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CANADIAN
MANUFACTURERS
& EXPORTERS

2024
MANUFACTURING
WORKFORCE REPORT

Roadmap for Ontario
Regional Industry Councils

MAY 2024



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CME INTRODUCTION – THE CASE FOR A MANUFACTURING WORKFORCE STRATEGY



VINCENT CARON

Director, Policy & Ontario Government Relations
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Over 800,000 people strong, Ontario's manufacturing sector is the heart of Canada's economy, a living force beating at its core, hub of its political and economic relationship with the U.S., pumping to its regions the lifeblood of advanced economies – talent.

While the sector's workforce has declined over the last two decades, losing 300,000 jobs since its peak in 2005, momentum has been regained following the COVID-19 pandemic. Driven by a low-carbon transition and Ontario's remarkable position in North America, our manufacturing workforce is now poised to grow again. Manufacturers continue to add new jobs, and even when the overall job market slowed down in 2023, Ontario's manufacturing sector witnessed a job increase of 2.7% year-on-year.¹

For the first time in its history, the province is building an Advanced Manufacturing Strategy. Investment in capital is finally on an upward trend after two lost decades.

But regular consultations with manufacturers continue to reveal obstacles to growth. Over 70% of businesses that report labour shortages today said that they are having the most trouble filling skilled trades positions. A high percentage (60%) are also struggling to fill general labour and assembly positions.² Worse, as highlighted in [CME's Manufacturing Ontario's Future Report](#), labour shortages are only expected to worsen given the large manufacturing projects underway and the current pace of retirements (as many as 18,500 workers are estimated to leave the sector every year between now and 2031).

In this context, partnerships between manufacturers and educational institutions are more crucial than ever. Schools, colleges and universities can design programs that meet the evolving needs of industry. Local workforce planners, unions and industry associations can provide a supportive environment to encourage more workers to enter the sector. On the flip side, it is the manufacturers

WHAT IS A REGIONAL INDUSTRY COUNCIL?

A consultative group meeting regularly in a defined geographical area to improve the alignment of workforce development with the needs of local manufacturing employers.

Each group is facilitated by Canadian Manufacturers & Exporters (CME), and is composed of:

1. Manufacturers (often business owners, executives or senior human resources leaders);
2. Representatives of local schools (mainly high-schools, colleges and universities);
3. Other local workforce development advocates such as Workforce Planning Boards or Ontario Youth Apprenticeship Program coordinators;
4. Observers from the federal or provincial government.

themselves who are best positioned to provide crucial on-the-job training and upskilling, supporting good-paying jobs to people of all ages across the province. These opportunities extend from apprentices and general labourers fresh out of school to individuals transitioning their careers and experienced professionals.

Historically, such partnerships have been clustered and often lacked alignment across industrial sectors. For example, there is a flurry of activity to map the needs of the transition of the automotive sector to electric mobility, and a growing focus on improving manufacturing productivity. But the myriad of reports, studies and recommendations don't always connect to a comprehensive industrial strategy. Worse, there is a risk of short-changing important parts of our workforce by focusing narrowly on the most recent investment trends and the most visible companies. As training students and workers spans over years and even decades, so should workforce planning.

With meetings held between September 2023 and February 2024, CME piloted a Regional Industry Council focused on the diverse needs of manufacturers in Southwestern Ontario. From discussions with participants, our survey of the workforce literature and recent data, we have outlined cross-cutting themes and charted a path for a multi-year engagement program between schools, regional stakeholders, governments, and the companies we rely on for the goods we consume and sell to the world.

We call on everyone to use this report as their north star for a renewed manufacturing workforce.



WHO WE ARE

ABOUT CANADIAN MANUFACTURERS & EXPORTERS

Since 1871, we have made a difference for Canada's manufacturing and exporting communities. Fighting for their future. Saving them money. Helping manufacturers 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.

ABOUT THE CANADIAN MANUFACTURING COALITION

The Canadian Manufacturing Coalition is comprised of more than 50 major industry groups, united by a common vision for a world-class manufacturing sector in Canada. The Coalition speaks with one voice on priority issues affecting manufacturers, and what must be done to ensure all Canadians continue to enjoy economic growth, high-value outputs and high-paying jobs. The Canadian Manufacturing Coalition's member organizations represent roughly 100,000 companies through their collective networks.

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RECOMMENDATIONS

TRAIN A TECHNOLOGICALLY AGILE WORKFORCE

1. Shore-up general manufacturing training to provide a short-term entry to the sector, building basic skills for college-age students exploring the diverse career options in manufacturing. This can be accomplished by funding general manufacturing programs such as the one currently developed by Fanshawe College in London.
2. Mandate Skilled Trades Ontario to conduct a timely review of curriculum for a short-list of in-demand occupations to consider the integration of more content on basic engineering and Industry 4.0 technologies.
6. Leverage Regional Industry Council (RIC) meetings to organize more visits of manufacturing facilities for Grade 8 to 10 high school students, while boosting increased participation of prospective workers (adult or students) in trades shows and events like Level Up! Skilled Trades Fairs.
7. Increase the number of apprenticeships and co-op placements available to students in the sector, particularly in the skilled trades, and with specific emphasis on increasing female representation.

BETTER DEFINE GREEN COLLAR JOBS

3. Plan more focused discussions between Ontario government officials, regulatory agencies in charge of developing standards such as the Technical Standards and Safety Authority (TSSA), schools and manufacturers to develop new academic and on-the-job training options, allowing the next generation of manufacturing leaders to better implement low carbon technologies.

PROMOTE THE SECTOR IN 3D

4. Promote the connection of manufacturers to FIRST Robotics and other problem-based, competitive learning opportunities to develop the skills of elementary and high school students.
5. Invest in digital twinning and simulation technology for more accessible hands-on learning experience.

ALIGN COLLABORATION TO MARKET-DRIVEN OUTCOMES

8. Ontario should establish a governance table under the leadership of the Minister of Labour, Immigration, Training and Skills Development to convene yearly and align action on recommendations from ongoing Regional Industry Councils.
9. CME should run at least four additional Regional Industry Councils to efficiently conduct discussions at the regional level, provide added coverage of Eastern Ontario and the North, and promote ongoing participation of regional stakeholders.
10. Connect all efforts to integrated workforce plans under Ontario's Advanced Manufacturing Strategy and explore the possibility of creating a new dedicated grant to augment training capacity for high-demand occupations.

HOW IS OUR WORKFORCE DISTRIBUTED?

In 2023, the Ontario manufacturing sector directly employed 808,000 people, up by 2.6% since 2021. This number remains far below total employment at its peak in the early 2000s, when the number was well over 1 million.

While the Greater Toronto Area has historically represented the largest employment centre, the number of manufacturing jobs in the region has declined by 22% since 2006. The downward trend has been less significant in other centres such as Kitchener-Waterloo, Hamilton, Windsor-Sarnia and London (see Appendix A for the full regional distribution).

The decentralization of manufacturing is expected to continue in the coming years, driven by the consolidation of manufacturing investment in Southwestern Ontario and to a lesser extent, other regions.

The transportation sector continues to make up for most of the sector, which investment trends indicate will continue to be the case in future years, as the electric vehicle segment take a greater share of production (see Highlight 1 and Appendix B). Nevertheless, manufacturing in the province remains very diversified in space and across sub-sector, requiring a targeted approach to economic development.

FIGURE 1
MANUFACTURING JOBS AS A SHARE
OF TOTAL EMPLOYMENT IN 2021
Ontario Census Divisions

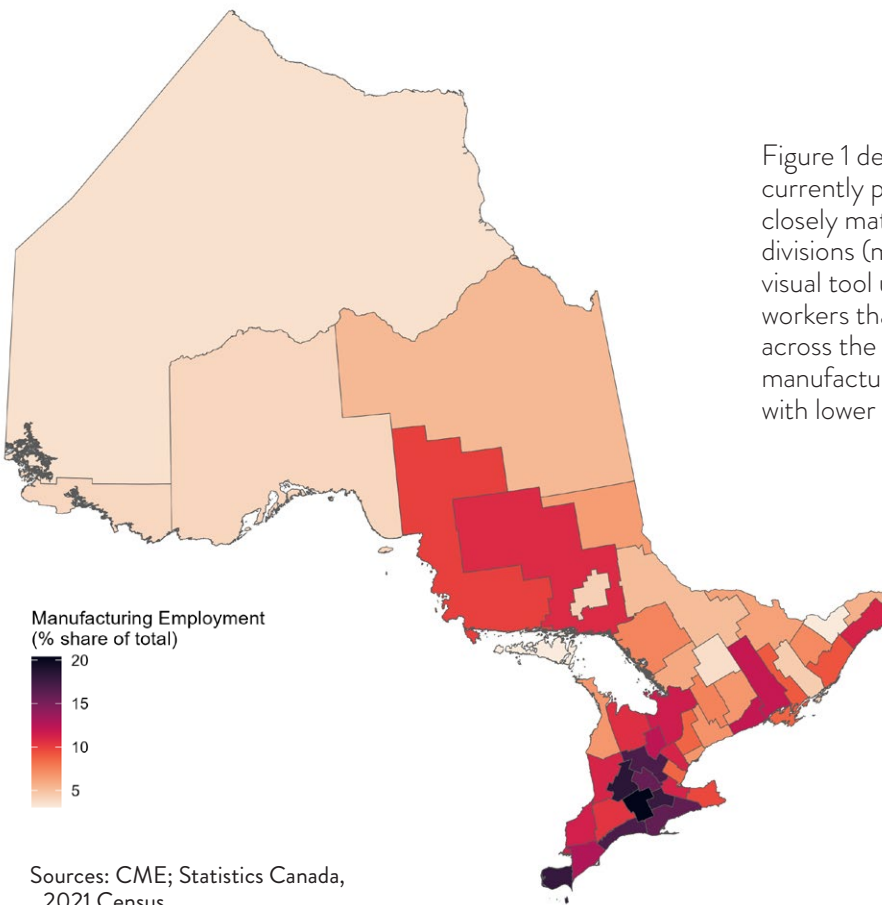
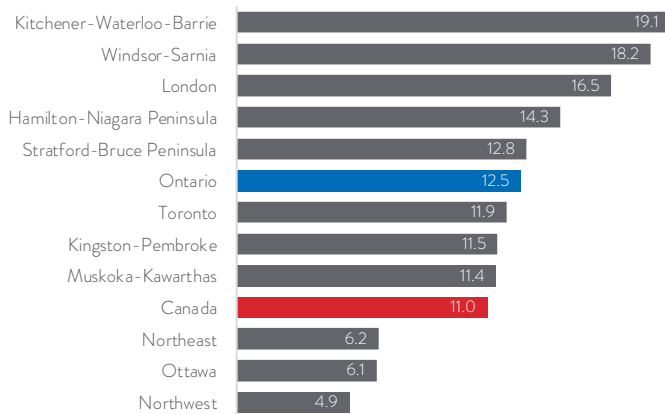


Figure 1 depicts the role that manufacturing employment currently plays in Ontario’s 49 census divisions. Those closely match the province’s 51 first-level administrative divisions (municipalities, counties, and districts). This visual tool uses colours to show the percentage of total workers that are employed in the manufacturing sector across the province. Areas with higher concentrations of manufacturing jobs are coloured in darker tones, while areas with lower concentrations are coloured in lighter tones.

Sources: CME; Statistics Canada, 2021 Census.

**FIGURE 2
MANUFACTURING AS A SHARE OF TOTAL
EMPLOYMENT IN 2023 IN ONTARIO**



Sources: CME, Statistics Canada

When looking at the concentration of manufacturing on a more regional basis (Figure 2) the Kitchener-Waterloo – Barrie region emerges as the strongest pole of employment, with manufacturing constituting 19.1% of total employment, almost twice the national average. Not far behind, the Windsor-Sarnia and London regions follow with 18.2% and 16.5% shares, respectively. Other southern Ontario regions cluster more closely around the Ontario average. Northern Ontario and Ottawa regions show concentrations of manufacturing well below national average, with a few notable exceptions such as the Algoma (Sault Ste. Marie) and Sudbury districts, where manufacturing accounted for 10.8% and 9.9% of total employment, respectively, in 2021.

HIGHLIGHT 1 – AUTO SECTOR (ZERO-EMISSION VEHICLES)

According to the International Energy Agency, (IEA), global spending on electric cars exceeded USD \$425 billion in 2022, up 50% relative to 2021. In the same timeframe, spurred by Ontario’s Driving Prosperity Plan, the province secured over \$16.5 billion in investment by global automakers and suppliers of electric vehicle batteries and battery materials. This includes \$12.5 billion related directly to EV and battery-related manufacturing investments.ⁱⁱⁱ

This shift to zero-emission vehicles (ZEVs) represents a unique opportunity for Ontario, while also presenting challenges as it relates to the workforce. As automakers navigate the transition, skills in software design, programming, and battery management are likely to witness greater demand in the manufacturing of ZEVs.^{iv} Detailed occupational profiles and analysis of jobs that may be able to effectively transition to EV manufacturing have been recently prepared by the Future of Canadian Automotive Labourforce Initiative (FOCAL) and Workforce Windsor Essex.

This transition calls for significant updating of existing curricula for schools, colleges and universities and developing new, relevant programs. For example, in Southwestern Ontario, Fanshawe College has begun working with the Government of Ontario and industry partners as it launches a new two-year Green Vehicle Technology Program in Fall 2024.^v The team at the Ontario Battery and Electro-Chemistry (OBEC) Research Centre of the University of Waterloo is also working to accelerate the development of innovative technologies. A student team from the University of Waterloo has won a place in the Battery Workforce Challenge, and with support from Stellantis and the U.S. Department of Energy, will work together with Lambton College to design, build, test and integrate an advanced electric vehicle (EV) battery pack.

In Eastern Ontario, St. Lawrence College, Queen’s University, and the Kingston Economic Development Corporation are partnering with local industry and the Ontario government to create a battery manufacturing certification program.^{vi}

HOW IS OUR WORKFORCE DISTRIBUTED? (continued)

GENDER ANALYSIS

A review of several occupations (see Table 1) revealed persisting under representation of women, particularly in the skilled trades.

TABLE 1
TOP MANUFACTURING OCCUPATIONS IN ONTARIO – BY GENDER, JANUARY 2024

Occupation	Overall Employment	Female Employment	Male Employment
Machine operators, assemblers and inspectors	224,560	75,090	149,470
Skilled Trades	97,550	5,290	92,260
Management	94,870	26,480	68,390
Administrative (incl. finance, legal, and logistics)	91,960	51,830	40,130
Engineering, Natural and Applied Sciences	81,240	14,490	66,750
Supervisors, central control and process operators	68,500	17,530	50,970
Sales and personal services	62,330	18,390	25,550
Other Occupations	10,260	6,830	3,880
TOTAL	796,700	250,560	546,140

Source: Statistics Canada, January, 2024 Labour Force Survey. Totals may not add up due to rounding.

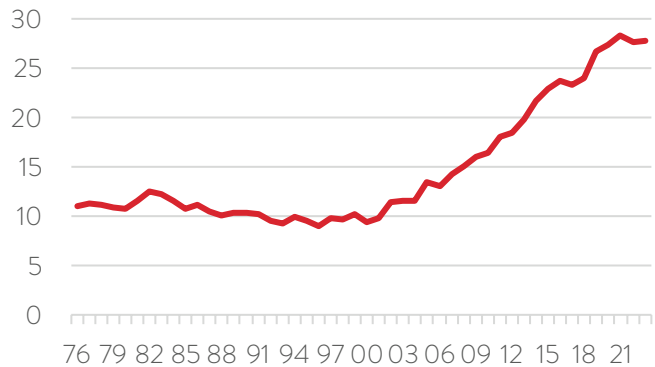
In roundtable discussions, Regional Industry Council participants acknowledged this as a deep concern to address. Participants highlighted several best practices that can help businesses market job openings more effectively to female candidates. Leveraging the influence of strong female role-models and planning more outreach and open house days targeted to a female audience were seen as possible solutions.

Based on those exchanges, increasing support from both industry and government sources for current Equality, Diversity and Inclusion (EDI) programs or towards the development of new programs in schools will be an important area of priority for future Regional Industry Council work.

DEMOGRAPHIC TRENDS

Figure 3 illustrates a notable trend - the manufacturing workforce is aging rapidly. In 2023, 27.7% of workers were aged 55 years and over. This demographic shift implies that companies will continue to struggle to find workers in the years ahead as those experienced manufacturing workers retire. Just in the London economic region, a recent study by the London Economic Development Corporation and the Smart Prosperity Institute estimated that more than half of all job openings in crucial manufacturing occupations will open because of retirements between now and 2031. The study concluded that immigration is likely to be an important source of recruitment and will be particularly important in some occupations like food processing.

FIGURE 3
SHARE OF ONTARIO WORKFORCE OVER AGE 55



Sources: CME, Statistics Canada

HIGHLIGHT 2 - NUCLEAR

Nuclear energy is the largest source of power generation in Ontario, accounting for 58% of the electricity produced. Additionally, for every dollar of GDP generated by small modular reactors (SMRs), the province is expected to get \$1.04 in direct and induced impacts.^{vii}

There are big projects underway, such as Bruce Power's Life Extension Program and OPG's Pickering Refurbishment, providing significant economic opportunity for the province. While the Bruce Power Life Extension Program will create 22,000 jobs directly and 5,000 every year, it will also create between 4,000 and 5,000 direct manufacturing jobs.^{viii} For example, in April 2024, BWXT announced an \$80M investment to expand its Cambridge facility, creating 250 new jobs.

During Regional Industry Council discussions, manufacturers involved in this supply chain expressed the importance of having a strong quality assurance function when making parts and components.

The nuclear sector being heavily regulated, the knowledge of applicable standards, and paying attention to quality and traceability are key to win and keep business.

Universities have been supporting research and outreach in the nuclear sector through their collaboration with the University Network of Excellence in Nuclear Engineering (UNENE). The University of Waterloo has established partnerships with companies such as Bruce Power and OPG, in addition to other partnerships that support small nuclear reactor development.^{ix}

McMaster University is also a known Center of Excellence, as it hosts Canada's most powerful research reactor and the nation's only major neutron source. This capability is paired with advanced expertise and equipment allowing it to study material behaviour under extreme conditions. Complementary to these unique capabilities, the McMaster Manufacturing Research Institute (MMRI) boasts design, prototyping and full-scale manufacturing process development facilities, using multi-disciplinary teams to solve real-world problems for the sector.

HOW IS OUR WORKFORCE DISTRIBUTED? (continued)

RECOMMENDED AREAS OF FOCUS

Based on the distribution of the Ontario manufacturing workforce, mapping of recent investments and participating companies, CME has identified the following regions as immediate priority areas for Regional Industry Council work. These boundaries may evolve over time, as the work evolves and subject to resourcing considerations.

**TABLE 2
PROPOSED DEPLOYMENT FOR CME
REGIONAL INDUSTRY COUNCILS**

Region	Key Sectors	Noteworthy Investments
Windsor – Sarnia – London	Automotive Food Machinery Petrochemical	Stellantis / NextStar Volkswagen / Power Co. Maple Leaf Foods Nova Chemicals
Kitchener – Waterloo – Barrie	Automotive Food Fabricated Metal	Honda Dana BWXT
Peel – Hamilton – Niagara	Primary Metal Chemicals and Plastics Aerospace Life Sciences	ArcelorMittal Dofasco Bombardier Cyclone Manufacturing Magna
Eastern Ontario (initial focus on Kingston)	Battery materials Computer & Electronics	Umicore
Northern Ontario (initial focus on Sault Ste. Marie and Sudbury)	Mineral Processing Primary Metal Pulp and Paper	Algoma Steel Vale Canada

HIGHLIGHT 3 – INSTRUMENTATION TECHNICIAN

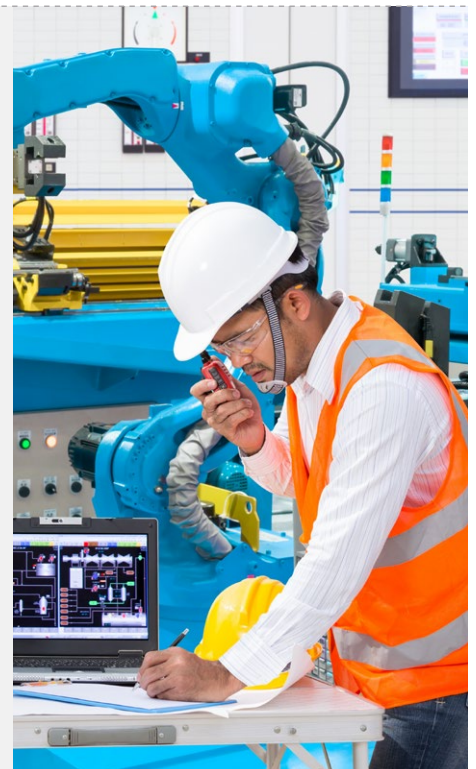
Industrial instrumentation technicians are central to the ability of a manufacturer to ensure its IT systems can communicate in real time with the equipment performing manufacturing operations on parts and goods. They repair, maintain, calibrate, adjust, and install industrial measuring on connected equipment. In-demand skills include foundational (troubleshooting, communication, teamwork, problem solving), specialized (repair, machinery, power tools, hand tools), and software (MS Excel, SAP, Word, PowerPoint, AutoCAD).

Recent Trends: Driven by the digitization of manufacturing and increased demand for connected equipment, demand for instrumentation technicians is expected to rise significantly in coming years.

Education: Four- or five-year apprenticeship program in industrial instrument repair and completion of a two-year college program in industrial instrumentation technology. This trade is non-compulsory, meaning the certificate does not have to be renewed, and the information of individuals practicing it will not appear on the Skilled Trades Ontario Public Register.

Median Annual Income (2021): \$103,000

Sources: National Occupational Classification 2021, Ontario Labour Market, Skilled Trades Ontario



SOLUTIONS - GROWING THE WORKFORCE OF THE FUTURE

Between 2013 and 2016, CME ran Regional Industry Councils (RICs) across Canada with funding from the Canadian Skills Training and Employment Coalition (CSTEC) and Employment and Social Development Canada (ESDC). Ontario regions included were Sault Ste. Marie, Sudbury, GTA, Peel-Halton, Kitchener-Guelph, Hamilton, London, and Windsor. The councils produced high quality labour market forecasts and built local networks between employers, academia, and students.

As part of its application to the Skills Development Fund (Phase 3) approved by the Ontario Ministry of Labour, Immigration and Skills Development in early 2023,

CME committed to pilot one RIC in Ontario, with involvement from manufacturers, high schools, colleges, and universities. The group held meetings at Toyota in Cambridge, Maple Leaf Foods in London, and McMaster University in Hamilton.

Discussion takeaways were complemented with results from CME's 2023 Technology Adoption Survey and a review of recent literature.

HIGHLIGHT 4 - INDUSTRIAL MECHANIC

A millwright is a skilled tradesperson who is responsible for the installation, location, and repair of industrial equipment within a facility. They assemble (and disassemble) large machinery, according to blueprints and layout plans, as well as conduct routine tasks involving preventative maintenance duties. Millwrights have a keen eye for detail and enjoy working with machines and precision instruments.

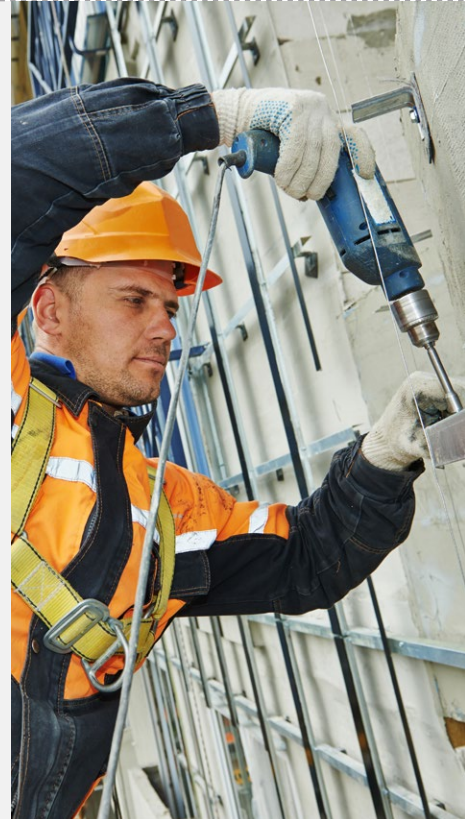
In-demand skills include foundational (troubleshooting, maintenance, teamwork, work area maintenance), specialized (repair, machinery, industrial mechanic experience, lathes, hydraulics, grinders) and software (SAP, PowerPoint, Word, Lockout).

Recent Trends: With the rise of artificial intelligence, technology proficiency will need to increase, as maintenance programs will increasingly rely upon predictive software and data analytics.

Education: An apprenticeship training program consists of on-the-job and in-school training. The time-frame to become competent is 8,000 hours, or approximately four years. This trade is non-compulsory, meaning the certificate does not have to be renewed, and the information of individuals practicing it will not appear on the Skilled Trades Ontario Public Register.

Median Annual Income (2021): \$85,000

Sources: Canada Job Bank Labour Market Information, Ontario Labour Market Information, Skilled Trades Ontario

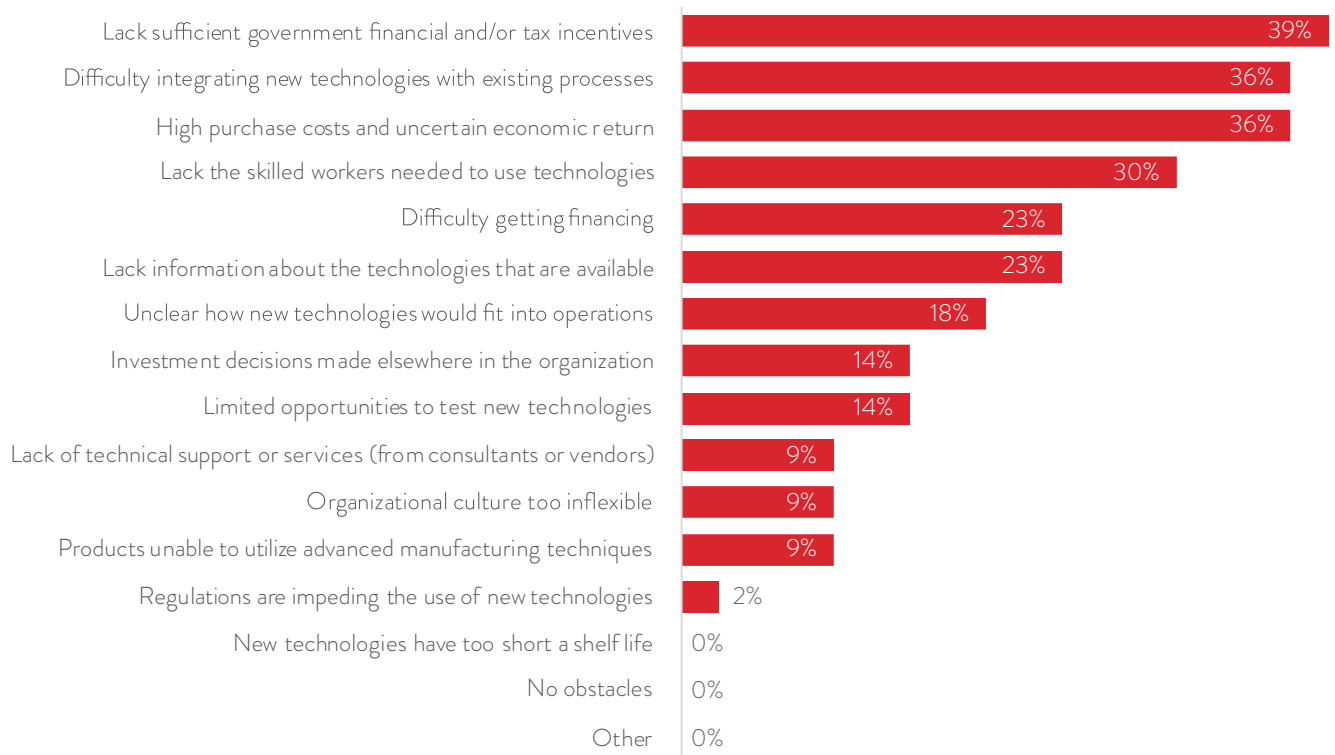


1. TRAIN A TECHNOLOGICALLY AGILE WORKFORCE

The starting point for discussions was a realization that the complexity of the manufacturing workplace has greatly increased in recent years.

Transitioning to Industry 4.0 is not just about technology; it is also a staffing and change-management issue. Automation demands digitally literate workers capable of problem-solving as a team. Workers need an inquisitive mindset to address machine calibration effectively, transforming maintenance into a more engineering-oriented task. In CME's 2023 Technology Adoption Survey, a third of participating manufacturers identified the lack of skilled workers as a key obstacle to using technologies.

FIGURE 4
OBSTACLES PREVENTING ONTARIO MANUFACTURERS TO INVEST MORE IN ADVANCED TECHNOLOGIES



Source: 2023 CME Technology Adoption Survey

In roundtable discussions, Regional Industry Council participants emphasized the need for schools to foster problem-solving skills in both general labour and skilled trades workers to adapt to future changes. The German model of vocational training, which emphasizes hands-on floor experience, especially for engineering students, was highlighted as beneficial. Recognizing more hands-on programs like Conestoga's accredited engineering degrees could be consistent with this approach.

University participants call for a renewed focus on connecting Ontario manufacturers with the extensive cooperative student programs available at Ontario's post-secondary institutions. Some institutions noted a decline in recent years from the manufacturing industry in offering placements, which happened concurrently with increased labour needs.

Other participants called for a better promotion of manufacturing to technology professionals (software, robotics engineers or data scientists) who may have in the past gravitated to other sectors. On-the-job training was also generally viewed as the best way for manufacturers to provide workers with the operational knowledge they need to be successful in their job.

HIGHLIGHT 5 - INDUSTRIAL ELECTRICIAN

An industrial electrician specializes in electrical wiring. They typically install, maintain and test new electrical equipment, as well as troubleshoot and repair old electrical installations to ensure a facility is running smoothly. An industrial electrician enjoys working independently and is a good problem solver.

Recent Trends: Inspection and evaluation are becoming an increasingly critical area of focus in the maintenance of industrial electrical equipment and systems, as facilities become more dependent on automation. In addition, the integration of distributed energy resources like rooftop solar panels will require new skills. Some institutions like Centennial College in Toronto have begun offering specific courses, including specific guidance on solar energy fundamentals, site surveys, and pre-planning, safety procedures and codes, standards and regulations related to photovoltaic systems.

Education: Industrial electricians require a college diploma and an apprenticeship training of approximately 5 years. Because this trade is compulsory, to practice it legally in Ontario a person must hold a Registered Training Agreement, Provisional Certificate of Qualification or Certificate of Qualification and their information must appear on the Skilled Trades Ontario Public Register. A Certificate of Qualification issued in this trade must be renewed to be valid.

Median Annual Income: \$93,000

Sources: Canada Job Bank Labour Market Information, Ontario Labour Market Information, Skilled Trades Ontario



SOLUTIONS - GROWING THE WORKFORCE OF THE FUTURE (continued)

SOLUTIONS

1. Shore-up general manufacturing training to provide a short-term entry to the sector, building basic skills for college-age students exploring the diverse career options in manufacturing. This can be accomplished by funding general manufacturing programs such as the one currently developed by Fanshawe College in London.
2. Mandate Skilled Trades Ontario to conduct a timely review of curriculum for a short-list of in-demand trades to consider the integration of more content on basic engineering and industry 4.0 technologies, the following being the top priorities:
 - a. Integrating familiarity with AI and predictive maintenance systems to Millwright training
 - b. Ensuring welders and electricians can work effectively with robotics
 - c. Ramp up ability of technicians and machinery operators to navigate connected equipment (see Highlight 3)

HIGHLIGHT 6 - CHEMICAL ENGINEER

Chemical engineers research, design, and develop chemical processes and equipment, oversee the operation and maintenance of industrial chemical, plastics, pharmaceutical, resource, pulp and paper, and food processing plants and perform duties related to chemical quality control, environmental protection and biochemical or biotechnical engineering.

They drive continuous improvements in production environments. Engineers can work independently but they rely on teamwork to bring their vision to reality and put to use. Much of an engineer's work is project-based with a clear start and end to address a challenge.

Recent Trends: With decarbonization becoming important, chemical and manufacturing engineers are expected to become increasingly sought-after, as they are essential to the functioning of battery component and assembly plants. Chemical engineers also play an important role in the development of renewable energy technologies, such as biofuels and solar energy.

Education: Chemical engineers usually require a university degree (bachelor's, master's or doctorate).

Median Annual Income (2021): \$93,000

Sources: Canada Job Bank Labour Market Information, Ontario Labour Market Information



2. BETTER DEFINE GREEN COLLAR JOBS

Global investments in the low-carbon energy transition reached a record \$1.1 trillion in 2022 and are only expected to grow, highlighting the importance of decarbonization for the continued operation and competitiveness of Ontario firms.^{xi}

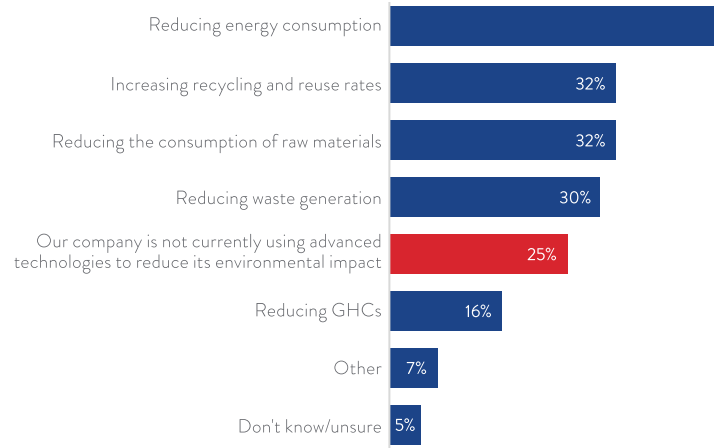
Yet, in discussions, participants noted several practical obstacles for manufacturers (especially SMEs) to complete decarbonization projects. This was consistent with the findings of CME's Low Carbon Transition Survey.

Challenges with early experiments with heavy-duty electric vehicles and inadequate infrastructure for refueling or recharging were highlighted. There was a general agreement that outside of sub-sectors like steel, industry does not currently have adequate tools to deploy hydrogen in industrial processes at scale. A lack of developed safety standards was highlighted as part of the issue. A recent [Transition Accelerator workforce study](#) also suggests the need for more specialized knowledge in engineering, design, assembly, and quality control for the manufacturing of products in the hydrogen economy.

The discussion and previous CME surveys outlined four areas of inquiry for future Regional Industry Councils to focus on: 1) reducing energy consumption (by far the most popular application for technology to reduce environmental impacts), 2) reducing waste and consumption of raw materials, especially for more challenging materials like non-recyclable plastics and chemicals; 3) better managing resources like water; and 4) managing supply chain activities, the shipping and receiving of materials, parts and finished goods in a way that minimizes its carbon footprint.

Some participants provided a hopeful note, pointing to manufacturing supply chain leaders having made important strides in sustainability. For example, Maple Leaf Foods achieved carbon neutrality in 2019 with a combination of processing organic materials more efficiently through anaerobic digestion, regenerative agriculture, better water management and a use of carbon offsets. The role of company leadership in driving a sustainability culture was mentioned as a key factor supporting the transition, highlighting the need for future discussions with business owners and senior executives.

FIGURE 5
USE OF TECHNOLOGY TO REDUCE ENVIRONMENTAL IMPACT IN ONTARIO MANUFACTURING



Source: 2023 CME Technology Adoption Survey

SOLUTIONS

3. Plan more focused discussions between Ontario government officials, regulatory agencies like Technical Standards and Safety Authority (TSSA), schools and manufacturing executives to develop new academic, on-the-job training and research partnerships. The following are priorities identified by participants:
 - a. Training on standards for use of hydrogen in industrial facilities
 - b. Quality assurance in the nuclear supply chain
 - c. Logistics and shipping efficiency
 - d. Training for energy managers
 - e. Academic research partnerships between universities and manufacturers to advance low carbon technologies that meet industry needs, with rigorous evaluation to ensure performance.

3. PROMOTE THE SECTOR IN 3D

Despite progress via awareness and government campaigns, further efforts are needed to drive recruitment of workers into the sector, at all stages of life.

For elementary and high-school students, misconceptions about skilled trades' careers continue to discourage youths from exploring occupations leading to manufacturing, as the bias toward liberal professions persists with many parents.

Several outreach strategies were discussed to address this situation.

One manufacturer described a successful partnership with a FIRST Robotics team, where older students (middle and high school age) promoted the club to younger students (elementary school age). Better yet, manufacturing sponsors spent thousands of hours mentoring students as they worked through the engineering, programming, electrical and assembly challenges of preparing for competitions (see Highlight 7).

Other participants emphasized the need to maintain outreach efforts later in life, when changes in life circumstances may require different and more targeted outreach approaches. This can be the lack of available child care, the inability of recent immigrants in higher population centres like Toronto to effectively connect to the requirements of local employers, or the inability of suburban or rural residents to commute to the workplace due to a lack of transportation or transit options.

Manufacturing co-op programs were seen by most participants as an important venue to steer post-secondary students to manufacturing. One manufacturer described how its program provided exposure to the Research & Development department and to cutting-edge technology, a key feature to attract participants and drive co-op program expansion.

SOLUTIONS

4. Promote the connection of manufacturers to *FIRST* Robotics and other problem-based, competitive learning opportunities to develop the skills of elementary and high school students.
5. Invest in digital twinning and simulation technology for more accessible hands-on learning experiences, for example, the Skills Ontario Virtual Trades and Tech Trucks.
6. Leverage RIC meetings to organize more visits of manufacturing facilities for high school students, while boosting increased participation of prospective workers (adult or students) in trades shows and events like Level Up! Skilled Trades Fairs.
7. Increase the number of apprenticeships and co-op placements available to students in the sector, particularly in the skilled trades, and with specific emphasis on increasing female representation.

HIGHLIGHT 7 – FIRST ROBOTICS

FIRST Robotics Canada, a registered charity, was established in 2001 and incorporated in 2004 to inspire Canadian high school and elementary school students to pursue further studies and careers in science, technology, and engineering.^{xii} The organization runs multiple programs for youth aged 4-18, beginning with *FIRST* LEGO challenges (kids 4 to 10) and culminating with *FIRST* Tech Challenges (for kids 12 to 18). With 679 active clubs in the province of Ontario (the largest concentration in Canada), the organization delivers high value learning and mentorship opportunities through hands-on challenges and annual competitions.

In 2018 ETBO Tool and Die, an Aylmer-based and family-owned manufacturer helped launch the Thunderstamps, the only *FIRST* Robotics team based out of Parkside Collegiate High-School in St. Thomas. Using a converted barn near its manufacturing facility, owner Etienne Borm has become increasingly involved in mentoring the team, contributing significant time helping students build the various components of robots to be used in competitions.

The robot for the 2024 competition was named ‘Sir Kappalot’ and took nine weeks to assemble. In the process, the team of 35 students had access to a team of volunteer mentors that included three teachers, three electrical engineers, two mechanical engineers, one mechatronic engineer, two tool makers (spending most of their working careers in automation), one MBA graduate, one engineering technician, and one dad.

The team won the Ontario District event at Georgian College and went on to compete at the World championship in Houston Texas, building invaluable skills and friendships in the process.

If you're interested in starting a team, helping to mentor a team, learning more about *FIRST*, or possibly even sponsoring this organization which is helping to build the future workforce of Ontario, please contact **Dave Ellis** at david.ellis@firstroboticscanada.org



Photo credit: Etienne Borm

4. ALIGN COLLABORATION TO MARKET-DRIVEN OUTCOMES

Throughout CME's Regional Industry Council meetings, a recurring issue emerged: the lack of sufficient collaboration between manufacturers and academic institutions. Often, academic offerings and curriculum development fail to align with manufacturers' market needs and the rapid pace at which those needs change. Additionally, fierce competition for talent among manufacturers results in skilled worker poaching, discouraging investments in workforce training. These problems impede collaborative workforce development.

Finally, the current proliferation of studies and recommendations on emerging opportunities, especially in the electric vehicle supply chain, poses a coordination challenge and the risk that short-term planning will short-change some areas of manufacturing. While it remains important to focus on areas of growth, holistic planning is required to ensure all manufacturing subsectors can continue to operate successfully.

SOLUTIONS

8. Ontario should establish a governance table under the leadership of the Minister of Labour, Immigration, Training and Skills Development to convene at least yearly and align action on recommendations from ongoing Regional Industry Councils. This table should have representation from:
 - a. Ministry of Economic Development, Job Creation and Trade;
 - b. Ministry of Education;
 - c. Ministry of College and Universities;
 - d. Skilled Trades Ontario;
 - e. Key associations representing manufacturers, colleges, universities, and regional workforce planning organizations; and
 - f. Organized labour
9. CME should run (as resources allow) at least four additional Regional Industry Councils to efficiently conduct discussions at the regional level, provide added coverage of Eastern Ontario and the North, and promote ongoing participation of regional stakeholders.
10. Connect all efforts to integrated workforce plans under Ontario's Advanced Manufacturing Strategy and explore the possibility of creating a new dedicated grant to augment training capacity for high-demand occupations.

APPENDIX A

MANUFACTURING EMPLOYMENT BY ECONOMIC REGION

Ontario (000s)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ontario	999.6	945.2	881.0	773.6	766.4	780.4	788.2	769.6	763.1	765.1	784.1	797.6	793.7	770.0	732.6	775.2	787.1	808.0
Ottawa	54.5	57.4	52.4	48.7	43.3	39.9	35.5	32.5	35.3	35.5	32.9	34.1	34.2	33.7	30.3	33.5	35.6	39.4
Kingston-Pembroke	27.1	25.2	23.2	20.1	23.1	19.6	21.6	18.6	20.9	14.8	15.5	13.9	19.7	16.3	15.5	20.3	21.9	23.3
Muskoka-Kawartha	24.2	20.2	17.7	16.2	13.9	17.8	18.7	18.7	18.3	15.4	11.4	14.4	18.1	21.4	18.0	19.5	16.5	20.8
Toronto	442.3	422.7	396.4	341.7	336.2	344.5	350.5	347.7	342.7	332.4	349.2	348.8	332.9	333.3	310.1	339.9	334.0	346.6
Kitchener-Waterloo-Barrie	139.1	132.2	125.7	113.0	114.8	119.3	120.6	113.1	111.4	115.2	125.5	126.0	126.0	112.6	121.5	120.6	128.8	125.8
Hamilton-Niagara Peninsula	110.9	112.4	100.7	94.2	97.0	95.5	92.1	93.4	92.8	93.8	89.7	99.4	97.5	97.0	89.6	92.9	94.7	97.0
London	63.3	54.9	52.0	44.4	42.7	44.4	47.9	45.9	43.7	50.8	53.1	51.5	53.1	53.9	46.8	52.4	52.8	55.1
Windsor-Sarnia	75.3	64.1	59.0	48.3	51.9	51.5	55.3	54.6	55.4	56.3	63.6	61.6	64.4	58.3	54.1	51.3	55.5	59.0
Stratford-Bruce Peninsula	27.8	25.3	23.2	22.0	19.7	22.1	22.3	21.9	21.5	24.3	20.5	22.4	22.2	23.5	24.5	23.5	24.2	19.8
Northeast	23.7	20.7	22.6	19.3	18.5	19.9	16.8	17.8	17.5	19.8	16.7	18.5	19.4	14.3	17.6	16.4	18.1	16.1
Northwest	11.2	11.8	8.0	5.5	5.3	5.7	6.8	5.4	3.4	6.9	6.0	6.9	6.1	5.7	4.6	4.9	4.9	5.2

Sources: CME; Statistics Canada.

APPENDIX B

MANUFACTURING EMPLOYMENT BY SUBSECTOR BY ECONOMIC REGION IN 2021

Ontario (000s)

	Ontario	Ottawa	Kingston- Pembroke	Muskoka- Kawarthas	Toronto	Kitchener- Waterloo- Barrie	Hamilton- Niagara Peninsula	London	Windsor- Sarnia	Stratford- Bruce Peninsula
Transportation equipment	117.5	2.3	2.3	1.5	38.5	30.7	11.5	14.0	12.3	3.6
Food and beverage	103.4	4.5	2.8	2.2	49.7	13.8	13.4	8.0	3.9	3.9
Fabricated metal product	54.3	2.2	1.0	1.1	21.4	9.7	7.5	3.8	4.0	2.0
Machinery	46.3	1.4	0.9	0.9	15.5	9.4	4.9	3.6	6.7	1.4
Plastics and rubber products	39.0	0.8	1.4	1.4	19.0	6.3	2.6	2.2	3.4	1.3
Chemical	37.6	2.0	1.1	0.9	21.4	3.6	3.3	1.0	3.7	0.3
Wood, pulp and paper	32.3	2.0	2.3	1.3	11.8	3.2	2.5	1.8	0.5	0.8
Miscellaneous manufacturing	31.1	2.7	0.9	1.0	15.3	4.3	2.8	1.9	1.2	0.5
Furniture and related product	27.4	1.4	0.7	0.6	16.1	3.2	2.3	1.1	0.6	0.9
Primary metal	24.8	0.8	0.5	0.5	5.5	1.8	8.8	1.4	1.4	0.5
Computer and electronic product	24.3	5.0	0.3	0.3	13.6	2.4	1.7	0.4	0.4	0.1
Printing and related support activities	20.1	1.9	0.2	0.4	11.1	1.8	1.2	0.6	2.0	0.5
Non-metallic mineral product	15.9	1.0	0.6	0.4	6.4	2.7	2.2	1.2	0.5	0.6
Electrical equipment, appliance and component	12.8	1.2	0.4	0.4	5.2	3.3	1.1	0.4	0.2	0.4
Apparel and textile	11.3	0.9	0.2	0.1	6.6	1.1	0.9	0.4	0.4	0.4
Petroleum and coal product	3.6	0.2	0.0	0.1	1.2	0.2	0.5	0.1	1.2	0.0

Sources: CME; Statistics Canada.

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