

TECHNOLOGY ADOPTION IN ONTARIO'S MANUFACTURING INDUSTRIES

Canadian manufacturers lag behind those in other countries in adopting new technologies. This is the subject of reports by the [BDC](#), the [CME](#), and more recently, [Manufacturing Automation](#). While these reports are helpful in highlighting a challenge, they are too often short on details regarding geographic and industry-based differences within manufacturing. As some of our recent work highlights, manufacturing industries are diverse in many respects. They have different [occupational compositions](#) and varying levels of [trade dependence](#) and [economic impact](#). The same applies to technology adoption.

In this bulletin, we draw upon data from two Statistics Canada surveys to explore the nuances of technology use and adoption on an industry-by-industry basis within Ontario manufacturing. The first, the Survey of Innovation and Business Strategy (SIBS), informs us on the use of 'advanced' and 'emerging' technologies and to what degree competition plays a role in these outcomes. The second, the Survey on Financing and Growth of Small and Medium Enterprises, helps us understand the reasons behind the reluctance to adopt such technologies.

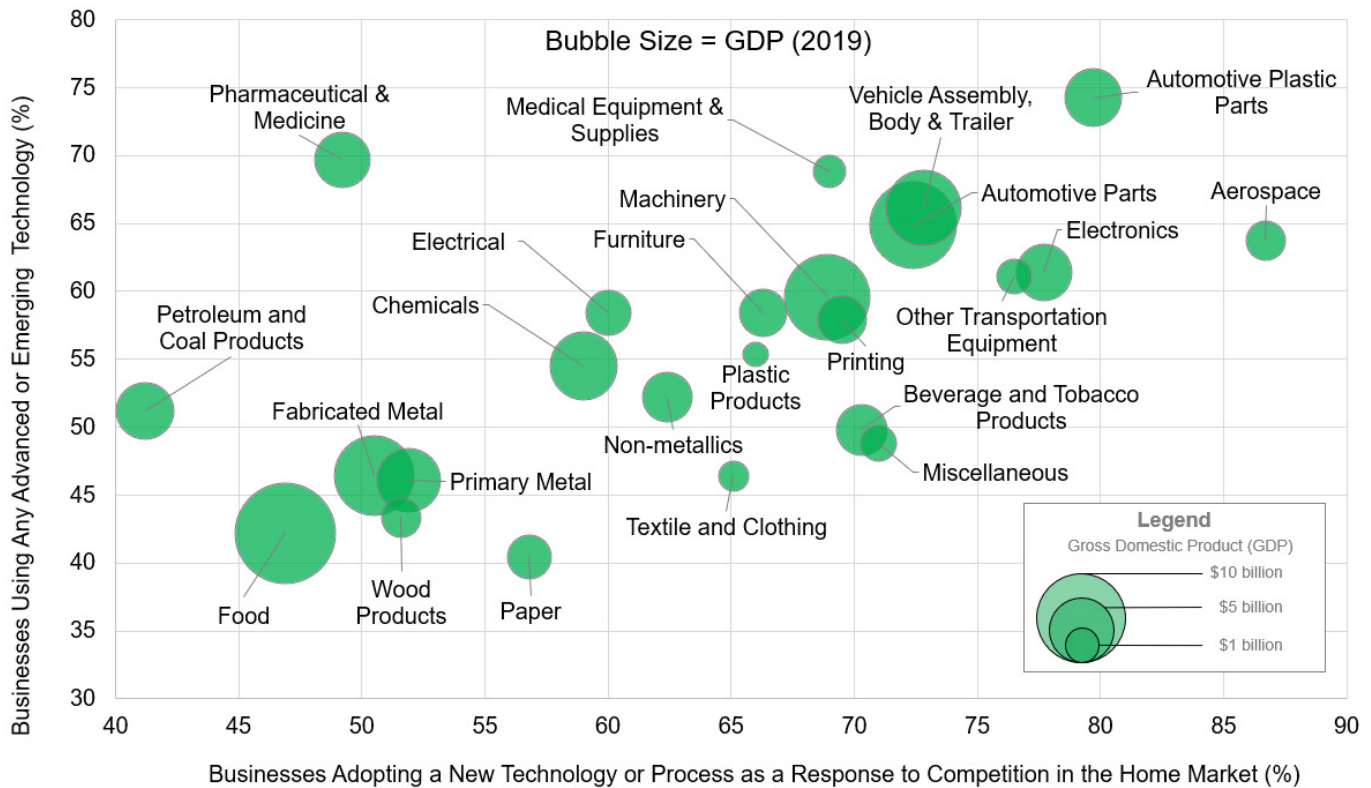
Statistics Canada defines advanced and emerging technologies as new technologies (equipment and software) that perform a new function or perform a function significantly better than the technologies commonly used in the industry or by competitors. Table 1 details the categorization of distinct technologies by Statistics Canada under this definition.

Table 1: Statistics Canada Categorization of Advanced and Emerging Technologies

Advanced Technologies	Emerging Technologies
<ul style="list-style-type: none"> • Material Handling, Supply Chain or Logistics Technologies • Design or Information Control Technologies • Processing or Fabrication Technologies • Clean Technologies • Security or Advanced Authentication Systems • Business Intelligence Technologies 	<ul style="list-style-type: none"> • Nanotechnology • Biotechnology • Geomatics or Geospatial Technologies • Artificial Intelligence (AI) • Virtual, Mixed and Augmented Reality • Integrated Internet of Things (IIoT) Systems • Blockchain Technologies • Additive Manufacturing (AM)

The figure below demonstrates the relationship between the level of advanced or emerging technology use in Ontario's manufacturing industries and technology adoption in response to competition. This figure illustrates two key points. First, Ontario manufacturing is diverse in terms of the level of technology use at the industry-by-industry level. Automotive plastic parts, medical, pharmaceutical, vehicle assembly, automotive parts, and aerospace industries demonstrate considerably higher levels of advanced or emerging technology use. There is a large difference in the rate of technology use between some of Ontario's largest manufacturing industries by GDP.

Figure: Advanced or Emerging Technology Use and Technology Adoption as a Response to Competition in Ontario Manufacturing Industries



Data Sources: Statistics Canada tables 27-10-0367-01, 33-10-0177-01, and 36-10-0402-01

Second, competitive pressures appear to be more strongly linked to technology adoption in the same industries that report higher levels of advanced or emerging technology use. For manufacturers in industries like aerospace, electronics, automotive plastic parts, and other transportation equipment manufacturing industries, new technologies may be a requirement of competition and survival. On the other hand, for manufacturers in food, rubber products, wood products, fabricated metal, and primary metal industries the link between competition and technology adoption is less clear.

One reason for this might be that these industries are also less trade dependent, meaning that they rely more on domestic supply chains for their inputs and a smaller share of their sales is exports (see [Data Bulletin Number 3](#)). Manufacturers in these industries may not be subject to the same level of global competitive pressures as those in industries like automotive and aerospace, leading to a lower technology use and adoption rate as a result.

To better understand the nuances of technology adoption in Ontario manufacturing industries, we also need to examine the types of technologies adopted by manufacturers. In Table 2, we demonstrate an industry-level comparison of advanced or emerging technology use reported by select Ontario manufacturing industries alongside the technologies adopted in each category.

Additive manufacturing is the most common emerging technology adopted by manufacturers in Ontario. Biotechnology, IIoT systems and geomatics/geospatial technologies appear to be adopted by industries with more specialized needs. Another observation is that aerospace, machinery, electrical and printing industries have relatively high emerging technology uptake rates. In contrast, the automotive parts industry shows a weaker emerging technology adoption rate despite a relatively high advanced technology use rate. Stakeholders focused on increasing technology adoption among manufacturers need to consider these differences.

Table 2: Industry-Level Comparison of Advanced or Emerging Technology Use and the Most Common Technologies Adopted for Top 15 Ontario Manufacturing Industries by GDP

Industry	Use of Advanced Tech. (%)	Use of Emerging Tech. (%)	Top Advanced Technology	Top Emerging Technology
Food	41	12	Processing/fabrication	Biotechnology
Automotive Parts	63	18	Business intelligence	Additive Manufacturing
Machinery	56	22	Business intelligence	Additive Manufacturing
Fabricated Metal	45	11	Material handling/logistics	Additive Manufacturing
Vehicle Assembly	63	24	Design/information control	Additive Manufacturing
Chemical	54	16	Clean technologies	Additive Manufacturing
Primary Metal	39	18	Security/authorization	IIoT Systems
Automotive Plastic Parts	70	32	Design/information control	Additive Manufacturing
Petroleum and Coal	51	18	Design/information control	Geomatics/Geospatial
Electronics	60	40	Processing/fabrication	Additive Manufacturing
Pharmaceutical	66	40	Business intelligence	Biotech
Beverage and Tobacco	49	15	Clean technologies	IIoT Systems
Non-Metallics	51	11	Clean technologies	Additive Manufacturing
Printing	56	20	Processing/fabrication	IIoT Systems
Furniture	57	14	Material handling/logistics	Additive Manufacturing
Manufacturing	51	16	Material handling/logistics	Additive Manufacturing

Data Sources: Statistics Canada tables 27-10-0368-01 and 27-10-0367-01

Finally, understanding the primary reasons for not adopting or using advanced technologies among Ontario manufacturing industries is key to fostering further technology use. The top reason is the perception that investment in technology is not necessary for continuing operations. This is followed by concerns about costs, which is common in industries that lag behind the Ontario sector average such as food, fabricated metal, and primary metal. In contrast, the biggest challenge Ontario manufacturers struggle with when they adopt or use new technologies is hiring talent with the necessary skills (Source: Statistics Canada Table 33-10-0620-01).

Key takeaways:

- Ontario manufacturing industries demonstrate varying levels of technology adoption and use, and the top technologies they have adopted also differ based on their needs.
- Advanced or emerging technology use is more common among industries that adopt technology as a way to respond to competition in their primary market.
- Efforts to boost technology adoption among Ontario manufacturers need to consider differences at the industry-level.