

The New Age of Advanced Manufacturing

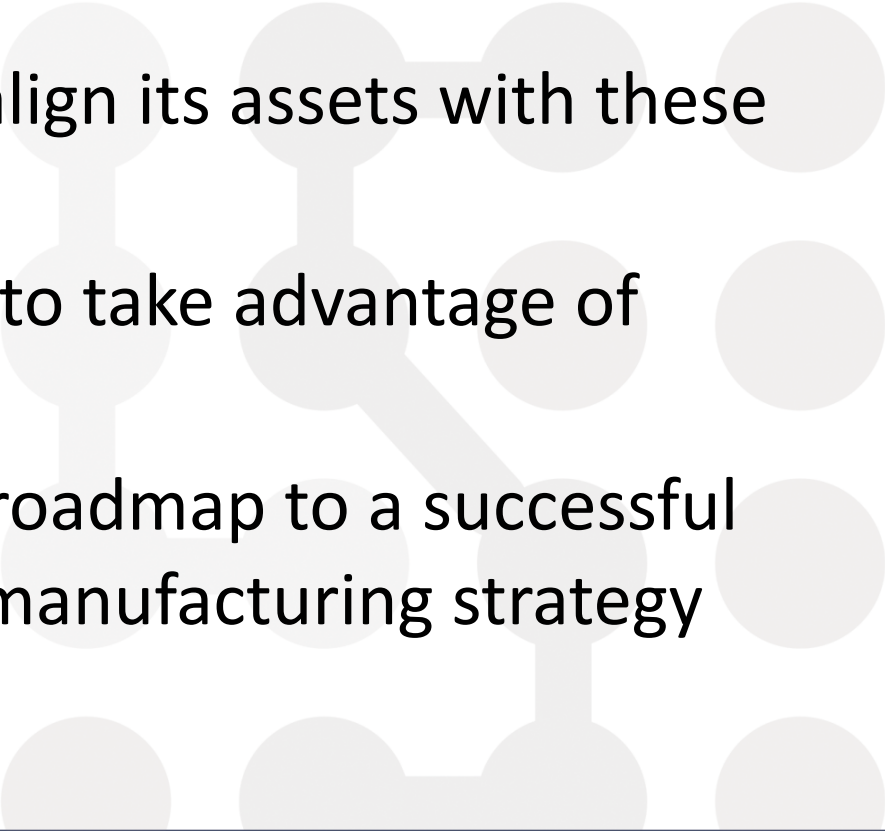
How Communities Can Capitalize

Location Strategies

- Established 2004
- Economic Development Consultants
- Eastern Ontario communities including Ontario East Economic Development Commission
- Large and small communities across Canada
- Urban and rural communities
- International: Enterprise Florida Business Birmingham (U.K.) Welsh Government

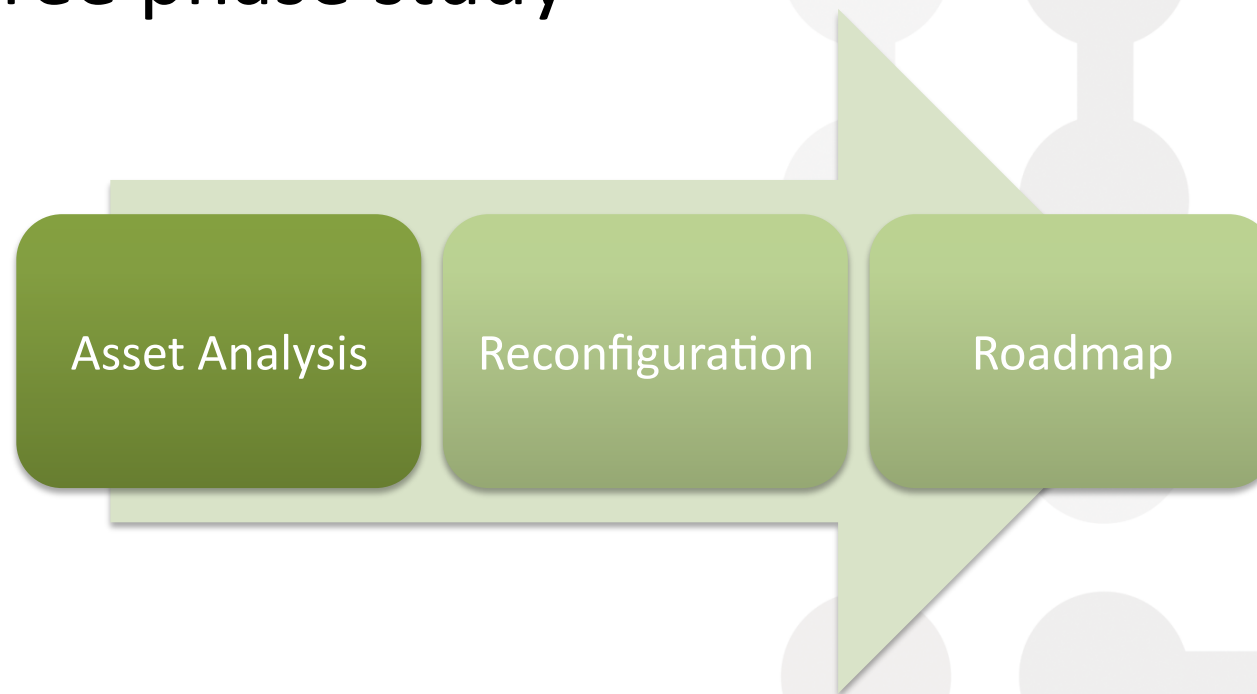


Overview

- Why is this important? The Opportunity
 - Key technologies that are changing the face of manufacturing
 - How your community can align its assets with these technologies
 - How to leverage attributes to take advantage of technology trends
 - Provide a foundation for a roadmap to a successful and sustainable advanced manufacturing strategy
- 

Location Strategies

- Ontario East Economic Development Commission
- Advanced Manufacturing Technologies 2015
- Three phase study



Why is this Important?



Why is this Important?

Technology is a Growth Driver

- New technologies provide higher quality jobs
- Manufacturing is an incubator of innovation
- Near-shoring and re-shoring: return of manufacturing to North America

New Technologies

- Have the potential to disrupt existing markets and to create billions of dollars of economic value
- First to market generally gain a disproportionate share of value
- Best potential to support innovative, inclusive, and sustainable growth

The Opportunity

Out with the Old

- Classic production-line model
- Network of global supply chains
- Job creation through large factories employing thousands of people



The Opportunity

In with the New

- Early days of the Internet era
- Clearpath Robotics (Waterloo) was launched in a basement seven years ago with just \$50
- Access to better, cheaper manufacturing equipment and design tools
- One-person startups can create market-shaking innovations
- Small, nimble manufacturing operations
- Highly specialized, highly advanced micro-factories
- Making traditional products in new ways, new products, and custom-made items



Collaborative Connected Communities

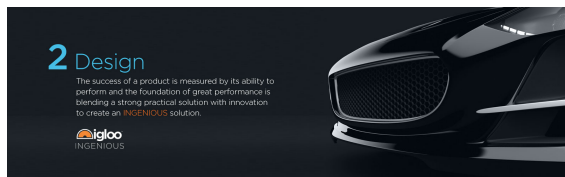
Smaller Communities Can Capitalize

- Opportunities are accessible
- Transition from physical world to virtual world
- Remote commercialization, design, configuration, and delivery of products and services
- Sense of community builds synergies
- Talent attraction and retention

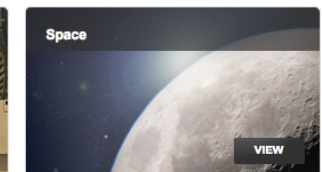
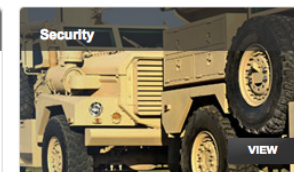
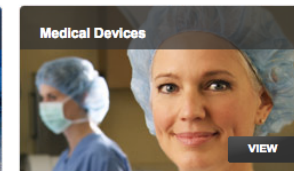
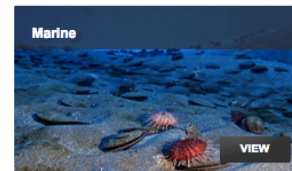
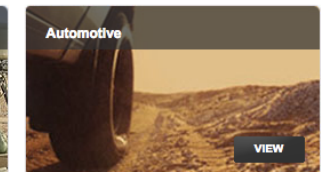
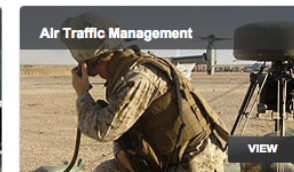
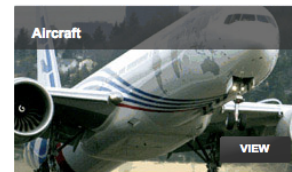




It Starts with Your Ideas.



MOOG



Traditional Industries Transformation



- Land use applications
- Agribots: automated apple harvesting system that doesn't bruise or damage the produce
- Traditional products: garments wearables
- Biometric shirt is a portable lab that monitors cardiac, respiratory, and activity data





Key Manufacturing Technology Themes



Four key manufacturing themes
European Union's 'Factories of the
Future Initiative'

- Sustainable manufacturing
- High performance manufacturing
- ICT enabled intelligent manufacturing
- New materials in manufacturing

- Additive manufacturing (3D printing)
- Nanomaterials
- The Internet of Things (Advanced Sensors):
- Next Generation Robotics
- Automation of knowledge work (Pervasive Automation)

Aligning Assets



Regional Assets Components

Economic Base – what is in the community	Entrepreneurship – capacity to create new firms
Talent – human capital base, workforce skills	Innovation – capacity to innovate and generate new ideas
Location, Infrastructure, Amenities, Factor Costs, Natural Resources	



Technology Audit

An asset audit of advanced manufacturing technologies

- Companies investing in technological innovation, productivity-enhancing technologies and skilled technical workforce
- Business and professional support ecosystem: assistance to growing companies and technology companies
- Research and development activities around key technologies
- Talent: Education programming and graduate output, skills inventory



Objectives

- Identify key technology strengths from asset compilation
- Identify technology gaps
- Is your community focusing on the right sectors?
- Sector re-configuration and re-alignment
- Facilitate sector presentation and value proposition
- Foundation for advanced manufacturing technology sector roadmap
- Capitalize on the new age of manufacturing



Companies

- Entrepreneurial activity
- New product development
- In-house R&D
- Company R&D centres have an important role in fostering innovation in a region
- Technologies deployed
- Collaboration: leading edge companies, research institutes, post-secondary education
- Grants/incentives for innovation

Advanced Materials Technologies

Technology Theme	Companies	Technology Theme	Companies
Lightweight materials and structures, including composites and hybrids	Sabic Innovative Plastics, Horizon Plastics, Universal Fan & Blower, VN Instruments	Natural and bio-based materials	PolyFerm Canada, DuPont, 3M
Materials to withstand more aggressive environments (e.g. high temperature, corrosive, erosive)	ADL Insulflex, Canadian Wear Technologies, Universal Fan & Blower, Kennametal Stellite, Impacto Protective Products, DuPont, Milex	Joining technologies	Protoplast, Limpact
Electronic and optical functional materials	OZ Optics, Evonik	Materials for portable power sources (batteries/fuel cells)	Evonik Industries, DuPont
Smart and multifunctional materials, devices and structures	They Innovate Inc	Nanomaterials (including graphene)	Grafoid, ALCERECO
Surface engineering and coating technologies	Berry Plastics, DuPont, Valspar Corporation, Safran Electronics Canada, CPK Interiors	Materials with reduced environmental impact through life	Limpact, Arclin, AkzoNobel, PolyFerm Canada, DuPont, 3M
Particulate engineering; near-net shape manufacturing	Arnprior Aerospace	Materials designed for reuse/recycle/remanufacture	PolyFerm Canada, DuPont, 3M
Fibre and textile-based technologies	Palziv, Canadian Wear Technologies, Miltex, INVISTA, DuPont, 3M, Coviden (Medtronic)	Nondestructive Evaluation (NDE/) structural health monitoring (SHM)/ condition monitoring	VN Instruments, Canadian Nuclear Laboratories (CNL), Kingston Process Metallurgy Inc. (KPM)
Bioresorbable, bioactive and biocompatible materials	PolyFerm Canada, DuPont, 3M	Predictive modelling through the full life cycle, including lifetime prediction	I.S.I. Controls, Siemens, Milltronics Process Instruments, Armada Tool Works, SigmaPoint Technologies, Kingston Process Metallurgy Inc. (KPM)



Incubator and Commercialization Networks Models

Significant in spawning cutting edge companies in Eastern Ontario

Canadian Hybrid Incubator Resource Platform (CHIRP) Canada's first and only Soft Landings International Incubator



Fast Start, Trent and Fleming College, University of Ontario Institute of Technology (UOIT), Durham College, working with the Greater Peterborough Innovation Cluster (GPIC) Spark Center



GreenCentre Canada (Kingston)
New online portal promotes green chemistry collaboration



Haliburton Creative Business Incubator



N100 Start-ups compete for a \$100,000 convertible note



Kawartha Trades and Technology Centre
Sustainable Skills, Technology and Life Sciences Centre, Loyalist College



Research: Advanced Manufacturing and Materials Technologies

UOIT	Queen's University
Distributed and Mobile Systems Laboratory (DaMSeL) the Robotics and Automation Laboratory The Ontario Power Generation Engineering building Rapid prototyping and manufacturing lab Combustion and engines lab Mechatronics lab Integrated Manufacturing Centre Durham College/UOIT Advanced Materials Research Group	The Robotics Laboratory Manufacturing and Dynamic Systems Group: Rapid Laminated Tooling Laboratory Advanced Design and Manufacturing Institute (ADMI) Queen's-RMC Centre for Advanced Materials and Manufacturing Energy and Power Electronics Applied Research Laboratory (ePEARL)
University of Trent:	The Advanced Polymeric Materials Characterization facility Center for Manufacturing of Advanced Ceramics and Nanomaterials Materials Characterization Laboratory
Community Colleges	Royal Military College – research groups
The Kawartha Trades and Technology Centre Fleming College Sustainable Skills and Technology and Life Sciences Centre. Loyalist College	Electrochemical Power Sources Environmental Remote Sensing Lab Chemical Thermodynamics of Materials, Nanocomposites, Organometallic Chemistry Polymer Characterization, Chitosan Fiber Spinning Group, Chemical Protective Clothing Test Facility



Education Programming

- Materials science programs at UOIT, Trent University, Carleton, Ottawa, RMC, Queen's
- Supported by a comprehensive range of over 300 programs (Eastern Ontario) in general engineering, maths, science, technician and trades from the region's universities and colleges
- Engineering (all disciplines), math, and science programs at all levels at the region's universities and colleges



Opportunity Assessment



Technology Themes

Technology	Eastern Ontario	Opportunity
High performance manufacturing: Productivity/efficiency gains facilitated by new and emerging technologies	<ul style="list-style-type: none"> Advanced manufacturing/materials company base Technology driven companies In-house R & D in companies; established centre of excellence Strathcona, Grafoid, DuPont 	<ul style="list-style-type: none"> Eastern Ontario manufacturing base is a potential market GAP Semi-conductor fabrication – MEMs,
ICT enabled intelligent manufacturing	<ul style="list-style-type: none"> Small number of companies involved in Predictive modelling, Geospatial, data driven applications 	<ul style="list-style-type: none"> Build on company base
New materials in manufacturing	Prevalence in: <ul style="list-style-type: none"> Lightweight materials and structures Materials to withstand more aggressive environments Surface engineering and coating technologies Fibre and textile-based technologies 	<ul style="list-style-type: none"> Use areas to identify niches in advanced materials; e.g. Transportation Energy, Defence, security, manufacturing sectors Broad range of manufacturing products and services Technical textiles
Sustainable manufacturing (including bio-manufacturing)	<ul style="list-style-type: none"> Companies producing materials with reduced environmental impact One bio-plastics manufacturer Plastics and packaging clusters Other bio-products around packaging Companies adopting sustainable practices 	<ul style="list-style-type: none"> Leverage plastics and packaging cluster as part of advanced materials strategy Bio-materials opportunity through research base and synergies with plastics and packaging companies

Disruptive Technologies

Technology	Eastern Ontario	Opportunity
Additive manufacturing (3D Printing)	<ul style="list-style-type: none"> ▪ Limited specialist company base ▪ Plastics companies deploying this technology 	<ul style="list-style-type: none"> ▪ Plastics cluster could provide entry route into this space ▪ Deployment expected to be widespread
Nanomaterials	<ul style="list-style-type: none"> ▪ Nanomaterials – graphene, Grafoid outstanding, high profile company ▪ Centre of excellence ▪ Graphite mine 	<ul style="list-style-type: none"> ▪ Build on company and R&D presence ▪ Next generation technologies facilitated across many sectors
Next Generation Robotics	<ul style="list-style-type: none"> ▪ Small robotics company base ▪ Main customer – automotive: supply chain ▪ No auto OEMs, aerospace assembly companies ▪ Strong research base ▪ Extensive lab facilities at post-secondary education institutions 	<ul style="list-style-type: none"> ▪ Develop technology base ▪ Route to sector is through research and lab capacity ▪ Collaboration could spawn new specialist technology companies ▪ Extension of applications in Aerospace
The Internet of Things (Advanced Sensors)	<ul style="list-style-type: none"> ▪ Small but innovative company base ▪ Industry leaders – media interest ▪ Electronics company base ▪ Embryonic group of geospatial companies 	<ul style="list-style-type: none"> ▪ Target opportunities around manufacturing ▪ Diversification opportunities for electronics companies ▪ Ubiquitous deployment of geospatial technologies
Automation of knowledge work (Pervasive Automation)	<ul style="list-style-type: none"> ▪ Initiatives will come from research base ▪ Lack of pure play ICT companies compared to other regions could be an impediment 	<ul style="list-style-type: none"> ▪ Early stage – not a priority ▪ Limited ability to capitalize ▪ Limited payback for effort involved

Opportunity Assessment

Things to consider

- Leverage leading edge technology opportunities and strengths
- Key sector strengths in verticals
- Supply chain depth
- Acknowledge external factors: competitive positioning, sector growth potential



Technology Opportunities

Key target opportunities: technology strengths, significant concentration, leading edge companies showcases, research and labour force capacity

Medium
Term

Potential opportunities: some presence (handful of growing companies with leading edge technologies), synergies with existing clusters, research

Long
Term

Embryonic opportunities: very small number of important companies, some research capacity, technology has significant upside/growth potential



Technology Opportunities

- New company formation
- Nurturing early stage companies
- Retention – re-shoring
- Reinvention – integrating technology into non-tech companies
- Attraction – near-shoring, gazelles



Ecosystem Platform

- Develop strategies to support the technology opportunities
- Capture value from synergies with research and development, higher education
- Leverage funding sources
- Engage universities/colleges, industry, entrepreneurs, and Investors aligned with technology strengths
- Build an entrepreneurial culture
- Form collaborative networks to develop innovation networks – act as catalyst
- Engage schools: 21st Century apprentice models: Germany track record producing highly skilled labour force 60% young people enter "dual" education system combines practical on-the-job training and education
- Core group of committed individuals
- Develop vision and value proposition



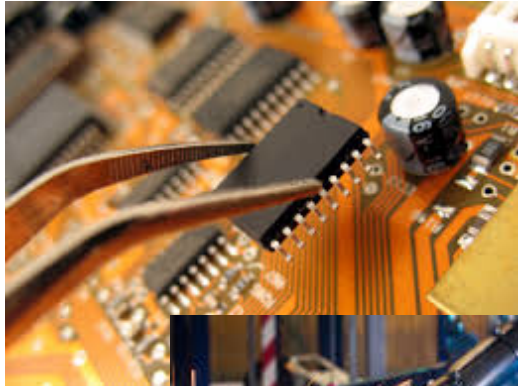
Community Assets

Moving from traditional physical assets to knowledge assets

- A community's assets are based on innovation and knowledge
- Specialized talent networks
- Talent driven Innovation #1
- Clusters, academia - research industry partnerships, commercialization
- Market positioning
- investment, talent, sustainability, place, and diversity



Community Asses



Reconfigure
Realign
Reinvent



Reconfigure Realign Reinvent

- The ability to present a compelling value proposition
- Convey the right messages to appeal to leading edge companies and their intermediaries
- Building awareness of capabilities and potential in advanced manufacturing technologies
- Position as a location of choice for target companies considering expansion and/or relocation
- Growth strategies built around industrial and commercial recruitment are becoming less and less effective
- Focus of investment attraction and business retention for leading edge companies is now more holistic
- 'Soft' variables embedded in the notion of 'quality of place'



Reconfigure Realign Reinvent

- Companies at the leading edge
- Ecosystem assets are technology enabled
- Highly developed research and development capabilities
- A tightly knit business support network facilitating commercialization, spin-off companies, company development
- Access to a highly skilled workforce regenerated through ten internationally renowned institutions.
- An environment providing safe and healthy communities, extensive year-round cultural and recreation opportunities with low commute times at an affordable cost.
- Creates a sense of place, belonging, and things are happening





Thank you

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