutions, like banks and credit unions. Government programs, selected by just under one-third of survey participants, rounded out the top 3. Notably, 7 per cent of respondents said they were currently not undertaking any digital transformation projects, so financing was currently not a pressing concern.

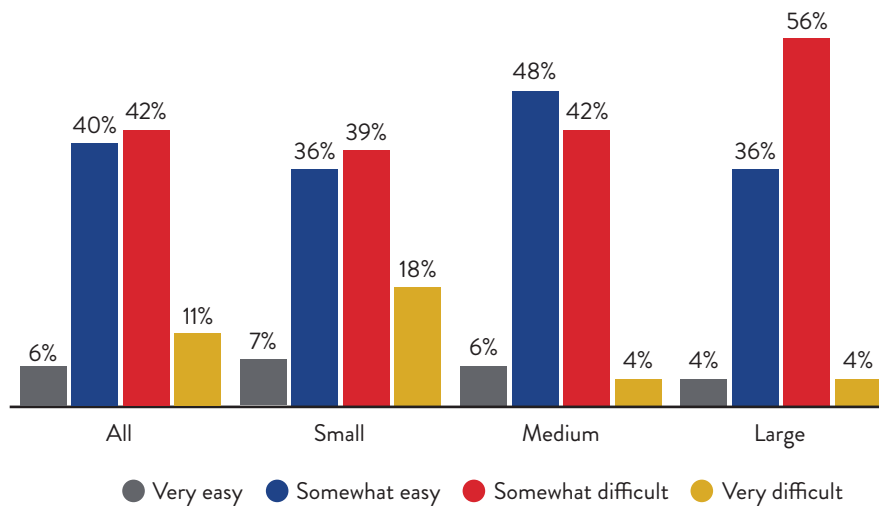




## HOW EASY HAS IT BEEN FOR YOUR BUSINESS TO FINANCE YOUR DIGITAL TRANSFORMATION PROJECTS?

Despite the many financing options, lack of access to capital is often identified as an important barrier to investment. Indeed, our survey suggests that this issue is affecting over half of Canadian manufacturers today. When asked how easy or difficult it has been for their company to finance their digital transformation projects, 54 per cent said it was somewhat or very difficult, greater than the 46 per cent that said it was easy or very easy.

Smaller companies have a more difficult time financing these projects compared to their larger corporate counterparts. In fact, while 18 per cent of small businesses said that financing digital transformation projects has been very difficult, only 4 per cent of medium and large manufacturers made the same claim.



# INDUSTRY 4.0 TECHNOLOGY USAGE

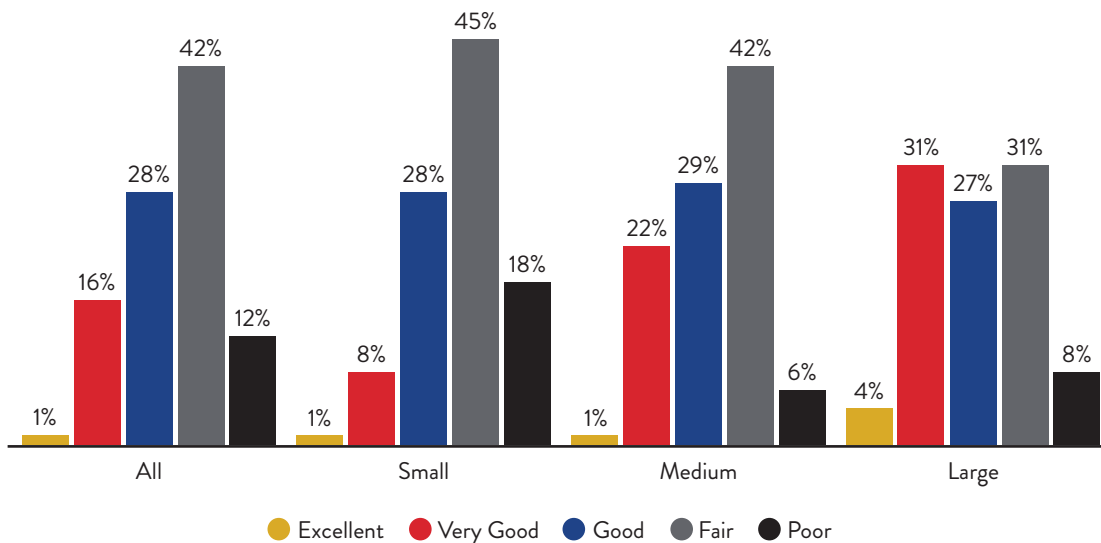
Industry 4.0 refers to the fourth industrial revolution and is characterized by the integration of advanced manufacturing techniques with the Internet of Things. This trend is being powered by the internet and web-enabled software applications capable of processing a large amount of data, transforming the factory floor with interconnected systems that communicate, collect, analyze, and exchange data.

These advanced manufacturing technologies are helping manufacturers to increase efficiency, lower costs, and improve product quality. These solutions are opening new doors for innovative, risk-taking companies, but also threatening to leave slow adopters behind. Accordingly, this section of the survey aims to find out more about advanced manufacturing technology trends in Canada's manufacturing sector, including measuring the rate of Industry 4.0 technology adoption.

## HOW WOULD YOU RATE YOUR KNOWLEDGE OF THE ADVANCED TECHNOLOGY SOLUTIONS AVAILABLE TO YOUR COMPANY TODAY?

With Canadian manufacturing firms generally known to be lagging in the adoption of advanced technologies, it should not come as a surprise that most survey participants expressed low confidence in their knowledge of the technology solutions available to them today. In fact, a mere 1 per cent of those answering the survey assessed their knowledge of advanced manufacturing technology as being excellent, while only 16 per cent rated it as very good. In contrast, 42 per cent of respondents thought that their level of knowledge was fair and 12 per cent considered it poor, together representing more than half of the responses.

Not unexpectedly, larger companies tended to express greater knowledge of advanced technology solutions than smaller ones. While 35 per cent of large corporations perceived their advanced manufacturing technology knowhow to be either very good or excellent, 23 per cent of medium-sized enterprises and a mere 9 per cent of small businesses made the same assessment. This speaks to the need for governments to increase funding for programs that help small- and medium-sized enterprises (SMEs) learn about key productivity-enhancing technologies and how they can be implemented within existing systems.



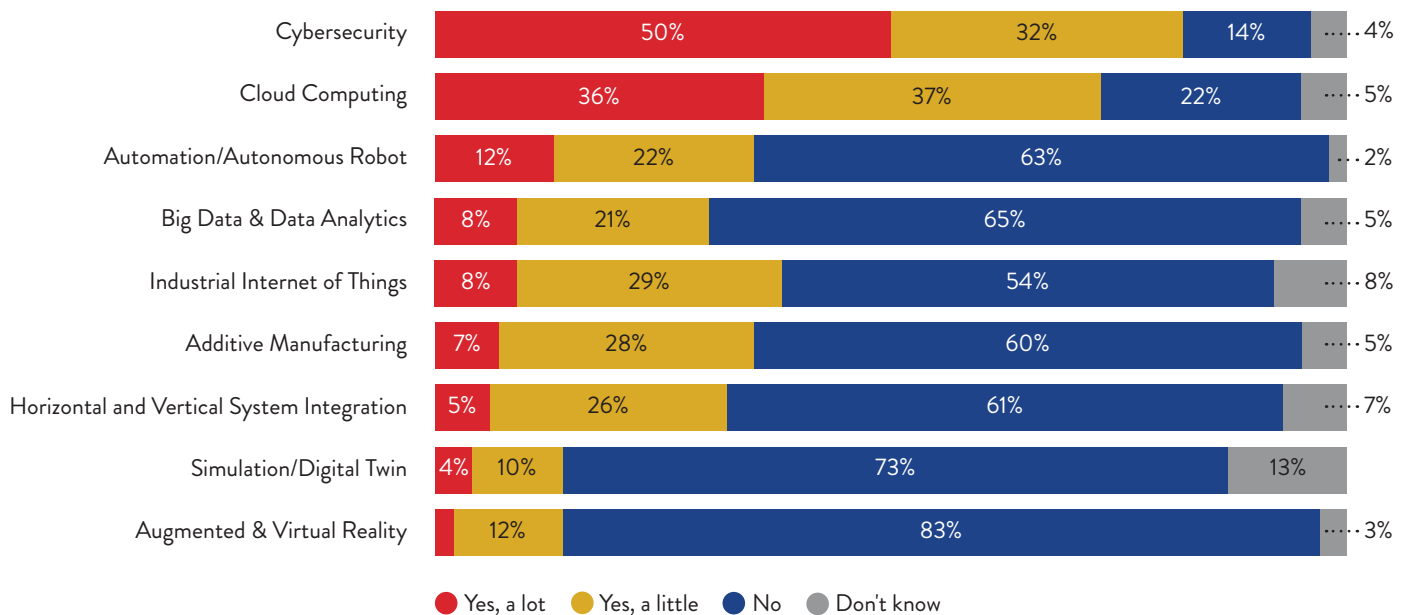
## IS YOUR BUSINESS CURRENTLY USING ANY OF THE FOLLOWING ADVANCED MANUFACTURING TECHNOLOGIES?

Industry 4.0 is built on nine technology pillars that bridge the physical and digital worlds and make smart and autonomous systems possible. (See Text Box 2 for their definitions). To measure the current rate of advanced manufacturing technology adoption, we asked survey respondents the extent to which they are using these nine advanced manufacturing technologies.

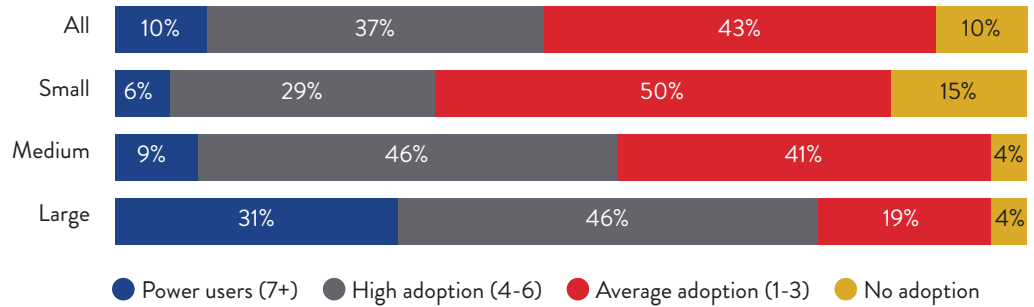
According to our survey, 66 per cent of manufacturers said they are using at least one Industry 4.0 pillar a lot, while 80 per cent said they are using at least one pillar a little. The most prevalent use of an Industry 4.0 technology across the manufacturing sector were cybersecurity systems, used a lot by half of firms and used a little by another one-third. This was followed by cloud computing technologies that are being used extensively by 36 per cent of manufacturers and being used to some degree by another 37 per cent. At the other end of the spectrum, only 14 per cent of manufacturers reported using augmented and virtual reality (AR/VR) technologies and simulation/digital twin platforms, the least popular Industry 4.0 pillars among respondents.

Using the same buckets defined in the above question on manufacturing software usage, we find once again that the typical manufacturer is an average adopter. In our survey, 43 per cent of respondents are using one to three Industry 4.0 platforms either a little or a lot. Meanwhile, 37 per cent of manufacturers are high adopters (four to six pillars), while 10 per cent are power users (seven or more technologies). This leaves 10 per cent that have yet to adopt any of the nine advanced manufacturing technologies outlined in the survey.

As was the case with software adoption, use of these advanced manufacturing technologies was especially low among small businesses. In fact, 15 per cent of small businesses are non-adopters, compared to 4 per cent of medium and large businesses. Likewise, more than 30 per cent of large manufacturers are power users, while the proportion among SMEs is in the single digits.



## NUMBER OF INDUSTRY 4.0 TECHNOLOGIES USED BY MANUFACTURERS BY COMPANY SIZE



### TEXT BOX 2: TYPES OF ADVANCED MANUFACTURING TECHNOLOGIES

**Additive Manufacturing/3D Printing** refers to the construction of a three-dimensional object from a computer-aided design (CAD) model or a digital 3D model

**Augmented & Virtual Reality (AR/VR)** provides no-contact methods for training employees, developing and testing products, and repairing equipment

**Automation/Autonomous Robots** are robots that are designed to work in ways like humans, with the added ability to monitor and transmit data

**Big Data & Data Analytics** provide manufacturers with the ability to track, trace, analyze, and streamline operations and optimize the supply chain

**Cloud Computing** refers to the practice of using a network of remote computers hosted on the internet to store, manage, and process data rather than on a local server or computer

**Cybersecurity** involves preparing and protecting information systems and production activities from growing cyber threats

**Industrial Internet of Things (IIoT)/ Interconnected Sensors** refers to internet-capable machinery and equipment that manufacturers can use to automate tasks, gain real-time visibility of operations, and establish better command and control

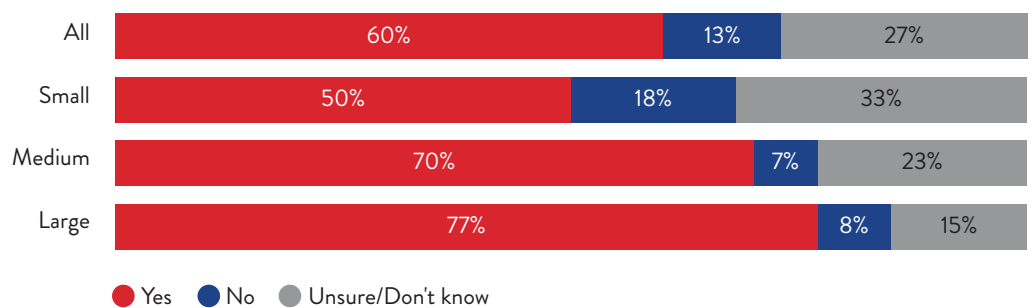
**Horizontal System Integration** ensures that machinery, IoT devices, and engineering processes work seamlessly together, while **Vertical System Integration** ensures that production data are used at all organizational levels

**A Simulation/Digital Twin** is a virtual representation of a physical product, process, or service that enables real-time data flow between virtual and physical spaces

## DO YOU PLAN ON INVESTING IN ANY OF THESE ADVANCED MANUFACTURING TECHNOLOGIES IN THE NEXT THREE YEARS?

The good news is that even if uptake of advanced manufacturing technologies is low today, some businesses are acting to change that. Roughly 60 per cent of respondents said they plan to invest in new technologies over the next three years, compared to only 13 per cent that have no intention of doing so.

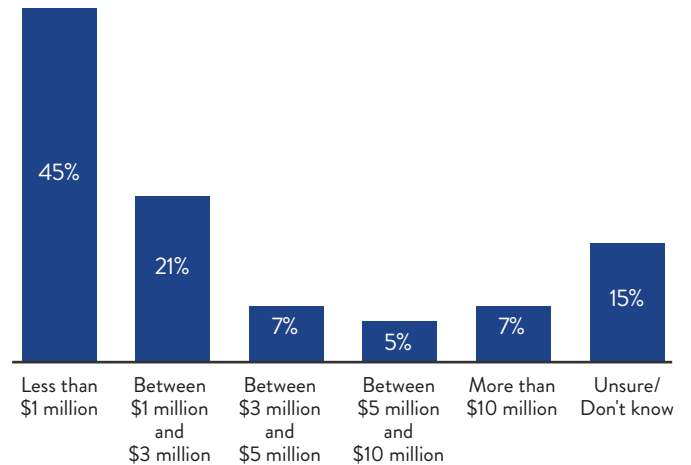
Consistent with trends from other survey questions, the propensity to invest increases with company size. While 50 per cent of small manufacturers are planning to invest in advanced manufacturing technologies over the next three years, this share rises to 70 per cent for medium-sized enterprises and 77 per cent for large corporations.





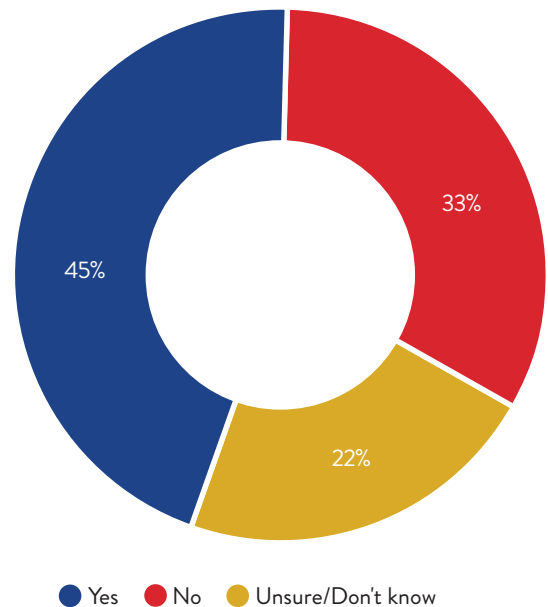
### HOW MUCH IS YOUR COMPANY PLANNING TO INVEST IN THESE TECHNOLOGIES OVER THE NEXT THREE YEARS?

That said, while most companies are planning to invest in advanced manufacturing technologies in the coming years, when asked how much their company is planning to spend, the amounts were generally modest. In fact, 45 per cent said it would be less than \$1 million per year, while another 21 per cent reported that it would be between \$1 million and \$3 million annually. In contrast, only 7 per cent of manufacturers are planning to spend more than \$10 million per year.



### HAS THE UNCERTAIN ECONOMIC ENVIRONMENT LED YOUR COMPANY TO POSTPONE OR CANCEL PLANNED INVESTMENT PROJECTS?

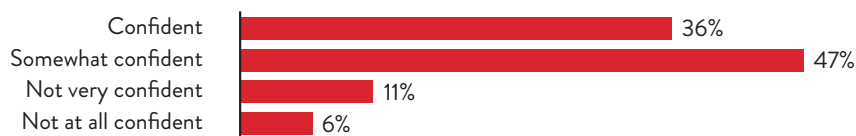
The current economic environment is clearly very challenging, with a sharp rise in borrowing costs, the pandemic's after-effects, and geopolitical conflicts weighing on the global economy. For this reason, we also asked manufacturers if the current economic situation had led them to postpone or cancel planned investment projects. Unfortunately, 45 per cent of manufacturers answered yes to this question, indicating that nearly half of manufacturers are scaling back investment plans in light of the economic slowdown. In contrast, a much smaller proportion of manufacturers (33 per cent) said that the current economic situation has not led them to alter their plans. This result corresponds to the conclusions drawn from other surveys, including those conducted by the Bank of Canada, showing that many Canadian companies are decreasing their investment intentions due to the impact of higher interest rates and recession worries.



## HOW CONFIDENT ARE YOU THAT YOUR CURRENT DIGITAL SYSTEMS ARE WELL PROTECTED AGAINST CYBER INTRUSIONS?

As we saw earlier, cybersecurity is the most widely used Industry 4.0 technology in manufacturing, and for good reason. As connectivity increases, the risk of a potential cyberattack grows alongside it, making cybersecurity a critical aspect of a company's technology infrastructure. Indeed, just one security breach could damage multiple areas of a business, from the supply chain to operations.

Unfortunately, even if uptake of cybersecurity systems is high relative to other advanced manufacturing technologies, a fairly large number of manufacturers expressed low confidence in their company's ability to defend against breaches. While 36 per cent of manufacturers are confident that their current digital systems are well protected against cyber intrusions, the remaining nearly two-thirds are not as sure. Specifically, 47 per cent are somewhat confident, 11 per cent are not very confident, and 6 per cent are not confident at all.

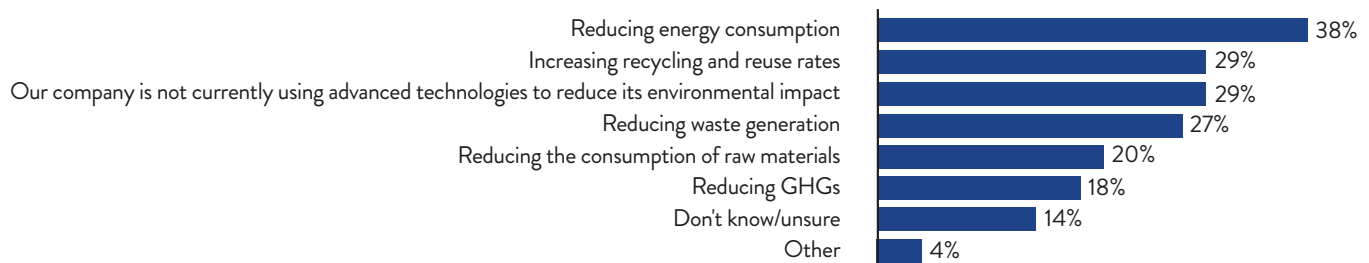


## IS YOUR COMPANY USING ADVANCED TECHNOLOGIES TO REDUCE ITS ENVIRONMENTAL IMPACT IN ANY OF THE FOLLOWING AREAS?

Environmental performance is a growing concern among manufacturers due to such factors as regulatory requirements, contractual compliance, public perception, and competitive advantage. Given that companies can reduce their environmental impact by adopting clean technology, one question in this survey was dedicated to learning more about the current use of this technology in the manufacturing sector and its intended purpose.

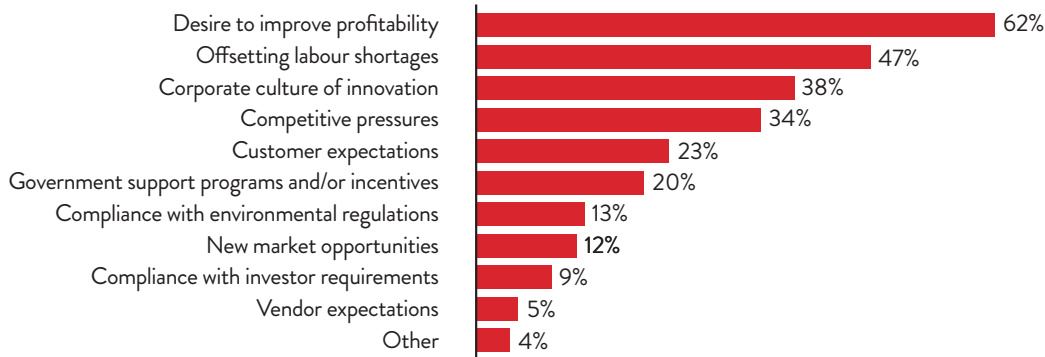
The survey results imply that most manufacturers are currently employing advanced manufacturing technologies to reduce their environmental impact. This is inferred from the fact that less than half of the participants indicated that they were either not using any such technologies (29 per cent) or they were not sure (14 per cent).

For those that are using advanced technology to improve their environmental performance, it most typically involves the kind that lowers their energy consumption. This was selected by 38 per cent of participants, the most popular response to this question. Manufacturers are also using advanced technology to increase recycling and reuse rates (29 per cent), to reduce waste generation (27 per cent), to reduce the consumption of raw materials (20 per cent), and to reduce GHG emissions (18 per cent).



## WHAT ARE THE MOST IMPORTANT FACTORS DRIVING TECHNOLOGY ADOPTION IN YOUR COMPANY?

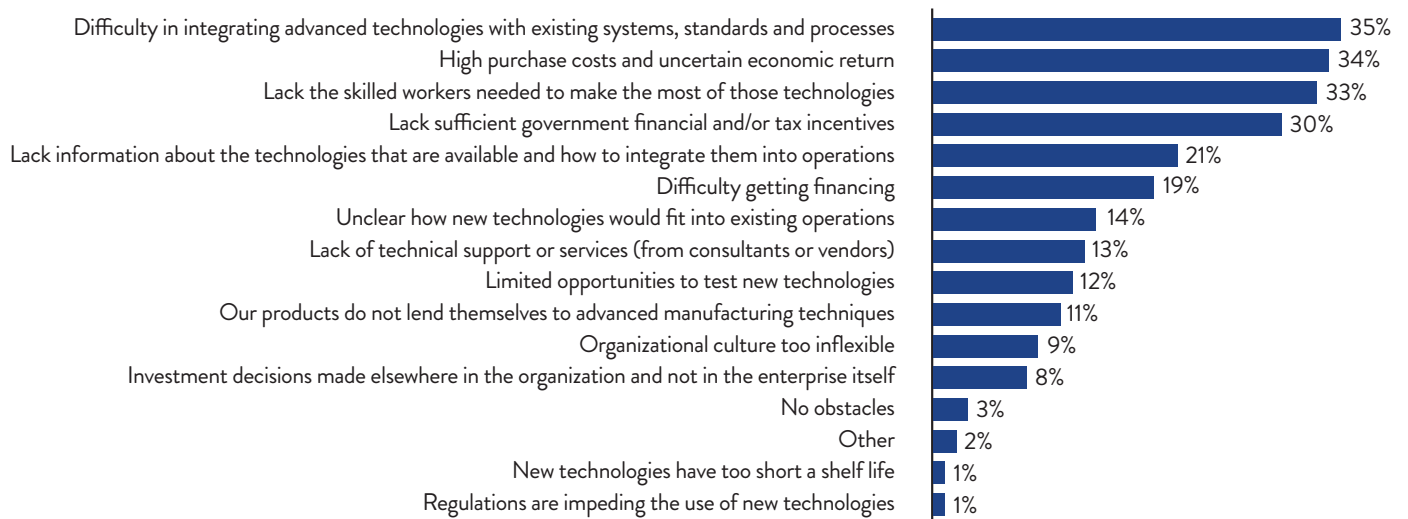
Manufacturers' decisions to adopt technology stem from several different factors. When asked to identify the most important factors, one stood out above the rest: a desire to improve profitability, selected by 62 per cent of respondents. This was followed by investing in automation technologies to offset labour shortages (47 per cent), a corporate culture of innovation (38 per cent), and competitive pressures (34 per cent).



## WHAT ARE THE MAIN OBSTACLES PREVENTING YOUR COMPANY FROM INVESTING MORE IN ADVANCED TECHNOLOGIES?

Although Canadian manufacturers feel increasing pressure to adopt technology, they face a range of barriers that limit their ability to take such steps. These barriers explain why manufacturers tend to underinvest in new technologies even when the benefits are so clear and the need so great.

In our survey, respondents flagged four main barriers to technology adoption: difficulty in integrating advanced technologies with existing systems, standards and processes (35 per cent), high purchase costs and uncertain economic return (34 per cent), a lack of skilled workers needed to make the most of advanced technologies (33 per cent), and a lack of sufficient government financial and/or tax incentives (30 per cent). At the other end of the spectrum, just 3 per cent of manufacturers felt that their company did not face any obstacles to technology adoption, pointing to barriers being a widespread issue in the sector.



# GOVERNMENT AND TECHNOLOGY ADOPTION

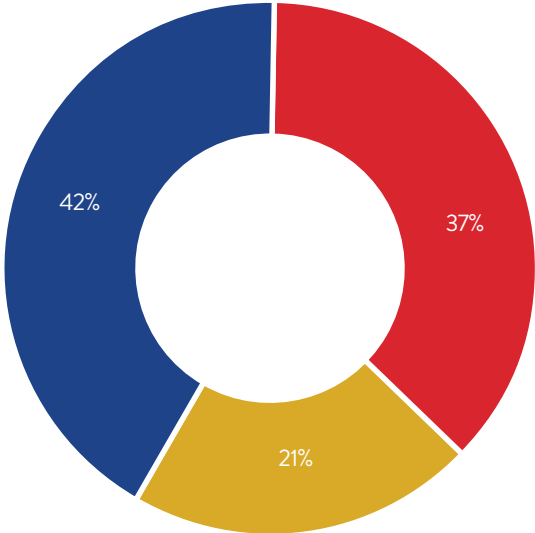
Governments have many levers at their disposal to encourage business investment. They can use fiscal policy tools such as tax credits, grants, and financing programs to stimulate investment. Governments can also create a regulatory environment that fosters innovation and investor confidence. As well, they can invest in infrastructure projects such as roads, bridges, and public transportation systems that create opportunities for businesses to expand and invest in new locations. This section includes questions that seek to assess the manufacturing sector’s experience with government incentives for investment. It also asks survey respondents to identify the policy solutions they would like to see.

## HAS YOUR COMPANY EVER APPLIED FOR A GOVERNMENT SUPPORT PROGRAM OR USED A TAX INCENTIVE DESIGNED TO ENCOURAGE INVESTMENT IN MACHINERY, EQUIPMENT OR TECHNOLOGIES?

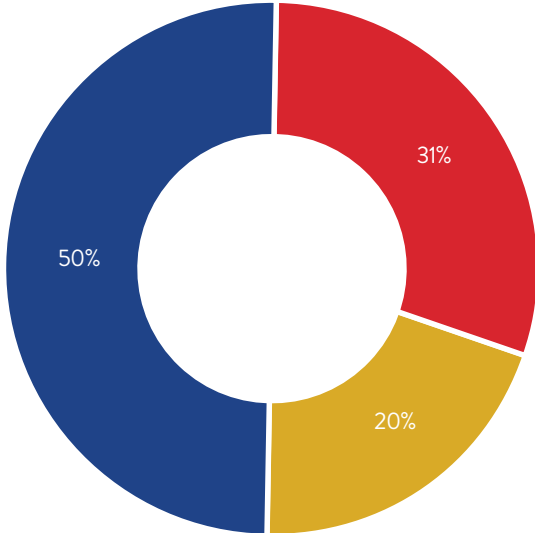
The federal government offers several support programs to encourage investment in new machinery, equipment and technologies, including the Accelerated Investment Incentive, the Atlantic Investment Tax Credit, and the Strategic Innovation Fund. However, our survey finds that not enough manufacturers are making use of them. In fact, less than half of those surveyed (42 per cent) said that their company had ever used one of these federal government programs, compared to 37 per cent that had not. This leaves one-fifth of those surveyed unsure whether their company had used a federal program or not, consistent with the notion that one of the main obstacles to higher participation includes low awareness of these programs and their benefits.

The result for provincial support programs was somewhat more encouraging, with 50 per cent of survey participants saying that they had made use of a program or tax incentive from this level of government, compared to 31 per cent that had not. Again, about one-in-five manufacturers did not know if their company had taken advantage of any such provincial government support program or incentive.

FEDERAL GOVERNMENT PROGRAMS



PROVINCIAL GOVERNMENT PROGRAMS



● Yes  
● No  
● Unsure



**THINKING ABOUT YOUR EXPERIENCE WITH THESE PROGRAMS AND/OR TAX INCENTIVES, PLEASE INDICATE YOUR LEVEL OF AGREEMENT WITH THE FOLLOWING STATEMENTS?**

Even if uptake was disappointingly low, many program users rated their experience as positive. In fact, for federal programs, 50 per cent either agreed or strongly agreed that the experience was generally positive, significantly higher than the 17 per cent that either disagreed or strongly disagreed with this statement.

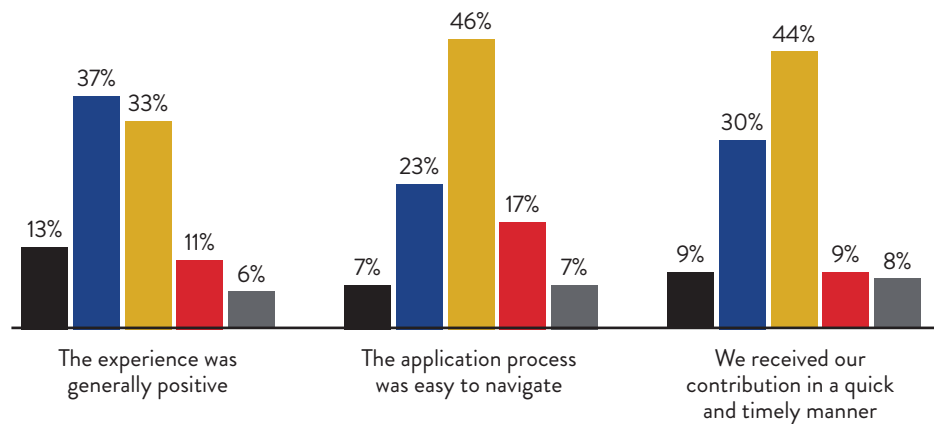
Again, the results for provincial programs were somewhat more encouraging, with 68 per cent of firms either agreeing or strongly agreeing that the experience was positive, compared with the 16 per cent that disagreed or strongly disagreed.

On a more negative note, less than half of respondents agreed or strongly agreed with the statement that application processes at both levels of government were easy to navigate. This corresponds to an oft-mentioned obstacle to higher participation with these programs—application processes are often too complex, resulting in an overwhelming experience and a high drop-off rate.

Finally, when it came to whether companies received their contribution in a quick and timely manner, once again, provincial programs have an edge over federal ones. While 52 per cent of survey participants agreed or strongly agreed that provincial funding was received quickly, only 39 per cent gave the same positive assessment for federal programs. This indicates that there may be more red tape and bureaucracy to navigate at the federal level than at lower levels of government.

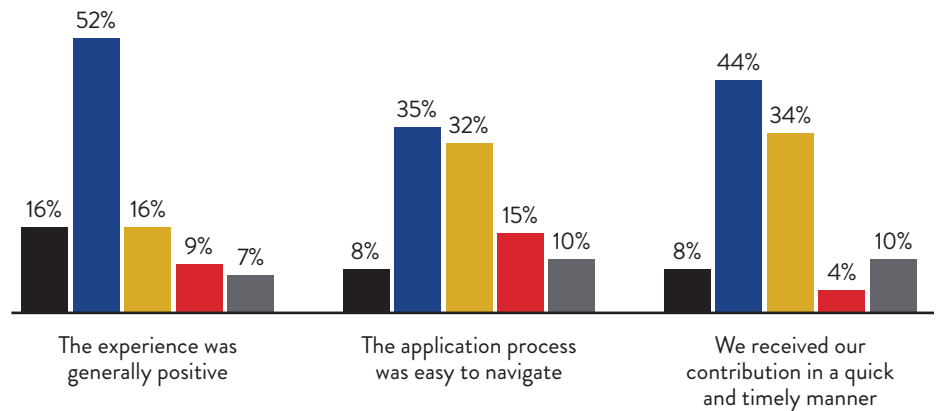
**FEDERAL GOVERNMENT PROGRAMS**

- Strongly agree
- Agree
- Neither agree or disagree
- Disagree
- Strongly disagree



**PROVINCIAL GOVERNMENT PROGRAMS**

- Strongly agree
- Agree
- Neither agree or disagree
- Disagree
- Strongly disagree



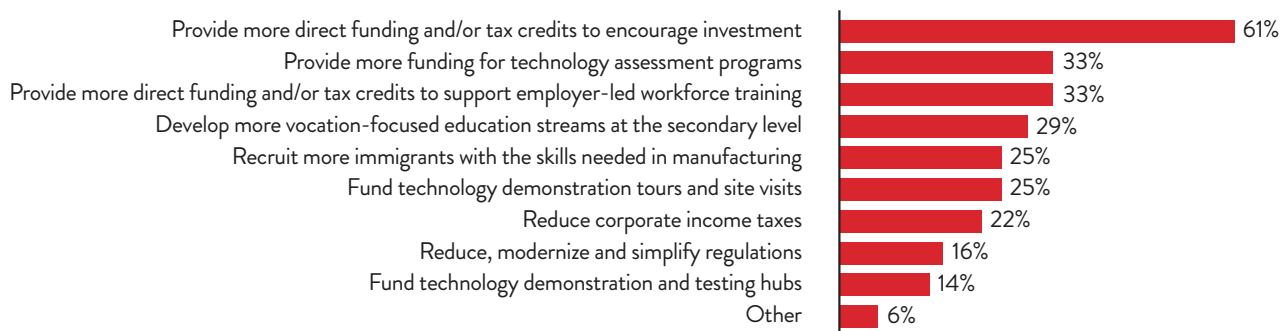
## WHAT WOULD BE THE MOST EFFECTIVE GOVERNMENT POLICIES AND ACTIONS THAT WOULD HELP ENCOURAGE TECHNOLOGY ADOPTION IN YOUR COMPANY?

Finally, the problem of low investment and slow technology adoption is so acute in manufacturing that it will not be addressed without a strong response from governments. What specific programs and policies should governments prioritize? In our survey, respondents favoured one policy above the rest: 61 per cent are looking for governments to provide more direct funding and/or tax credits to reduce costs. This would help lower a key barrier to technology investment—its high purchase cost.

Three other policies were also relatively popular and chosen by about one-third of respondents:

1. Providing more funding and support for technology assessment programs
2. Providing more direct funding or tax credits to support employer-led workforce training
3. Increasing the skills of the workforce by developing more vocation-focused education streams at the secondary level

The latter two policy actions speak to the strong relationship between two of the most pressing problems facing manufacturers today: underinvestment in technology and labour and skills shortages. While labour shortages usually push companies to invest in automation technologies, skills shortages often work in the other direction by discouraging manufacturers from taking this critical step. The reason for this is simple: as advanced manufacturing technologies become more commonplace and as production processes grow ever more sophisticated, the skillsets that businesses need are changing rapidly. Not only do new entrants need up-to-date specialized training, but also the ability to adapt and evolve in time with future technological advancements. But without educational reform and increased government support for employer-led training, skills gaps will remain high and thus will reduce the propensity to invest.



# CME RECOMMENDATIONS

Based on the findings of this survey and other research, along with ongoing consultations with members, CME recommends that governments take the following actions to encourage the investment in and adoption of advanced technology in the manufacturing sector:

## SUPPORT INFORMATION AND TESTING OPPORTUNITIES

1. Provide financial support to facilitate technology demonstration tours and site visits for Canadian manufacturers that showcase cutting-edge machinery, equipment and technologies.
2. Fund technology demonstration and testing hubs across Canada to give manufacturers the opportunity to learn about and test new and emerging technologies.
3. Develop an online technology adoption roadmap that allows businesses to learn about the various stages of technology adoption, assess their own progress in moving towards Industry 4.0, and get information on the steps needed to advance to the next level.

## REDUCE PURCHASE COSTS AND DE-RISK INVESTMENTS

4. Introduce a nationwide federal 10 per cent refundable manufacturing investment tax credit (ITC) for investments in new buildings and new machinery, equipment, and software. This could be accomplished by extending the Atlantic Investment Tax Credit—currently only eligible for capital projects in the Gaspé Peninsula and the Atlantic provinces—across the whole country.
5. Introduce a matching 10 per cent ITC in all provinces, using the same base as the federal program.
6. Extend the Accelerated Investment Incentive's current rate for three more years.
7. Expand the Canada Digital Adoption Plan (CDAP) by creating a dedicated manufacturing stream including a non-repayable component to offset the high cost associated with software critical to process automation.
8. Support the creation and delivery of a nationwide technology assessment and investment program that would offset the cost of technology assessment and diagnostic services and provide support for advanced manufacturing technology adoption initiatives at SMEs.

## REDUCE SKILLS SHORTAGES AND SKILLS GAPS

9. Develop more vocation-focused education streams at the secondary level and provide more information to secondary students about career options in manufacturing.
10. Fund Regional Industry Councils (RICs) that bring together employers, government, and educators to coordinate skills training and education programs based on regional needs.
11. Support employer-led training through a 50 per cent tax credit that offsets half the costs of employee training.
12. Increase funding of the Canada Job Grant to \$1 billion annually, make it permanent, and expand it to include on-the-job training.



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