Building an Advanced Manufacturing Supercluster for Canada an Initiative of NGM Canada

Southern Ontario is the heart of manufacturing and technology in Canada. It is the only region in Canada with a globally ranked start-up ecosystem, a diverse and concentrated manufacturing base, a highly skilled workforce, world-class research and educational facilities, and a remarkable entrepreneurial dynamic. We should be excelling as an advanced manufacturing economy. Instead, our manufacturing sector is falling behind in terms of innovation, competitiveness, and growth. And, our technology companies struggle to attract the talent and investment they need to scale up and grow. The Advanced Manufacturing Supercluster aims to reverse this trend by driving greater connectivity and collaboration between our manufacturing and technology sectors and leveraging southern Ontario's innovation infrastructure to better effect. In a world of accelerated change, hyper-connectivity is critical. The Advanced Manufacturing Supercluster will drive exponential benefits for industry and the Canadian economy.

Next Generation Manufacturing Canada (NGM Canada) is an industry-led, not-for-profit organization dedicated to building next generation manufacturing capabilities in Canada. Its mission is to position Canadian companies as global leaders in advanced manufacturing technologies, create the most competitive advanced manufacturing supply chains in the world, and develop the world's most talented advanced manufacturing workforce, creating economic prosperity for all Canadians. NGM Canada's supercluster strategy will leverage the innovation strengths of southern Ontario to supercharge Canada's manufacturing performance by investing in:

> ### A Manufacturing Powerhouse
>
> Ontario is home to 49% of Canada's total manufacturing output. It accounts for:
> - 96% of Canadian automotive production.
> - 60% of Canada's information and communication technology sector.
> - 58% of Canada's medical device industry.
> - 52% of Canadian steel production.
> - 48% of Canada's fabricated metals, machinery, and equipment manufacturing.
> - 40% of Canadian food and beverage production.
> - 26% of Canada's aerospace industry.

- **Ground-breaking Process Transformation:** game changing technologies applied in today's manufacturing;
- **High Potential Technology Development:** scaling Ontario technologies for next generation manufacturing; and
- **Ecosystem Development:** creating a network of supports and services that accelerate technology adoption in manufacturing and generate new customers and scale-up opportunities for technology firms.

The Advanced Manufacturing Supercluster will target those advanced manufacturing technologies that offer Canadian companies the greatest potential for step-change productivity improvement and new revenue growth based on the strengths of Ontario's innovation ecosystem.

It will accelerate the adoption of digital technologies at the forefront of the Fourth Industrial Revolution – Industry 4.0. And, it will invest in developing and scaling up new technologies in manufacturing including vision systems, robotics, smart materials, IOT software and devices, additive manufacturing, microelectronics, data analytics, artificial intelligence and smart machines.

NGM Canada has raised $743M in private sector support for its Supercluster strategy. With a co-investment of $250M from the Innovation Superclusters Initiative, NGM Canada will transform competitiveness and create new opportunities for firms, supply chains, communities, and thousands of Canadians employed in key industry segments like automotive, steel production, wood products, food and beverage production, microelectronics, and Information and Communications Technologies.

NGM Canada modelled the expected impacts of its strategy based on an equal match between industry cash and Supercluster funding. Based on this assumption, the Advanced Manufacturing Supercluster would increase:
- Business investment in R&D by $157.1 million
- Investment in hardware, machinery and equipment by $45.9 million
- Investment in software by $38.4 million
- Investment in training by $61.3 million
- Investment of $302.7 million in advanced manufacturing technologies

Our original analysis considers direct, indirect, and induced impacts on the economy, including the impacts of subsequent investments in the commercialization of new technologies – indicating an increase in real GDP by $65.5 billion and over 70,800 new jobs for Canadians over the next ten years.

Since industry commitments have far exceeded our original expectation, every dollar of Supercluster funding will actually be matched by $2.40. Thus, the Supercluster is expected to lead to a cumulative increase in GDP of $157 billion and generate 170,000 new jobs over the next decade.

Strategy

NGM Canada will build an Industry 4.0 ecosystem in Ontario by accelerating private sector investments to improve process innovation in key industry segments; increase next-generation manufacturing through R&D investment in critical technology areas; and cultivate a robust hyper-connected ecosystem of large and small manufacturers, technology companies, universities, colleges, and research centres.

Using a Hub and Network model, NGM Canada will deliver services and resources across the Southern Ontario region through partnerships with a set of regional nodes.

NGM Canada's network will engage companies where they are – connecting them quickly and easily to whatever services they need, whether they be physical facilities, equipment, testing and advisory services, talent development programs, and/or knowledge transfer activities.

Implementation

Over the next five years, NGM Canada will enhance integration and collaboration across technology and manufacturing sectors with the following initiatives:

INDUSTRY-LED PROJECTS

NGM Canada will support four major project types to accelerate process transformation in key industry segments and advance development of critical types of technologies. These four project types are: company-specific process transformation, company-specific technology development, ecosystem process transformation and ecosystem technology development.

Application	Process Transformation	Technology Development
Company-Specific		
Objective	Game changing improvements in competitive performance in key sectors of Ontario manufacturing through the application of advanced technologies.	Development of new technologies for next generation manufacturing.
Type of Projects	Manufacturers or groups of manufacturers work with technology companies, universities, colleges, research centres to apply advanced technologies in revolutionizing production processes.	Manufacturers and technology companies partnering to develop and scale-up new technologies.
Sample Projects	Automotive – led by Woodbridge Steel products – led by Dofasco + Algoma	Vision Systems – led by Linamar + Teledyne DALSA Additive Manufacturing – led by Magna Smart Machines – led by Kinova
Benefits	World leading product and process capabilities Significant improvements in competitiveness in key sectors of Ontario manufacturing Direct benefits to proponents and innovation supply chain partners Technology demonstration for broader manufacturing sector.	Technology leadership in global market Accelerated scale-up and commercialization of technologies Direct benefits to proponents and innovation supply chain partners
Ecosystem		
Broad Ecosystem	Accelerated adoption of advanced technologies in process and product innovation enabling significant improvements in the competitiveness of Ontario manufacturers.	Development and broad adoption of new technologies creating next generation products, processes, and industry sectors.

Type of Projects	Hub & Network activities to manage industry project activity, build collaboration, deliver programs and services to help de-risk technology adoption	Companies, universities, colleges, R&D centres partnering to develop, demonstrate, and apply new technologies in manufacturing.
Sample Projects	Wood products – led by Bluewater Wood Alliance	Smart Machines – led by Clearpath + Celestica
		Smart Materials, Printable & Flexible Electronics – led by Intelliflex + Myant
Benefits	Create opportunities for companies to collaborate across technology/ industry sectors	New manufacturing capabilities
	Build Canada's global leadership profile in advanced manufacturing	Technology leadership in global market
		Accelerated scale-up and commercialization of new technologies
	Provide a docking point for Canadian companies to find tools, testbeds, partners, investors, talent, and customers	Broad based industry benefits through application of new technologies

Co-investing in these industry-led projects will be the first pillar of our implementation plan. The other pillars are to develop robust infrastructure and to cultivate a strong ecosystem.

ROBUST INFRASTRUCTURE
Building out a robust set of tools and test-bed infrastructure will be critical to the success of company efforts. Southern Ontario has facilities where companies can go to test, validate, and scale-up new technology applications, but there are gaps in this infrastructure and access is not always easy.

NGM Canada will provide more visible, timely and streamlined access to innovation by developing and maintaining an inventory of innovation assets, and mapping sources of technology and expertise. Access to assets will be enabled through a concierge service located at a network of eight regional hubs in Southern Ontario.

A STRONG ECOSYSTEM
Though there is a wealth of world-leading business, expertise, talent, and technologies related to advanced manufacturing, there is no systematic connection between the technology and manufacturing sectors. There is little visibility, coordination, alignment, or collaboration across assets. There is no single point of contact that could help guide manufacturers to the integrated solutions they need for successful technology adoption, or to help smaller technology companies develop solutions. And, there is a large gap to bridge between technology readiness and manufacturing readiness.

The NGM Canada Supercluster strategy will address these ecosystem challenges by: leveraging a network of technology providers, manufacturers, academic institutions, and technology platforms/centres, working together to provide neutral advice and guidance to manufacturers and tech firms. NGM Canada will also develop and manage national and international linkages with research centres, technology providers, manufacturers, education and training organizations and investors.

NGM Canada will lead the coordination of the ecosystem activities with eight trusted partner hubs that will act as a point of contact for manufacturers looking for technology solutions. Each of the eight hubs will offer access to the same set of core services and capabilities to companies.

	Technology	Innovation	Business & Financing
Advisory Services	e.g. facilitated visits to Ontario companies employing advanced technologies to assess feasibility and implementation requirements e.g. production and process optimization, production technology selection and adoption, implementation of advanced ICT technologies e.g. technology/business readiness assessments and facilitated introductions for technology startups with potential manufacturing applications	e.g. on-Line confidential assessments of company performance against industry and world-class benchmarks e.g. "SWOT team" assessments of operational performance (strategy, products, processes) and customized improvement plans identifying the integrated business, research, technological, training, and process re-engineering requirements for performance improvement e.g. product innovation, commercialization	e.g. assessing the competitive position of a firm and identifying technology roadmap to close any gaps e.g. management & operational training (short, implementation-specific training programs) e.g. operational optimization, market access, government grants for R&D and capital investments, export financing, business expansion
Technology	Applied Research	Technology Application & Integration	Adoption
	e.g. contract research services to address production challenges e.g. proof of concept e.g. feasibility e.g. prototyping	e.g. virtual design & engineering (access to digital product, process, and factory visualization, design, engineering, and testing technologies) e.g. technology demonstration & testing (access to technology demonstration, application development, and testing centers)	e.g. enable technology implementation in actual production settings e.g. software and access best-of-class full scale production technology to stress test solutions e.g. risk analysis e.g. customer demonstrations
Knowledge	Outreach	Education & Training**	Asset Mapping

e.g. branding	e.g. executive education	*e.g. advanced manufacturing asset map (on-line inventory of solution providers and capabilities)
e.g. knowledge dissemination	e.g. retraining	
e.g. field awareness	e.g. post-secondary training	*e.g. solutions concierge (assistance in qualifying and sourcing integrated solutions from partners)
e.g. market awareness	e.g. internships	
	e.g. apprenticeships	
	e.g. equipment, technology training for industry	e.g. match making (industry-to-academia; business-to-business)

After piloting successful activities in the core geography of the Supercluster, we will expand to deliver services in partnership with organizations like ETS in Quebec, and the Digital Technologies Supercluster in Vancouver.

Benefits to Canada

By 2025 Canadian manufacturers will set world benchmarks in competitiveness and growth through the application of advanced technologies. Our manufacturers will speed their adoption of advanced technologies to produce new products and services, optimize production processes, improve operating efficiencies, and develop new revenue opportunities. Our tech companies will scale their production capabilities to sell in to massive manufacturing value chains. Canada's companies will attract and retain the highly qualified people, capital investments, and product mandates to sustain their growth.

NGM Canada aims to spark an advanced manufacturing renaissance in Canada that will:
- Double the rate of manufacturing investment in R&D, capital equipment, and skills training;
- Boost Canadian manufacturing output by more than 30%;
- Expand sales for Canada's technology sector by 50%;
- Increase the value of Canada's exports of manufactured goods and advanced manufacturing technologies by 50%;
- Achieve a sustainable 3.5% annual growth rate in total factor productivity in Canada's manufacturing sector;
- Double the number of high growth advanced manufacturing technology firms;
- Create an additional 350,000 jobs in Canada's manufacturing and technology sectors;
- Reduce manufacturing greenhouse gas emissions by a further 25%; and,
- Improve the quality and inclusiveness of employment by tripling the rate of female participation in Canada's manufacturing and technology sectors and raising average earnings by more than 30%.

By driving the integration of leading technologies into manufacturing processes and products, NGM Canada will disrupt and transform firms, supply chains, and communities. It will achieve this by:

- Promoting **technology leadership** by providing funding to companies undertaking leading-edge applied research and technology development projects with other NGM Canada members in fields related to the development and application of product and process design, advanced digital products and applications, materials, and production technologies in manufacturing;

- Creating **partnerships for scale** by connecting smaller technology companies with potential partners and customers in manufacturing and by offering services to smaller manufacturers to build awareness about advanced technologies, identify business requirements for successful implementation, and de-risk technology acquisition including support for technology demonstration and scale-up projects. NGM Canada members will participate in collaborative R&D projects led by major industry partners;

- Developing a **skilled talent pool** by providing companies additional funding for training, secondments in research centres, and work integrated learning programs;

- Providing more visible and timely **access to innovation** by developing and maintaining an inventory of innovation assets, mapping sources of technology and expertise, and providing a solutions concierge service for manufacturers and scale-up technology firms. NGM Canada will provide companies easier, timely and streamlined access to technology providers, universities, colleges, and technology pilot and demonstration centres; and,

- Creating **global advantage** by focusing on connecting local technology with Canadian manufacturing to drive higher value applications in Canada, enhance supplier capabilities in international supply chains, and attract talent, investment, and product development mandates to Canada.

The synergies that will be created by engaging large and small manufacturers and technology companies from across industry sectors and technology platforms ensures that the value created by Next Generation Manufacturing Canada will far exceed the sum of its parts. NGM Canada will create a critical mass of innovation activity with gravity powerful enough to attract talent, technology, investment, and customers from around the world.

Participants List (as of November 23, 2017)

Downsview Aerospace Innovation & Research Hub
Danby Products Limited
intelliFLEX Innovation Alliance
Intermarket CAM Limited
Centennial College
INO (institut national d'optique)
Autodesk
Queen's University at Kingston
City of Kitchener
Timereaction
SOSCIP
University of Toronto
Toronto Region Board of Trade
Canvass Analytics
Bluewater Wood Alliance
Trillium Network for Advanced Manufacturing
ESCRYPT
GreenCentre Canada
Ryerson University
Niagara College of Applied Arts and Technology
Halton Hills Chamber of Commerce
The Woodbridge Group
Milton Chamber of Commerce
Conestoga College Institute of Technology and Advanced Learning
MyShop Inc.
Sightline Innovation Inc.
Real Ventures
Advanced Technology For Food Manufacturing
Regional Municipality of Waterloo
Georgian College
General Dynamics Land Systems-Canada
Clearpath Robotics Inc.
City of Guelph
The PEER Group
Stackpole International
voestalpine High Performance Metals Ltd.
Magna International Inc.

University of Waterloo
Manufacturing Innovation Network
Mohawk College of Applied Arts and Technology
MAJiK Systems Inc.
McMaster University
Waterloo Region Economic Development Corporation
City of Hamilton, Economic Development Division
George Brown College of Applied Arts and Technology
Sheridan College
Western University
Teledyne DALSA Inc.
Wilfrid Laurier University
National Research Council of Canada
Kinova Robotics Inc.
Brampton Board of Trade
City of Waterloo
City of Barrie
City of Markham
CMC Microsystems
SterileCare Inc.
ventureLAB
YetiWare Inc.
Regional Municipality of York
Maple Leaf Foods Inc.
Javelin Technologies Inc
Lakehead University
Siemens Canada Ltd.
York University
Intel of Canada Ltd.
Canadian Association of Mold Makers
LAVAL International
Microsoft
Crest Mold Technologies
OCAD University
RoweBots Research Inc.
Standards Council of Canada
RainGrid Inc.
Daneson Ltd

Hamilton Chamber of Commerce
City of Hamilton
Refined Manufacturing Acceleration Process (ReMAP)
Be Wear
Canadian Digital Media Network
Festo Canada Inc.
City of Toronto
Communitech Corporation
Universite de Quebec - Ecole de technologie superieure
Greater Kitchener Waterloo Chamber of Commerce
Burlington Economic Development Corporation
Osmington Inc.
MaRS Discovery District
Inventing Future Technology Inc.
IBM Canada Limited
ArcelorMittal Dofasco LP
CleanSlate UV
2020 Armor
Vertex
Humber College Institute of Technology and Advanced Learning
ChipCare Corporation
Durham College
Miovision Technologies Inc.
ELEVEN-X INCORPORATED
Xerox Research Centre of Canada
Seneca College
Mitacs
Canadian Solar Solutions Inc.
Automotive Parts Manufacturer's Association
Fibos
Sheba Microsystems Inc.

Peytec Inc.
Canadian Manufacturers & Exporters
University of Ontario Institute of Technology
Colleaga Health Solutions
City of London
Linamar Corporation
Essar Steel Algoma Inc.
Burlington Chamber of Commerce
Husky Injection Molding Systems Ltd.
Nix Sensor Ltd.
Innovation Factory
Celestica
Christie Digital Systems Canada Inc.
University of Guelph
The Corporation of the City of Brampton
ABB Canada
Maple Lodge Farms
Brannon Steel
Thalmic Labs
Cisco Systems Canada Co.
Rockwell Automation Canada Ltd.
Blockchain Association of Canada
Crystal Fountains Inc.
Guelph Chamber of Commerce
Barrick Gold Corporation
CMTE Development Ltd., trading as Mining3
Queen's University Mining Systems Laboratory
Komatsu Mining Corp
MacLean Engineering
The Corporation of the City of Cambridge
OpenText Corporation
Myant Inc.
Province of Ontario
Toyota Motor Manufacturing Canada Inc.