

Campus to Commerce: How Universities are Fostering Industry Innovation

Joint Presentation by:

NYSTAR Center Universities

and

The Business Council of New York State, Inc.

Thursday, February 28, 2019

Working to create economic growth, good jobs and strong communities across New York State.



Our thanks to . . .

Participating Organizations:

- ESDC/NYSTAR
- University of Rochester
- Alfred University
- Rochester Institute of Technology

Supporting Organizations:

- [Fuzehub](#)
- [Rochester Technology and Manufacturing Association](#)
- [Buffalo Niagara Manufacturing Alliance](#)



The Business Council . . .

- New York's largest statewide employer advocacy organization
 - 2,300 members statewide
 - Includes 60 local and regional chambers of commerce
- We focus on a broad range of business issues
 - NYS Legislature
 - State Regulatory Agencies
 - Municipal legislatures
 - Congress



Our Advocacy Team:

- **Heather Briccetti**
- **Johnny Evers**
 - Technology/Telecomm, Manufacturing, Construction, Transportation, Contract Procurement
- **Lev Ginsburg**
 - Financial Services, Legal Reform, Health & Health insurance
- **Amber Mooney**
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- **Meghan Kayser**
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- **Frank Kerbein**
 - HR & Labor, Workers' Compensation
- **Ken Pokalsky**
 - Tax, Economic Development, Chambers
- **Darren Suarez**
 - Energy, Environment



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**Division of
Small Business**

Division of Small Business & Technology Development

A Division of Empire State Development

2/28/2019

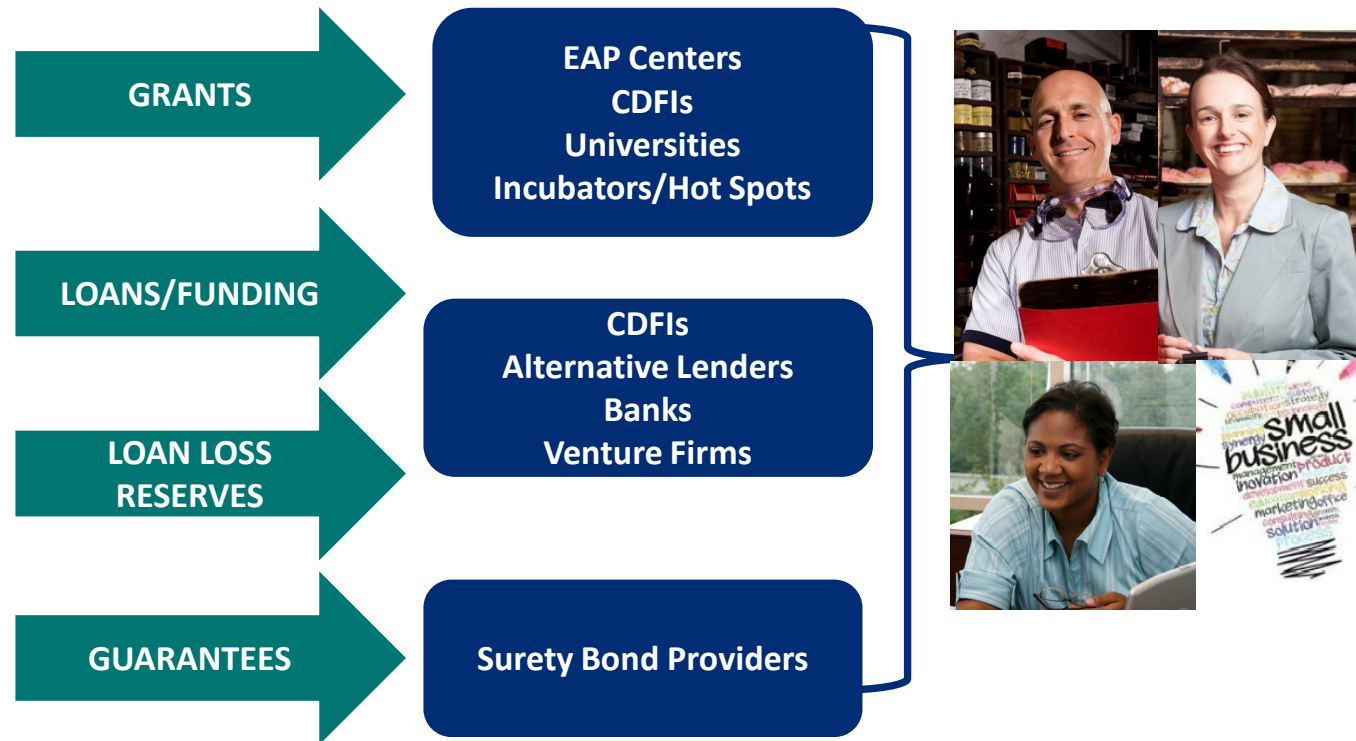
Types of Programs Offered

- Access to Capital
- Venture Financing
- Entrepreneurial Development
- Procurement Assistance
- Innovation and Technology Assistance



How the Programs Work

Division of Small Business and Technology Development provides the following:



Loans from \$500 to \$2 million

- ESD provides financial assistance to a network of alternative lenders, Community Development Financial Institutions (CDFIs) and banks, who provide loans to eligible small businesses.
- Loans can be for: (a) working capital, (b) acquisition of machinery & equipment, (c) acquisition and/or improvement of real property, (d) refinancing of debt obligations, (e) technology upgrades or (f) business start-up.
- Directory of Alternative Lenders and educational resources can be found on esd.ny.gov

NYS Contractor



Bridge to Success

- Short-term working capital loans for \$75,000 to \$200,000 for certified Minority and/or Women-owned Business Enterprises (MWBE) with NYS and local government contracts.

Surety Bond Assistance Program

- Technical assistance and surety bond guarantees for certified MWBEs and small businesses with NYC and NYS contracts.

Additional Loan Programs



Linked Deposit Program (LDP)

- Provides interest rate reduction of up to 2-3% to small businesses.
- Eligible certified MWBE firms may qualify for up to 3% interest rate reduction.

Global NY Loan Fund

- Export loans to small businesses through participating lenders to create or expand direct exports or to serve as suppliers to larger exporters.

Job Development Authority (JDA)

- JDA provides direct loans to small business owners for growth of manufacturing in New York State.
- Loans can either be for real estate or machinery and equipment.
- Typical financing structure: 50% bank, 40% ESD/JDA, 10% owners equity.

New York Ventures Program

	Direct Investment Fund	Fund of Funds		
	NYS Innovation Venture Capital Fund (NYSIVCF)	Technology Commercialization	Innovate NY	MWBE
Investment Stage	Seed & Early-Stage	Pre-Seed	Seed	Seed
Investment Size	\$500K - \$5M	Up to \$100K	\$500K - \$750K	\$500K - \$750K
Matching Funds Ratio (on portfolio basis)	2:1	1:1	2:1	2:1
Fund Size	\$100M	\$8M	\$45.9M	\$2M
Currently Deploying \$	Yes	Yes	No	No
Launch Date	2014	2016	2012	2016

Entrepreneurial Development

Business Mentor NY

- Meet with a volunteer mentor virtually (web or phone) or in person.

Entrepreneurial Assistance Centers

- Training, technical assistance and support services to individuals who recently started their own business or are interested in starting a business, including help on MWBE certification application.

Procurement Assistance

Procurement Assistance

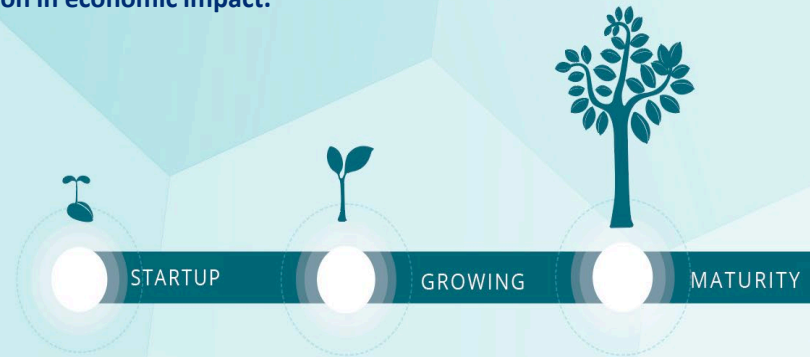
Assist small businesses with identifying contracting opportunities with state government agencies and finding resources to compete.

The screenshot shows the top section of the website. On the left is the New York State logo. To its right are navigation links: Services, News, Government, and Local. Below the logo is a statistics panel with three rows: 'Opportunities posted today' with a value of 56, 'Opportunities posted in the last 7 days' with a value of 158, and 'Total available opportunities' with a value of 715. To the right of the statistics is the main header for 'The New York State Contract Reporter', which includes the URL 'NYSCR.ny.gov' and the tagline 'NYS' official source of contracting opportunities Bringing business and government together'. Further right are buttons for 'Log In', 'Sign up and register for your free account!', and 'Click here to get started'. At the bottom of the screenshot is a dark blue navigation bar with four links: 'I want to find contracts to bid on', 'I want to advertise opportunities', 'Learn about the New York State Business Registry', and 'Learn about doing business with New York'.

NYSTAR

NEW YORK STATE IS LEADING THE WAY FOR INNOVATION

Empire State Development offers programs that assist companies from start-up through maturity, leveraging New York's unparalleled investment in **world-class technology assets and expertise**. **Over the past five years, NYSTAR programs helped create or retain more than 40,000 jobs and generated more than \$8 billion in economic impact.**



70+

FUNDED CENTERS

NYSTAR provides more than \$50 million in annual funding to 70+ centers.

NYSTAR funded centers provide vital tools for enabling technology- and manufacturing-led growth and job creation.



**Division of
Small Business**

Technology Assistance - NYSTAR

Centers of Excellence

- Collaboration between academic research and businesses to develop and commercialize new products and technologies.

Centers for Advanced Technology

- Collaboration between academic research and businesses to develop new technologies and industries.

NY Manufacturing Extension Partnership (MEP)

- Provides small and medium sized manufacturers and entrepreneurs with various assistance.

Innovation Hot Spot and NYS Certified Business Incubator Program

- Hot Spots and incubators provide entrepreneurs with various services to build and grow high tech and innovation businesses.

Technology Assistance - NYSTAR

New York State Science & Technology Law Center

- Provides legal research, education and information to entrepreneurs and companies to help commercialize new technologies from lab to market.

Manufacturing USA

- Support NYS industry engagement in federal manufacturing R&D institutes and technology dissemination into the NYS industrial base (e.g. integrated photonics, sustainable/re-manufacturing, industrial robotics).

Defense Industry Assistance

- Partnership with the Department of Defense's Office of Economic Adjustment to help New York State defense suppliers diversify and explore new applications for their technologies.

Innovation Resource Center

- Providing tech entrepreneurs with comprehensive strategy to leverage NYS supported commercialization assets.

Small Business Assistance

www.esd.ny.gov

www.esd.ny.gov/SmallBusiness.html

1-800-STATE NY



Helps NYS Small Businesses Launch, Grow and Thrive.



Commercial Solutions Using Data Science

Walter Johnson, PhD

Executive Director, Center of Excellence in Data Science,
University of Rochester

Executive Director, Rochester Data Science Consortium

February 28, 2019

Working to create economic growth, good jobs and strong communities across New York State.



What do we need to successfully apply cutting edge Data Science – or AI, or Machine Learning – to solve commercial problems?

- The Infrastructure to **DO** data science
- People with the skills and time to do it
- Subject matter expertise
- Willing and flexible customer partners
- Clearly specified (eventually) goals



Historical look at the UR approach, in partnership with NY State

- **GIDS:** The Goergen Institute for Data Science
 - BS & MS degree programs in Data Science
 - Broadly inclusive of faculty in a variety of subject areas
 - Strong, Integral Internship programs with Commercial Partners
- **CIRC:** Center for Integrated Research in Computing
 - Cloud and Supercomputer infrastructure
- **Center of Excellence in Data Science**
 - Incentive seed funding for faculty and students to partner with commercial entities
 - Provides students real world experience [particularly in Data Science] – not strictly theory
 - Introduce regional companies to what Data Science can do for them



Historical look at the UR approach, in partnership with NY State (continued...)

-
- **Rochester Data Science Consortium (RDSC)**
 - Consortium of Universities and Companies who are (or would like to) use Data Science
 - Staff of Full-time professional PhD Data Scientists and staff (non-teaching faculty) with broad experience
 - Real and challenging DS/AI problems
 - De-risk expensive entry into field
 - Provide high-value jobs to the region
 - Internship program created to (again) provide real world experience and exposure to companies who are looking to expand their data science competencies and capacities



Benefits of the approach

- Incentives every step of the way – for the State, the University, professors, students, and commercial entities
- Lowers the barrier of entry *for everyone* to engage in data science
- Creates a pipeline of data scientists – from students to professionals – working on real-world problems
- Strengthens the bonds between Industry and the University
- Synergy stems from the continued interaction of all of these components
- Our flexibility of approach enables us to work on any size project or company, from small startups to large corporations and/or government grants



Synergy

- GIDS provides Capstone projects and internships as part of its curriculum
 - This encourages students and faculty to engage with industry
 - Partners often realize unexpected benefits and ask for deeper engagements
- CoE provides seed money to PI's to work on specific problems identified by commercial partners
 - Often "real" DS starts here, with academics and students beginning to understand commercial needs, and learning how to work with them.
 - CoE requires economic Value to be created – thus providing another "real world" learning experience for those in The Academy
 - Companies often find that the person they have been working with – especially students – would be a great hire to start them on the path to internal DS resources with Subject Matter expertise
- RDSC: Full-time data science projects with Industry or Government at a substantially higher scale
 - Operates at the speed of Industry
 - Pool of interns always available
 - De-risk entry to DS/AI/ML
 - Companies often recruited via GIDS or CoE, and vice-versa
 - Academic Contributions don't require the full-time commitment that commercial projects require



Examples

- Capstones from startups like VisualDx to mega-corps like Harris and Wegmans
- Seed projects via CoE in a variety of strategic fields, including:
 - free-form optics
 - quantum photonics in cancer diagnosis
 - targeted marketing platforms
- RDSC has over a dozen members tackling problems in:
 - multimodal satellite and drone image understanding
 - disease progression modeling in Parkinson's and other neurological conditions
 - natural language interfaces in specialty areas such as medical diagnostics
 - and a wealth of optimization problems across various domains.
- RDSC has identified clear commercial needs that have become ideal projects for the CoE, and vice versa.



Working with Industry: Academic Approach to Collaborative R&D

Alastair N. Cormack

Van Derck Fréchette Professor of Ceramic
Science and Founding Dean

Inamori School of Engineering

Alfred University



Center for Advanced Ceramic Technology

- One of 15 NYSTAR-funded Centers for Advanced Technology
- Founded on the ceramics and glass engineering & materials science expertise in the New York State College of Ceramics at Alfred University
- The CACT is Alfred University's portal for working with industry
 - Started in 1987, although AU's history of working with industry is much older
 - Faculty work with industry in a number of ways
 - Short-term, analytical services, or longer-term research projects
- Alfred University has extensive, well-equipped facilities for materials characterization and processing



Universities are a source of expertise

- Faculty undertake research and scholarship
- Most research is funded by the Federal Government, or philanthropic foundations
 - Professors propose research topic
 - Grants provide long-term support for research assistants
 - Graduate (PhD) students or post-doctoral fellows
- Once funded, they “get on with it”
 - Reporting requirements are generally light: annual (written) reports
 - Success is predicated on publications: papers and presentations



Federal v. Industry

- Industry R&D is different: typically more D than R
 - Short-term: e.g. production line problems requiring more or less urgent engineering solution
 - Longer-term: problem needs to be solved to improve/sustain existing market share, or to develop Mark II product
 - Many companies do not have sufficient in-house capabilities to conduct this kind of research
 - It's more fundamental, but not blue skies
- There are programs which provide Federal support for faculty to work with industry



Cormack: a case study

- My interests are in fundamental materials science
 - A 'theoretician': use atomic scale computer simulations to model structure and properties of ceramics and glasses
- Worked with three NYS companies over last ~10 years
 - One small, with modest R&D capabilities
 - Two Fortune 500 companies, with large internal R&D efforts
- My experience complements and supplements company expertise and capabilities

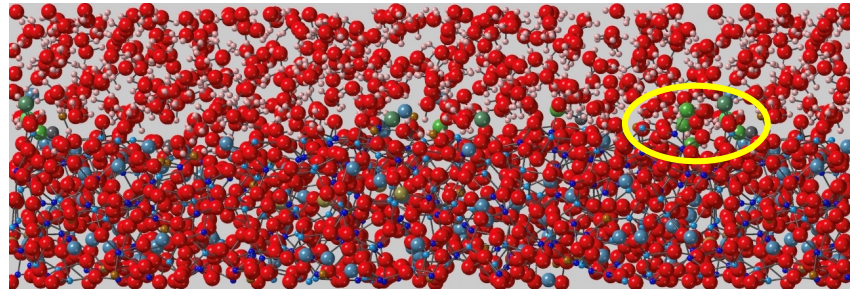


Cormack: a case study

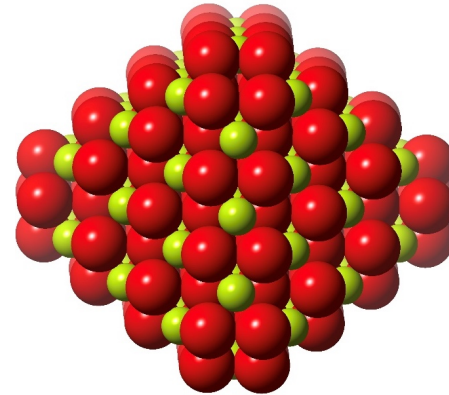
- Why do I work with industry?
 - Research problems have an immediate technological relevance
 - Fundamental enough to be amenable to my expertise and resource availability
 - Results can impact company decisions
 - Regular contact and interactions with sponsors
 - Discussion/Feedback allows changes of direction or emphasis
 - Supports (NYS) industry
 - Usually can still publish and present
 - Company internal review processes can slow things down sometimes
 - Additional CACT support enhances my capabilities



Pretty Pictures



Water on glass surface
Green atoms show where the water has reacted



1 nm ceria nanoparticle

The CACT's role

- Helps to link up companies with appropriate faculty expertise
 - Companies get access to expertise and facilities not available internally
- Can augment project budget
 - Provide for additional equipment or instrumentation upgrades
 - Provide for additional student support

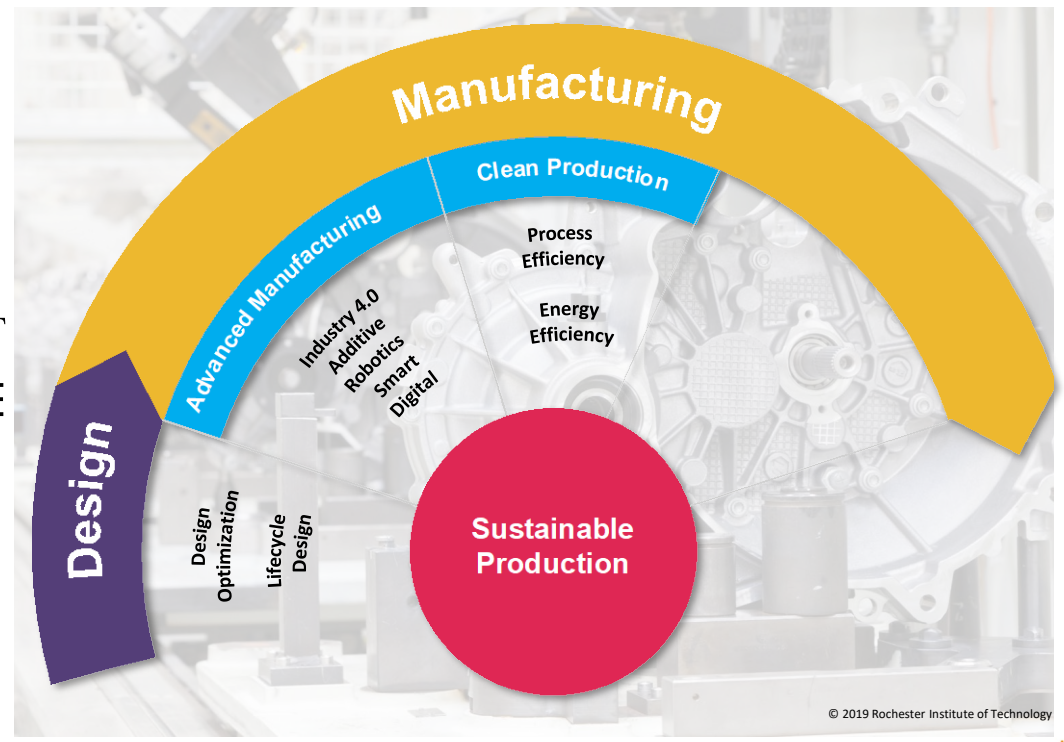


Training in Smart and Digital Manufacturing

Mark Krystofik, Ph.D.
COE in Advanced & Sustainable Manufacturing



Applied Research Centers



■ FUTUREWORKS NYC

- ❑ Developed and funded by the New York City Economic Development Corporation
- ❑ The program seeks to increase access to prototyping and advanced manufacturing resources within the five boroughs
- ❑ Includes the following components:
 - ❑ Futureworks Ops21
 - ❑ Futureworks Virtual Incubator
 - ❑ Futureworks Shops

Inspiring and equipping New York City's advanced manufacturing community



■ Ops21

- ❑ Ops21 – operations for the 21st century – which is led by ITAC, is the Futureworks NYC program that specifically aims to help manufacturers and industrial companies
- ❑ Making advanced technology, knowledge, and resources – specifically on advanced materials, digital manufacturing, and robotics – more accessible to NYC manufacturers
- ❑ Ops21 programming includes two types of workshops (awareness and advanced) led by technical experts, across the three technology areas

OPS 21
TOMORROW'S OPERATIONS —
FOR TODAY'S MANUFACTURERS

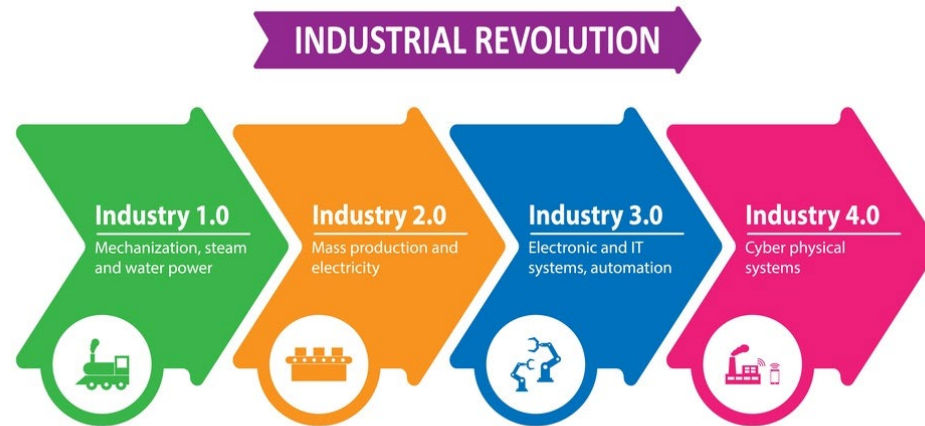


WHAT IS INDUSTRY 4.0?

Working to create economic growth, good jobs and strong communities across New York State.



How did we get to Industry 4.0?



Source - <https://www.tharstern.com/blog/3-key-roles-a-printer-needs-for-industry-4.0>

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■ WHAT IS DIGITAL MANUFACTURING (DM)

Applying data collection, computing, and analytics technologies across the product lifecycle to improve manufacturing systems

- ❑ Connecting machines, factories, and supply chains
- ❑ Creating a digital link between design, production, and use
- ❑ Supporting business & technical decisions with real & modeled data



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■ WHAT IS DM: CONNECTING MACHINES, FACTORIES, AND SUPPLY CHAINS

Information is collected from and transmitted between elements of a manufacturing system via:

- ❑ **Sensors:** electrical, mechanical, and physical parameters help understand performance
- ❑ **Communication Technology:** wired ethernet, wi-fi, Bluetooth, and short-range digital radio
- ❑ **Analytics Software:** analyzes data to show trends, anomalies, and opportunities
- ❑ **User Interface:** represents data visually for decision



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Are companies ready for Industry 4.0/DM?

Typical NYC Manufacturing Company

- More than just manufacturing – often have retail locations, web orders, sell other manufacturers products
- A variety of software systems to “get” business, but a poor manufacturing software backbone (no ERP)
- Few connected machines
- Lack data analysis expertise

Typical NYS MFG. Companies

- Primarily a manufacturing company, selling to other manufacturers/distributors
- Strong manufacturing backbone software infrastructure
- Some connected machines, some connections across ERP and other systems
- Lack data analysis skills

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THANK YOU

Working to create economic growth, good jobs and strong communities across New York State.

