



IEDC2019

ECONOMIC FUTURE FORUM

Pioneers in a New Global Market

June 9-11, 2019 • Salt Lake City, UT

INDUSTRY 4.0 – CANADIAN SUPPORTS

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LONDON
ECONOMIC
DEVELOPMENT
CORPORATION



INTERNATIONAL
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COUNCIL

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London Quick Facts



532,984¹
Population

- Located on the **busiest NAFTA highway in North America**
- Access to more than **150 million consumers** within a **1-day drive**
- Close proximity to **3 U.S. border crossings**

London's Proximity to Automotive Assembly^{2,3}

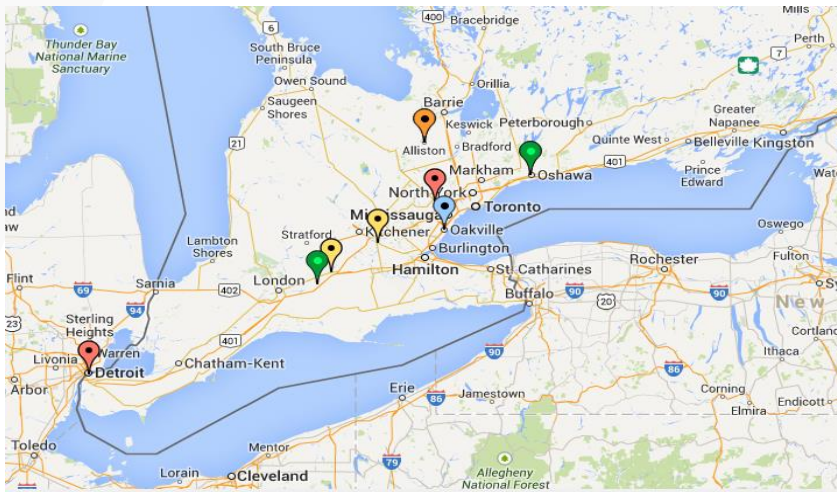


Image Source: Government of Canada – "Vehicles made in Canada 2018"

-  Red marker: Fiat (Brampton, Windsor)
-  Blue marker: Ford (Oakville)
-  Green marker: General Motors (Oshawa, Ingersoll)
-  Orange marker: Honda (2 plants in Alliston)
-  Yellow marker: Toyota (Woodstock, Cambridge)

How Canada Matches Up

- Canada's population (37M) ~ California population (39M)
- Canada's economy (\$1.65T) ~ Texas economy (\$1.7T)



How Canada Matches Up

- According to a World Economic Forum (WEF) 2018⁴ Canada is:
 - A “leading country” in terms of its readiness for industry 4.0 changes
 - 4th place for industry 4.0 human capital
 - A leader for its strong manufacturing base

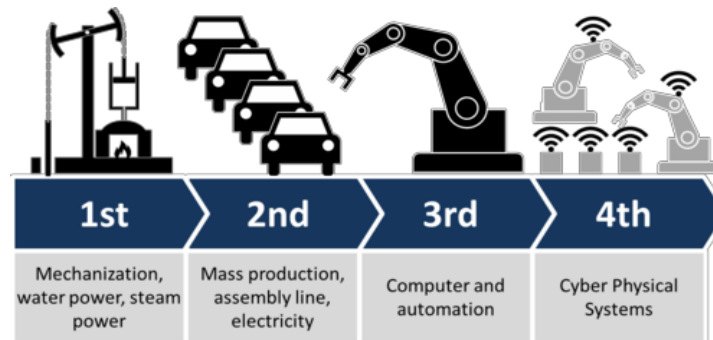


Image Source: AllAboutLean.com website

Canada

- National Research Council (NRC) of Canada
 - Industrial Research Assistance Program (IRAP)⁵
 - Digital Technologies Research Centre⁶
 - Security and Disruptive Technologies Research Centre⁷
 - Advanced Electronics and Photonics Research Centre⁸
- SR&ED tax incentives⁹
- Strategic Innovation Fund¹⁰
- CanCode youth digital skills¹¹ \$110 M (2017-2021)
- Pan-Canadian AI Strategy¹²

Canada's New Superclusters ^{13,15-17}



“Internet of fish”¹⁴



Image Source:
 Venco website

Autonomous farming^{18,19}



Image Source:
 DOT
 Technology
 Corp. website

Innovation Superclusters

- 5 Superclusters across the country
- Advanced Manufacturing, Artificial Intelligence (AI), Digital Technology, Protein Industries, Oceans
- Arms-length, Non-profit corporations
- \$1B investment requiring 1:1 private sector match
 - Expected 50,000 jobs,
 - \$60B GDP growth over 10 years
- About 500 companies and 60 research institutions

NGen

Next Generation
Manufacturing Canada

- Advanced manufacturing supercluster based in Ontario
- **\$190 M** in federal funding for industry-designed projects leveraging Canada's advanced technology
- **Technology focus:** IoT, machine learning, cybersecurity, and additive manufacturing (3D printing)

Project Size: Total costs between \$1M - \$20M

NGen Reimburses: Up to 44.4% of eligible costs

Ontario

- Ontario's industry 4.0 directly applicable tax incentives
 - Three tax credits including the **Innovation, Business Research Institute** and **R&D** tax credits²²⁻²⁴
- Ontario's business grants and loans (E.g., SWODF and EODF)²⁵
- Ontario-based industry 4.0 not-for-profits
 - **MaRS Discovery District** – MaRS supported science and tech companies cumulatively raised over **\$4.38B in capital** since '08²⁶
 - Vector Institute – advances AI research and commercialization²⁷
 - Ontario Research and Innovation Optical Network (ORION)²⁸



Ontario Centres of Excellence (OCE)



Ontario Centres of
Excellence

Where Next Happens



- Autonomous Vehicle Innovation Network (AVIN)²⁹
- IBM Innovation Incubator Project³⁰
- Next Generation Network Program³¹
- OCE industry 4.0 Ontario-based partner organizations:
 - Southern Ontario Smart Computing Innovation Centre³²
 - Centres of Excellence in Next Generation Networks (CENGN)³³
 - ENCQOR³⁴



Unleashing 5G for Innovation

- Pre-competitive testbed for 5G technology³⁴
- \$400 M Canada-Ontario-Québec partnership
- E.g., Internet of Things (IoT), smart cities, and cloud computing

Ontario's Advanced Manufacturing Consortium ³⁵

- Partnership between **McMaster University**, the **University of Waterloo** and **Western University**



- OAMC provides Ontario manufacturers industry-friendly R&D support, IP ownership of project work, and access to world-class facilities and extensive infrastructure
- E.g., composites, IoT, robotics, automation, wireless testing, and additive manufacturing

OAMC – Waterloo and McMaster Facilities³⁵

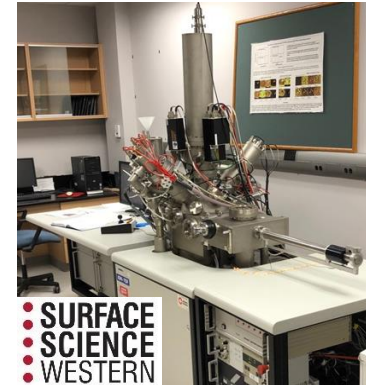
- ***The Waterloo Centre for Automotive Research (WatCAR Manufacturing)*** – access to automotive development through forming, moulding, and joining processes
 - Assessments of durability and crashworthiness
- ***Multi-Scale Additive Manufacturing (MSAM) Lab*** – access to advanced materials, products, modeling and simulation devices
- ***Centre for Intelligent Antenna and Radio Systems (CIARS-IOT Hub)*** – testing and development of wave technology for the IoT
- ***McMaster Manufacturing Research Institute (MMRI)*** – offers expertise on a wide variety of manufacturing processes
 - Strong focus on tooling, robotics, and process optimization

Facilities at Western University in London³⁵

Surface Science Western

- Consulting and research laboratory specializing in the analysis and characterization of surfaces and materials
- Serving high profile clients in automotive, aerospace, electronics and other industry sectors

Surface Inspection Centre



EOS Additive Production Suite



Additive Manufacturing Western

- Supports manufacturing through the design and production of specialized components and equipment
- 3D printing, modelling, prototype manufacturing, and welding fabrication

Fraunhofer Project Centre for Composites Research at Western University³⁵

- Joint venture between Western University in London, Ontario and Fraunhofer in Germany



Fraunhofer Project
Centre, London



- Develops, tests, validates, and characterizes new lightweight materials and advanced manufacturing processes at industrial scale
 - Accelerates the adoption of advanced composites technologies and the development cycle for new products in industry

London's Manufacturing Leaders



Trudell Medical International



London's Educational Institutions



Western
UNIVERSITY • CANADA

- **Enrolment: 40,000**
 - Full range of PhD programs, Medical, Law, Engineering, Business Schools
 - 310,000 alumni worldwide
 - 60+ undergraduate & graduate programs



FANSHAWE
COLLEGE

- **Enrolment: 22,000**
 - Focus on practical training
 - 180,000 alumni
 - 100+ post-secondary programs offered



WIN 4.0³⁵

Western's Industry
4.0 Network



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Connection

Collaboration

Education

Solutions



Thematic Areas – WIN 4.0³⁵

1

**Advanced
Manufacturing
and Materials**

2

**Advanced
Manufacturing
Infrastructure
and
Communications**

3

**Systems and
Software**

4

**Business,
Analytics,
Mathematical
Modeling, and
Statistical
Analysis**



WIN 4.0

Western's Industry 4.0 Network



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Strong Team – WIN 4.0³⁵

A highly interdisciplinary network

~ 50 faculty members and their labs

Multinational cooperation

- Faculty of Engineering
- Faculty of Science
- Ivey Business School
- Schulich School of Medicine & Dentistry
- Canada
- Germany
- China



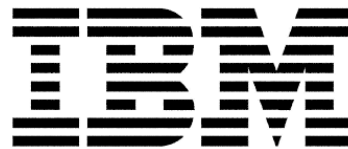
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Global Network – WIN 4.0³⁵

- Western University
- German Institutes, KIT, Fraunhofer (ICT, IOSB)
- WORLDiscoveries® Business Development
- Surface Science Western (SSW)
- Western Nanofabrication Facility
- Leading companies in Industry 4.0

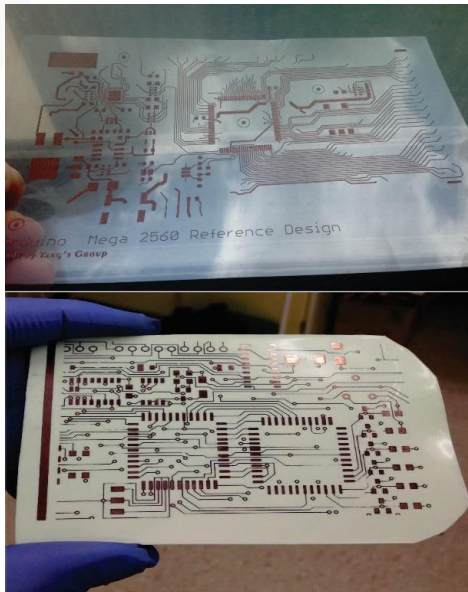
NanoWestern



Advanced Printing Technologies – WIN 4.0³⁵

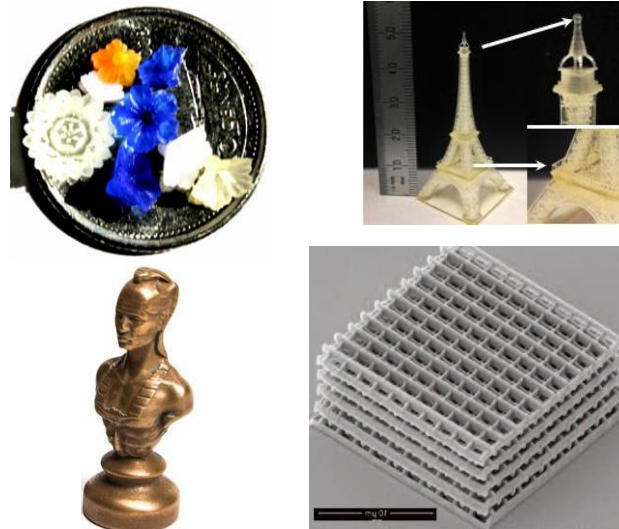
2D Printing

- Printed / flexible electronics



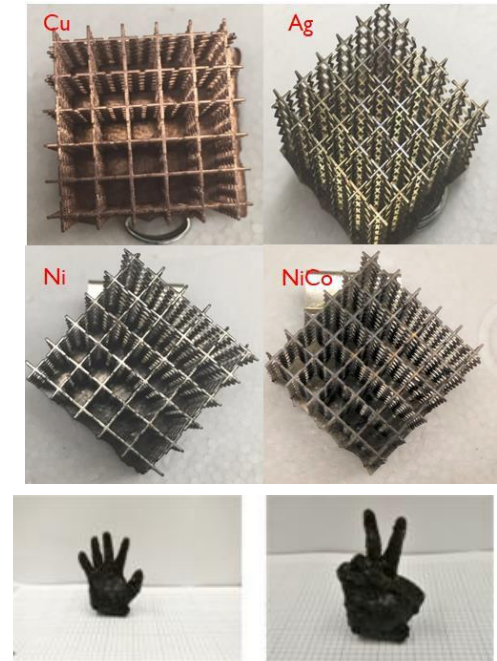
3D Printing

- Structural / bioprinting
- High resolution, strength, transparency, and temperature



4D Printing

- Functional and time-evolving



Software for Highly Interconnected Systems

– WIN 4.0³⁵



- Areas of research:
 - Cyberphysical systems, smart cities / buildings, and data processing
- Some active research projects:
 - Diagnosis of outages and rerouting of power in grids
 - Intelligent driving, computer vision and driving behavior
 - Middleware to develop, deploy, and monitor cyberphysical systems



Digital Twin – WIN 4.0

- Plant optimization / simulation: Siemens PLM NX Software³⁶
 - **\$522M** industry 4.0-related software grant to Western³⁷



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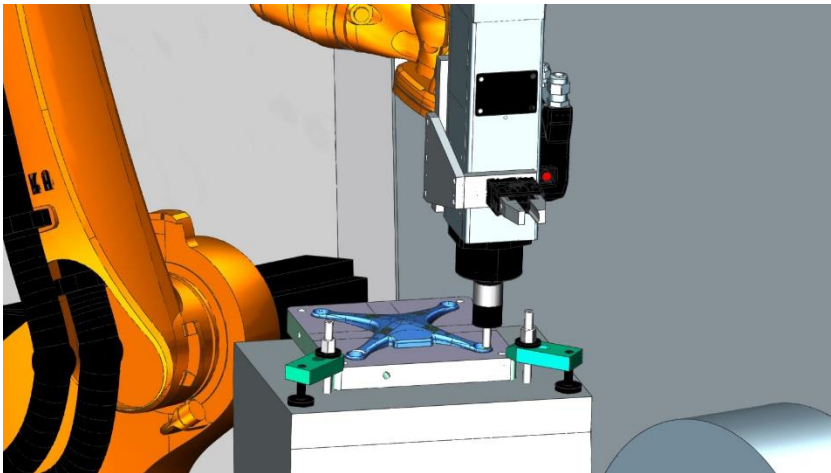


Image Source: Siemens AG website

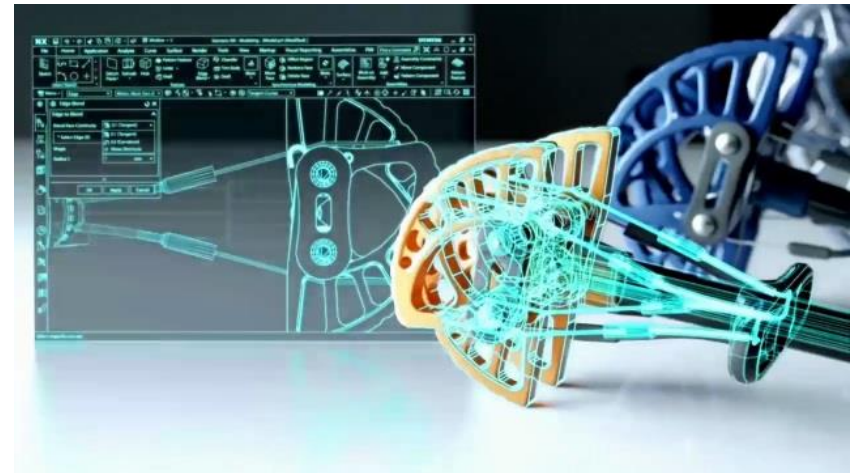


Image Source: Siemens AG website

Key Takeaways

1. Canada is a leader for its industry 4.0 readiness
2. Federal industry 4.0 economic development is ongoing on multiple fronts, including five dense superclusters



3. Ontario has an advanced manufacturing supercluster with major industry 4.0 companies and R&D facilities
4. Western's Industry 4.0 Network, in **London, Ontario**, is a leading interdisciplinary collaboration driving the research and development of new technologies and processes



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THANK-YOU



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