The Strong Link Inc.

Overview of Aerospace Manufacturing, Technologies, Trends

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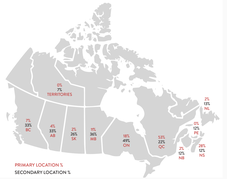
Manufacturing in Canada

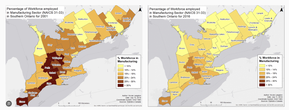
WHERE IS YOUR HEAD OFFICE OR PRIMARY LOCATION IN CANADA?

CME received 563 responses to our 2022 Labour and Skills Survey, representing all regions of Canada. The largest share of responses – about 33 per cent – came from Quebec. About 28 per cent have their primary operations in Western Canada, 19 per cent of respondents mainly operate in Ontario, and 6 per cent are headquartered in Atlantic Canada.

Some survey participants work for companies that have facilities in more than one province. Companies are most likely to have additional operations in Ontario, Manitoba, BC, and Alberta.



Ontario Manufacturing Sector



- The manufacturing sector currently employs 776,200 Ontarians.
- On average, Ontario employees working in manufacturing make over $60,000 a year.
- There are over 36,000 manufacturing companies in Ontario.
- The sector directly accounts for almost 11 per cent of the province's GDP.
- Manufacturing is responsible for close to 80% of Ontario's outbound goods. The sector's top five export markets are the US, Germany, Mexico, Norway, and China.

Sources: CME, Statistics Canada.

Ontario Aerospace Manufacturing Sector

Sector Maps

ONTARIO'S AEROSPACE INDUSTRY BY THE NUMBERS

- **75%** OF CANADIAN AEROSPACE PRODUCTS EXPORTED TO 180 COUNTRIES ACROSS 6 CONTINENTS
- **$2.66B** IN EXPORTS OF AEROSPACE PRODUCTS
- **3 OF THE TOP** GLOBAL LANDING GEARS EXPERIENCE PRODUCING FULL OR MAJOR COMPONENTS
- **OVER 200** FIRMS EMPLOYING ALMOST **30,000** DIRECT AND INDIRECT PEOPLE
- **MORE THAN 50** POST-SECONDARY PROGRAMS IN APPLIED AEROSPACE, MANUFACTURING ENGINEERING

AIRBUS HELICOPTERS · Collins Aerospace · BOMBARDIER · DE HAVILLAND AIRCRAFT OF CANADA LIMITED · Diamond AIRCRAFT · Honeywell Aerospace · L3HARRIS · MDA · MHI CANADA AEROSPACE, INC. · Pratt & Whitney Canada A United Technologies Company · Raytheon Technologies

Voice of the Employer

FIGURE 6
Ontario Employment by Industry, 2001-2012

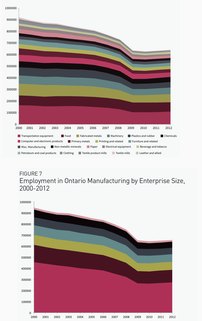
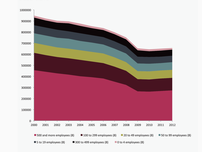
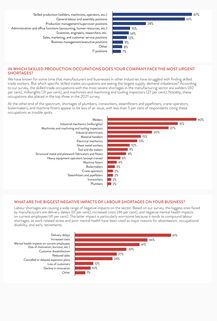


FIGURE 7
Employment in Ontario Manufacturing by Enterprise Size, 2000-2012





IN WHICH SKILLED PRODUCTION OCCUPATIONS DOES YOUR COMPANY FACE THE MOST URGENT SHORTAGES?

We have chosen for some time now manufacturers and businesses in other industries have struggled with finding skilled trade workers. But which specific skilled trades occupations are seeing the largest supply-demand imbalances? According to respondents to our survey, the occupations with the most severe shortages are tool and die makers (cited by 19 per cent), millwrights (17 per cent), and machinists and machining and tooling inspectors (13 per cent). Notably, these occupations also placed in the top three in the 2021 survey.

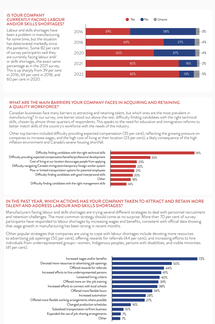
At the other end of the spectrum, shortages of plumbers, instrumentists, steamfitters and pipefitters, crane operators, boilermakers, and machine fitters appear to be less of an issue, with less than 5 per cent of respondents rating these occupations as trouble spots.

WHAT ARE THE BIGGEST NEGATIVE IMPACTS OF LABOUR SHORTAGES ON YOUR BUSINESS?

Labour shortages are causing a wide range of negative impacts on the sector. Based on our survey, the biggest ones faced by companies are delays in filling orders (cited by 69 per cent of respondents), a decline in profitability (49 per cent), and a hit on current employees (47 per cent). The latter impact is particularly worrisome because it points to a compound labour shortages, as work-related stress and poor mental health have been cited as major reasons for absenteeism, occupational disability, and early retirements.

IS YOUR COMPANY CURRENTLY FACING LABOUR SHORTAGES AMONGST...

Labour and skills shortages have been a problem in manufacturing for some time, but the situation has become more acute since the pandemic. Some 83 per cent of survey participants said they are facing labour shortages or skills shortages, the most same figure as in the 2021 survey. And more than 50 per cent – up from 41 per cent in 2018, 44 per cent in 2019, and 40 per cent in 2020.



WHAT ARE THE MAIN BARRIERS YOUR COMPANY FACES IN ACQUIRING AND RETAINING A QUALITY WORKFORCE?

Canadian businesses face many barriers to attracting and retaining talent, but which ones are the most prevalent in manufacturing? In our survey, one barrier stood out above the rest: difficulty finding candidates with the right technical skills and experience. Nearly 60 per cent of respondents cited this challenge, pointing to the need for education and training reforms to better match skills of the country's workforce with the needs of the industry.

Other top barriers included difficulty providing expected compensation (51 per cent), reflecting the growing pressure on companies to increase wages, and the high cost of living at their location (32 per cent), a likely consequence of the high inflation environment and Canada's severe housing affordability crisis.

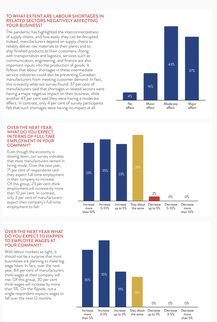
IN THE PAST YEAR, WHICH ACTIONS HAS YOUR COMPANY TAKEN TO ATTRACT AND RETAIN MORE TALENT AND ADDRESS LABOUR AND SKILLS SHORTAGES?

Manufacturers facing labour and skills shortages are trying several different strategies to deal with personnel recruitment and retention challenges. The most common strategy should come as no surprise. More than 70 per cent of survey participants have responded to labour shortages by increasing wages and benefits, consistent with official data showing significant growth in manufacturing wages in the past few years.

Other strategies that companies are using to cope with labour shortages include devising more resources to advertising job openings (52 per cent), offering rewards for referrals (44 per cent), and increasing efforts to hire individuals from underrepresented groups—women, Indigenous peoples, persons with disabilities, and visible minorities (41 per cent).

TO WHAT EXTENT ARE LABOUR SHORTAGES IN RELATED SECTORS NEGATIVELY AFFECTING YOUR BUSINESS?

The pandemic highlighted the interconnectedness of supply chains, and how easily they can be disrupted. Indeed, manufacturers depend on supply chains to source the materials and components they need to ship finished products to their customers. Along with transportation and logistics, services such as wholesale trade and finance are also considered important inputs into the production of goods. It follows that labour shortages in these intermediate industries can have a significant impact on manufacturers. Manufacturers from making customer demand. In fact, this is exactly what our survey found: 37 per cent of manufacturers said that shortages in related sectors were causing a major impact on their business, while another 47 per cent said they were facing a moderate effect. In contrast, only 4 per cent of survey participants felt that such shortages were having no impact at all.



OVER THE NEXT YEAR, WHAT DO YOU EXPECT IN TERMS OF FULL-TIME EMPLOYMENT IN YOUR COMPANY?

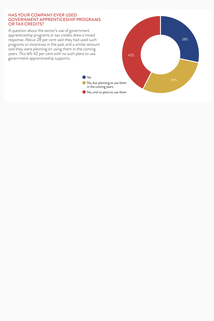
Even though the economy is facing headwinds, most companies that have manufacturers remain in hiring mode. Over the next year, 39 per cent of respondents say they expect full-time employment in their company to increase. Only 15 per cent say the risk employment will increase by more than 10 per cent. In contrast, 23 per cent of survey participants expect their company's full-time employment to fall.

OVER THE NEXT YEAR WHAT DO YOU EXPECT TO HAPPEN TO WAGES AND BENEFITS AT YOUR COMPANY?

With labour markets so tight, it comes as no surprise that most businesses are planning to make big wage hikes. In fact, over the next year, 72 per cent of respondents think wages at their company will rise. Of this group, 32 per cent anticipate that increase will be more than 5%.On the flipside, not a single respondent expects wages to fall over the next 12 months.

HAS YOUR COMPANY EVER USED GOVERNMENT APPRENTICESHIP PROGRAMS TO HIRE STAFF?

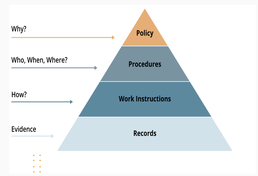
A question about the sector's use of government apprenticeship programs or tax credits drew a mixed response. About 28 per cent said they had used such programs in the past and plan to do so in the future, while said they were planning on using them in the coming years. This left 42 per cent with no such plans to use government apprenticeship supports.



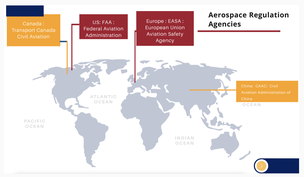
Regulatory Compliance

Regulatory Standard

Quality Management System

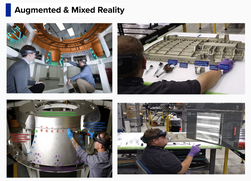


Regulation Agencies



Technologies & Trends

Augmented & Mixed Reality



Climate Neutral Aviation

The Strong Link Inc.

Shift Operations & Floor Management Systems

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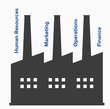
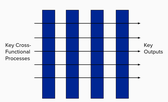
Fundamentals

Organizational Structure

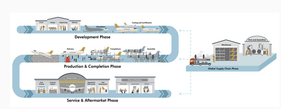
Functional Silos



Cross-Functional Matrix



Manufacturing Supply Chain



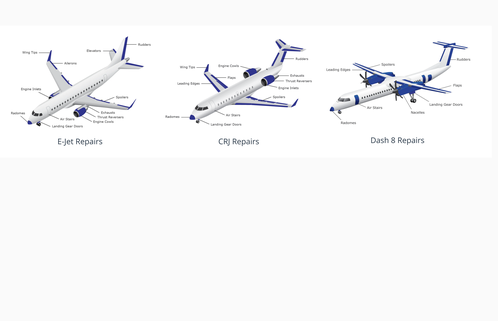
Global Supply Chains

Skill Development & Supply Chain

Five Stages of Followership

1. Wait to be told
2. Ask to be told
3. Seek approval for a recommendation
4. Seek approval for action undertaken
5. Get on and inform in a routine way

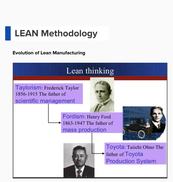
Aircraft Components



LEAN Methodology

LEAN Methodology

Evolution of Lean Manufacturing



Lean manufacturing is a production process based on an ideology of **maximizing productivity** while simultaneously **minimizing waste** within a manufacturing operation. The lean principle sees waste is anything that doesn't add value that the customers are willing to pay for.

Operational Excellence

Operational Excellence is the systematic removal of anything that blocks the free flow of value to the customer.

There's no limit on better.

Toyota Production System

A production system based on the philosophy of achieving the complete elimination of all waste in pursuit of the most efficient methods.

8 Waste's of LEAN Manufacturing

he Toyota Production System originally detailed seven wastes that don't provide value to the customer.

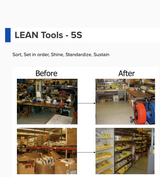
- Unnecessary transportation
- Excess inventory
- Unnecessary movement of people, equipment or machinery
- Waiting – either people or idle equipment
- Over-production of a product
- Over-processing of unnecessary features to a product
- Defects that require costly correction

An eighth waste has since been highlighted by many lean practitioners:

- Unused talent and ingenuity

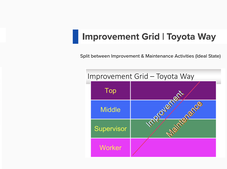
LEAN Tools - 5S

Sort, Set in order, Shine, Standardize, Sustain



Improvement Grid | Toyota Way

Split between Improvement & Maintenance Activities (Ideal State)



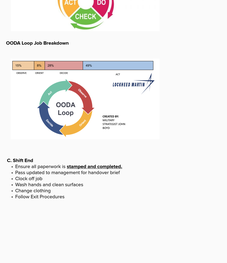
Gemba - Go Look See

The action of going to see the actual process, understand the work, ask questions, and learn from those who do the work. It is an opportunity for management and support staff to break away from their day-to-day tasks to walk the floor of their workplace to identify wasteful activities.

Kaizen

Kaizen involves workers from all parts of the organization focusing on eliminating waste, improving productivity, and achieving sustained continual improvement in targeted activities and processes of an organization.

Additional Resources



Site Layouts

Bombardier Site

Google Overview

Department Types

Operations I Manages and oversees the day-to-day activities and processes of the business.

Production I Responsible for the manufacturing process of a company's products or services.

Logistics I Feature transportation/delivery, storage, packaging, cargo handling, distribution processing, and information processing.

Quality I Plans, measures, analyzes and reports on quality.

Facilities I Responsible for keeping buildings properly maintained, clean and safe.

Human Resources I Responsible for talent management, compensation and employee benefits, training and development, compliance, and workplace safety.

Health & Safety I Develop, implement and enforce safety rules, regulations, standards and procedures appropriate to the operations of the department

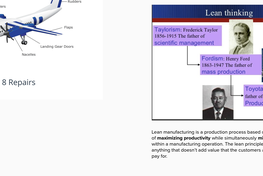
Security I Securing the premises and personnel by staying on patrol, monitoring surveillance equipment, performing building inspections, guarding entry points, and verifying visitors.

Engineering I Responsible for developing innovative devices to bring out advanced materials into the world and designing, introducing, preserving and improving plants for stable and efficient production.

Methods I It connects with lean management techniques so that the company keeps its competitiveness in an evolving market. It is the interface between the production line and the design office

Work Centers

Work Center & Pulse Operations Examples



Floor Management System

Overview of a Floor Management System (FMS)

Communication Zones

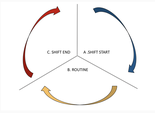
Communication Zones Examples

Com Zone Breakdown

- Safety
- Quality
- Productivity
- Cost
- Human Resources
- Actions

3 Phases to a Shift

Shift Breakdown



A. Shift Start
- Arrive
- Change into work clothes
- Don PPE – Personal Protective Equipment
- FOD (Foreign Object Debris) Walk
- Team Daily Morning Meetings (DMMs)
- No external memory sticks/phones, dependent on security protocols.

B. Routine Stage
- Planned Vs. Unplanned Work
- Clocking Work. (Manufacturing Execution Systems - MES).

Kanban PDCA Cycle

OODA Loop Job Breakdown

C. Shift End
- Ensure all paperwork is **stamped and completed.**
- Pass updated to management for handover brief
- Clock off job
- Wash hands and clean surfaces
- Change clothing
- Follow Exit Procedures