

MAKE IT BETTER

A Blueprint for Manufacturing
in Northeast Ohio

2021

A vision to lead the world
in smart manufacturing.
Brought to you by industry leaders,
nonprofits, community groups,
educators, and more. Together,
we're going to make our region
better. Learn more:
www.makeitbetterohio.org.



Deonia Duncan at
Lincoln Electric in
Euclid, Ohio

A POWERFUL PARTNERSHIP TO MAKE IT BETTER

As founding champions, we're proud to support this Blueprint for Manufacturing in Northeast Ohio.
Together, we will create thousands of jobs, transform our industry, and lead the world.



ABOUT THIS REPORT

Manufacturing doesn't run on machines. It runs on people. So, we interviewed 150 of them – manufacturing CEOs, community leaders, business leaders, academics, workers, students, and nonprofit leaders. In more than 300 hours of conversation, we got smart, honest advice on how to reinvent our industry. This report shares the best insights and stories. This is not another initiative. It is a vision for the future supported by practical advice, expertise, and inspiration from companies at the leading edge. We hope these stories show the power of what's possible in Northeast Ohio. We hope they encourage more of us to come together and build a brighter future. No document or single organization can change the course of our industry – but together, we can.

ACKNOWLEDGEMENTS

I would like to personally thank every individual, company, and community organization who so willingly gave of their time and expertise to help create this *Blueprint for Manufacturing in Northeast Ohio*. In particular, I'd like to recognize our Board Chair Felix Brueck and Board Member Scott Cade for their fearless leadership in creating this vision for the future, along with our Board Task Force members: Peter Broer, Michael Garvey, George Haritos, Jeff Sinclair, John Brandt, and Sanjay Singh. And special thanks to the Cleveland Innovation Project, Team NEO, and Jacob Duritsky for their partnership and data analysis. Additional thanks to Brandon Cornuke, Leah Epstein, Greentarget, Ken Harbaugh, Margaret Kashmir, Tria Tedford-Ames, Cathy Little, Tony Rossello, and Adam Snyder for bringing this report to life in stories and video.

With Gratitude,

Dr. Ethan Karp, President & CEO, MAGNET



MAGNET MAGNET: The Manufacturing Advocacy and Growth Network ignited this change movement as part of our work to grow the manufacturing industry in Northeast Ohio and bring prosperity to our region. We're a nonprofit on a mission to help companies transform to make the future better. Since 1984, we've been proudly helping manufacturers with hands-on consulting and community-connecting workforce programs as part of the national NIST (National Institute of Standards and Technology, part of the U.S. Department of Commerce) Manufacturing Extension Partnership (MEP), and the Ohio MEP (part of the State of Ohio's Development Services Agency). www.manufacturingsuccess.org

Ohio | Manufacturing Extension Partnership

a NIST | Network MEP | Affiliate

We are adding champions all the time. See the latest list here: www.makeitbetterohio.org/champions



MANUFACTURING IS A POWERHOUSE IN NORTHEAST OHIO

Manufacturing
drives almost
50%
of our economy

1 out of every 2 jobs
from factories to restaurants
to banks depends on
manufacturing

Manufacturing contributes
2 times more
to the GRP than
healthcare

Our Industry is Vibrant & Growing

- Northeast Ohio is a major hub for aerospace and aviation with a \$3.2 billion cluster.
- The region is a leading producer and supplier for the automotive industry and has more than 26,000 trained automotive workers.
- Biohealth is taking off with more than \$2.3 billion invested in 400+ Northeast Ohio startups since 2003.
- There are almost 400 food processing and manufacturing companies that provide food and beverage products to consumers worldwide.
- The region is a location of choice for manufacturing headquarters with one of the heaviest concentrations in the nation.
- Northeast Ohio has more than 2,300 metal production and fabrication companies representing every link in the supply chain.
- The region is an ideal environment for chemical, plastics, and polymer operations with almost 1,000 companies in the sector.

(Source: Team NEO)

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Manufacturing in Northeast Ohio

WE MAKE OUR REGION BETTER



Northeast Ohio was the Silicon Valley of the early 1900s. Lured by burgeoning big oil and steel, innovators came here from all over the world to chase their dreams. Cleveland led the country in patent registrations and what we now call venture capital. It even opened its own stock exchange. By the 1940s, the Mahoning “Steel Valley” was one of the most productive industrial centers in the world. Akron was the global rubber capital.

We were the industrial engine that drove America for decades, until we crashed. In the '70s and '80s, automation, offshoring, and the death of big steel made us a national symbol of the demise of the middle class. We became famous for a name no one likes: the Rust Belt. But we didn't give up. Fueled by a legacy of grit and ingenuity, Northeast Ohio rebuilt the manufacturing industry. Gone are the one-smokestack towns where everyone works for one plant. They've been replaced by a thriving network of 10,000 innovative companies making aircraft parts to X-rays and everything in between. Yes, far fewer people work in manufacturing. But wages and productivity are higher than they've ever been.

We fought through the Great Recession. We survived the global pandemic. And today we stand on the cusp of a tremendous opportunity. As we rebuild our post-COVID-19 industry, the big question is this: Who do we want to be next? That's the question this Blueprint for Manufacturing in Northeast Ohio sets out to answer. And we believe the answer is clear: **We want the future to be made here in Northeast Ohio. By our people, in our factories. We want to make**

more of the things that run the world. We want to, once again, be a place where innovators bring big ideas from all over the world. We want to create thousands more high-tech manufacturing jobs. We want to lead the world in smart manufacturing – leaving behind the Rust Belt to become the Manufacturing Technology Belt.

Despite all the ups and downs, manufacturing remains a powerhouse in the region. It creates 270,000 jobs, and every one of those jobs delivers four more in the community – that's more than one million jobs in Northeast Ohio. As a result, it drives half the regional economy. We have a rich legacy of manufacturing know-how, world-class educational institutions, and a solid industrial base to build on. But the future is coming fast, and we need to be ready.

First, there's a talent time bomb approaching. In January 2020, almost 60% of Northeast Ohio manufacturers said they couldn't find the skilled workers they need to grow. Despite COVID layoffs that problem persists. The talent shortage is so systemic and significant that even the pandemic couldn't wipe it out. Plus, a looming wave of retirements is set to make this worse. Second, a manufacturing revolution is being fueled by emerging Industry 4.0 technologies, such as collaborative robots, sensors, 3D printing, and big data. These technologies are the foundation of future competitiveness, but Northeast Ohio manufacturers are not adopting them fast enough – particularly the small- and medium-sized companies that make up the bulk of our regional industry. And

third, as an industry we're simply not innovating far enough or fast enough. In fact, 75% of Northeast Ohio manufacturers say that innovation is not a top priority.

On top of these challenges, COVID-19 has created economic chaos and forced us to change the way we work. America is also facing a national reckoning on racism. The sad reality is that people of color have less access to jobs, healthcare, and opportunities. And we see it in manufacturing, which is 83% white. We can help change this by connecting the thousands of underemployed and unemployed people of color in our region to careers in manufacturing. Manufacturing can be a positive force for change.

As an industry we face a powerful moment of truth. We can simply rebuild and bounce back to the way we were. Or we can use the accelerating forces of this unique time to leap forward. The pandemic was a stark reminder of the need to reestablish local supply chains. It has reignited a desire to buy American and bring home jobs from overseas. Smart manufacturing technologies are the only way Northeast Ohio manufacturers can compete globally on quality and price. Now is the time to transform our factories, train a new generation of high-tech talent, and innovate to make things that haven't been made here in decades. Now is the time to reinvent our industry and fuel a true manufacturing revival.

Yes, it's a bold vision. But the hundreds of manufacturing CEOs, business leaders, community

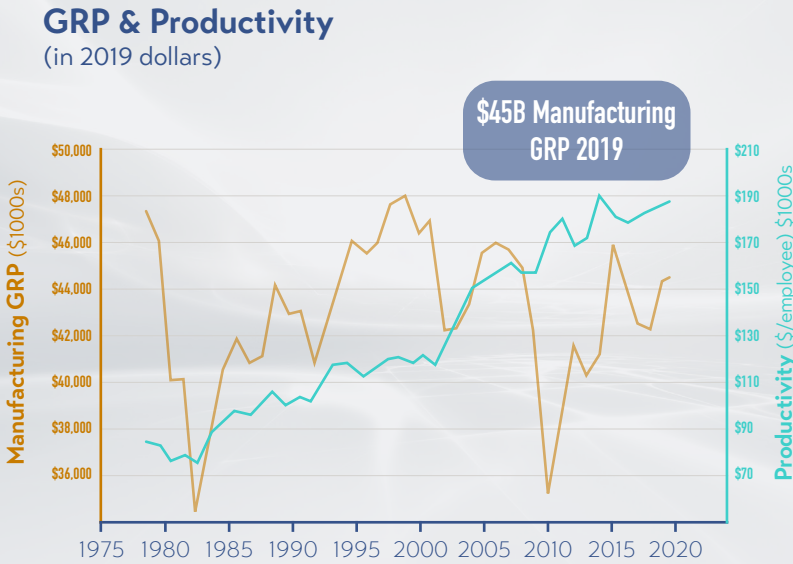
leaders, educators, and workers that helped create this vision are committed to making it happen. We believe that within a decade, Northeast Ohio can lead the world in smart manufacturing. That we can finally close the talent gap and have all the skilled workers we need to grow. That our factories can be as diverse as our cities. That manufacturing can give everyone a pathway to prosperity. That we can be one of the fastest growing and most innovative manufacturing hubs in the world.

But, to unlock this future, we require massive systemic change in four areas: talent, transformation, innovation, and leadership. We need to build the workforce we need to win in the future. We need to use Industry 4.0 technologies to unlock advantage and fuel reshoring. We need to pioneer new products and services, and new ways of working. And we need to boldly lead our companies and region.

Why do we believe we can do this? Because we've done it before. We are masters of the comeback. We've been reinventing ourselves since the advent of our industry. And all the stories we share in this report have one thing in common: They prove that everything we need to lead the world in smart manufacturing is already here. It's already happening. We just need to come together as a community and as an industry and do much more of it. With strategic investment and radical collaboration, there is no question Northeast Ohio can lead the way and lead the world in smart manufacturing. We just have to do what we do best: **Make It Better.**

OUR HISTORY

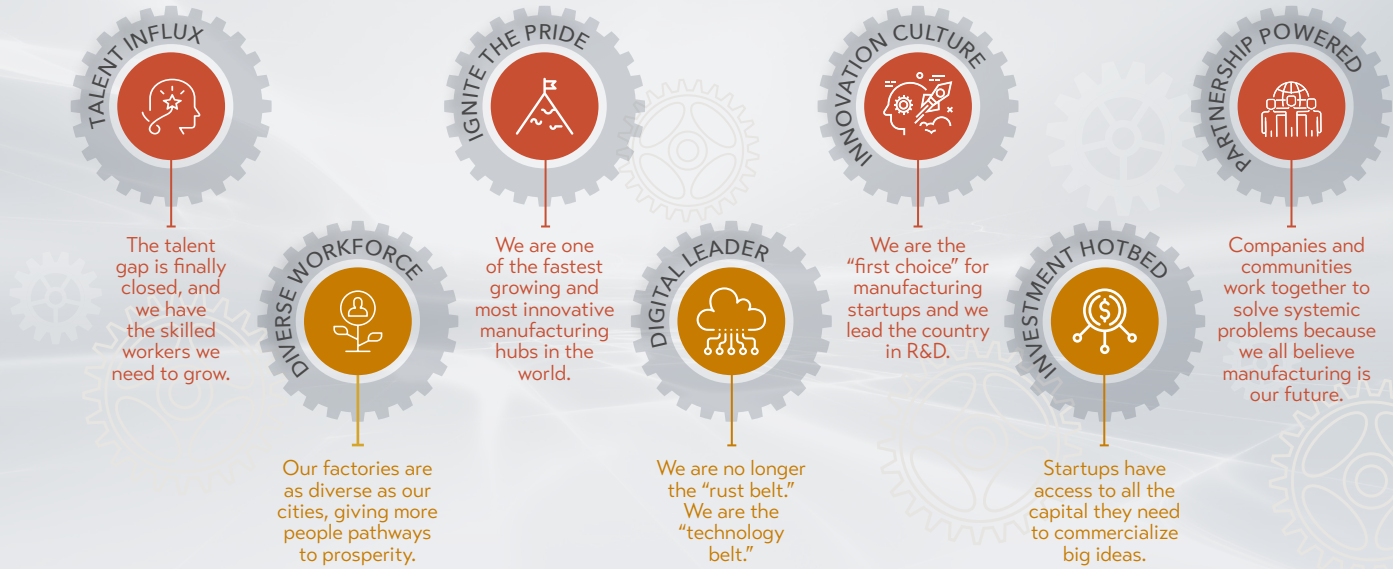
Masters of the Comeback



Manufacturing in Northeast Ohio has had its ups and downs, but the industry has mastered the comeback. Today, there are far fewer people employed than at the height in the 1970s, but wages and productivity are now higher than they have ever been. The industry is steady and ready for growth.

OUR VISION

Northeast Ohio Can Lead the World in Smart Manufacturing



OUR CHALLENGE

Manufacturing is a Powerhouse But the Future is Coming Fast



Almost half the regional economy



Almost 270,000 jobs



Every job delivers four more jobs

10,000

manufacturers – 98% of them small and medium sized companies



Talent Time Bomb

In January 2020, 60% of NEO manufacturers said they couldn't find the skilled workers they need to grow



Avoiding Industry 4.0

Industry 4.0 is a low priority for most NEO manufacturers



Ignoring Innovation

75% of NEO manufacturers say innovation is not a top priority

OUR PATHWAY

Four Keys to Unlocking Our Future

1

TALENT

Build the workforce we need to win in the future, today.

2

TRANSFORMATION

Use Industry 4.0 technology to unlock advantage.

3

INNOVATION

Pioneer new products & services, and new ways of working.

4

LEADERSHIP

Boldly lead our companies and region.



Build the Workforce We Need to Win in the Future, Today

Advanced manufacturing jobs are high-tech – offering a world of opportunity in everything from robotics to blockchain to artificial intelligence. With an average salary of more than \$75,000, manufacturing is a lucrative career, and one that offers much room to grow as companies embrace technology that's transforming the shop floor into the factory of the future.

The problem is not enough people know this. Many students have no idea what a manufacturer actually does. Some people think manufacturing is the dark, dirty, dangerous industry of the olden days. Memories of mass layoffs in the '70s and '80s also linger, making people wrongly think that manufacturing is unstable. Nothing is further from the truth, yet hundreds of free manufacturing training spots sit empty in Northeast Ohio every year, along with 8,000 jobs that manufacturers can't fill.

Not being able to find enough skilled workers is the number one thing that's holding back the growth of the industry. We have a tremendous opportunity before us to finally close that skills gap. To pivot from a talent shortage to a talent influx. If we do this, we can boost the prosperity of the entire region. Just filling the current 8,000 open jobs would boost the economy by an estimated \$5 billion annually.

To achieve this, we need to build innovative on-ramps for new talent: returning veterans, people with disabilities, people in disadvantaged communities, people of color, women, people re-entering the workforce from the criminal justice system, and underemployed people who want a brighter future. We need to be as innovative with our recruitment as we are with our products. We need to expand innovative, fast-track training programs and "earn and learn" options to make it fast and affordable for people to retrain for manufacturing careers. There are thousands of unemployed and underemployed people working in retail, fast food, and hospitality who within weeks could be in high-paying manufacturing jobs.

We also need to continue reinventing manufacturing education, so it keeps up with the pace and promise of

smart manufacturing technologies and drives flexible career-long learning. We know that companies most effectively compete in Industry 4.0 if they keep their workforce ahead of the technology curve, so we must create the cutting-edge training they need.

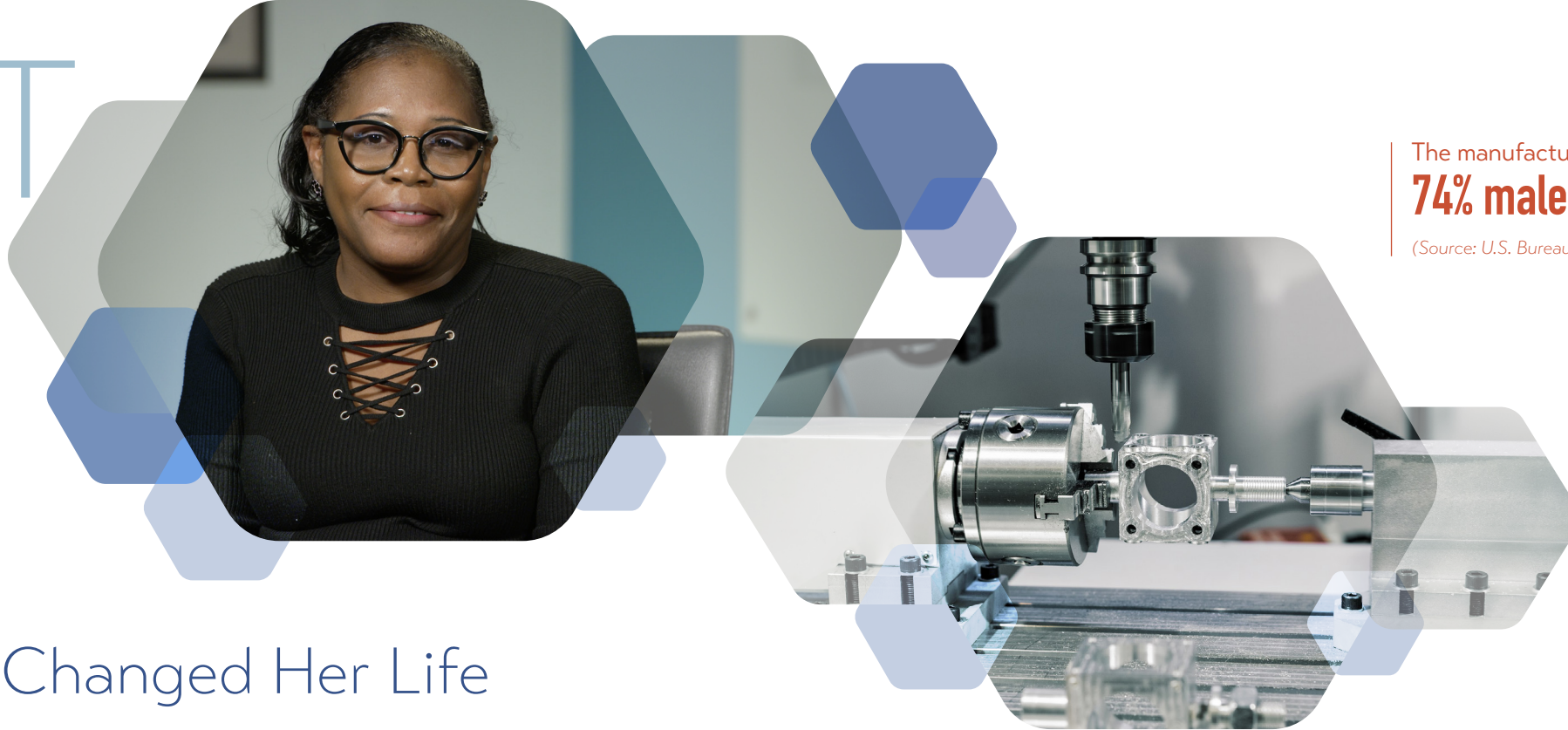
We already have a vast pool of programs and initiatives dedicated to raising awareness about manufacturing and getting more people into great jobs. Robotics competitions to get students excited about smart manufacturing. Free high school training and apprenticeship programs. Countless workforce programs. The challenge now is to connect all these pieces to solve this enormously complex puzzle. We need a holistic approach that pioneers solutions across the entire manufacturing employment spectrum, from awareness to recruiting to training. That's how we can create a seamless pipeline and get the best talent flowing into manufacturing. And perhaps most importantly, we need to put manufacturers in the driver's seat. They know what they need, and we need to let them lead.

And this isn't just good for business. Manufacturing can also be a positive force for good in our communities by providing high-tech, high-paying jobs to the people who need them most. It can be a social elevator lifting people to prosperity. That's the promise of manufacturing. And if we get all this right, we can be the capital of manufacturing education for the United States. We have proven strength in this – innovative programs, manufacturers that are heavily investing, and amazing educational assets. We can aspire to be the place where people from across America come to be trained in smart manufacturing – filling our own skills gap, training the workforce of the future, and fueling the national resurgence of manufacturing.

The Talent Gap in Northeast Ohio



TALENT



The manufacturing workforce is currently
74% male and 83% white
(Source: U.S. Bureau of Labor Statistics)

Ezabarin Moore: Changing Careers Changed Her Life

Ezabarin Moore drove a city bus for 18 years and then worked hard raising four children.

“I was a stay-at-home mom, working odd jobs here and there. The money was limited. It was really limited. My children wanted things that I didn’t have the funds to give. So, I knew in order for me to give my children what they needed, I needed more money. I needed training. I needed a school. And I needed a job,” she says.

So, at 47 years old, Moore signed up for computer training at the Council for Economic Opportunities in Greater Cleveland. And there she stumbled upon the idea of a manufacturing career.

“They had brochures out, and, of course, I’m nosy. I like to read everything I see. I saw a brochure with a female welder on it and I said, ‘If she can do this, I can do it too.’ I didn’t know about manufacturing, mind you, not a thing. But I decided to give it a try.”

Until the moment she saw that brochure, Moore says she never imagined that women did those kinds of jobs in manufacturing. This lack of awareness is a big part of the problem when it comes to recruiting

new talent. The manufacturing workforce is currently 74% male and 83% white. To close the talent gap, the industry recognizes it needs to increase diversity and connect with new pools of talent.

“The unemployment rate skyrocketed during the pandemic, yet there are still open positions in manufacturing. If that doesn’t tell us there is something systematically broken in our talent system, then nothing will. We’ve got to stop looking for the same talent in the same places. Manufacturing can be a positive force for good, for change. And the biggest way it can do that is by connecting people to high-tech, high-paying great jobs. People of color, people who are unemployed or underemployed, people from disadvantaged communities. That is the promise of manufacturing,” says Dr. Ethan Karp, President & CEO of MAGNET.

When Moore reached out to MAGNET in 2018 after the brochure sparked her interest, she signed up for a six-week Certified Technician Program at

Cuyahoga Community College. This entry-level manufacturing program is a partnership between several organizations, including MAGNET, Towards Employment, and Ohio Means Jobs. This kind of partnership works because it’s practical, flexible, and seamless for students. They receive not only manufacturing training but also financial and social support – including education in everything from job readiness basics to financial literacy. All Moore had to pay out of pocket was \$100, which made the program achievable – but that doesn’t mean it was easy.

“It was a struggle. But I had a lot of backup. Everybody wanted to help and see me grow, including MAGNET and everyone else in my training. And that’s why I’m here now. Staying up all night and doing homework was the biggest struggle. It was go straight home, do the homework. You can’t sleep right now. You can’t do anything but do your mom thing and then homework. And then it was time to get up and start over. It was a juggle,” says Moore.

But it was a juggle that paid off. Moore got hired right away, and in the next year and a half, she was promoted twice.

“They welcomed me in, and I started as a molder. Then I became an inspector. Then I became a trainer. I just felt like here I am in a new career and someone likes my work for something I never knew I had talent for

doing. I even won awards. So, it was real exciting. It really was.”

And Moore didn’t stop there. In 2020 she trained as a CNC operator at the Cleveland Industrial Training Center, sponsored through funding from Ohio Means Jobs. As soon as she graduated, she was hired as a machinist at Presrite, a metal forging company in Cleveland.

“Manufacturing – the whole process – excites me every day. Just being in the manufacturing field because it’s something I’ve never done before. I use a lot of technology and tools – micrometers, calipers, drills. I feel good knowing I can walk in here and hold my head up and make a well-produced part. We precisely cut and measure gears for multiple automotive and heavy equipment companies that make the roads we commute on daily. We make parts for carnival rides. Just to name a couple. I’m fascinated by everything we do.”

[READ THE FULL STORY](#)

TALENT

Closing the Manufacturing Talent Gap with Radical Collaboration

Deonia Duncan was 16, in high school, and working what she describes as a “dead-end job” in a pizza shop. Eddie Taylor had just been released after serving 13 years in a federal prison. Two very different stories — but with one thing in common: Both Duncan and Taylor found a new future in manufacturing. And they found that future thanks to collaborative programs that are bringing companies and communities together to solve manufacturing’s talent shortage.

These training programs are based on a stark truth. The skills gap is such a massive and complex problem that no one company or organization can solve it alone. Despite post-pandemic unemployment, in 2021 there are still an estimated 8,000 open jobs in manufacturing in Northeast Ohio that companies can’t find people to fill. And that number is expected to quadruple in the years ahead.

“The future of the industry really relies on finding a new generation of skilled workers. And we have to meet these new skilled workers where they are,” says Autumn Russell, Vice President, Diversity & Inclusion and Early College Early Career, MAGNET.

Duncan’s pathway into manufacturing came when she was in 10th grade at the John Marshall School of Engineering in the Cleveland Metropolitan School

District. Her principal suggested she apply for the MAGNET *Early College, Early Career (ECEC)* program. It’s the first of its kind in the nation. Inner-city high school students get to take college courses in manufacturing and do paid apprenticeships at local manufacturers, opening up careers and college education sponsored by employers.

“I wanted to try something new because I always liked to do hands-on stuff myself. So I just decided to go ahead and go for it,” says Duncan.

Conversely, Taylor’s introduction to manufacturing came when he was struggling to find a job after leaving prison.

“I needed a lift. I needed a fresh start. I didn’t want to start off where I left off. So I was trying to change my life for the better,” says Taylor.

That change came when someone suggested he enroll in an innovative new program launched in 2020 called the ACCESS to Manufacturing Careers Program. Taylor was one of 12 participants who made up the inaugural class of justice-served individuals seeking to reenter the workforce. Since that first class, 75% of graduates have secured jobs — including Taylor, who was hired as a material handler at Elsons International. And there’s been zero recidivism.



Deonia Duncan at Lincoln Electric.

Duncan and Taylor are two very different people with different paths and journeys, but both were successful for the same reason: radical collaboration. Both of their programs brought together everyone who was needed to build a seamless pipeline into manufacturing from CEOs to funders, from workforce groups to nonprofits. This collaborative and holistic approach made all the difference.

Russell, the head of the ECEC program, says an integrated approach is the only way to tackle the massive, complex, and often invisible barriers that keep people from connecting with opportunities.

“Eighty-seven percent of our students live below poverty guidelines. Eighty-three percent identify as persons of color. And many of them, at just 16 to 18 years old, have experienced homelessness, inadequate nutrition, and food insecurity — many barriers and challenges that they must face each and every day. So our secret sauce is really our mentorship component. Students from inner-city and underrepresented populations often don’t have the support needed to be successful, and our mentors are really intentional about being that support, that guide, and that consistent person in their lives,” says Russell.

[READ THE FULL STORY](#)

Making Manufacturing a Career of Choice

In one study, manufacturing ranked dead last among career industry choices for 18–24-year-olds.

(Source: Deloitte and the Manufacturing Institute)

About 41,000 students graduate from high school annually in Northeast Ohio.

(Source: Team NEO)

Only 5.5% of them go directly into manufacturing.

(Source: MAGNET analysis)

If we doubled this, it would boost the regional economy by \$7.5 billion in 5 years.

(Source: MAGNET analysis)



Eddie Taylor at Elsons International.

TALENT

Automation Tool & Die: Growing Your Own Talent

Manufacturing isn't just what Randy Bennett does, it's who he is. It's in his blood.

"As a family, we didn't really go out and play ball, we built things. If we wanted some time with our dad, we needed to go out to the garage and interact with him while he was doing things on the drawing board. Dad taught us the trade, he taught us the business, and he taught us a lot of things that we work to carry on today, to carry on his legacy," says Bennett, co-owner of Automation Tool & Die (ATD).

ATD started in his father's garage in 1974. The company now has more than 80 employees in a 102,000-square-foot, state-of-the-art manufacturing facility on 22 acres in Valley City, Ohio. ATD uses advanced technology to design and build high-volume progressive metal stamping dies, produce metal parts, and add value to these parts with things like welding and assembly.

When Bennett and his brother graduated from Medina High School in the '80s, they were proud to follow

their father into manufacturing and take over the family business. But about 20 years ago, that pride diminished and manufacturing stopped being a career of choice for young people. The pipeline of new talent that once flowed into Northeast Ohio's factories slowed to a trickle.

"The skills gap is the biggest problem manufacturing faces, and there's no close second," Bennett says. "The challenge is that the culture changed from 'trades are perfectly okay' to one where university is the only option."

The college-or-nothing shift Bennett saw wasn't unique to his peers, industry, or even region. It was a nationwide culture shift that took hold in the '80s and '90s, and it has been identified as a major contributor to the dearth of middle-skill workers today – those who have received training beyond a high school diploma but have not attained a four-year degree, precisely the kind of employees ATD and other manufacturers need to keep production flowing and grow. Bennett's solution? To bring back apprenticeships and build his own pipeline of talent.

"We have engaged in multiple strategies: upskilling, stackable certificates, apprenticeships, and professional and personal development opportunities for our team. Workforce

Students from Sidney Fenn and Garfield elementary schools visiting Automation Tool & Die in Valley City, Ohio.



Randy Bennett hosting teachers from Buckeye Local Schools in Medina, Ohio.

development – being wide and deep – takes time, so we're working hard at it. It just goes on and on, it's just a continual thing," says Bennett.

After creating his own apprenticeship and training programs, Bennett realized much more needed to be done. That's when Bennett and 10 other manufacturing companies came together to form the *Medina County Manufacturers Partnership (MCMP)*. Their goal is to work with other local manufacturers and colleges to bring state-approved apprenticeship training to their community. They spend most of their time raising awareness about the lucrative high-tech careers that manufacturing can provide. Bennett invites hundreds of students and teachers to tour his factory every year. For him, there is nothing more rewarding than watching these seeds take root.

"That's the meaning of the work. That's the fuel. Manufacturing is tough and there are a lot of challenges. But on the people side, when you can do something to help someone establish a career path for their entire life, it gives back what was given so easily to me. That's a meaningful way to pay it forward," says Bennett.

[READ THE FULL STORY](#)

86% of manufacturers
say hiring is extremely difficult.
Almost 60% say lack of skilled
workers keeps them from growing.

(Source: Ohio MEP 2020 Manufacturing Survey)



Apprentice working at Automation Tool & Die.





We Can Accelerate Smart Manufacturing by Collaborating with Universities

Create industry-led research projects with local educational institutions. Companies benefit from the research findings and these projects also help train and grow high-level engineering talent.

Create easy on-ramps for incumbent engineers to gain new skills on Industry 4.0 technologies.

Engage manufacturers to jointly develop cutting-edge training in Industry 4.0 and constantly modify to keep up with technology advances.

Launch an academy where students work on specific manufacturing problems while getting advanced degrees. This could include short-term executive education, sponsored PhDs, or joint technology projects.

Become known for Industry 4.0 (or a subset of technologies like Internet of Things) in academic circles to attract more professor expertise that will benefit industry collaborations, as well as student learning.

Pursue applied research centers on Industry 4.0 with industry research partners, potentially across multiple universities. This will enable more startup activity and commercialization, in addition to accelerating the digitization of manufacturing as a whole.

Only about **1 in 4** Cleveland area STEM graduates remain in the region.

(Source: McKinsey & Company analysis)



"I probably would not have stayed in this region if it wasn't for this tremendous opportunity. As a biomedical engineer and entrepreneur, I probably would have naturally gravitated to one of the larger hubs, Boston or San Diego or Bay Area type region. I think that what we can do as a region is have a better connection between industry and academia. The manufacturers and companies here need to do a better job of connecting with universities. There's a lot of talent there, a lot of potential to do new projects and research. I think that's something the region doesn't take as much advantage of, the great institutions that we have here."

Vedang Kothari, CEO of MuReva Phototherapy, Biomedical Engineer, and Case Western Reserve University graduate.

We Can Become the Capital of Manufacturing Education

Northeast Ohio has more than 30 colleges, universities, and training centers with specialties in manufacturing. They are key partners in creating the next generation of manufacturing talent.

"Our educational assets are the envy of the country and we need to build on that. Working with manufacturers and workforce systems, we can link this network together into a powerful pipeline. And perhaps even become the capital of manufacturing education for the country. The place where people come from all over the U.S. to get trained," says Dr. Ethan Karp, President & CEO of MAGNET.

For example, community colleges have a long history of innovative programs and cutting-edge partnerships with manufacturers. Like when Lorain County Community College established the *Nord Advanced Technology Center* it was the first technology center based on a college campus in the state of Ohio. Since then, the college has partnered with the community to create the *Great Lakes Innovation & Development Enterprise* which provides support services and funding to technology-oriented startups. The college also established the *Richard Desich SMART Commercialization Center for Microsystems*, an advanced facility for researching, manufacturing, testing and packaging microsystems including MEMS (micro-electromechanical systems). And, most recently, it launched the *Campana Center for Ideation and Invention* focusing on fueling innovation in digital and additive manufacturing.

"Lorain County Community College believes in working closely with our stakeholders – students and companies – to understand the individual needs and sector challenges within manufacturing. That constant examination and reflection is how we continue to provide the qualified talent pipeline companies need and develop programs that help to innovate and upskill the existing workforce," says Dr. Marcia Ballinger, President, Lorain County Community College.

Another example is *Cuyahoga Community College's Manufacturing Technology Center of Excellence* –



"If you add up all of the higher education institutions in Northeast Ohio, you'd be shocked. I think it rivals what we think of as hotbeds of education in Silicon Valley or the East Coast. We want to keep our kids here. We want to keep our best and our brightest. Well, we can. We have all the ingredients. Manufacturing is one way to do that through a great career, by being in an industry that's actually producing something that can be meaningful not only to the community, but to the world."

Denny Saunier, President & CEO of the Canton Regional Chamber of Commerce

one of the largest technology training facilities in the country. It even has a mobile training unit in a 53-foot trailer that brings training programs to the doorsteps of Northeast Ohio companies and schools.

"We are in a unique moment to think creatively about collaboration between educational institutions and manufacturers so that we can develop training programs that best prepare individuals to leave our doors and go right into successful careers," says Alicia Booker, Vice-President, Cuyahoga Community College.

These are just two examples of many that showcase the innovative, flexible, collaborative approach to education required to propel Northeast Ohio from a talent shortage to a talent influx.

TALENT

The Manufacturing Talent Pipeline Is Broken Here Are 10 Ways To Fix It

PROBLEM:

Manufacturing is dead last among career industry choices for 18-24-year-olds.

WE NEED TO ATTRACT NEW TALENT

1. Raise awareness of manufacturing as a great career with competitive pay, benefits, and opportunities.
2. Find immersive ways (e.g. factory visits, camps, technology showcases) to show students that manufacturing can be an exciting STEM career.

PROBLEM:

Manufacturing is 83% white and 74% male.

WE NEED TO MAKE OUR FACTORIES AS DIVERSE AS OUR COMMUNITIES.

3. Create innovative on-ramps for veterans, people with disabilities, people in disadvantaged communities, people of color, women, and the underemployed.
4. Increase benchmarking and training on Diversity & Inclusion to help create more equitable manufacturing workplaces.

PROBLEM:

57% of manufacturing companies say they can't find the skilled workers they need to grow.

WE NEED TO INNOVATE TRAINING

5. Pioneer an innovative mix of college, training, and company programs that are industry-led, flexible, and stay ahead of the technology curve. Use what's already working. (e.g. Sector Partnerships)
6. Invest in more German-style apprenticeship, internship, and skills certification programs. Expand programs that are working.

PROBLEM:

The vast majority of Americans say they won't encourage their children to pursue manufacturing careers because most don't believe these jobs are interesting, rewarding, clean, safe, stable, or secure.

WE NEED TO CELEBRATE MANUFACTURING AS A GREAT PLACE TO WORK

9. Encourage companies to build winning workplace cultures and pioneer ways to be great employers.
10. Provide forums and workshops to teach and share workplace culture best practices.

If we get this right...

Northeast Ohio can be the capital of manufacturing education in the U.S. We can finally close the skills gap and help our regional industry grow into a global leader. We can help thousands of people move from poverty to prosperity every year.

THE PIVOT WE NEED
Talent Shortage → Talent Influx



Using Industry 4.0 Technologies to Unlock Advantage

Technology is to smart manufacturing what coal was to the original steel mills. It fuels modern production, and we can't win without it. Hidden behind factory walls, the fourth wave of the industrial revolution is completely changing the way we make things and what we make. Industry 4.0 is all things digital, automated, and connected: cobots, robots, Internet of Things (IoT), automation, artificial intelligence, big data, and more.

They sound like buzzwords, but here are some examples of what they can do. Cobots are collaborative robots, machines that work alongside people on the production line doing more of the repetitive tasks. Big data is taking all the data from the computers and sensors on your machines and using it to monitor performance, find inefficiencies, and prevent things from breaking. Sensors can tell you that you need to service a big machine. Connecting your products to the Industrial Internet of Things (IIoT) can tell your customer when they need to service something. Virtual reality can help train people safely and more effectively.

To be clear, this is not about technology for technology's sake. This is about empowering and supporting manufacturers to find the best ways to make these technologies work for them, to make their businesses better.

And there's no question, Industry 4.0 technologies can help us make things better. They have amazing potential to improve productivity and competitiveness. For example, using big data to do advanced analytics can boost production by up to 25% and reduce downtime by 45%.

But, as always, there's a catch. These technologies are expensive and incredibly complex. You can't just buy Industry 4.0 off the shelf. Plus, it might take several years before a manufacturer sees a return on their investment. So, there's a significant cost and expertise barrier – especially for the small manufacturers that make up 90% of our regional industry. That's why Northeast Ohio is falling behind on Industry 4.0 adoption. The Ohio MEP 2020 Manufacturing Survey found that investing in new technologies is at the bottom of the priority list for the vast majority of manufacturers here.

It may feel too risky to finance this leap. But investing wisely in smart technologies is actually de-risking and future-proofing your company and your profits. The upfront costs are real, but if we don't adopt and adapt, we simply don't have a future.

If companies do invest strategically, it can help them grow and compete on quality, lead time, service offerings, and price. It can also help with workforce issues. When some people hear about Industry 4.0, they think, "That means automation will take people's jobs." Yes, it reduces some jobs. But the Ohio MEP 2020 Manufacturing Survey found that 85% of local companies are using automation to supercharge productivity rather than replace people. They're using technology to free people up to do more high-tech jobs like maintaining and running human-machine interfaces. Employees get to use more mind and less muscle. And smart manufacturing roles have the added benefit of a wage premium. They pay an average of \$12,000 more a year than more traditional manufacturing jobs.

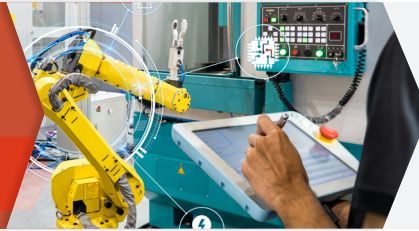
The challenge now is to find a way for the region to go from lagging to leading. This is a big leap, and it won't be easy. It requires raising awareness, raising expertise, and raising the profile of "lighthouse" companies that are doing Industry 4.0 well – so everyone can learn from them. Small companies need very practical support and expertise on the shop floor to get them experimenting with digital technologies. They need opportunities to learn from other companies, connect with technology suppliers, and see technology in action at the lighthouse companies leading the way. We need to find innovative ways to reduce Industry 4.0 financial barriers with incentives, funding, and loan loss guarantee programs where investors share the risk on innovative projects. And we need to attract more technology suppliers and startups here so that we not only transform our factories with technology but also invent, commercialize, and export digital manufacturing technologies themselves.

This is how – company by company – we can accelerate adoption and fast-track technology. It's also how we can make the dream of reshoring a reality. Transforming our companies with technology is the only way we can regain our global competitive advantage and win.

TRANSFORMATION

Technology

Robots & Cobots



What It Does

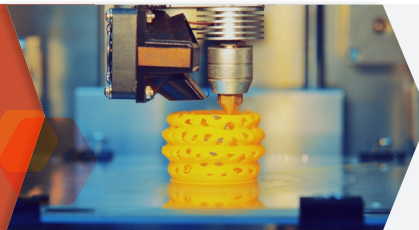
Intelligent robots are used for automation and production. Cobots are robots that work collaboratively alongside people.

Big Data



Using data to monitor production so you can troubleshoot, prevent problems, address issues quickly, improve efficiency, and share information across the value chain.

Additive Manufacturing/ 3D Printing



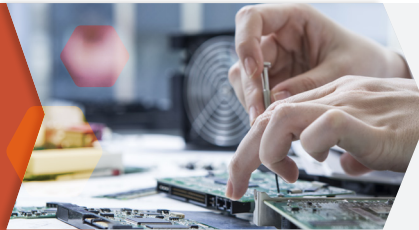
Using a machine to make a three-dimensional object from a digital model, increasing speed, flexibility, and customization.

Automation



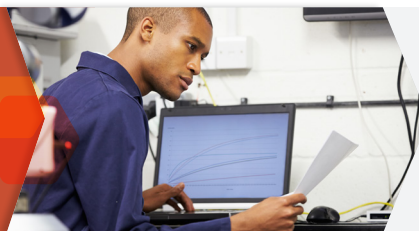
Using machines, human machine interfaces (HMIs), and digital technology to make production run automatically.

Industrial Internet of Things (IIoT)



Networks of low-cost sensors connecting machines or products to allow for data collection, connectivity, monitoring, and optimization.

Cybersecurity

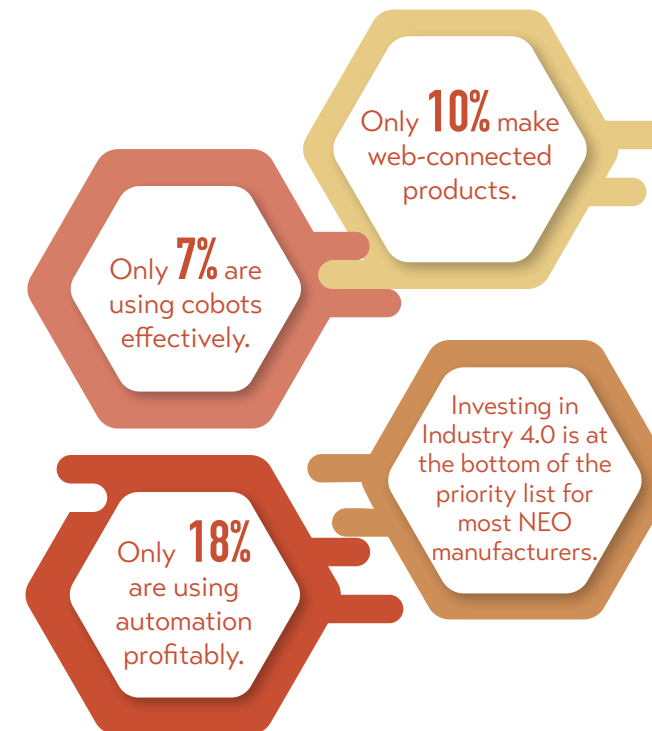


Using digital technology to prevent disruption of operations and protect valuable intellectual property from virtual threats.



We Are Falling Behind on Technology

The digital transformation journey is just beginning for the vast majority of Northeast Ohio manufacturers.



(Source: Ohio MEP 2020 Manufacturing Survey)

"We have an opportunity to reimagine manufacturing in a way that makes a real impact on our community and every single individual who lives in it. The longer-term engine has to be not only about what we make today, but about the innovation we bring to the table that helps make things better, smarter, sharper, and faster down the road to strengthen and build our economy for the future. We can do this. There's no question in my mind that we can do it if we do it together. If we leverage the resources we have, the relationships we have, the expertise we have embedded here, we can do it."

Bill Koehler, CEO of Team NEO

TRANSFORMATION



Technicians at Center Street Technologies in Youngstown, Ohio.

M-7 Technologies: Transforming a Family Foundry into a Digital Pioneer

In 1985, Michael Garvey got a phone call that changed his life. His father was critically ill. It was his turn to come home and run the family business in Youngstown, Ohio.

“My grandfather started a bronze foundry to service the 23 independent steelmakers in this area in 1918. And he was very successful up to the Depression. And then the Depression took him into some financial challenges. Shortly after World War II, my father joined my grandfather and built a very, very successful business, servicing steel mills, primary metal producers in a 400- to-500-mile radius of Youngstown. And then in the 1980s, everything collapsed,” says Garvey.

Garvey was about to find out just how complete that collapse was. He quit his job on Wall Street and headed home. He was 24. His father was in isolation in the hospital for months. And the family foundry was bleeding cash. “We were beyond the brink, we were insolvent,” says Garvey.

Starting in the early 1900s, Youngstown was a bustling industrial center for coal and then steel. Youngstown’s steel mills were so prosperous that the city became the embodiment of the American Dream – with incomes and home ownership rates among the highest in America. But when the steel industry began collapsing in the 1970s, Youngstown became a national symbol for the death of the middle class. In 1977 the Campbell Works mill closed. In five years, Youngstown lost 50,000 jobs and \$1.3 billion in manufacturing wages. Hundreds of businesses like Garvey’s went under. Countless families lost everything. And the Garveys came very close when disaster struck shortly after Michael took over the foundry.

3D printing could add an estimated \$4.5 billion to the Northeast Ohio economy.

(Source: Team NEO)

“We had a disastrous fire that wiped it out, burned it to the ground. And we were left with a very small machine shop that only had two or three people working at it at the time. So, we made the decision not to rebuild the foundry, and I transitioned to the machine shop. I didn’t know anything about a machine shop. And so that learning curve was very steep for me. And through that learning curve, I met some different people and I realized that measurement science was the key to an effective and successful machine shop,” says Garvey.

That’s when the company began to transition into digital technologies – purchasing machines that could accurately and precisely measure parts.

“I learned from my father from the bronze casting industry that the key to his success was focusing on product life cycle, and measurement, fit and function. We transitioned that thought process into all mechanical operating equipment using up to date, very leading-edge digital technologies to measure items. Then we applied that to steel, iron, and aluminum and we were able to extend the life cycle of parts for our customers, thus creating value without increasing price,” says Garvey.

It seemed like a risky move to invest in expensive digital equipment when the company was insolvent. But Garvey says it was the only choice. It was change or die. It took 10 years to turn the company around, but the risk paid off.

“It’s not just the risk, it’s the energy, the perseverance, the 100-hour weeks, the sleepless nights. But, yeah, they’re definitely paying off. When I came back in 1985, we had three employees across the machine shop and the foundry. We were doing, it’s almost embarrassing to say, probably \$100,000 worth of business a year, and we were sinking rapidly. Through all of these transitions, now, we have approximately 50 employees. And we’ve grown our revenue at about 18% a year, year over year, for the last 35 years,” says Garvey.

[READ THE FULL STORY](#)



Mike Garvey standing inside his company's 3D printer in Youngstown, Ohio.

TRANSFORMATION



GOJO, MAKERS OF PURELL™ has plants in Ashland, Cuyahoga Falls, Navarre, Maple Heights, and Wooster.

GOJO, MAKERS OF PURELL™: Using Technology to Solve Pandemic-Sized Problems

At the height of the global pandemic in 2020, some manufacturers locked down. Some went out of business entirely. Others faced unimaginable spikes in demand – companies like GOJO, MAKERS OF PURELL™, the family business in Northeast Ohio that invented hand sanitizer in 1988.

Despite stress, fear, and unprecedented new safety protocols, GOJO found a way to deliver. The numbers tell an incredible story. GOJO increased production of PURELL™ by 300% in 2020. It shipped 140 billion doses of soap, sanitizers, and spray around the world. It ramped up 2.5 million square feet of new manufacturing and distribution space. And it hired more than 500 new employees. In one year.

For Stephanie Onderko, automation and systems director for supply chain at GOJO, it was a moment of truth for the company's purpose of "saving lives and making life better." People needed GOJO products to stay safe, and GOJO had to find a way to make enough, fast enough.

The company's secret weapon was technology. It's been investing for years, transforming the way it

makes things – think all things digital, automated, and connected. Technology is the single biggest reason GOJO was able to triple production virtually overnight.

"It allowed us to get more product out in the market quicker than we would have if we didn't have those things in place. It helps with the flexibility and agile manufacturing that are so critical. It helps us stay competitive as a business," says Onderko.

GOJO is investing heavily in Industry 4.0 because these technologies are revolutionizing manufacturing. Ever since Henry Ford invented the first production line to make the Model T, manufacturers have been finding ways to make production easier, faster, and more profitable. Industry 4.0 offers more promise and progress than any other suite of technologies in history.

Collaborative robots that work alongside people. Big data from computers and sensors on machines to remotely monitor and troubleshoot. Artificial intelligence to make instant adjustments on the production line. Virtual reality to easily train people.

Like many manufacturers, GOJO is excited about the promise of these technologies. But they're also very

Smart manufacturing could boost the GRP up to **\$13 billion.**

(Source: Team NEO)

aware of the pitfalls. That's why they're not taking a technology-first approach – they don't want to fall into the "solution looking for a problem to solve" trap.

"This is not about putting technology in for technology's sake. This is about aligning and using that technology as a key enabler for our business strategy and to continue to grow and profit as a business. We constantly challenge and break our current processes. So, we really look at using Industry 4.0 technologies to enable process innovation and continually get better," says Onderko.

During a year rife with supply chain disruptions, raw material shortages, and shutdowns, GOJO was able to accelerate its use of new technologies – largely because it had a clear strategy and had already made significant investments. It all started several years ago with a project to automate the production of custom-labeled hand sanitizer.

[READ THE FULL STORY](#)



"Even seemingly small improvements in operational efficiency generate thousands of dollars in productivity gains and cost savings which add immense value for manufacturers in an increasingly competitive landscape. The IoT Collaborative is helping drive this kind of innovation on behalf of the manufacturing sector."

Shilpa Kedar, Co-Executive Director, IoT Collaborative. The IOTC is an educational collaborative led by Case Western Reserve University and Cleveland State University to drive research, innovation, and education to unlock the disruptive potential of Internet of Things in Northeast Ohio.



Automated and digital production line at GOJO, MAKERS OF PURELL™.

TRANSFORMATION



Masks being made at
Buckeye Mask Company.

Automation & 3D Printing: Saving Lives and Making a New Future

In just two days, more than 2,000 Ohio manufacturers joined the fight against COVID-19. It was March 2020. The governor had just put out an urgent call for help. Spurred by stories of nurses wearing garbage bags and doctors using the same dirty masks for a week, the *Ohio Manufacturing Alliance to Fight COVID-19* was formed to make personal protective equipment (PPE).

MAGNET was one of the Alliance leaders, working alongside the Ohio Manufacturers' Association, the Ohio Hospital Association, the Ohio Manufacturing Extension Partnership (Ohio MEP), and JobsOhio. MAGNET started by producing 1 million reusable face shields.

"We were on the phone all hours of the day and night. Tracking down plastic leads. Bringing decision makers together to make lightning-fast decisions on funding. Driving the prototype back and forth across Cleveland to improve it with doctors' feedback. The way it all came together was incredible. We went from an idea

to prototype to production in less than two weeks," says Dr. Ethan Karp, President & CEO of MAGNET.

All told, the Alliance produced 15 million pieces of PPE in a few months as thousands of Ohio manufacturers made a powerful pivot. They went from making toys to face shields, from whiskey to hand sanitizer, from mattresses to medical gowns. ROE Dental Laboratory in Independence, Ohio, which normally makes crowns and dentures, was part of the pivot.

"Unfortunately, and with a heavy heart, we laid off probably about 70% of our workforce with the full intention of hiring everyone back. But shortly after that happened, I started looking into what we could do with all the technology and 3D printers we have here," says BJ Kowalski, President of ROE Dental Laboratory.

In April, ROE started working with the Alliance to make face shields and nasal swabs with 3D printing.

"At the time, the two main producers of nasal pharyngeal swabs were woefully undersized for the worldwide need. They couldn't handle the demand because everyone wanted to get tested. So, I made

85% of NEO companies say they are using automation to supercharge productivity rather than replace people.

(Source: Ohio MEP 2020 Manufacturing Survey)

a decision to triple our number of 3D printers, and we went ahead and ordered another 40-odd printers. We worked seven days a week, probably 12, 13 hours a day. And the printers never stopped. They worked 24 hours a day," says Kowalski.

In two months, ROE made 500,000 nasal swabs, which allowed the government of Ohio to ramp up COVID-19 testing and paved the way for the state to safely re-open. Without these swabs, lockdowns and shutdowns would have continued for weeks longer – costing billions more.

"I wanted to get my people back to work. And it was also an opportunity to help the people of Ohio, our state, which was even better," says Kowalski.

Despite the disruptions of the pandemic, because the company branched out into new products it was able to grow its workforce from 180 to 220 people in the last year. The fact the company had already transformed its operations and trained its workforce in digital production and 3D printing was a huge benefit when it came to the transition.

"We've really evolved into computer screens and milling machines and working with a mouse as opposed to hand tools. So, we have a very

technologically advanced staff. And that really helped us make this transition quite easily. I know in my industry, the companies that haven't made that plunge into technology are falling way behind. And many of them won't make it because not only does technology allow you to do things faster, but it also allows it to be more consistent, to be higher quality, and at a lower price point," says Kowalski.

Innovation and technology were key for quickly making hundreds of thousands of testing swabs. They also fueled the production of millions of "made in Ohio" face masks. Carla Macklin is a successful "serial entrepreneur" who was working with MAGNET as a consultant to help sewing manufacturers convert their production to gowns and masks. Even with heroic efforts, they were only able to produce 150,000 masks a week by hand. And they were simply too expensive and of variable quality.

That's when Macklin decided to start a mask business.

READ THE FULL STORY



Automated sewing
machines at Buckeye
Mask Company.

ROE Dental in
Independence, Ohio.

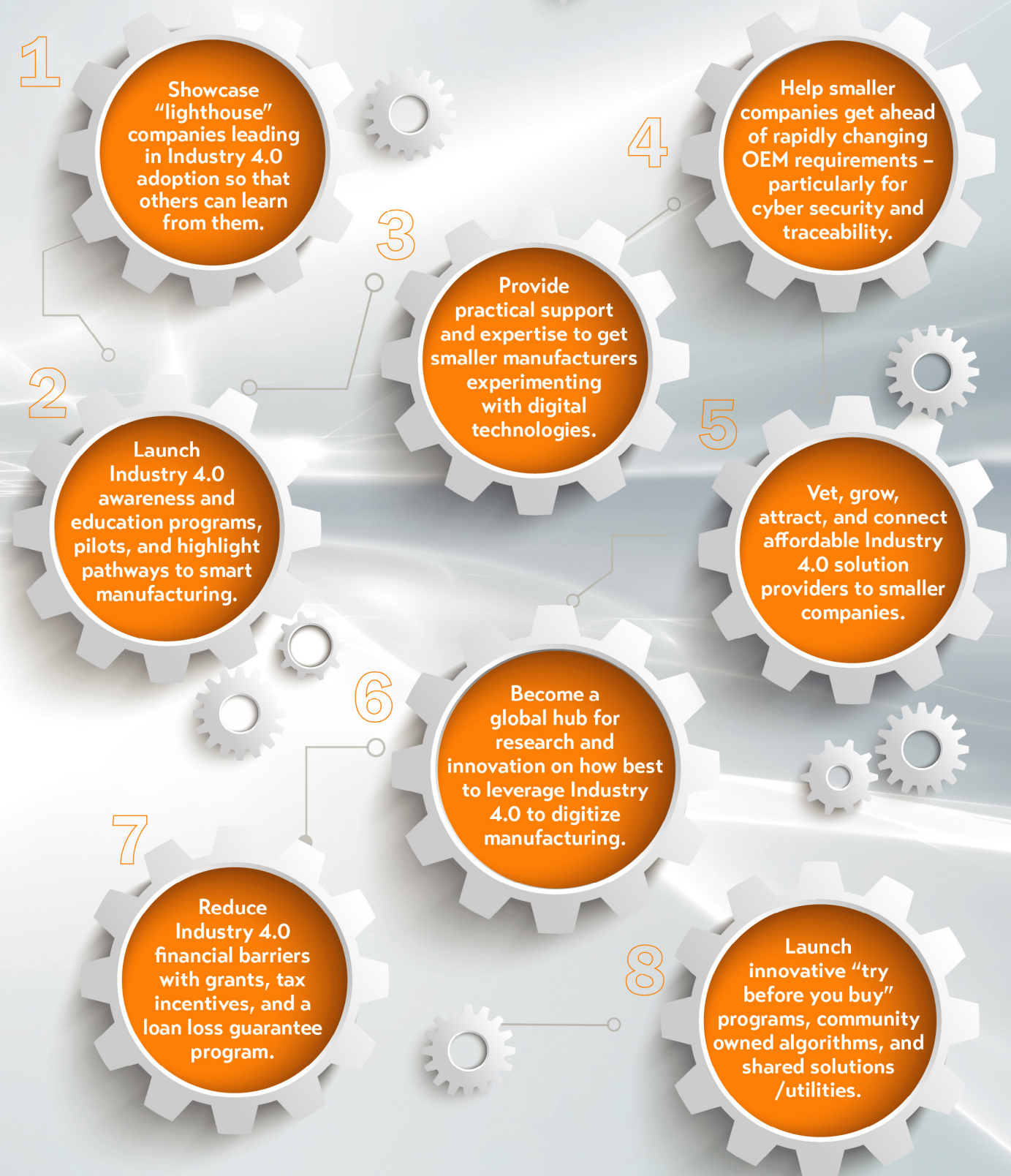
8 Ways We Can Transform our Future with Industry 4.0



But we are not ready to lead. The Ohio MEP 2020 Manufacturing Survey found that we're falling behind on Industry 4.0 adoption, technology investments are not keeping pace, and companies don't believe Industry 4.0 is a priority.



THE PIVOT WE NEED Rust Belt → Technology Belt



GOAL

Make Northeast Ohio the fastest adopter of Industry 4.0 technology in the U.S. Unlock huge productivity, quality, and lead time advantages.

New Products, New Services and New Ways of Working

The future is not incremental. It's innovation. It's invention. It's using technology to make new ideas come to life. It's relentlessly looking at your products, services, and ways of working and seeking to make them better – that's where the opportunities lie. Manufacturing growth will only come through innovation; without it, the industry will inevitably shrink.

And that innovation needs to happen at several levels, simultaneously. We need new products and new services across the board from big companies, small companies, spinoffs, and startups. And this means we need to create an environment where innovation and innovators can thrive. We need to invest in the ecosystem – all the supports that make spinoffs and startups easier and create common spaces for experimentation and innovation. This will not only help manufacturers but lift the entire regional economy.

We may be great at minding the store. But, at the moment, Northeast Ohio is falling behind on innovation. The Ohio MEP 2020 Manufacturing Survey found that 75% of Northeast Ohio manufacturers say innovation is not a top priority. And according to McKinsey & Company, Cleveland generates about 20% more inventions per \$1 million invested. But only one startup is commercialized for every 10 patents. That's three times below the average in peer cities. Another barrier is a lack of innovation funding, particularly the early-stage dollars needed to attract startups. Compared to peer cities, Cleveland is in the bottom third of attracting early-stage venture capital - only 0.4% of GRP is currently being invested.

To build innovation capabilities across the region, we need to find new sources of capital. We need an early-stage venture fund focused on commercializing Industry 4.0 applications in manufacturing. We need new collaborations with colleges and universities that grow engineering talent while stoking applied research. If that research is chosen strategically, the benefits trickle down to the small companies that power the large company supply chains, then back up to the large anchor companies through advancements in products and production.

Contract manufacturers, which make up the vast majority of our regional industry, face a specific challenge when it comes to innovation. These "build to print" shops don't own proprietary products – they build them to specifications provided by other manufacturers. These companies have provided many great jobs for decades, but the long-term challenge is viability. If they are not investing in

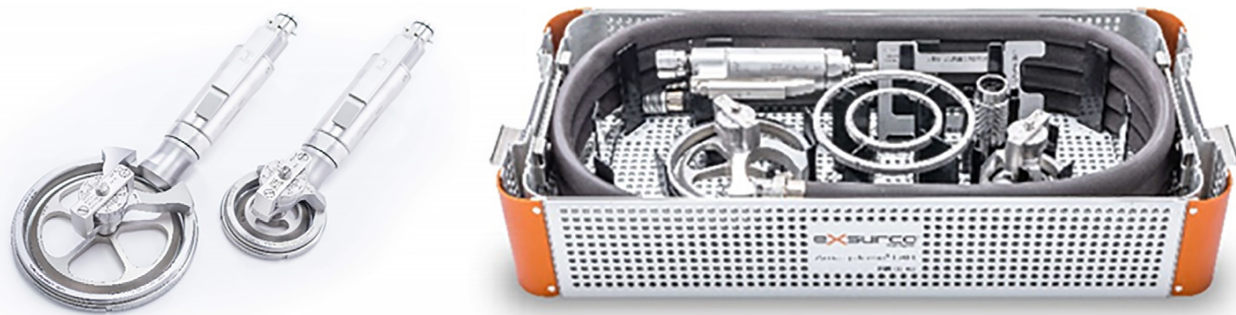
differentiating themselves, making themselves truly unique compared to their peers, they risk going out of business as the industry evolves, a segment disappears, or they lose a major customer.

But Innovation isn't just about inventing a proprietary product. It can also help contract manufacturers move up the value chain and protect their future. There's a real opportunity to look at how innovation and technology can unlock growth pathways. We need to provide experts to help companies think outside the "order-taking" box. How can they use technology to help customers with product design and optimization? How can they digitally integrate into the customer's supply chain to provide better service? If a contract manufacturer can reduce its cost and provide seamless service, faster prototyping, more sophisticated sensors to optimize quality, better lot tracing, better cybersecurity, and shorter lead times because of smart investments in innovation and technology – that's a win for the company and the region.

Another proven way to grow new ideas is to encourage companies to look on their own shelves to get the inside track on innovation. The concept of intrapreneurship – encouraging people to think and act like entrepreneurs inside an established company – is a powerful one. This helps companies find different ways to use what they're uniquely great at to solve new problems and move into adjacent markets. Incubating these ideas and then spinning them off into new companies has been tremendously successful for some high-profile companies in the region, and there's a mine of potential here to learn from.

Without exception, one thing we heard from every entrepreneur and innovator is that we need to rethink risk. To be great at innovation, we have to reframe our mindset and see risk as something to be managed, not avoided. Northeast Ohio has all the building blocks of a robust and successful innovation ecosystem – we just need to overcome our innate Midwestern conservatism, start taking more smart risks, and invest in more big ideas in the smart manufacturing space.

INNOVATION



Exsurco Medical's Amalgatome ® SD.

Bettcher Industries & Exsurco Medical: Leapfrogging from Meat to Medical with a Smart Risk on Innovation

In 2008, someone called the switchboard at Bettcher Industries. It regularly gets calls from around the world about the cutting tools it makes for meat processing plants. But this call was different. It was so strange it would have been easy to ignore as a prank. But it actually spawned a new company and an invention that's saving lives. Sara Ann MacKinlay, President of Exsurco Medical, recalls the moment that's become part of the company's founding folklore.

"It was a tissue banking professional who asked the question, 'Do you sell products that could be used for recovering human skin?' I guess you can imagine the shock and surprise of someone on the customer service line. And the part of the story that I really love is rather than saying, 'No, we don't do that. You've got the wrong number,' that spirit of ingenuity and innovation was, 'Let me connect you with our engineers. They might have an idea on how to help you,'" says MacKinlay.

Bettcher invented the first mechanically powered hand-held meat trimmer back in 1954 and it's

been innovating ever since. In fact, in 2016 it opened a dedicated Innovation Center at its global headquarters in Birmingham, Ohio. The company's strong culture of innovation meant that when someone called with a problem – no matter how strange – the response was entrepreneurial: "How can we solve that?" The person who called Bettcher that day in 2008 worked at a tissue bank, an organization where people donate organs when they die, including skin that can be used to help people who need grafts. The tissue bank worker had a serious problem he couldn't find an instrument on the market to solve – until he saw Bettcher's unique circular meat trimmers.

"He was really describing the problems that they were having in terms of recovering and maximizing the gift of skin from donors. The current product they were using was sub-optimal, wasn't meeting their needs, and Bettcher's engineer developed a great relationship with this prospective customer and a product concept was developed," says MacKinlay.

Bettcher saw an unmet need and a chance to use its expertise in a new industry. So, it incubated the idea for several years. After much research, iteration, prototyping and a strategic hire from a Cleveland-based tissue bank (plus a \$1 million JobsOhio Third Frontier grant) a product called the Amalgatome ® MD was born. It was a big leap from meat to medical, so it was time to spin-off a new company.

"There just was an openness that, if we're going to do this and really build an enterprise sustainably for the long term, we're going to have to do things differently, and we won't be able to do it the way that Bettcher did it. We need to develop it the way that a successful medical device company would," says MacKinlay.

Moving into the heavily regulated world of medical devices meant building Exsurco from the ground up – a new state-of-the-art facility in Wakeman, Ohio, and a team with deep medical expertise. Bettcher's support as a parent company was invaluable during this early stage, recalls MacKinlay.

"Medical device is not for the faint of heart. It requires investment. It requires change management. It requires a very different commitment to building infrastructure, processes, and process controls. There was really this mentality of, build the team, get the right leaders in place, and go forth and prosper. To me, that's the ultimate empowerment. And I think that's really what has led to our success."

[READ THE FULL STORY](#)

Our Innovation Opportunity

Boost Funding: Particularly the early-stage dollars needed to attract startups. Compared to peer cities, Cleveland is in the bottom third of attracting early-stage venture capital - only 0.4% of GRP is currently being invested.

Boost Support: Cleveland generates about 20% more inventions per \$1M invested than peer cities. But only 1 startup is commercialized for every 10 patents. That's 3 times less than peer cities.

(Source: McKinsey & Company analysis)



Members of the Exsurco Medical team in Wakeman, Ohio.

INNOVATION



Peter Broer and Vedang Kothari.

Lumitex and MuReva: Light Years Ahead with Innovation and Intrapreneurship

In six short years, Vedang Kothari went from intern to CEO. His meteoric rise was powered by three things: a groundbreaking invention to help cancer patients, a CEO who believed in him, and a company that's excellent at incubating innovation. That company is Lumitex – a lighting manufacturer in Strongsville, Ohio.

“We try to improve life by innovating with light. Innovation is in our bones – everything we’ve ever done has been unique and very often a first in the industry. How do you wrap a baby with light to treat jaundice without heating the baby? We did that. How do you backlight a laptop keyboard at a quarter of a millimeter thick? We did that. We light deep inside surgical cavities so that surgeons can see what they’re doing. Lately, we’ve been working at the cutting edge of photobiomodulation, which involves accelerating the body’s self-protective mechanisms with light to treat conditions in the body,” says

Peter Broer, who has been CEO of Lumitex for 30 years.

And that’s where Kothari comes in. He first met Broer when he was completing his master’s in engineering and management at Case Western Reserve University, after having done his undergraduate in biomedical engineering there as well.

“Here comes this California kid at Case Western Reserve looking for an internship. So, we say, ‘Vedang, how else can light help treat medical conditions?’ He goes off and does this study. He comes up with 25 different applications, ranks them all on eight different ratings, and presents them to the board. And one of the board members was so excited about this, he practically jumped on the table,” recalls Broer.

What had the Lumitex board so excited was Kothari’s idea to use light to prevent and treat a terrible side effect of cancer therapy called oral mucositis.

“Whether you go through chemotherapy or radiation therapy, you can develop this as a side effect. It’s characterized by an ulceration and

inflammation of the soft tissues within the oral cavity, and in certain patient populations like head and neck cancer patients, virtually all of them will get this condition. As it becomes severe, it can lead to terrible pain and prevent a patient from being able to eat or speak. This is an absolutely debilitating problem for which there is no adequate solution on the market today,” says Kothari.

Seeing a big opportunity, Lumitex hired Kothari to develop the idea. The company prides itself on having an extremely innovative culture. It actively fosters intrapreneurship – where an established company rewards, nurtures, and incubates entrepreneurial thinking, innovation, and risk-taking.

“I always like to joke that being an intrapreneur is like being an entrepreneur with training wheels. It was like having my own startup, but I had Lumitex’s whole staff of engineers to support me in any area I needed. And I knew that no matter what happened, we had a great senior staff and team that wouldn’t let me fail. That really gave me the confidence I needed to be successful,” says Kothari.

The company was awarded two Small Business Innovation Research grants from the National Institutes of Health to fund research and develop a prototype. The team created a silicone-based light emitter and mouthpiece that can treat the entire mouth in just five minutes a day – stopping oral mucositis before it ever starts. That’s when Broer faced the all-important question of when to spin off the new company.

[READ THE FULL STORY](#)



“Investing in innovation, investing in transformation, is required not only to grow your business, it’s required to sustain your business. If you’re not willing to make those investments today, I guarantee one of your competitors across the world is making those investments, positioning them to take business from you in the future. For Cleveland, if we don’t invest in smart manufacturing at scale, another region will, and our industrial heritage will be a part of our history rather than a platform for our future.”

Baiju Shah, President & CEO of the Greater Cleveland Partnership and head of the Cleveland Innovation Project

MuReva
Phototherapy's
invention to treat oral
mucositis.

INNOVATION

Technician explaining a Kinetico water system.



Kinetico: Relentlessly Innovating and Rethinking Water

A black tank sits in a dusty field in the blazing Texas sun. It doesn't look like much, but inside it's a brilliantly engineered water filter running entirely on waterpower.

"Inside it looks like a Swiss watch. It has many, many small moving plastic parts that require high-precision molding using some challenging specialty plastics that need to be manufactured and assembled into a system that is very compact and robust. They can last for 10, 20, often 30 years, even in the most hazardous conditions. Many people have tried to copy and imitate what we do, but they can't," says Toby Thomas, President & CEO of Kinetico.

Kinetico is a global company based in Newbury, Ohio. It employs more than 500 people in nine countries. It's privately held, but estimates put annual revenue in the hundreds of millions. The company makes innovative water treatment products – softeners, reverse osmosis systems, and filters for homes and businesses. The vast majority of them don't require any electricity or batteries. Kinetico is a market leader in every category it's in.

"We're this little company that not many people have heard of, but those who need us absolutely know us,

trust us, and depend on us. We're really rethinking water. We do that by bringing the best technology, the best people, and the best services to help people get better water in their lives," says Thomas.

You may not know the company name – but you've probably used water they've treated. Kinetico helps a national coffee chain filter its water so your cappuccino tastes the same no matter what city you're in. They purify water for treatments like kidney dialysis. They make contaminated water safe to drink in hundreds of thousands of homes and businesses around the world. And they're able to do all of this because of one thing: relentless innovation.

"We relentlessly and systematically look at how to go to market more effectively, how to improve the effectiveness and efficiency of our products and services, and how to make things in a way that's not only economical and cost-effective but produces very high-quality product and does so in a very reliable and effective way. It's not rocket science – know what you're good at, stick with it, and really focus on it. Focus on the critical few things that drive your success in the market and build your innovation around that," says Thomas.

Successful innovation has fueled rapid growth – Kinetico has tripled in size in the last decade. And it's become a triple threat when it comes to innovation. One, they innovate their products and how they manufacture them. Bright yellow robotic arms work the line, installing cartridges in water systems. And they just started linking their products to the Internet of Things (IoT) so customers can get alerts on their smartphones when filters need changing. Two, they innovate their marketing and distribution. They drive demand by educating people about the universal need to understand what's in your water and how to make it healthier. They constantly improve how they get their products to market through a robust network of dealer-installers. And three, they innovate processes and supply chains to continuously improve quality and efficiency. Most importantly, all this innovation is tied directly to the company's strategy.

"If you don't have a good strategy and you don't have a good foundation, it's the old metaphor – you can't build a house on sand. You fundamentally need to start from where you stand and what you do really well, stick with it, and really build from that. The growth will come, the opportunities will come," says Thomas.

[READ THE FULL STORY](#)

Robots on the production line at Kinetico in Newbury, Ohio.



"It's imperative that we lead and we focus on advanced manufacturing, smart factories, Industry 4.0. This is how we stay competitive. If we don't then we risk obsolescence. It's critically important that we drive manufacturing innovation so that Ohio's manufacturers continue to be among the most productive and innovative in the world. This is the manufacturing heartland of the United States. We can make anything here, we can make it better."

Ryan Augsburger
President, Ohio Manufacturers' Association

INNOVATION

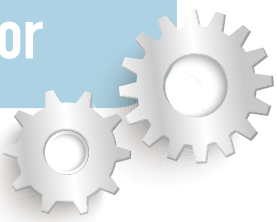
We are Falling Behind the Innovation Curve



(Source: Ohio MEP 2020 Manufacturing Survey)

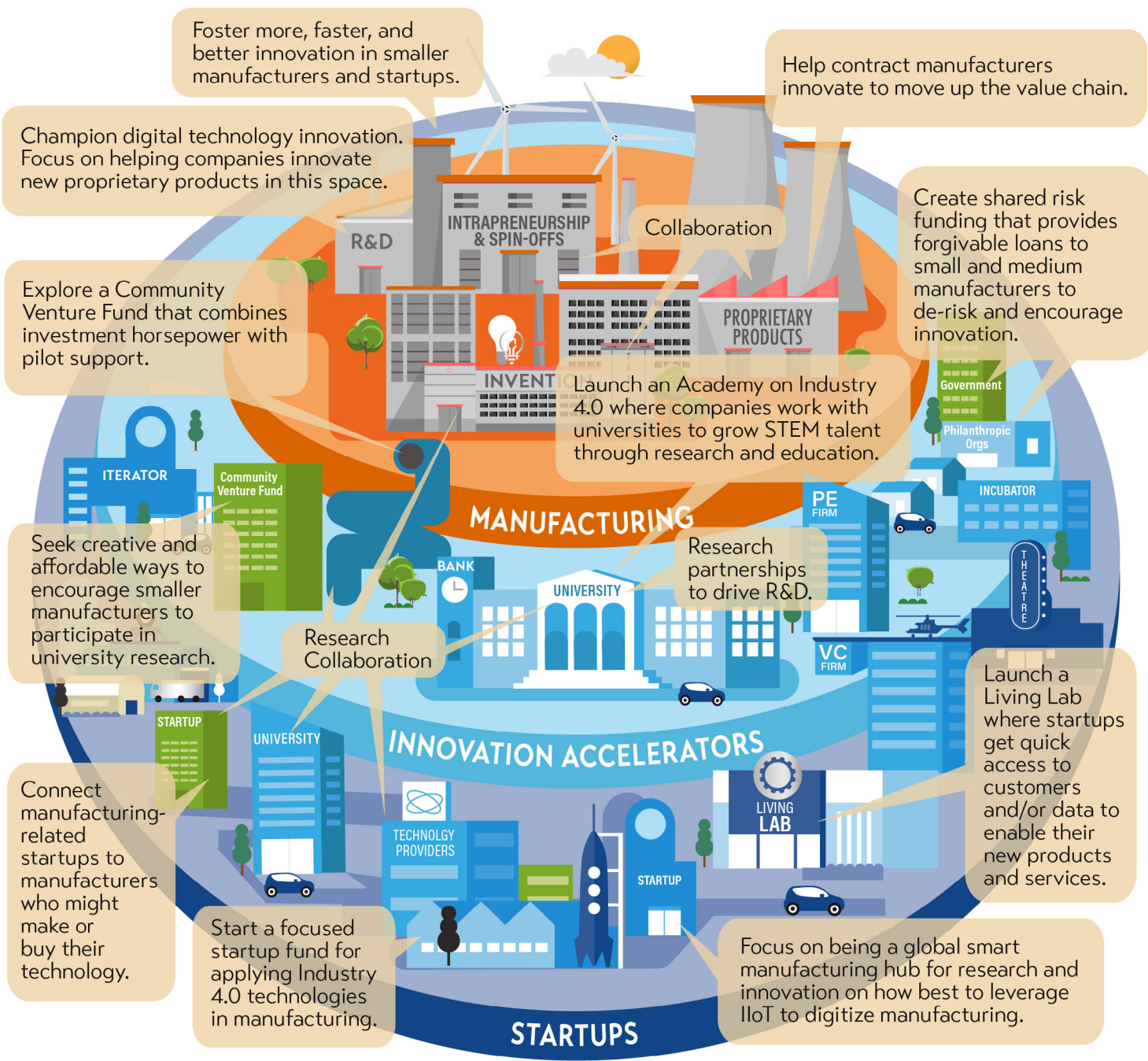


THE PIVOT WE NEED
Order Taker → Innovator



We Need to Build an Innovation Ecosystem to Power Our Future

- Only 14% of manufacturing companies in Northeast Ohio say innovation is core to their strategy.
- Overall, we are falling behind similar sized cities. We have slower growth and less innovation.
- We currently don't have what we need to power a robust Innovation Ecosystem: STEM talent, private and academic R&D, startup density, and seed & venture capital.



- If We Build This...
- NORTHEAST OHIO WILL BECOME THE FIRST CHOICE FOR MANUFACTURING STARTUPS.
 - WE WILL HAVE ONE OF THE HIGHEST RATES OF R&D IN THE COUNTRY.
 - WE WILL LEAD THE WORLD IN SMART MANUFACTURING.



Boldly Lead our Companies and Region

We need bold leadership at every level to lead the world in smart manufacturing.

Like the leadership of LeBron James when he and the Cavaliers ended a 52-year drought by winning the NBA Championship. James motivated his team to one of the most incredible comebacks in sports history to win it all, down to the wire, in Game 7.

Like the captain of Oracle Team USA in America's Cup in 2013. Despite a superstar crew and a \$10 million boat, they were about to lose. They were down eight races to one and then they won nine straight races to take the cup. How did they win? They identified four key things and changed them: strategy, team members, techniques, and boat modifications. They knew that if they made the right changes, they could change the future. They did and we can too. We just have to come together as a team and focus on changing four key things: talent, transformation, innovation, and leadership.

Our manufacturing industry has fought back from the brink many times. We're already masters of the comeback, and we can do it again. We have the vision. We have the legacy. We certainly have the grit and pride. Now we need inspirational leadership at all levels to bring it all together and make it happen – company leadership, industry leadership, community leadership, and government leadership.

Catalyzing this leadership and synchronizing it is probably the single greatest challenge of this Blueprint. We need to partner across companies, communities, and governments. We need to connect existing initiatives, groups, and funding for maximum impact. We need to sail in the same direction so that we all get to a better future, faster.

There is so much great work already happening in workforce development, education, manufacturing, innovation, and Industry 4.0. We don't want to duplicate it – we want to harness it. There are more than 300 organizations in Northeast Ohio working on economic and workforce development. We want to

go from a loose collection of initiatives to a powerful partnership united behind one vision for the future of manufacturing.

It won't be easy. It won't happen overnight. It's going to be messy and incredibly complicated. But the upside is immense. And we can only get there if we work together. We need to start by coming together – collaboration is the only way to drive this kind of complex and multifaceted regional change. We need to work across companies, communities, and governments to create competitive talent solutions; offer the support, incentives, and funding companies need to accelerate Industry 4.0 adoption; and build a world-class innovation ecosystem, together.

We don't want to reinvent the wheel. We want to double down on proven strategies already in place and build what's missing. We plan to focus on scaling collaborations that are working, such as sector partnerships and the Smart Manufacturing Cluster. We also need to leverage the amazing network of large corporations headquartered in the region to directly fund and advocate for more community and government funding for the things we need to do to drive change.

This includes promoting and advocating for the policies and community investments manufacturing needs to thrive. For example, companies can't build the future without the infrastructure of the future. We need a strong, united voice as we work towards better public transportation, innovative solutions to get urban workers to job hubs, reliable utilities, high-speed internet, and better roads – all the scaffolding we need to become a world leader in smart manufacturing.

There is no single voice, no single leader at the helm – no one company, board, or organization can own this strategy. This is something we can only achieve as a team, by aligning our activities, agreeing on outcomes, and pushing progress in the same direction. By leading wherever we are, doing whatever we can to advance the Blueprint and make manufacturing better.

LEADERSHIP

Jergens and Jack Schron: Leading with Education, Integrity, and Inclusivity

Jack Schron Jr. is positive Northeast Ohio has what it takes to be the smart manufacturing capital of the United States, and he's doing his part to help it earn that title — much more than his part, by most measures. As President & CEO of Jergens Inc., a Cuyahoga County councilman, and a longtime leader in the worlds of education, workforce development, and community service, Schron has established himself as a champion of Northeast Ohio's manufacturing evolution.

From his unique vantage point, he believes education coupled with a "big tent" mentality will be the most critical component behind the region's advancement.

"For Northeast Ohio to be a leader in manufacturing, we have to lead with workforce and trained skills. That's instrumental to building a foundation for growth, and it will drive manufacturing businesses here. And the manufacturing community has to open up a big tent. That means welcoming special-needs kids to the manufacturing floor. That means welcoming second-chance individuals who were formerly incarcerated. It means that somebody coming from

the hospitality sector who wants a higher-paying manufacturing job has the opportunity to upskill into the role. We have to be inclusive. We want everyone to be a part of manufacturing," says Schron.

The Schron family company has never hesitated to lead by example. Since Jergens was founded by Jack Schron Sr. in 1942, the company has always tried, as Schron puts it, "to do the right thing for our people, our community, and the environment."

And Jergens has certainly walked the talk when it comes to engaging and training the next generation of manufacturing talent. Schron explains: "Education is in our DNA. Our commitment began when my dad and grandfather took the initiative to train people during World War II so that

Jack Schron Jr. in
Cleveland.



Employees at Jergens in
Cleveland's Collinwood
neighborhood.

they would be able to build parts." Those parts would later prove to be crucial to the war effort.

The company continues to live that commitment because, says Schron, "education raises the level for everyone who wants to enhance their lives, not only those earning degrees, but those who want to learn a skill. That's the fundamental foundation behind all of our training programs, apprenticeships, and internships, and it's why we started Tooling U ©."

Tooling U © was launched by Jergens in 2001 as a response to the looming skilled labor shortage. It sold to the Society of Manufacturing Engineers © in 2010 and is now the largest online manufacturing training platform of its kind, boasting more than half of the Fortune 500 as clients. Over the years, approximately 800,000 students have taken millions of courses ranging from basics like blueprint reading to advanced welding techniques.

Within its walls, Jergens makes a concerted effort to ensure its employees have every opportunity to move up through training and skills development — all paid for by the company.

Schron proudly recounts the story of an employee who began her career at Jergens in the shipping department "with no manufacturing skills whatsoever." She has since moved on to run sophisticated machines, a role in the quality lab and, then became a department supervisor. He is also particularly proud of Jergens' first-of-its-kind program for special-needs students. The students and two full-time teachers spend the entire school year at Jergens, in a factory-floor training facility, learning invaluable career and life skills.

[READ THE FULL STORY](#)

LEADERSHIP

Pierre's Ice Cream Company: Bold Leadership that Puts People and Community First



BEFORE: MidTown Cleveland in the 1980s.



AFTER: Pierre's Ice Cream Company's headquarters helped to transform MidTown.

Pierre's Ice Cream Company started out as a small shop in 1932. Today, it has about 36 million scoops of ice cream in its freezer. The company has moved and expanded many times, but it has always stayed in the MidTown neighborhood, in the heart of Cleveland.

"The whole time we've been within one square mile of our origin. This is our home. And we wanted to support it," says Shelley Roth, President of Pierre's Ice Cream Company. In the 1980s, Pierre's outgrew its factory and needed to build a new one. At that time, MidTown was littered with abandoned buildings, crumbling sidewalks, and vacant lots filled with trash. No one was building anything. There was zero investment. Until Roth made a bold and risky decision to revitalize an 8-acre brownfield site.

"When we made the decision 40 some years ago to do this, we were the pioneers to plant a flag and say, 'Yes, we'll remain here. We'll create a state-of-the-art facility.' We were one of the first companies to have new construction between Cleveland State and Cleveland Clinic. And suddenly, we were designing it with windows and landscaping and nice features to really make a difference. Once we moved in, in '95, it took another 20 years for things to fill in around us. So, we stayed here alone that whole time, knowing eventually it would take hold and now it's really transformed," says Roth.

A strong sense of loyalty – to the community, customers, and employees – has always been at the heart of this family business. And it's actually a business Roth never



Shelley Roth, President & CEO of Pierre's Ice Cream Company in Cleveland with Ray Barlow, Lead Sanitation Team Member.

intended to take over. She moved to New York to work at Atlantic Records, until her dad asked her to come home.

"At the time it was a hard decision because in 1979, Cleveland had just defaulted. I was having a great time in New York City. I was working for a very exciting industry, show biz. But deep down, the most important thing to me was supporting my family and my father. And so, I returned to Cleveland and then really was blessed to have that ability to work side by side with my father in the eighties. He was truly courageous in inviting a daughter to join him because back then, dads weren't inviting their daughters to help, but he had faith in me," says Roth.

Roth personifies the leadership it takes to build and sustain a thriving manufacturing business. Since she's been at the helm of Pierre's, sales have grown exponentially. The company has gone from offering one product in three flavors to more than 235 different products and flavors. And she says there's

no secret recipe for this success – it starts with getting the basics right. Focus on customers. Focus on quality. Develop a team that shares these values. And build a place where people love to come to work.

"I think we have a great team. It's such a pleasure to be here every day and work side by side with the team. When people go to work, they should like what they do, they should enjoy their surroundings and their team members. And we try to create that collaborative atmosphere," says Roth.

[READ THE FULL STORY](#)



Marvin Blythe, Maintenance Technician, Pierre's Ice Cream Company.

LEADERSHIP

Lincoln Electric: Welding a Better World

Lincoln Electric was founded in Cleveland in 1895 with \$200, an invention, and a dream. John C. Lincoln wanted to manufacture his innovative electric motor and build a company where people worked by the golden rule. One hundred and twenty-six years later, Lincoln is still headquartered here in Euclid, Ohio, but it's now the world's largest welding company — a \$2.7 billion multinational corporation, operating in 18 countries with almost 11,000 employees. One thing has not changed though. The company's culture is still centered around the same thing.

"The golden rule — treating others as you want to be treated — it is really simple. And that code of ethics is what is at the heart of successful organizations," says Chris Mapes, Chairman, President & CEO of Lincoln Electric. "When we think about our company, we think first about the culture and the people, then about the products and the processes. Products and processes evolve over time. Our culture is foundationally driven around living and leading by the golden rule. And we know that if we're doing that, everything else follows."

That ethos helped Lincoln gain recognition as one of the *World's Most Ethical Companies* by Ethisphere® for four years running. And it shapes every aspect of how the company treats its people. Lincoln has not laid off a single employee in Northeast Ohio

since the late 1940s. It invests heavily in training and paying for performance. In fact, Lincoln's incentive management system is so unique that several business cases have been written about it by the Harvard Business School.

"All of our employees here in Northeast Ohio are bonus eligible, every one of them. And we have a profit-sharing program for nearly all employees here in Northeast Ohio," says Mapes. "That, foundationally, for me, is a company that cares about its people and recognizes that they can be a big part of the success that we're driving for the company."

Lincoln is known for having exceptionally loyal employees — many who stay with the company their entire careers. But that doesn't mean it's immune to the shortage of skilled workers affecting the manufacturing industry.

"At Lincoln Electric, we're not going to sit around and say, 'There's a skills gap, there's a talent gap, and that means we're not going to be able to execute on our strategy, because we can't find the people we need.' That's just not an acceptable answer. We are going to passionately continue to do the things that we think are critical to be able to overcome that challenge," says Mapes.

This includes raising awareness of great manufacturing careers, sponsoring tuition for employees, and getting involved in innovative

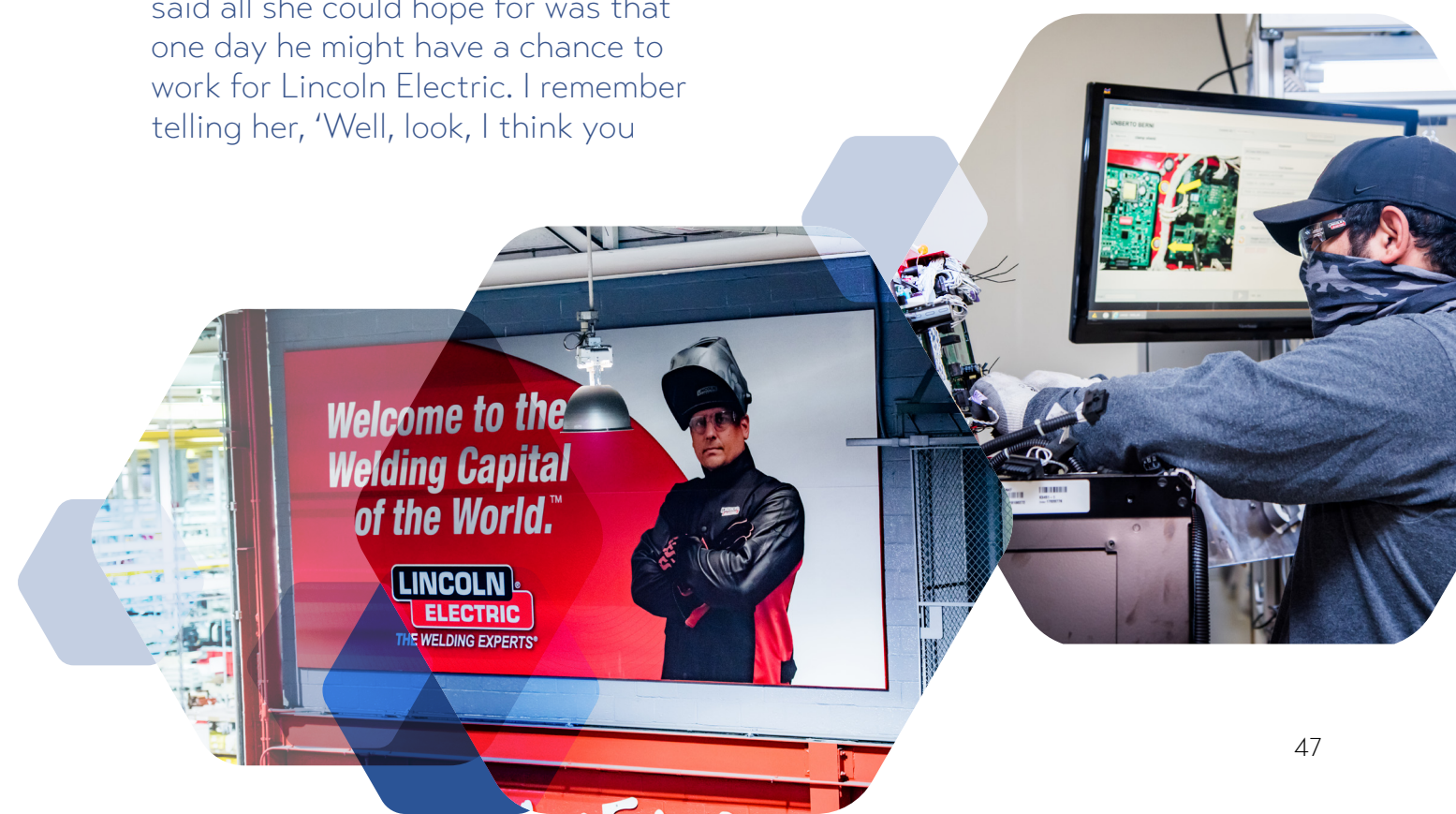
recruiting and training programs like MAGNET's *Early College, Early Career* program, where Lincoln is a founding partner. Mapes says it's been life changing for his company and for the students who get to intern and take college courses in manufacturing while still in high school.

"I saw one of the young men who is in the program, and I sat down, and he introduced me to his mom, and his mom was so proud of him being part of our company and the program. She said all she could hope for was that one day he might have a chance to work for Lincoln Electric. I remember telling her, 'Well, look, I think you

should be very proud, but we need to set the bar higher, because I don't want him to come and just work for Lincoln Electric — I want him to come and be a leader at Lincoln Electric.' And that conversation will always stay with me."

[READ THE FULL STORY](#)

Team members at Lincoln Electric in Euclid, Ohio.



Here's the Leadership We Need to Lead the World in Smart Manufacturing





THE PIVOT WE NEED Individual Initiatives → Powerful Partnerships



Dr. Ethan Karp with
Ohio Governor Mike DeWine
and Lt. Governor Jon Husted.

The Path Forward: Doing the Work

This is a vision for the future of manufacturing in Northeast Ohio. But at the heart of it, it's not really about manufacturing. It's about making life better for every person who lives here. It's about growing our industry so we can live up to our full economic potential and grow the region's prosperity.

If we lead the world in smart manufacturing, here's what our future can look like. Our talent shortage becomes a talent influx. People are lined up for manufacturing jobs, and we are the capital of manufacturing education in the United States. We put everyone to work. Our plants are as diverse as our cities. Manufacturing is a career of opportunity. It gives more people a pathway to prosperity. We are no longer the Rust Belt, we are the Technology Belt. We adopt Industry 4.0 faster than our competition – giving us huge productivity, quality, and lead time advantages. We lead with ideas and innovation. Northeast Ohio is the first choice for manufacturing startups and has one of the highest rates of R&D in the country. As a result, we become a hotbed for investment. And all of this is powered by partnership – companies and communities

working together to solve systemic problems because we all believe that manufacturing is our future.

This vision is bold. It's aspirational. And it's ours to build. We estimate that if we succeed, we can create 3,000 new advanced manufacturing jobs every year. That's 30,000 direct jobs in the next decade, which would support 120,000 indirect jobs in the community. Achieving this would increase Northeast Ohio's manufacturing GRP an estimated \$10 billion by 2030, providing a \$40 billion boost to the regional economy.

To get there, we all need to do the work. Like LeBron James said when he came home to Cleveland, "In Northeast Ohio, nothing is given. Everything is earned. You work for what you have. I'm ready to accept the challenge."

Our challenge is clear. We need to do the work. We need to stand up and use our individual and collective leadership influence to make manufacturing and our community better. We need to lead boldly so that Northeast Ohio can lead the world.

Bringing the Blueprint to Life

1. SHARE

 - Join our campaign to broadly share the Blueprint across the region.
 - Help us win hearts and minds and galvanize our community towards action.
2. ALIGN

 - Join us as a Blueprint Champion.
 - Align your messaging and actions around the four key themes of Talent, Transformation, Innovation, and Leadership.
 - Help foster collective action and build a unified vision of the journey and destination ahead.
3. COLLABORATE

 - Actively work to tie together existing and future manufacturing initiatives.
 - Use the Blueprint as a forcing function to link initiatives, connect the dots on funding, reduce duplication and waste, coordinate messaging, and push collective progress in the same direction.
4. ENGAGE

 - Come together as manufacturing leaders to lead initiatives and provide overall Blueprint oversight. The Blueprint is meant to advance manufacturing, so manufacturing leaders must drive it forward.
 - Convene a group of leading manufacturers to oversee the Blueprint – a group we have named the Manufacturing Innovation Council.
5. MEASURE

 - Set collective targets for success and make sure our strategies, tactics, and initiatives build towards achieving those goals.
 - Work with the Manufacturing Innovation Council and other stakeholders to measure and monitor our progress so we stay on track for success.



“We need bold manufacturing leaders who take risks, invest in talent, technology, and innovation. We need leaders who grow and advance their companies so we can all benefit. And as a region, we need to think about ways to turn chaotic individual initiatives into powerful partnerships. Partnerships that move us in the same direction. Because we really are exponentially stronger when we come together.”

Dr. Ethan Karp, President & CEO, MAGNET

Our Targets

| 5 YEARS | TALENT | TRANSFORMATION | INNOVATION | LEADERSHIP |
|----------|--|--|---|--|
| | 100% increase in graduates from advanced manufacturing programs 3x increase in manufacturing companies on 'Best Places to Work' list 3,000 additional manufacturing jobs filled by women and people of color | 20% of manufacturers piloting advanced manufacturing technologies 100% increase in adoption of advanced manufacturing technology by manufacturers | 2x the number of manufacturing-related startups receiving external funding \$10M increase of seed stage investment in manufacturing startups | 2x increase in talent transformation, and motivation investment 2x increase in the number of collaborating organizations as measured by participation in alliances, councils and clusters \$45M invested in support of diverse ownership transitions 20% increase in people of color and women in manufacturing executive pathway positions |
| 10 YEARS | TALENT | TRANSFORMATION | INNOVATION | LEADERSHIP |
| | All manufacturing jobs filled upon demand | 30,000 new advanced manufacturing jobs created | 2% in manufacturing related GRP growth (above national average) | Manufacturing employment equals the diversity of the population |

Our Vision for Success

- 3,000

new advanced manufacturing jobs every year.
- \$10B increase

in manufacturing GRP by 2030
- \$40B boost

to the regional economy by 2030

(Source: MAGNET analysis)



Make it Better

Learn More: www.makeitbetterohio.org

Join Us: blueprint@makeitbetterohio.org

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