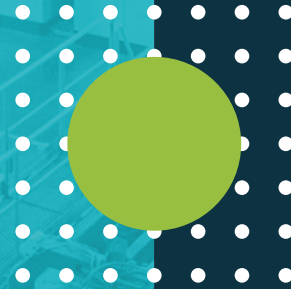


SEPTEMBER 2022

Pennsylvania
Manufacturing
Advisory Council



Pennsylvania's Manufacturing Competitiveness **PLAYBOOK**



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Executive Summary

Manufacturing in Pennsylvania is vibrant, innovative, and a path to economic success for many across the commonwealth. Because manufacturing has been the heart of Pennsylvania's economic engine for more than 250 years, many of Pennsylvania's citizens know more about what manufacturing used to be and not enough about its emergence as a source of technological innovation, great career opportunities, and the economic foundation of many smaller communities. Today, Pennsylvania boasts some 14,000¹ manufacturing companies including household names like Hershey and Crayola; mainstays of industry like US Steel and Westinghouse; leaders in life science like Merck and Sanofi Pasteur, and manufacturing startups like Gilson Snow, one of the world's fastest-growing snow sports companies. Pennsylvania's innovative companies make everything from polarized filters and snowboards to powdered metal parts and sustainable products made from recycled materials.



Photo credit:DMI Companies

A strong manufacturing sector is critical to Pennsylvania's economic growth and essential to the economic success of its citizens. However, the manufacturing sector's foundational role to the Pennsylvanian economy is, and has been, under threat from external sources. The manufacturing sector has encountered a great deal of turbulence in recent years tied to a severe worker shortage, an onslaught from global competitors, and significant pandemic-related supply chain disruptions. Addressing these issues requires public policy attention at the highest levels of Pennsylvania government.

The Pennsylvania Manufacturing Advisory Council was launched in July 2021 with support from Pennsylvania's Department of Community and Economic Development to facilitate and energize attention for manufacturing. The Council seeks to provide a stronger, more unified state-level voice for manufacturers – to tell the story of what Pennsylvania manufacturing is and what it can be.



1. U.S. County Business Patterns, 2020, released April 2022

Manufacturing is an Economic Engine in Pennsylvania



\$113.2
billion (roughly)

Manufacturing is the largest economic sector in terms of the size of its contribution to state GDP. Manufacturing's total GDP in 2021 was roughly \$113.2 billion, 13% of Pennsylvania's economic output.²



\$33.1
billion in goods

In 2020, Pennsylvania manufacturers exported \$33.1 billion in goods—roughly 5% of the total value of goods exported to US Free Trade Agreement partners.³



\$52
billion in goods & services

In 2020, Pennsylvania manufacturers bought an estimated \$52 billion in goods and services from other in-state companies, ranging from iron and steel to warehousing.

Top 10 Manufacturing Buys from Main Street

Groceries \$930 M

Electric Power \$902 M

Lumber & Construction \$804 M

Agricultural Goods \$737 M

Professional Services \$707 M

Legal Services \$673 M

Machinery and Supplies \$651 M

Services to Buildings & Dwellings \$630 M

Real Estate \$580 M

Hardware, Plumbing & Heating \$560 M

\$52 B Spent by Pennsylvania Manufacturers Drives Main Street

2. U.S. Bureau of Economic Analysis, SQGDP2 Gross domestic product by state in current dollars (data estimate as of 2021, Q4).

3. "2021 Pennsylvania Manufacturing Facts," NAM (National Association of Manufacturers, 2021), <https://www.nam.org/state-manufacturing-data/2021-pennsylvania-manufacturing-facts/>.

Many Pennsylvanians Benefit from Manufacturing



9.5%

Manufacturers employed 9.5% of Pennsylvania workers in May 2022, about 562,700 people in total.⁴



33%

Pennsylvania manufacturing workers earn roughly 33% more than the average for other nonfarm businesses in the state.⁵



90%

These higher paying jobs provide workers more than just higher wages; 90% of manufacturing workers have medical benefits.



78%

And 78% receive retirement contributions from their employers.⁶



2.5
workers

Every Pennsylvania manufacturing job helps to support 2.5 workers in the commonwealth, including those hired directly by manufacturing employers, their suppliers, and those providing goods and services to the employer's workers.⁷

4. Current Employment Statistics (U.S. Bureau of Labor Statistics), <https://www.bls.gov/regions/mid-atlantic/data/xg-tables/ro3fx9525.htm>.

5. US Bureau of Economic Analysis, Calculated data from Tables SAEMP25N and SAINC6.

6. "What Does It Mean to Be Made in Pa?: #PAProud Blog," PA Department of Community & Economic Development (State of Pennsylvania, October 2016), <https://dced.pa.gov/paproudblog/mean-made-pa/>.

7. Lightcast: Pennsylvania Economy Overview, Q2 2022 Data Set.

8. Kenneth P. Voytek, "Manufacturing in Pennsylvania: Challenges & Trends," U.S. NIST Manufacturing Extension Partnership, Presentation to Pennsylvania MEP, January 2021.

BUT Pennsylvania is Losing Ground



Pennsylvania is missing opportunities for expanded manufacturing activities. The data show that many jobs and plants left Pennsylvania or opted to expand in other states during the past three decades.⁸



Globalization impacted Pennsylvania's competitive advantage significantly. The commonwealth lost the 3rd most manufacturing jobs due to offshoring or import competition among 53 states and territories between 1994 and 2020.⁹



Manufacturing employment decreased by **0.5%**

Pennsylvania's manufacturing employment decreased by .5% between 2009 and 2020. Had Pennsylvania's industries performed as well as its peers nationally during that period, manufacturing employment would have increased by 7.4%.¹⁰

What Manufacturers Say

Between December 2021 and May 2022, the Council gathered input from over 500 manufacturers who represent the diversity of the commonwealth's regions and industries, through focus groups and a survey, to understand the most pressing issues and opportunities they face.



90%
were currently hiring workers

Finding, hiring, and retaining employees emerged as the most common issue raised by focus group participants. Survey respondents reinforced the prominence of that concern. A full 90% of manufacturers surveyed indicated they were currently hiring workers.

8. Kenneth P. Voytek, "Manufacturing in Pennsylvania: Challenges & Trends," U.S. NIST Manufacturing Extension Partnership, Presentation to Pennsylvania MEP, January 2021.

9. Public Citizen. Department of Labor Trade Adjustment Assistance Consolidated Petitions Database. Washington, DC, <https://www.citizen.org/article/trade-adjustment-assistance-database/>. Database includes all 50 states, D.C., Puerto Rico, and U.S. Virgin Islands

10. Voytek, January 2021.



90%

are currently investing in or plan to invest in automation

Many manufacturers in Pennsylvania are embracing advanced manufacturing strategies to compete and are ready to invest in the factory of the future. Nearly 90% of responding companies reported that they are currently investing in or plan to invest in automation. The greatest obstacle to adopting technology and innovation is the complexity of integrating new technologies into current business practices (53%), followed by limited available capital (45%) and worker skills gaps (44%).



59%

would consider increasing purchases if they charged the same or less than their current supplier

Manufacturers are interested in stronger connections with other manufacturers in the same region. Over half of respondents (59%) reported they would consider increasing purchases from in-state suppliers only if they charged the same or less than their current supplier.



25%

would increase purchases from in-state suppliers even if the supplier charged slightly more

Yet, a significant minority (about 25% of respondents) said they would increase purchases from in-state suppliers even if the supplier charged slightly more than what they were currently paying.



One in Three

see existing business growth, attraction or expansion incentives as helpful.

Only one in three companies see existing business growth, attraction, or expansion incentives as helpful. Almost as many see the state's economic development incentives as either too complicated or simply not sufficiently relevant.



Advanced manufacturing

is the use of innovative technologies to create existing products and the creation of new products, including production activities that depend on information, automation, computation, software, sensing, and networking. (*Manufacturing.gov*)



Three Game Changers for Pennsylvania Manufacturing

Based on what we learned from our engagement with more than 500 manufacturers, the Council recommends three game changers, encompassing ten recommendations, to strengthen Pennsylvania's manufacturing sector:

Game Changer 1

Recapture Pennsylvania's manufacturing competitive advantage by aggressively pursuing manufacturing growth sectors to drive prosperity.

- 1 Make a transformative investment in the ability of advanced manufacturing technologies to solve real-world problems.
- 2 Connect vulnerable companies to local opportunities to grow more competitive clusters and strengthen supply chains.
- 3 Make Pennsylvania more attractive for investing in manufacturing facilities.
- 4 Provide a sustained and unified voice to advise the Governor and legislature on the needs of manufacturers.

Game Changer 2

Invest in the factory of the future to boost the performance of small and medium-sized companies, improve the quality of manufacturing jobs, and provide better career options for more of Pennsylvania's citizens.

- 5 Accelerate the transition to connected factories.
- 6 Deliver training in automation to upskill incumbent employees and to attract new employees to manufacturing careers.
- 7 Support manufacturers as they transition to high-retention work environments.

Game Changer 3

Unleash the power of advanced manufacturing to drive regional prosperity through policies and services that are more responsive to the needs of manufacturers.

- 8 Raise the visibility and impact of regional, private sector-led partnerships.
- 9 Strengthen regional manufacturing workforce pipelines.
- 10 Help local leaders better understand how the development process impacts manufacturing investment.

Why Manufacturing Matters In Pennsylvania

Turbulence in manufacturing during the pandemic years can be traced to a number of factors, but they can be summarized by disruptions due to changes in what consumers demand, how and where goods are produced, to whom they are delivered and how predictably, and the availability of skilled workers to design, produce, or deliver product.¹¹ These monumental supply chain disruptions created inflationary pressures not seen for decades.

Getting manufacturing back on track is critical for Pennsylvania's economy because manufacturing has been the heart of Pennsylvania's economic engine for

more than 250 years. From its earliest days, Pennsylvania translated its natural assets, including access to fertile farmlands, dense woodlands, and raw iron ore inputs from the Great Lakes region, into a powerhouse for producing goods that could be easily shipped to markets across America and the rest of the world.

Ingenuity and innovation are hallmarks of Pennsylvania's advantage and have long been recognized as the key to success. Moreover, Pennsylvania's people are a vital foundation for a sector that has become increasingly reliant on skilled talent with knowledge about how to translate ideas into products and how to get those products to customers in global markets.

Today, Pennsylvania boasts some 14,000 manufacturing companies including household names like Hershey and Crayola; mainstays of industry like US Steel and Westinghouse; leaders in life science like Merck and Sanofi Pasteur, and manufacturing startups like Gilson Snow, one of the world's fastest-growing snow sports companies.

Over the past four decades, Pennsylvania manufacturing has endured seismic shifts. Fierce global competition and rapid advances in technology have transformed many critical industries and products, including food, biopharmaceuticals, locomotives, automotive, and aerospace. While these and related sectors remain vital parts of Pennsylvania's economy, manufacturing's ongoing success depends on its agility in the face of an onslaught from changing market demands, technological innovations, and demographic shifts in both markets and the product-producing talent.



11. Lazaro Gamio and Peter S. Goodman, "How the Supply Chain Crisis Unfolded," *New York Times*, Dec. 5, 2021

Manufacturing is an Economic Engine in Pennsylvania

Manufacturing is the largest economic sector in terms of the size of its contribution to state GDP. Manufacturing's total GDP in 2021 was roughly \$113.2 billion, 13% of Pennsylvania's economic output.¹²

In 2020, Pennsylvania manufacturers exported \$33.1 billion in goods—roughly 5% of the total value of goods exported to US Free Trade Agreement partners.¹³ These new revenues add directly to the state economy because the export activity brings sales dollars back to Pennsylvania to be recycled into contracts for local suppliers, worker pay, and the goods and services that workers buy.

For every \$1.00 spent by manufacturers, there is a total impact of \$1.76 on the overall Pennsylvania economy.¹⁴ And every \$1.00 of income earned by manufacturing workers generates nearly \$2.17 of income for others in the Pennsylvania economy.¹⁵

Many Pennsylvanians Benefit from Manufacturing

Manufacturing is a key to Pennsylvania's prosperity, and it creates economic opportunity for citizens because it offers family-sustaining jobs for so many. Manufacturers employed 9.5% of Pennsylvania workers in May 2022, about 562,700 people in total.¹⁶ Every Pennsylvania manufacturing job helps to support 2.5 workers in the commonwealth, including those hired directly by manufacturing employers, their suppliers, and those providing goods and services to the employers' workers.¹⁷ With a multiplier of 2.5, that means that manufacturers are responsible directly or indirectly for 1.4 million Pennsylvania jobs. That includes those working in manufacturing as well as those employed by Main Street businesses—from accounting and law to car dealerships and hardware stores.

Part of the reason manufacturing is so important is that Pennsylvania manufacturing workers earn roughly 33% more than the average for other nonfarm businesses in the state.¹⁸ The average compensation (including benefits) per manufacturing worker in 2021 was about \$86,129 per year.¹⁹ These higher paying jobs provide workers more than just higher wages. About 90% of manufacturing workers have medical benefits and 78% receive retirement contributions from their employers.²⁰

12. U.S. Bureau of Economic Analysis, *SQGDGP2 Gross domestic product by state in current dollars (data estimate as of 2021, Q4)*.

13. "2021 Pennsylvania Manufacturing Facts," NAM (National Association of Manufacturers, 2021), <https://www.nam.org/state-manufacturing-data/2021-pennsylvania-manufacturing-facts/>.

14. U.S. Bureau of Economic Analysis: *Total compensation includes wage, salaries, and other cash payments or benefits*.

15. *Lightcast: Pennsylvania Economy Overview, Q2 2022 Data Set*.

16. *Ibid.*

17. *Ibid.*

18. *Current Employment Statistics (U.S. Bureau of Labor Statistics)*, <https://www.bls.gov/regions/mid-atlantic/data/xg-tables/ro3fx9525.htm>.

19. *US Bureau of Economic Analysis, Calculated data from Tables SAEMP25N and SAINC6*.

20. "What Does It Mean to Be Made in Pa?: #PAProud Blog," PA Department of Community & Economic Development (State of Pennsylvania, October 2016), <https://dced.pa.gov/paproudblog/mean-made-pa/>.

Many of the customers for Pennsylvania products are international. The \$33 billion in exports to Free Trade Agreement partner countries alone represents nearly 30% of all manufacturing GDP for Pennsylvania. Manufacturing drives local economic activity by bringing new dollars from sales to customers outside the commonwealth that are redistributed to local workers, suppliers, Main Street shops, and state or local taxing authorities. In 2020, Pennsylvania manufacturers bought an estimated \$52 billion in goods and services from other in-state companies, ranging from construction materials and agricultural crops to scientific and legal services.



Photo credit: Pennsylvania Department of Community and Economic Development

Where Pennsylvania is Losing Ground

Globalization impacted Pennsylvania's competitive advantage significantly. Between 1994 and 2020, Pennsylvania lost the 3rd most jobs from manufacturing downsizing due to offshoring or import competition among 53 states and territories.²¹ Pennsylvania's lag has continued even after manufacturing jobs rebounded from the 2008-2009 recession in most other peer states.²² Pennsylvania's manufacturing sector performed worse than expected considering the state's existing industry mix. Rather than lose manufacturing jobs as it did, had Pennsylvania's industries performed as well as its peers nationally between 2009 and 2020, manufacturing employment would have increased by 7.4%.

Opportunities for the Next Generation of Pennsylvanians

As manufacturing evolves, it will provide new and innovative positions for workers. The factory of the future is increasingly technology driven and requires workers with advanced skills – skills not necessarily gained through traditional postsecondary education. Increasingly, manufacturers are investing in digital systems and automated machines that require a new generation of workers who can adapt to fast-changing customer needs and technologies. The factory of the future provides exciting new career opportunities for workers in fields (e.g., robotics technicians, mechatronics engineers, and programmers combined with more traditional assemblers, operators, and production managers), all of which must require computer literacy and intellectually curiosity.

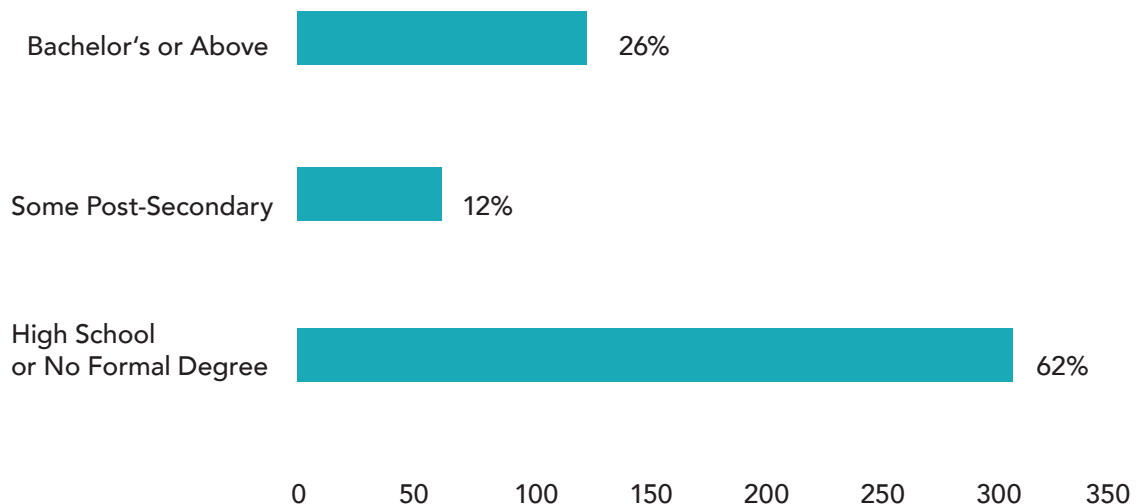
21. Public Citizen. Department of Labor Trade Adjustment Assistance Consolidated Petitions Database. Washington, DC, <https://www.citizen.org/article/trade-adjustment-assistance-database/>. Database includes all 50 states, D.C., Puerto Rico, and U.S. Virgin Islands

22. Kenneth P. Voytek, "Manufacturing in Pennsylvania: Challenges & Trends," U.S. NIST Manufacturing Extension Partnership, Presentation to Pennsylvania MEP, January 2021.

Despite increased technological integration, manufacturing does not necessarily require workers to possess an advanced education. Indeed, most manufacturing jobs in Pennsylvania require no formal academic degree beyond a High School Diploma (62%). Even though only 12% require some post-secondary education and another 26% require a bachelor's degree or above, the remaining jobs will still need workers to have increasingly advanced skills and an ability to adapt and learn that often comes from post-secondary adult learning experiences. While manufacturing currently provides an entry point for careers with little formal education, this dynamic will likely change over time with more advanced skills and education needed to keep up with rapid technological advancements in manufacturing.

Manufacturing has the potential to provide careers for Pennsylvanians from a multitude of backgrounds with an array of skillsets to create products more efficiently than ever before, while benefiting from competitive wages and benefits.

Share of Jobs Requiring Different Levels of Education at Entry



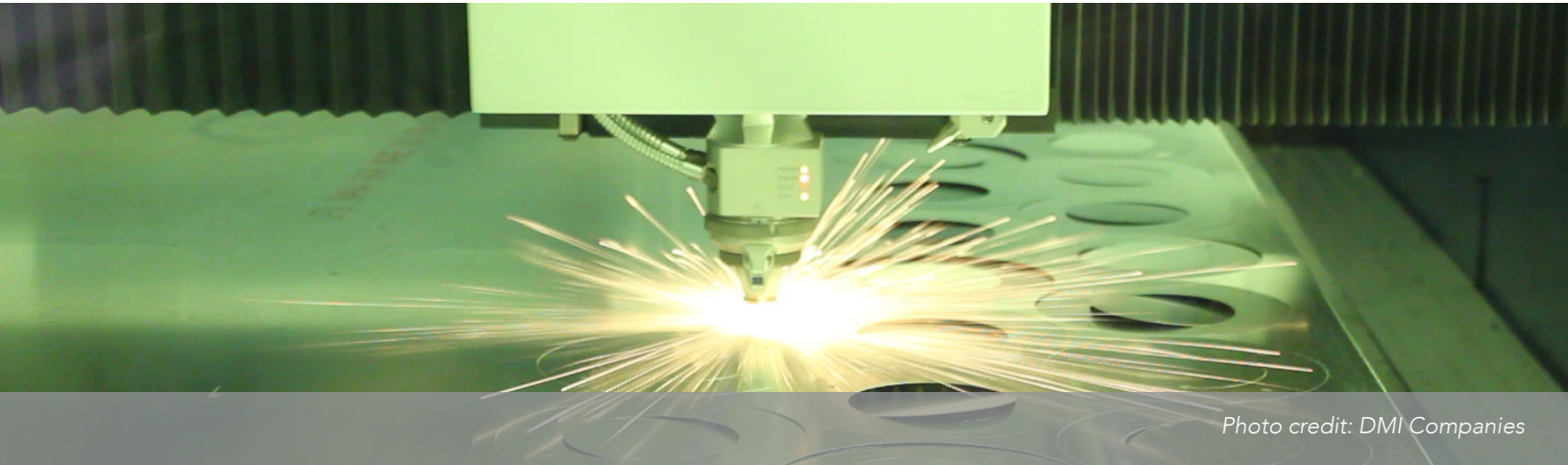


Photo credit: DMI Companies

Three Game Changers For Pennsylvania Manufacturing

The Playbook for Manufacturing Competitiveness is grounded in and responsive to the current challenges and opportunities facing manufacturers in the commonwealth. To gather industry input, the Council hosted focus groups and conducted a survey, together reaching more than 500 manufacturers in the commonwealth. Between December 2021 and February 2022, the Council hosted thirteen focus groups with over 150 manufacturers who represent the diversity of the commonwealth's regions and industries. These focus groups provided initial insights on the most pressing issues facing manufacturers. In April 2022, the Council used those insights to develop a survey to explore four topics that arose during the focus groups as critical to the future of manufacturing: supply chain, workforce, technology adoption, and business environment. Nearly 400 manufacturers across the commonwealth responded.

Finding, hiring, and retaining employees emerged as the most commonly identified issue among focus group participants. Survey respondents reinforced this finding. Nine of ten manufacturers surveyed indicated that they need workers immediately.

Many manufacturers in Pennsylvania are embracing advanced manufacturing strategies to compete and are ready to invest in the factory of the future. Nearly 90% of responding companies reported that they are currently investing in or plan to invest in automation. The greatest obstacle to adopting technology and innovation is the complexity of integrating new technologies into current business practices (53%), followed by limited available capital (45%) and worker skills gaps (44%).

When asked more broadly about why they want to leverage technology and innovation in their enterprise, companies responded that they view technology as their best opportunity to increase workforce productivity in response to expanding consumer demand (55%), automate repetitive or unsafe tasks (44%), lower overall production costs (34%), and improve systems management (31%). It is clear from these responses that automation is being used to enhance, not eliminate, jobs to make them safer, more interesting, and as a result, more desirable.

Manufacturers are interested in stronger connections with other manufacturers in the same region. Over half of respondents (59%) reported they would consider increasing purchases from in-state suppliers only if they charged the same or less than their current supplier. Yet, a significant minority (about 25% of respondents) said they would increase purchases from in-state suppliers even if the supplier charged slightly more than what they were currently paying. These manufacturers seem ready to pay a premium for supply chain reliability, but the proof will be in their actions when they become more aware of opportunities to buy locally.

Pennsylvania has an extensive set of incentives, and some can support companies in addressing these top issues related to new technology adoption, worker skill training, and increased usage of local suppliers. However, only one in three companies see incentives as helpful while almost as many see the state's economic development incentives as too complicated to be useful or simply not sufficiently relevant to pursue. Furthermore, most manufacturers noted that, in general, regulatory restrictions are not overly onerous even though a vocal minority (about 25 percent of firms) see local land use permitting and environmental regulations as significant impediments to growth.

Based on what we learned from our engagement with more than 500 manufacturers, the Council recommends three game changers to strengthen Pennsylvania's manufacturing sector:



Game Changers

Game Changer 1

Recapture Pennsylvania's manufacturing competitive advantage by aggressively pursuing manufacturing growth sectors to drive prosperity.

Game Changer 2

Invest in the factory of the future to boost the performance of small and medium-sized companies, improve the quality of manufacturing jobs, and provide better career options for more of Pennsylvania's citizens.

Game Changer 3

Unleash the power of advanced manufacturing to drive regional prosperity through policies and services that are more responsive to the needs of manufacturers.



Photo credit: Pennsylvania Department of Community and Economic Development



Game Changer 1: Recapture Pennsylvania's Manufacturing Competitive Advantage

While Pennsylvania may be showing modest gains of late, it appears to be missing opportunities for expanded manufacturing activities. For many years, the data show that many jobs and plants left Pennsylvania or opted to expand in other states. By holding national trends constant in each industry, analysis of “competitive effect” can help ascertain how much of Pennsylvania’s growth is due to its diverse mix of industries and how much is due to unexplained competitive factors. Based on an analysis of the commonwealth’s industry mix and overall US manufacturing growth patterns, the number of Pennsylvania manufacturing jobs should have grown by 7.4 percent between 2009 and 2020.²³ Instead, the number of jobs declined by 0.5 percent. Pennsylvania performed worse than several competitor states, including Michigan and Ohio. The analysis found that this cannot be explained by broader national trends in manufacturing. Something not fully explained by the data but unique to Pennsylvania is happening.

Data from the DCED’s On Target Dashboard show that the manufacturing clusters that are largest in terms of jobs and Gross Regional Product (GRP) are also vulnerable and, in some cases, shrinking. Food processing, machinery, plastics, and upstream metal manufacturing are the top clusters in the state based on both GRP and number of jobs in 2021. All these industries, except plastics, are potentially vulnerable and a few are shrinking (e.g., machinery, and upstream metal). The most at-risk clusters have sustained significant employment losses, often at a rate faster than the corresponding national clusters. These include upstream metal, metalworking technology, machinery, automotive, and information technology and analytics instruments. Manufacturing clusters most affected by the pandemic include upstream metal, automotive, machinery, metalworking technology, and plastics manufacturing.

23. Voytek, January 2021.

Top Significant Manufacturing Clusters (Based on Number of Jobs and GRP in 2021)

1	Food Processing and Manufacturing	Jobs: 57,003
2	Production Technology and Machinery	Jobs: 42,276
3	Plastics	Jobs: 37,691
4	Upstream Metal Manufacturing	Jobs: 35,966
5	Automotive	Jobs: 24,795
6	Information Technology	Jobs: 24,075
7	Downstream Metal Products	Jobs: 23,809
8	Metalworking Technology	Jobs: 19,546
9	Biopharmaceuticals	Jobs: 15,170
10	Downstream Chemical Products	Jobs: 13,244

Plastic products are competitive and growing – as are aerospace/defense and downstream metal products. Though these latter two have lower GRP and jobs, this set of industries offers high growth potential relative to other regions and momentum to unlock new markets.

Why does it matter for Pennsylvania citizens?

Manufacturers that lose their competitive edge tend to lose value and reduce their workforce. These decisions don't just impact the owners of their firm or their shareholders, they impact the entire community. Nearly one in every ten Pennsylvania workers – 562,700 people – is employed in manufacturing as of May 2022.²⁴ Based on the market power of manufacturing, these companies not only support local producers supplying the firm, but also local Main Street jobs. The livelihoods of an estimated 1.4 million Pennsylvanians (or nearly one in four workers) rely on the success of the state's manufacturing sector. Furthermore, these jobs typically offer good wages and benefits, including health care. Many of tomorrow's retirees will be able to continue living comfortably due to contributions to retirement programs being made today.

24. Current Employment Statistics (U.S. Bureau of Labor Statistics), <https://www.bls.gov/regions/mid-atlantic/data/xg-tables/ro3fx9525.htm>.

Top actions to take to recapture Pennsylvania's manufacturing competitive advantage:

1

Make a transformative investment in the ability of advanced manufacturing technologies to solve real-world problems.

2

Connect vulnerable companies to local opportunities to grow more competitive clusters and strengthen supply chains.

3

Make Pennsylvania more attractive for investing in manufacturing facilities.

4

Provide a sustained and unified voice to advise the Governor and legislature on the needs of manufacturers.



The pipe line robot at the DMI Monongahela facility lifts on average over 16,000 pounds a day making it essential for the efficient and safe operation of the line.



Photo credit: Pennsylvania Department of Community and Economic Development



How would it work?

- Launch a signature advanced manufacturing sectors initiative with a 100-day sprint.
- Support the creation of new makers and manufacturers.



Make a transformative investment in the ability of advanced manufacturing technologies to solve real-world problems.

In response to the current supply chain crisis, national experts are examining which sectors of the economy will be the foundation for building U.S. competitiveness, looking at sectors such as energy, transportation, agriculture and food production, health preparedness, information communication technologies, and the defense industrial base.²⁵ Forward-looking states are wise to take a similar look at their competitiveness. In doing so, the new Governor should identify one or two compelling real-world problems that a targeted investment in advanced manufacturing would make considerable progress towards addressing and, simultaneously, propel the growth of the commonwealth's manufacturing base. With help from the state legislature, he should propose to make strategic, significant, and transformational investments that inspire achievement and leverage the strengths of existing and emerging manufacturing sectors that help make that vision a reality. This vision builds on the state's strengths but keeps its eye on the future of manufacturing. Pennsylvania needs a governor and leaders who are thinking big about Pennsylvania as a global leader in advanced manufacturing.

Where can Pennsylvania be a global leader? In sectors that bring together and build on the commonwealth's existing areas of research, development, innovation, and manufacturing strength. The goal is to focus Pennsylvania's attention on addressing one or two real-world problems in which Pennsylvania's manufacturing and research ecosystem is on the cusp of helping the world to resolve and, make

25. White House, Executive Order on America's Supply Chains: A Year of Action and Progress, nd, released February 7, 2022.

sufficient investments to propel solutions that leverage the creativity and ingenuity of the companies and institutions that make up state's existing and future economic base to spur the emergence of new sectors that can lead the cutting edge of growth. Advanced manufacturing tools and techniques are at the heart of several sectors that offer Pennsylvania the potential to become a global leader in making things that solve real-world problems, such as:

- **Improving human mobility among aging citizens** through applications of robotics and AI to healthcare – bringing together regional powerhouses in robotics and automation with clinical research occurring at several major medical centers.
- **Developing greater protection against disease** through applications of smart vaccine manufacturing with robotics – bringing together expertise in industrial systems with pharmaceutical production.
- **Securing the safety and reliability of America's food systems** through the application of agricultural technologies, building on Pennsylvania's long history of agriculture and food production and its strengths in cybersecurity.
- **Reshaping Pennsylvania's energy horizons** by deploying energy technology and renewables, recognizing Pennsylvania's long tradition of being on the cutting edge of transitioning to the next generation of energy as new technologies emerge— including recognizing the important role that coal, oil, and natural gas play in revolutionizing industrial energy sources and transitioning to a new energy future.
- **Creating new transportation options** for humans and cargo through the production of next generation unmanned aerial vehicles, building on the state's strong aerospace and defense supply chains as well as emerging new battery storage technologies and production capabilities.
- **Developing America's independence from uncertain access to manufacturing-critical minerals**, tapping into the state's expertise with oil and gas exploration to find ever more valuable natural resources in response to changes in advanced materials design.



Pennsylvania has all the right ingredients to return to global prominence as an

**advanced
manufacturing
powerhouse.**

Pennsylvania has all the right ingredients to return to global prominence as an advanced manufacturing powerhouse: pioneering research universities, innovative global manufacturers, a strong base of small manufacturing companies to build out competitive local supply chains, entrepreneurial individuals willing to tackle new problems, and a robust economic development and workforce system to facilitate companies and people as they pivot to next generation

product opportunities. Pennsylvania could LEAD in advanced manufacturing by making catalytic investments in signature advanced sectors and business approaches, including but not limited to, life sciences, energy, agricultural and food production technologies, and digitalized production processes. Other areas of strength in materials sciences, aerospace and unmanned vehicles, as well as several defense sector technologies might also be leveraged in this initiative.

Catalytic investments would focus on bringing together the ingredients required for the success of key technology areas to solve an agreed upon problem as the foundation for Pennsylvania's most competitive and growing manufacturing sectors. Those investments should give the state's signature sectors a common goal and new strategic direction. Failing this vision, efforts to assist manufacturers will fall flat and will not make the significant difference needed to change Pennsylvania's growth trajectory.

Why does it matter for Pennsylvania manufacturers?

Pennsylvania has hundreds of innovative manufacturing companies that are making things that solve real-world problems. For instance, American Polarizers, a Reading company, makes polarized filters used for skin cancer screening. Or Pittmoss, a Pittsburgh company, uses recycled materials to make potting mixes that reduce the need for watering. These products can make a difference in a way that can transform Pennsylvania. The state needs targeted investments that lift up and transform entire manufacturing sectors that are lagging. What would be the effect of an entire sector of companies focused on solving real-world problems, like food insecurity, the climate crisis, or health epidemics?



How would it work?

Launch a signature advanced manufacturing sectors initiative with a 100-day sprint: The new Governor should convene subject matter leadership and expertise to identify a singular real-world problem in which Pennsylvania's assets – its institutions and its industrial base combined – have the greatest potential to make a transformative impact on a potential solution. In selecting an appropriate "moonshot" problem, that leadership group should consider both the short and long-term impact on the future of manufacturing in Pennsylvania. That means that the selection group strongly consider the role that Pennsylvania manufacturers could play in solving a unique human challenge and how getting ahead of the solution could establish the related sectors as global leaders in designing and producing products.

We recommend launching this signature advanced manufacturing initiative with a single-minded focus: Make Pennsylvania globally known as the leader in selected cutting edge, advanced manufacturing sectors that build on Pennsylvania's strengths.

To see the potential of strategic investments to transform an economy, Pennsylvania needs only to look at its own history and the strategic investments made in the life science industry in the early 2000s. In 2001, Pennsylvania invested part of its multi-billion dollar Tobacco Settlement funding in life sciences research and commercialization, including using \$100 million to create the Pennsylvania Life Sciences Greenhouse Initiative, \$60 million for health and biotech venture capital, and ongoing funding for research as part of the 25-year settlement agreement.²⁶ A 2017 report on the economic impact of the life sciences sector in Pennsylvania found that the industry had generated a direct annual economic impact of \$48.8 billion.²⁷ The Life Sciences Greenhouse Initiative has achieved a 51:5 private-sector leverage of state funding and launched 239 new companies or projects, among which 46 have exited and provided returns to investors and entrepreneurs.²⁸

Other states are making big investments in the sectors that will drive the future of manufacturing. For example, Michigan just made a \$1.4 billion investment in addressing climate change by fostering the transformation of personal transportation. To this end, Michigan is leveraging its global leadership in automobile manufacturing to become a global hub for electrical vehicle manufacturing. Through the Michigan Strategic Fund, the state has already announced more than \$1 billion in incentives to GM and Ford to help retool their production for electric vehicle manufacturing and plan to make more investments to support the transformation required in the automotive supply chain to ensure Michigan remains at the cutting edge for future automotive products.

Support the creation of new makers and manufacturers: Pennsylvania's investment in innovation-based, advanced industry should pay attention to the creation and retention of manufacturing startup companies, especially those that could support this transformative initiative. New manufacturing enterprises experience high start-up costs when compared with other industries; it takes both

more time and more capital for these companies to scale. This poses a significant barrier to raising start-up capital. The Ben Franklin Technology

Partners program makes early-stage investments in technology-oriented companies throughout the commonwealth, but in focus group discussions, manufacturers identified a gap between that early-stage funding and a company being established enough to access funding from banks. Ohio created the Advanced Manufacturing Fund to bridge the funding gap for manufacturing startups



Photo credit: Pennsylvania Department of Community and Economic Development

26. "The State Science & Technology Institute," *The State Science & Technology Institute (blog)*, June 29, 2001, <https://ssti.org/blog/life-sciences-wins-big-pa-tobacco-settlement-plan>.

27. "Pennsylvania Life Sciences Industry - Advance" (KPMG Global Cooperative, *Life Sciences Pennsylvania*, September 2017), <https://lifesciencespa.org/wp-content/uploads/2017/09/Life-Sciences-Pennsylvania-Report-20171.pdf>.

28. <http://palifesciencesgreenhouseinitiative.com/>

through a collaboration between a venture development organization, JumpStart, and the state's Manufacturing Extension Partnership (equivalent to the PA Industrial Resource Centers).²⁹

Other studies have found that manufacturing startups face significant challenges during the scale up of production and often move production abroad as a result. These start-ups need support, information services, and access to facilities for prototyping products and to tools that may be too expensive for a start-up to purchase.³⁰ Innovation Works, the Ben Franklin center in Southwestern Pennsylvania, has a promising approach to this issue that could be expanded and scaled. The Scalable Innovation Program connects manufacturing entrepreneurs with established local manufacturers in the region that can help bring a prototype to production.

Another approach to supporting manufacturing startups is to create and expand business incubators like the Allentown Economic Development Corporation, a manufacturing incubator with the goal of strengthening urban manufacturing in the City of Allentown.

Which organizations could be involved?

The Governor should lead the signature advanced manufacturing sectors initiative and leverage his entire Administration to ensure its success. Team PA and the Pennsylvania Manufacturing Advisory Council could help facilitate engagement with Pennsylvania's manufacturers. The Ben Franklin Technology Partners could lead an effort focused on increasing the number of manufacturing startups and keeping them in the commonwealth.

29. <https://www.manufacturingsuccess.org/advanced-manufacturing-fund>

30. David Adler, Rian Whitton, and James Poulos, "Financing Advanced Manufacturing: Why Vcs Aren't the Answer," *American Affairs Journal*, May 20, 2019, <https://americanaffairsjournal.org/2019/05/financing-advanced-manufacturing-why-vcs-arent-the-answer/>.

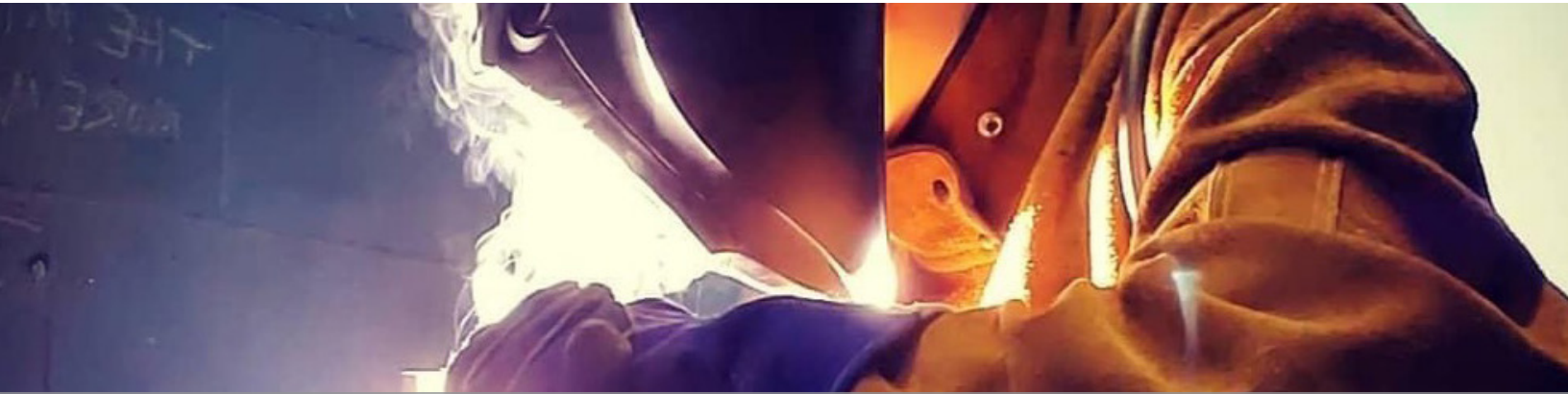


Photo credit: Manufacturers' Association



How would it work?

- Expand or redirect the work of economic developers to provide services that strengthen the resiliency of small and medium-sized manufacturers in an uncertain world.
- Assist companies in lagging sectors pivot to high-growth sectors by providing targeted economic development resources.
- Create or expand networks and tools that connect companies to local suppliers and recycled inputs.



Connect vulnerable companies to local opportunities to grow more competitive clusters and strengthen supply chains.

For the past three decades, the U.S. has developed one of the most sophisticated supply chain networks in the world, relying on suppliers from across the globe. While globalization benefited consumers and helped larger firms drive down costs, smaller companies often lost out. From 1994 to 2020, Pennsylvania lost hundreds of thousands of jobs from private sector outsourcing to companies in other countries (3rd highest job loss among U.S. states). Job loss was most severe from 2000 to 2010, resulting in a “hollowing out” of the domestic supply chain in many key sectors. As new opportunities arose in those sectors (for example during the boom of shale gas in the 2010s or during the pandemic-induced shortage of medical gear and personal protective equipment), Pennsylvania firms did not have the capacity to take advantage. Manufacturers in low-growth, downward-trending sectors or supply chains need support to adapt to opportunities in new, high-growth, prosperous supply chains and sectors.

At the same time, Pennsylvania manufacturers across sectors face supply chain issues that have been made much worse by the COVID-19 pandemic and by deglobalization efforts that have followed, including product scarcity, delivery delays, and lengthy lead times. The coronavirus shock made it difficult for manufacturers to find resin, plastics products, rare earth metals, metal inputs, and many other resources for production. Meanwhile, post-use plastics in Pennsylvania were—until recently—classified as disposable waste, scrap metal is largely thrown into landfills, and rare earth minerals, dredged up by fracking, are left unutilized.

Why does it matter for Pennsylvania manufacturers?

During focus group conversations with Pennsylvania business leaders, it became clear that companies have been so concerned about surviving the disruptions, they have not had the time or resources to build resiliency and flexibility into their supply chains.

Local sourcing can help mitigate risks, strengthen supply chain resiliency, and reduce carbon emissions. Companies need resources and support as they transform their enterprises to compete and succeed in the new economic environment. While manufacturers were, in general, quick to say in focus groups that they are eager to “buy Pennsylvania,” they are willing to do so only if Pennsylvania companies are price competitive. Sixty percent suggested that they would buy in-state only if the costs are the same or less than they are currently paying. Only 25 percent of manufacturers surveyed by the Council indicated that they would increase purchases from in-state suppliers if the supplier charged more than their current out-of-state provider.

Companies prefer local suppliers when they offer an economical option, but they are unaware of the availability of viable suppliers in the state. Most manufacturers surveyed by the Council find new in-state suppliers through referrals (69%) and/or internet searches (62%), very few respondents utilize public intermediaries (such as economic development organizations—5%—or state or local government resources—1%) to find suppliers. The lack of information on local suppliers and their production capabilities is hindering manufacturers' ability to localize their supply chains.



How would it work?

Expand or redirect the work of economic developers to provide services that strengthen the resiliency of small and medium-sized manufacturers in an uncertain world: Pennsylvania can mobilize its wealth of economic development organizations to help companies find new customers, manage and mitigate risk, manage cost uncertainty (inflation, healthcare, energy), prepare better for impact of severe weather on operations, manage supply chain disruptions, and deal with unstable global political environments through enhanced cybersecurity. Those organizations will need resources to enhance their capacity to meet these needs.

Create and expand networks and tools that connect companies with local suppliers: To help companies connect with local suppliers, Pennsylvania can create or expand tools like a supplier database, supplier scouting, and assistance with “total landing cost” price modeling to help companies better appreciate the value proposition that local suppliers offer. A supplier database can provide manufacturers a single point of access to consolidated and standardized supplier information, including production capabilities and certifications. Several states (Michigan, Missouri, Kansas, Florida, Oklahoma, and Utah) are creating state-wide supplier databases that catalog manufacturers' assets, certifications, equipment, material types and other relevant information.

To address this issue, however, will take much more than a database that promotes one-off transactions. Managing, maintaining, and ensuring the accuracy of the data can be extremely costly, and often supplier databases are underutilized due to poor marketing and outreach. As New York has done with its FuzeHub initiative (a one-stop resource for manufacturing expertise, funding, and market solutions), Pennsylvania can help manufacturers build stronger relationships with in-state partners through incentives to participate in regional networks, like Pennsylvania's Next Gen Industry Partnerships, and incentives to make repeat purchases from local suppliers. These networks and tools may be particularly useful to startup companies, a group of companies often overlooked by traditional manufacturing services, but one that offers great potential for strengthening local supply chains.

In 2020, Pennsylvania manufacturers bought an estimated \$52 billion in goods and services from other in-state companies. The largest share of those suppliers are other Pennsylvania manufacturers, wholesalers, and transportation companies. The key is to expand those purchases by setting a target aimed at increasing local purchasing. Even a modest 5% increase in locally sourced goods or services could mean another \$2.6 billion in new business opportunities for existing Pennsylvania companies across every sector of the economy.

Top Manufacturing Suppliers in Pennsylvania

1	Company/Enterprise Management \$4.1B	6	Nonferrous Metal Production \$1.4B
2	Iron/Steel Mills \$3.2B	7	Plastic Products \$1.2B
3	Freight Trucking \$2.5B	8	Animal Production \$1B
4	Warehousing/Storage \$1.3B	9	Animal Processing \$1.1B
5	Converted Paper Products \$1.2B	10	Machine Shops \$948M

Assist companies in lagging sectors pivot to high-growth sectors by providing targeted economic development resources:

More attention is needed to help vulnerable companies while they remain viable. We recommend that the commonwealth proactively classify manufacturers in low-value-add, low-tech, highly competitive subsectors as “distressed” and target those companies for special economic development attention. The focus is on working with companies that still have the will and resources to pivot into new markets. Pennsylvania’s existing network of economic development service providers, especially the Industrial Resource Center Network, are well positioned to help existing manufacturers shift into new product lines or into high-growth supply chains, but they often need to invest much more time with these companies than their current resources may allow.

Connect manufacturers to recycled inputs: Pennsylvania can also help its manufacturers identify potential recycled inputs from local suppliers, helping manufacturers benefit both from localized sources and lower costs. In fact, with inputs like rare earth metals, buying recycled may be the most realistic option for manufacturers looking to reshore in a market currently dominated by Chinese and other firms.³¹

One example that illustrates how a supply chain database might work already exists in Pennsylvania as a best-practice model to build a network of waste-to-input pipelines. The RMC “Circular Merchant” acts as a clearinghouse where manufacturers looking for materials at a reduced rate can trade with companies that need to dispose unneeded materials or meet certain sustainability and conservation goals. The market facilitates trade through a simple-to-use online application which lists materials on offer by category. Between 2015 and 2017, the Recycling Marketplace Center facilitated \$50.9 billion in sales activity and contributed \$22.6 billion to Pennsylvania’s Gross State Product.³²

Which organizations could be involved?

The Pennsylvania Manufacturing Extension Partnership’s Industrial Resource Center Network could work with the Steel Valley Authority and Strategic Early Warning Network to identify manufacturers in need of assistance and partner with industry-led partnerships and regional economic development organizations like Local Development Districts and the Partnerships for Regional Economic Performance (PREP) Network to help manufacturers develop and implement new market entry strategies. Pennsylvania’s Business One Stop Shop could play a role in connecting smaller manufacturers to networks and tools and Ben Franklin Technology Partners can help connect startup companies to local supply chains.

31. Samantha Subin, *The New U.S. Plan to Rival China and End Cornering of Market in Rare Earth Metals*, April 17, 2021, <https://www.cnbc.com/2021/04/17/the-new-us-plan-to-rival-chinas-dominance-in-rare-earth-metals.html>.

32. RMC Progress Summary, “*Pennsylvania Recycling Markets Center (Pennsylvania Recycling Markets Center, 2017)*,” <https://penrrmc.org/summary>.



Photo credit: Schroeder Industries



How would it work?

- Create and market a statewide database of development-ready sites.
- Increase funding for the Business in Our Sites program.
- Provide additional subject matter expertise to local communities to help identify and assemble sites.
- Continue the commitment to lowering the corporate net income tax rate.



Make Pennsylvania more attractive for investing in manufacturing facilities.

With its legacy in manufacturing, Pennsylvania has many sites that were devoted to heavy industry put into place before modern environmental protections and zoning. Repurposing these facilities is often more costly than building on green fields in other places. For the largest investments, companies typically require large sites and considerable planning efforts. However, one of the most significant impediments to large investments is the limited inventory of available sites. Those that may be available typically either must be (re)zoned for manufacturing purposes or have costly brownfields issues that must be addressed.

Why does it matter for Pennsylvania manufacturers?

During focus group conversations with Pennsylvania business leaders, it became clear that the commonwealth is challenged with a lack of appropriately zoned, pad-ready sites in corridors with infrastructure capacity to allow for one or multiple users to expand quickly. To add to the challenge, Pennsylvania firms that have experience with the state and local land use regulation process say that the state is not as responsive to company needs on environmental and construction permitting as it could be.

Developing a large site typically requires a long period of time and extensive pre-development work to ready the site, including the need for access to water, wastewater, energy, rail, or highway interchanges that meet a substantially changed business purpose for the land. For companies looking at major sites, they also assess how development-ready that site is compared with alternative options because lengthy delays tied to rezoning or site preparation can cost the firm time and

money. The goal of this effort is to reduce lead times for companies from the time they make a decision until they can get their facility operating at its full capacity.



How would it work?

Create and market a statewide database of development-ready sites:

Pennsylvania has created a litany of programs to address the needs of businesses seeking to develop a new parcel or expand their facilities, but these programs do not always address the true risks that firms have in finding an appropriate site for large-scale development or expansions. Some states help address this issue by providing structure information about development-ready properties through a statewide database of pre-qualified sites. In some cases, the states develop formal certification processes as part of a process to ensure that advertised sites are indeed fully ready for development. For instance, Indiana, North Carolina, Ohio, Virginia, and Wisconsin created certified sites programs that include a selective database of the best sites for large companies expanding in their targeted sectors. In addition, these and other states have created grant programs to support pre-development work – often tied to the site certification process.

The power of commonwealth engagement in identifying, readying, and/or certifying sites is invaluable. Site selection firms and global prospects seeking large sites value state agencies as a source of information, so the commonwealth has power in its marketing outreach for pad sites. Communities with effective, forward-looking plans are more likely to invest in site preparation. Sites with completed pre-development work have a huge competitive advantage in corporate investment decisions.

Increase funding for the Business in Our Sites program:

Currently, Pennsylvania empowers communities to help build an inventory of ready sites through the Business in Our Sites (BOS) grant and loan program. The program focuses on providing resources for shovel-ready sites in areas that have been zoned for development. Primarily, the program provides grants (or patient loans) to support up to 40 percent of the pre-development costs (up to \$4 million). With limited funding, this program can be critical to leverage local financing for large speculative sites. More funding for this program would be helpful. Also, incentives for natural gas companies in the state could help leverage potential pad-ready sites (with immediate natural gas availability), especially if the site is tied to preferential gas unit pricing or another related incentive.



Sites with completed pre-development work have a huge

**competitive
advantage
in corporate
investment
decisions.**

Provide additional subject matter expertise to local communities to help identify and assemble sites: A key resource need is in facilitating local efforts to develop spec buildings or “pad-ready” sites. These resources might include technical assistance through hands-on engagement with zoning, planning, environmental and building permitting, infrastructure access, or any other site-specific deficiencies. Preparing these sites for ‘typical prospects’ in target or high value industries can help the state attract new firms or encourage existing firms to expand. Business expansion efforts may be particularly important in Pennsylvania where technical resources could help companies with existing facilities find and use state or local programs to address their facility expansion needs more efficiently.

Continue the commitment to lowering the Corporate Net Income (CNI) tax rate: Pennsylvania's Corporate Net Income tax rate is currently the second highest in the nation at 9.99 percent.³³ In focus group discussions, manufacturers identified high corporate taxes as a unique disadvantage to manufacturers in Pennsylvania and recommended that lowering the rate would allow companies to reinvest in their companies and their workforce. The July 2022 bipartisan agreement to lower the CNI tax rate to 4.99 percent by 2031 represents a timely response to manufacturer concerns. Implementing that agreement on time and communicating this historic agreement will help Pennsylvania in its continued competition for manufacturing investment.

Which organizations could be involved?

The Governor's Action Team, a group of economic development professionals at the Department of Community and Economic Development with direct access to the governor, serves as a single point of contact for companies looking to establish or expand operations in Pennsylvania. The Governor's Action Team could lead this effort in collaboration with Pennsylvania's PREP network of business assistance partners and other local organizations.

33. Janelle Fritts, “State Corporate Income Tax Rates and Brackets for 2022,” Tax Foundation, January 18, 2022.



Photo credit: Pennsylvania Department of Community and Economic Development



How would it work?

- Institutionalize the Manufacturing Advisory Council or a similar body.
- Leverage members of the Council as a “dream team” of manufacturing ambassadors.



Provide a sustained and unified voice to advise the Governor and legislature on the needs of manufacturers.

The Pennsylvania Manufacturing Advisory Council was created in 2020 by a group of public and private partners. Led by the Department of Community and Economic Development, key commonwealth leaders participated in a national project with nine other states to improve state support for manufacturing. The Pennsylvania team identified a coordination gap in the services provided to manufacturers in the commonwealth. Though the commonwealth has strong service providers, there had not been a central group that set a common strategy or coordinated work in support of the manufacturing industry.

The Council went through a forming stage led by public sector members and formally launched in July 2021 with public and private members. At that meeting, the Council set a goal of engaging manufacturing leaders and gaining industry knowledge to inform the development of a long-term playbook for manufacturing growth across the commonwealth. Council members were asked to make a commitment through June 2023 to assist with developing the playbook and then educating key policymakers about the need to implement policies that will help manufacturing prosper in Pennsylvania.

Why does it matter for Pennsylvania manufacturers?

In addition to developing a Playbook for Manufacturing Competitiveness, industry members identified an opportunity for the Manufacturing Advisory Council to serve as an integrated voice and resource to help regions avoid duplication and better share ideas.



How would it work?

Institutionalize the Manufacturing Advisory Council or a similar body: The next governor of Pennsylvania can demonstrate commitment to the success of manufacturing in the commonwealth by institutionalizing the Council or a similar body to represent the voice of manufacturers in public policy.

To be an effective voice of manufacturers, we recommend that the Council have:

- Direct access to the Governor, through a position such as a Manufacturing Ombudsperson or Chief Manufacturing Officer, who has private sector manufacturing experience;
- A strong connection to regional Next Gen Industry Partnerships;
- Private-sector co-chairs appointed by the governor;
- A majority of private sector members;
- Ex officio representation with non-voting public members that have direct impact on relevant public policy domains;
- Permanent staff; and,
- A clear mission and charter that describes what is expected of the Council on an ongoing basis.

Leverage members of the Council as a “dream team” of manufacturing ambassadors:

Given the recommendations of this Playbook, a clear mission for the Council is emerging. There is an opportunity for a private sector-led Council to collaborate with government to:

- Create and lead an ambassador program deploying manufacturing executives to help recruit new companies, investments, and expansions to the commonwealth;
- Promote advanced manufacturing (i.e., Industry 4.0) technologies to other manufacturing companies;
- Provide unfiltered feedback to government leaders about the effect of business incentives or efforts to reduce overall tax burden; and,
- Champion Pennsylvania-made products and solutions to state agencies that are currently procuring similar products from out of state.



A statewide campaign to modernize the image of manufacturing

should be led by the private sector.

The Council could partner with the Governor's Action Team to assemble an elite team of government officials, Pennsylvania's Manufacturing Officer (or Manufacturing Ombudsperson) and C-level executives from the commonwealth's top manufacturers to visit corporate offices – both elsewhere in the United States and overseas – of larger corporations with production facilities in Pennsylvania to ensure that their Pennsylvania-based facility is top-of-mind for expansion, modernization, and growth. The same team could assist with business attraction efforts targeted at new manufacturers.



The Council should lead a marketing campaign focused on the importance of manufacturing to the commonwealth. Currently, manufacturers believe that Pennsylvania lacks a cohesive message/brand and strategy that is needed to attract talent, new companies, and residents to the state. Almost 75 percent of manufacturers recently surveyed by the Council think that a statewide campaign to modernize the image of manufacturing should be led by the private sector. There is an urgent need to act now as other states are gaining attention for their manufacturing sectors and young people are increasingly interested in the field, particularly where it can serve as a springboard to meaningful careers.³⁴

Promoting manufacturing means telling the stories of the companies and the people that work for them. Raising the profile of leading Pennsylvania-based manufacturers has the potential to attract investment and talent to the manufacturing sector and bolster the profile of companies that are generating innovations, adopting, and producing new technologies and tools.

Which organizations could be involved?

First and foremost, manufacturers should be involved. They should represent the diversity of the commonwealth's manufacturing base in company size (including startup companies), industry sector, and region. They should meet certain conditions for membership – they should not be retired; they should not be consultants. They should be engaged in regional private sector-led partnerships.

The Governor should lead by engaging key manufacturing CEOs to participate in working, not figurehead, positions on the Council and by creating a structure that is seen as nonpartisan. To fully position the Council as industry-led, we recommend that the Governor's office should lead a process to transition the Council to majority private sector membership, with public partners participating as non-voting, ex officio members.

34. "Deloitte and the Manufacturing Institute: Big Gains in Perceptions of US Manufacturing as Innovative, Critical and High Tech – Press Release," Deloitte United States, March 30, 2022, <https://www2.deloitte.com/us/en/pages/about-deloitte/articles/press-releases/deloitte-and-the-manufacturing-institute-big-gains-in-perceptions-of-us-manufacturing-as-innovative-critical-high-tech.html>.



Photo credit: DMI Companies



Game Changer 2: Invest in the Factory of the Future

The factory of the future is capital intensive, driven by data shared through interconnected devices across the supply chain, and staffed with highly skilled workers focused on responding to rapidly changing markets. It is already here today for many companies, but not for all. Some small and medium-sized companies will need assistance making the transition to the factory of the future. This is a crucial transition for companies to make not just to stay competitive, but to boost their performance, improve the quality of their jobs, and provide better career options for more of Pennsylvania's citizens. This will require investing in a connected factory that looks very different than what many Pennsylvanians imagine manufacturing to be.

Historically, Pennsylvania has been a leader in innovation due to its global industrial base working closely with a robust university system that generates significant R&D. Investments in innovation and technology have helped manufacturers respond to changing markets, lead in developing new technologies, and remain competitive. The manufacturing sector tends to dominate industry investments in R&D spending, and Pennsylvania's firms are more likely than those in other states to invest in industry R&D. Pennsylvania businesses take a leading role in executing and investing in R&D, accounting for almost 70 percent of all R&D spending and funding almost 88 percent of that R&D with their own spending.³⁵



87%

of Pennsylvania manufacturers are currently investing in or plan to invest in automation.

Manufacturing innovation and productivity face several threats, including competition from abroad that could displace firms in the Pennsylvania manufacturing ecosystem. Recent

35. Bureau of Economic Analysis: U.S. R&D Expenditures, by state, performing sector, and source of funds: 2018.

studies found that manufacturers' productivity in traditional industries (e.g., fabricated metals) declined relative to foreign competitors in part because **Pennsylvania companies are slower to adopt productivity-enhancing technologies.**³⁶

For small and midsize companies, customer needs drive innovation: unreliable customer demand or weak signals from customers can lead to missed opportunities to upgrade and invest. Where innovation is focused on process improvements to current product lines rather than wholesale re-imagining of production methods, there may be missed opportunities to introduce new technology and ground lost to companies that are new-to-market and adopting new business models.

Nearly 90 percent of businesses that participated in the Council's recent survey of Pennsylvania manufacturers are currently investing in or plan to invest in automation.

There are several drivers impacting manufacturers' plans for investing in automation. According to the Council's recent survey of Pennsylvania manufacturers, the current shortage of technical talent was a top driver for investing in automation for 17 percent of the respondents. Following close behind were companies that are investing in automation to improve product quality or value (15%), to respond to growing demand for products (15%), and to automate highly repetitive tasks (14%). When asked more broadly about best opportunities to leverage technology and innovation, companies responded that their biggest opportunities are increasing workforce productivity (55%), automating repetitive or unsafe tasks (44%), lowering costs (34%), and improving systems management (31%). It is clear from these responses that many companies are using automation to enhance (rather than eliminate) jobs by making them safer, more interesting, and as a result, more desirable. Respondents were not as likely to prioritize developing new products (23%), improving data analysis (7%), increasing cybersecurity (5%), and decarbonization (2%) as potential opportunities.

Efforts to accelerate the transition to connected factories and the adoption of advanced technologies must go hand-in-hand with a commitment to deliver training in automation to upskill incumbent employees. In Pennsylvania, about forty-four percent of manufacturers surveyed by the Council said a lack of skill somewhere in their workforce was an obstacle to adopting new technology. Pennsylvania is 21st in the nation in robotics adoption, but only 1 in 10 workers have been exposed to robotics.³⁷

When asked what the factory of the future entails in focus groups, manufacturers responded that it is more than advanced technology. They described a place where people thrive – where investing in automation allows them to pay higher wages, where manufacturing careers have purpose, where employees have better work-life balance, and where they are tapped into previously unreached or underrepresented

36. Simeon Alder, David Lagakos, and Lee E. Ohanian, "The Decline of the U.S. Rust Belt: A Macroeconomic Analysis," *SSRN Electronic Journal*, August 2014, https://www.atlantafed.org/-/media/documents/cqer/publications/workingpapers/cqer_wp1405.pdf, 28.

37. U.S. Census Bureau, *Annual Survey of Manufactures Industrial Robotic Equipment: 2018*

Connected Factories and Automation Skills Foundational to the Factory of the Future

Connected factories are the result of the process of “digitalization,” a term which describes the transformation of modern manufacturing through the adoption of digital technologies such as robots and cobots, automation, high-sensitivity sensors, additive manufacturing, artificial intelligence, and business software systems that use data analytics and machine learning for warehouse management, production forecasting, and inventory management. Digitalized industrial production can be reflected in every phase of the manufacturing process: simulation and modeling during the design phase, real-time adjustments to computer programmed assembly activities, and just-in-time inventory controls. Digitalization includes, but is not limited to, what some describe as Industry 4.0, the industrial internet of things (IIoT), or smart manufacturing, and it is ever evolving.

(Additional Resource: Stephen Ezell, “Why Manufacturing Digitalization Matters and How Countries Are Supporting It,” Information Technology and Innovation Foundation, April 2018.)

Automation describes the application of machines to the production process to handle repetitive or mechanical tasks and to improve efficiency and productivity. In today’s environment, automation typically involves using computerized systems to manage equipment. As such, it changes the skills needed to make things, from the engineers programming machines to the machine operators on the plant floor. The skills needed also depend on the stage of automation adoption. Automation represents an entire spectrum of constantly advancing computerized systems. At one end of the spectrum is fixed automation, in which a system performs a single repetitive task, like installing a pneumatic cylinder with a push button on a line or machine. Computerization can help increase the production process by using programming language to direct equipment to respond more flexibly and to integrate more easily automated processes into production. At the most advanced end of the spectrum, lines operated by industrial computers can complete a series of specialized tasks alongside workers. The skills required in these environments are technical and interpersonal; both are necessary to maintain operations and troubleshoot mechanical failures.

(Additional Resource: Automate Team, “12 Automation Trends Redefining Manufacturing Today,” April 11, 2022.)

populations. For example, during focus group discussions, a company in Erie described their success in hiring from the growing immigrant and refugee community to meet their labor needs. For some companies, the “factory of the future”³⁸ means transitioning to renewable energy sources or finding ways to decarbonize their production process.³⁹ **Perhaps most importantly, manufacturers emphasized that the factory of the future is no longer something that might happen in the distant future; the most competitive companies are implementing the factory of the future now.**

Why does it matter for Pennsylvania citizens?

Nearly 10,700 Pennsylvania manufacturers (or more than 80% of the 14,000 companies) have 49 or fewer employees.⁴⁰ These are the backbone of the state’s supply chain, providing specialty goods and services to Original Equipment Manufacturers (OEMs) that keep production lines moving. They typically have the greatest agility to adapt when customers demand new products because a large customer order can be the difference between surviving or thriving. These smaller firms are also important employers providing a critical entry point for new-to-career manufacturing workers and important local champions for career and technical education. They also tend to provide foundational cross-training and skill building for employees that must learn to become masters of many trades simultaneously. As these companies adopt the factory of the future, they will be able to provide Pennsylvania citizens with higher quality, higher paying jobs. Moreover, a shift to high-retention employment strategies will involve providing more flexible shift schedules or other initiatives to expand the talent pipeline by better aligning these jobs with approaches to overcome barriers to rewarding manufacturing careers.

38. Daniel Küpper, Kristian Kuhlmann, Sebastian Köcher, Thomas Dauner, and Peter Burggraaff, “The Factory of the Future,” Boston Consulting Group, December 6, 2016.

39. Ezell, Stephen, *Policy Recommendations to Stimulate U.S. Manufacturing Innovation*. Information Technology and Innovation Foundation, May 18, 2020

40. U.S. County Business Patterns, 2020, released April 2022

Top actions to invest in the factory of the future:

- 5 Accelerate the transition to connected factories.
- 6 Deliver training in automation to upskill incumbent employees and to attract new employees to manufacturing careers.
- 7 Support manufacturers as they transition to high-retention work environments.



Leslie Maier, Manufacturing Engineer (left), and Max Wyerman, Software Design Engineer (right), are working together on upgrades to an Automated Tilt Sensor Testing System. This collaborative robotic system runs autonomously, testing thousands of sensors every day to ensure the performance meets The Fredericks Company's strict quality standards.

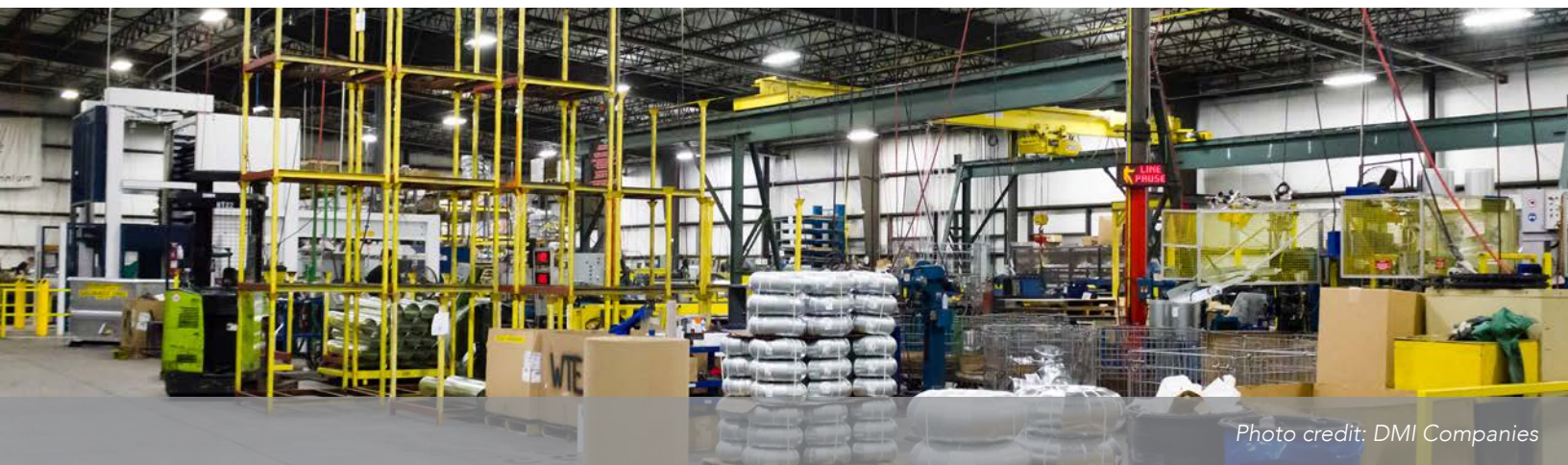


Photo credit: DMI Companies



How would it work?

- Increase awareness of and funding for existing tools and resources.
- Provide financial incentives to lower the risk for companies to test and adopt automation technologies.
- Connect manufacturers to national networks of expertise. Invest in cybersecurity.



Accelerate the transition to connected factories.

Connected factories are more productive because increasingly automated tasks rely on computers that allow equipment to interface with human operators and with one another, ensuring that (1) customer needs are communicated more effectively, (2) product and process customization is executed more quickly, (3) repetitive tasks are accomplished more precisely, and (4) equipment maintenance issues are identified earlier to reduce production disruptions. Transitioning to a connected factory requires a transformation of manufacturing operations in every phase of the manufacturing process: simulation and modeling during the design phase, real-time adjustments to computer-programmed assembly activities, and just-in-time inventory controls. These system advances make companies more efficient and flexible. They also require new work processes, skills, and advanced technologies.

Why does it matter for Pennsylvania manufacturers?

These advanced systems are currently out of reach for many companies, especially small and medium sized companies. Studies at the national level find that small and medium sized manufacturers are often aware of these so-called Industry 4.0 technologies and are at various stages of adoption, investment, and deployment, but they encounter many challenges in implementing these technologies.^{41, 42} In Pennsylvania, about fifty-three percent of manufacturers surveyed by the Council said the complexity of integrating new technologies into current business practices is an obstacle to embracing them.

41. Mayank Agrawal et al., "Industry 4.0: Reimagining Manufacturing Operations after COVID-19," McKinsey Company, July 29, 2020, <https://www.mckinsey.com/business-functions/operations/our-insights/industry-40-reimagining-manufacturing-operations-after-covid-19>.

42. Justin Rose et al., "Sprinting to Value in Industry 4.0," Boston Consulting Group, December 8, 2016, <https://www.bcg.com/publications/2016/lean-manufacturing-technology-digital-sprinting-to-value-industry-40>.

About forty-four percent of surveyed manufacturers said a talent gap somewhere in their existing labor force was the critical obstacle to moving forward with technology adoption. More specifically, respondents cited skill gaps among their operators (29%), management (15%), maintenance staff (13%), and engineers (6%). Beyond workforce, companies cited other common obstacles, such as limited capital (45%) and the high cost of acquiring and deploying new technology (38%). About 14% of respondents reported limitations among their suppliers in using new technologies as an impediment while another 18% cited a complete lack of knowledge about available technology suppliers.



How would it work?

Increase awareness of and funding for existing digitalization tools and resources:

Industrial Resource Centers provide manufacturers with critical services foundational to connected factories, including new technology demonstrations, existing technology or process adoption assessments, as well as planning and research to identify which technologies best meet manufacturers' needs. More companies need to be aware of these services. The Pennsylvania IRCs in collaboration with specialty research centers are best positioned to help companies with technology integration, but they lack resources to help companies implement a new technology once it has been purchased by the company. In fact, the IRCs are currently funded at their lowest levels since inception in 1988.

Provide financial incentives to lower the risk for companies to test and adopt automation technologies:

Capital needs are an important impediment according to almost half of surveyed manufacturers. Pennsylvania has an allocation of more than \$200 million through the State Small Business Credit Initiative (SSBCI), a US Treasury program funded under ARPA. These programs are designed to leverage more than \$2 billion in private capital to support the state's small business sector. Manufacturers are eligible to receive financing through this program, but the commonwealth may need to target technical assistance to for-profit and nonprofit entities to ensure eligible companies develop creditworthy proposals.



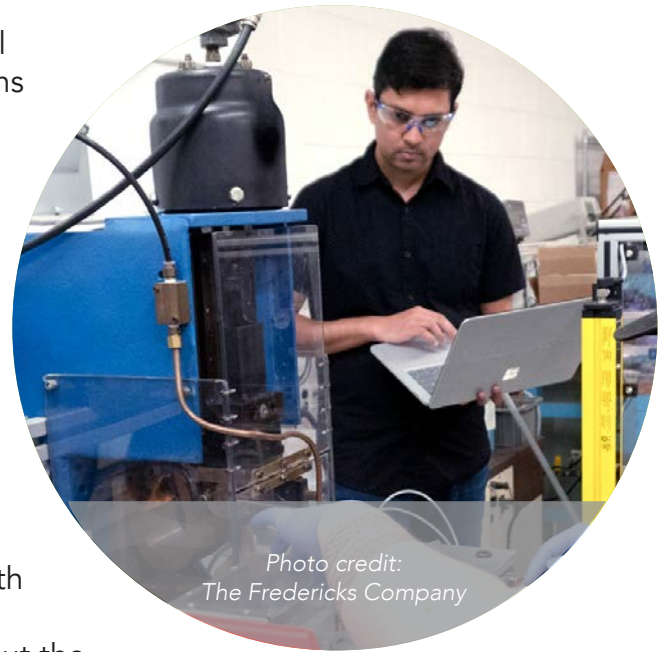
53%

of manufacturers surveyed by the Council said the complexity of integrating new technologies into current business practices is an obstacle

To address this issue, Minnesota designed a specialized program focused on encouraging manufacturers to adopt new technologies or to test new business models. Using \$12.5 million of its \$97 million SSBCI allocation, Minnesota created a special Automation Loan Participation Program to help lower the risk for private lenders financing new automation and to make available lower interest rates offered to companies seeking out the financing for that investment.

Furthermore, the terms of the Minnesota loans will allow repayments to be deferred for 6 to 12 months while companies take delivery, set up, and train their workers on new equipment. No new job creation is required for companies receiving loans. Instead, the focus is on retaining existing jobs and retraining incumbent workers on new equipment or on new production processes.

Pennsylvania needs to redouble its efforts to encourage small and medium-sized manufacturers to transition to connected factories as well as financing resources to help those companies afford to make the investment. Currently, Pennsylvania provides manufacturers with access to some tools and technical assistance that assist with technology adoption and integration, but the state has not made a significant investment in ensuring that manufacturing companies in the commonwealth are adopting the technologies that will be needed to ensure their growth and survival.



The Manufacturing PA Innovation Program, funded through the Manufacturing PA initiative, helps place undergraduate and graduate student fellows at Pennsylvania universities with manufacturers to advance new products or process improvements. It does not provide financial incentives to the company to test and adopt automation technologies. Pennsylvania's Machinery and Equipment Loan Fund provides a foundation for an initiative but has been underfunded and is not targeted to technology adoption, leaving a significant gap that needs to be addressed.

Programs that offer a financial incentive to manufacturers to lower the risk of testing and adopting technology are limited both in funding amount and in statewide reach. Companies in Southwest and Northeastern Pennsylvania can access financial incentives to adopt technology through the Ben Franklin Technology Partners program, which provides funding for technology-based, enterprise-wide innovation. In Northeastern Pennsylvania, some of this funding is targeted to provide manufacturers with one-to-one matching grants (up to \$25,000 per project, for a total not to exceed \$50,000 per client). The grants help companies update their manufacturing processes, develop new products, or improve existing products. The Ben Franklin Center in Southwest Pennsylvania, Innovation Works, offers manufacturers an Innovation Adoption Program with grants of up to \$25,000 to develop or adopt a new process, product, or technology. These programs could be scaled to provide access to manufacturers across the commonwealth.

Other states are making large scale investments in accelerating technology adoption among manufacturing companies. Connecticut's Manufacturing Innovation Fund provides vouchers that help manufacturers defray the significant costs of investing in

a wide array of state-of-the-art manufacturing advances from specialized equipment and workforce training to research and development and marketing. The voucher program launched in 2015 with a \$3.5 million investment. In fiscal year 2021, Connecticut provided \$23.8 million through the manufacturing voucher program, which was matched three-to-one with \$69.8 million from participating companies. Seventy-five percent of those funds were used for equipment.⁴³

Between 2020 and 2021, Indiana invested \$4 million in Manufacturing Readiness Grants to Indiana manufacturers to support the integration of smart technologies through \$200,000 one-to-one matching grants.⁴⁴ In response, budgeting for technology adoption among participating companies has nearly doubled. The program has been so successful that Indiana has committed an additional \$20 million through fiscal 2023.⁴⁵ Similarly, Michigan is providing small manufacturers with \$25,000 one-to-one matching grants to support the adoption of eligible Industry 4.0 technologies.⁴⁶

Connect manufacturers to national networks of expertise: Pennsylvania can also address lagging investments in industrial digitalization by doing more to connect manufacturers, particularly smaller manufacturers, with the national networks such as the MEP National Network, the National Institute of Standards and Technology, and Manufacturing USA institutes. Manufacturing USA is a national network of 16 sector-specific innovation institutes that were created to spur large scale public-private collaboration on technology, supply chain, and workforce development. The Advanced Robotics for Manufacturing (ARM) Institute is in Pittsburgh. Four institutes are in adjacent states.

Other states are trying to leverage these Institutes for their companies. For instance, Massachusetts has invested over \$80 million in advanced manufacturing projects that leverage the technological expertise of the Manufacturing USA network. The Massachusetts Manufacturing Innovation Initiative (M2I2) funds capital projects that are related to Manufacturing USA Institutes. Universities or companies partnering with universities are eligible for funding for capital projects that include developing new technology platforms or systems, acquisition of land and existing facilities, construction and renovation of buildings, or salaries of staff directly engaged in planning and managing capital projects. As part of their own membership in the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), North Carolina and Delaware offset membership fees for small companies and startups to access the institute, which is based in neighboring Delaware. Likewise, the University of Northern Iowa Metal Casting Center, Youngstown State University, and the National

43. Connecticut Manufacturing Innovation Fund Annual Report, 2021, https://portal.ct.gov/-/media/DECD/Business-Development/05_Funding_Opportunities/2021-MIF-Annual-Report.pdf.

44. "Programs" Overview (Indiana Economic Development Corporation, n.d.), <https://www.iedc.in.gov/program/economic-activity-stabilization-and-enhancement/overview>.

45. Manufacturing Readiness Grants," Conexus Indiana (Conexus Indiana, March 10, 2022), <https://www.conexusindiana.com/advancing-industry/manufacturing-readiness-grants/>.

46. Michigan Business (Michigan Economic Development Corporation, May 9, 2022), <https://www.michiganbusiness.org/press-releases/2022/05/funding-available-support-small-manufacturers-statewide-adopt-industry-4.0-technologies/>.

Center for Defense Manufacturing and Machining are collaborating on a national \$10 million initiative to encourage Industry 4.0 technology adoption like robotics, artificial intelligence, and 3D printing among the Defense supply chain for metal casting. They are developing new curriculum for workers as well as guiding business executives on how companies can prepare to adopt advanced metal casting technologies.⁴⁷

Match companies that are lagging in the transition to connected factories with mentor companies that have navigated the transition successfully:

In focus group discussions, Pennsylvania manufacturers expressed interest in a program or incentive that would match Pennsylvania companies in a mentorship program in which companies that are farther along in the technology adoption process could help other Pennsylvania companies navigate the process. This effort will require identifying leading companies willing to serve as mentors as well as an incentive for them to participate. In designing such a program, it may be helpful to learn lessons from the SCORE Foundation, which evolved from the Senior Corps of Retired Executives (SCORE) and receives support from the US Small Business Administration, philanthropy, and thousands of volunteers.

Invest in cybersecurity to protect companies against cyber-attacks as they transition to connected factories:

One of the greatest risks facing most small and medium-sized manufacturers, especially as they digitalize, is cyberattacks. Increased data sharing may enhance corporate decision making and improve productivity, but it also comes with risks that must be recognized and managed. In focus group discussions, manufacturers recognized the need to improve cybersecurity, but identified the financial cost of a cybersecurity gap analysis as a significant barrier to entry for smaller companies. Cybersecurity consultants can be extremely costly, variable in quality, and unfamiliar with the particular needs of SMEs. Moreover, many companies do not know how to access support from the state. The Council's survey of manufacturers showed that only 5 percent of the respondents were using technology and innovation to increase cybersecurity. Financial support and technical assistance resources can ensure that companies incorporate cybersecurity as an integral part of their management operations.

Which organizations could be involved?

Organizations like the Ben Franklin Technology Partners and the Pennsylvania Manufacturing Extension Partnership's Industrial Resource Center Network will be important leaders in this effort by increasing awareness among manufacturers, providing access to tools and qualified resources, and acting as a gateway to networks like NIST, the MEP National Network, and the Manufacturing USA Institutes. Manufacturing associations that are active in economic development and workforce efforts and industry-led partnerships can play an important role in raising awareness, sharing best practices, and matching companies that are interested in a mentoring program.

47. National Center for Defense Manufacturing and Machining, "UNI, national partners launch major Industry 4.0 technology initiative," April 19, 2022.



Photo credit: Pennsylvania Department of Community and Economic Development



How would it work?

- Create opportunities for students to gain experience in emerging occupations through paid work-based learning.
- Provide customized upskilling training programs.
- Expanding the WEDNet program to provide a higher level of reimbursement for advanced technology training.



6 Deliver training in automation to upskill incumbent employees and to attract new employees to manufacturing careers.

Innovation in manufacturing will require enhancing the skills of those who are already working in manufacturing. This requires regular training for incumbent employees as well as new hires on how best to use the latest technologies and the newest production methods. More advanced production methods tend to rely on automation to replace highly repetitive or dangerous tasks and digitalization to optimize processes; these methods create new challenges for workers in directing, operating, responding to, and maintaining the work of new machines, technologies, software, and hardware. To ensure the best return on public investments, targeted training to upskill incumbent employees must help bolster businesses' efforts to (1) make the transition to running and maintaining automated equipment and processes and (2) commission and integrate new technologies into current business practices.

Larger manufacturers often have access to consultants and expertise that can lead this change, but their biggest concern is the cost of the transition, especially the cost of purchasing expensive equipment and training workers in using these new tools and adopting new work processes. Smaller manufacturers often lag in technology adoption, making them less competitive and more vulnerable to competition from those companies that are making rapid adaptations. Solutions for smaller companies must focus on influencing how management develops and executes their business plans and helping the leaders of smaller companies to make small steps toward long-run productivity gains.

Why does it matter for Pennsylvania manufacturers?

With automation has come a greater reliance on equipment that uses state of the art electronics and software programs to direct the movements of robots and cobots. The instructions and the record of work and equipment movements are maintained in storehouses of terabytes of data. Companies nationwide are recognizing the need for workers with cross-cutting skills in the use of both vast quantities of “big data” and advanced analytics to access the value of Industry 4.0 technologies. The skills required are technical and interpersonal; both are necessary to troubleshoot mechanical failures through a team approach, source knowledge from operators and engineers as necessary, and imagine new processes that benefit from the experience and knowledge held by older workers as well as the technological aptitude of younger workers.

Programs that invest in the skills of the future can also address persistent issues with talent recruitment, onboarding, training, and advancement. In Pennsylvania, manufacturers are seeking short-term training programs that can help make new workers productive quickly, training on the job to deliver a return-on-investment to company and trainee alike. Seventy-five percent of manufacturers surveyed by the Council reported that short-term training (e.g., bootcamps and certifications) could help address their immediate talent needs. Seventy-five percent also reported that they can continue training and upskilling at work, with in-house training experts or experienced workers prepared to train operators and technicians.

Automation is not the immediate solution for the nine out of ten manufacturers currently seeking workers. A wholesale move to automation is impractical in the short run, so incremental change is more likely. However, automation-related upskilling and talent pipeline development can help the companies be more competitive, productive, and innovative in the long run. The response to manufacturers today will determine Pennsylvania's future as an industrial leader.



How would it work?

Create opportunities for students to gain experience in emerging occupations through paid work-based learning:

There is increasing recognition that work-based learning and specific programming designed to make it widely available are helpful to inform transitions of high school students to college and career. Manufacturers in Pennsylvania are willing to sponsor shorter-term programs (4-8-week training programs, bootcamps, non-degree microcredentials offered at community colleges) as well as longer-



75%

of manufacturers surveyed by the Council reported that short-term training (e.g., bootcamps and certifications) could help address their immediate talent needs

term apprenticeship programs. Pennsylvania can build on this interest and respond to manufacturer demand by encouraging the collaborative development of 4-week, 8-week, and 12-week “manufacturing skills readiness boot camps” or similar training programs. Pennsylvania should work with manufacturing companies that sponsor apprenticeships to expand and update apprenticeship programs. One best practice model to emulate is the Philadelphia-based Wistar Institute’s Biomedical Research Technician Apprenticeship, a registered nontraditional program that provides a career pathway for future biomedical research technicians.

Provide customized upskilling training programs by expanding the list of eligible training providers: Upskilling programs must address pressing issues in technology adoption and help manufacturers stay on the cutting edge of production and training. To be effective, they require a high level of customization and expertise. Pennsylvania can best provide that expertise and customization by expanding the list of Eligible Training Providers to include IRCs, LDDs, SBDCs and other economic development organizations. This expansion would help to expand the pool of trainers in response to manufacturers’ demands for better customized upskilling solutions that reflect differing firm sizes and the unique needs of varied manufacturing sub-sectors. ETPL-approved provider offerings should include not only skills training, but also training in recruitment, onboarding, and approaches to shop floor process improvement. The effort must also be integrated into a broader automation effort, including incentives to help companies adopt automation. For instance, Minnesota implemented an upskilling program that focuses on helping companies get their workforce up to full productivity when they purchase new technologies. The program does not require new job creation, making it a powerful resource for companies focused on making the transition to implement more connected factories.

Expand the WEDNet program to provide a higher level of reimbursement for advanced technology training: WedNET is a highly regarded program that provides funding for training, but funding limitations mean that companies must “sit out” a year every third year to extend the program’s reach. Furthermore, there are no performance evaluation or guidelines that would allow leading manufacturers that deliver results to access additional funding. The program’s oversubscription demonstrates how valuable it is to companies. These high-demand programs deserve to be expanded – and need to be staffed, evaluated, and strategically deployed so they can be better targeted to producing key outcomes for the manufacturing sector and its workforce.

Which organizations could be involved?

Leadership from the Department of Labor and Industry and the Department of Community and Economic Development will be critical, along with active participation from manufacturing companies and organizations like local Workforce Development Boards, Workforce Innovation and Opportunity Act (WIOA) policy makers and program managers, existing training providers and organizations that are interested in becoming training providers.

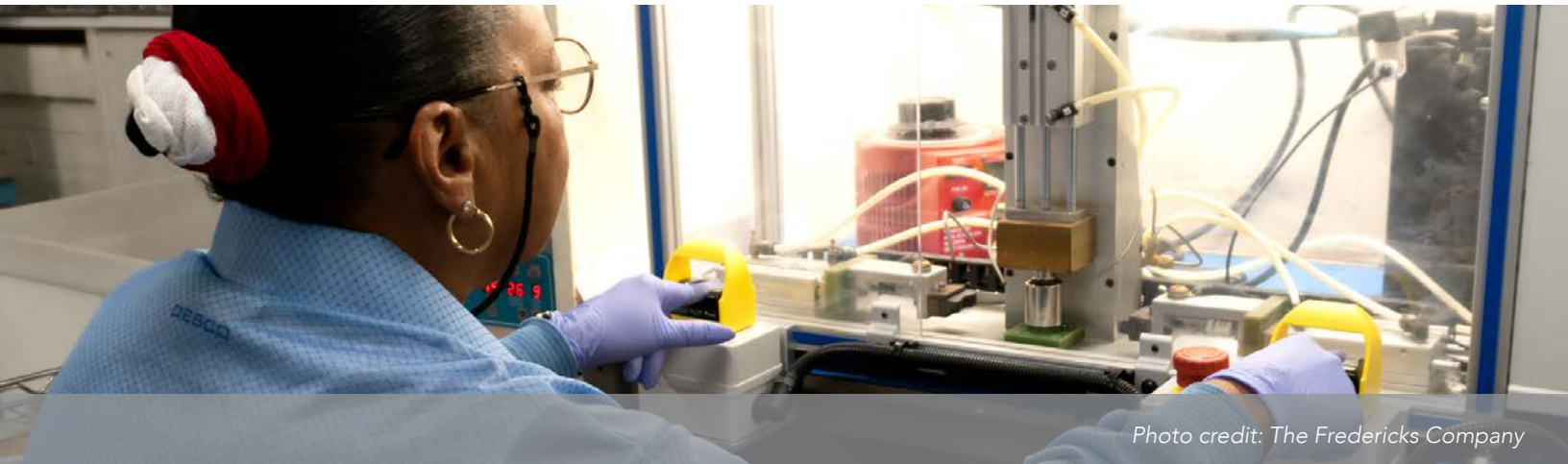


Photo credit: The Fredericks Company



How would it work?

- Assist manufacturers in assessing the cost of employee turnover.
- Help manufacturers effectively implement practices that promote retention and job satisfaction.
- Invest in apprenticeship, work-based learning, and career exploration programs.
- Provide support for childcare.



Support manufacturers as they transition to high-retention work environments.

Almost 45% of manufacturers have turned away potential new work because of a lack of workers according to the 2022 survey by Deloitte and the National Manufacturing Institute.⁴⁸ At the same time, national-level studies and other states find that the manufacturing pipeline lacks diversity in terms of gender, racial/ethnic mix, and age. Fewer than one third of manufacturing employees are women – 27 percent in Pennsylvania.⁴⁹ The same analysis found that while 12 percent of the Pennsylvania population identifies as Black, only five percent of the manufacturing workforce does.

These underrepresented groups face many hurdles and are more likely to leave manufacturing as a career than other groups. For instance, in 2021, one in four women in manufacturing nationwide were contemplating leaving the industry. Black employees are also more likely to consider leaving the industry due to lack of promotion opportunities and culture mismatch, according to a Deloitte and Manufacturing Institute report – and these workers are already under-represented in Pennsylvania manufacturing.

Why does it matter for Pennsylvania manufacturers?

Almost half of the manufacturers who responded to the Council's recent survey reported significantly increasing their hiring or retention

48. Deloitte and The Manufacturing Institute, "Big Gains in Perceptions of US Manufacturing as Innovative, Critical and High Tech," Press Release, March 30, 2022 (<https://www2.deloitte.com/us/en/pages/about-deloitte/articles/press-releases/deloitte-and-the-manufacturing-institute-big-gains-in-perceptions-of-us-manufacturing-as-innovative-critical-high-tech.html>).

49. CREC analysis of Census data provided via Lightcast—formerly EMSI Burning Glass, 2022.

of employees from underrepresented applicant pools over the past 12 months. Sixteen percent have significantly increased their hiring or retention of women. Twelve percent of respondents have significantly increased their hiring or retention of people of color. Strategies that typically serve these and other companies well include explicit support and training for new recruits learning the manufacturing process and clear steps for advancement and better wages. Further state-led support for additional high-retention strategies can complement and boost the work these companies have already started and help them meet their immediate need for workers.

Meanwhile, younger generations and working parents are looking to other industries for careers with more flexible work schedules. For manufacturing, flexible work environments often seem impossible or high risk. Workers in technical and operational jobs on the shop floor need to be available to keep expensive machines running continuously to meet customer demands. At larger companies, continuous and seamless operations historically required multiple shifts that keep machines running around the clock. At smaller companies, strict hours reduce time lost to coordination issues. But COVID disruptions and the corresponding difficulties of retaining workers at in-person and on-site jobs with strict schedules have some manufacturers exploring different ways of working.

More flexible work environments may be a solution if they effectively increase retention and/or productivity. But it is important to note that flexible work hours are only part of the equation. Higher wages and more communication about career pathways to better paying jobs are also needed to attract and retain entry-level workers. Many manufacturing jobs pay well while also being accessible without a college degree and serving as a gateway to two- and four-year college degrees. Beyond flexibility is also the need to understand and address barriers to work. For many technicians and experienced workers, limited access to high-quality childcare means that working parents may not be able to take and stay in these manufacturing jobs, especially those with strict schedules or offering evening and night shifts.



How would it work?

Assist manufacturers in assessing the full cost of employee turnover: Because it is very expensive to hire and train new employees, companies that assess the cost of employee turnover find that it is in their best financial interest to take extra measures to retain workers. But one study found that most manufacturers do not include the hidden costs of temporary labor to fill gaps, productivity losses, or opportunity costs such as lost business opportunities in their cost of turnover calculations.⁵⁰ There's an



Photo credit: Pennsylvania
Department of Community and
Economic Development

opportunity for public partners to help companies assess this full cost of turnover and prioritize employee retention.

Provide a mix of tools, resources, and partnerships that help manufacturers to effectively implement practices that promote retention and job satisfaction:

These resources will reduce the costs of any given transition, making Pennsylvania-based manufacturers an employer of choice and broadening the appeal of a manufacturing career. The commonwealth could identify partners who can promote the exchange of company best practices around remote work, flexible shifts or new shift schedules, human resources practices around onboarding and retention, and more effective response to demographic shifts to ensure manufacturing careers are visible and attractive to communities statewide.

Provide demographic and labor market analysis to direct investments in apprenticeship, work-based learning, and career exploration programs:

Women and people of color are typically under-represented in supervisory, managerial, and maintenance roles. To attract women and people of color, there must be explicit recruitment efforts, engagement of community-based and interest-based organizations that represent the communities of interest. Retention requires mentorship and attention to current norms of operating that may not serve women and people of color who are seeking to advance in the manufacturing field.

Provide support for childcare: Especially important to the effectiveness of these changes is the provision of support for childcare to incentivize more parents to work in manufacturing. Iowa is investing \$25 million in grants to help businesses create partnerships with childcare centers and build or expand childcare centers.⁵¹

Which organizations could be involved?

Leadership from the Department of Labor and Industry and the Department of Community and Economic Development will be critical, along with active participation from the Department of Human Services, manufacturing companies and organizations like local Workforce Development Boards, WIOA policy makers and program managers, and organizations with access to manufacturers such as the Pennsylvania MEP's IRC Network, Next Gen industry partnerships, and manufacturing associations.

50. Tooling U and SME, "The True Cost of Turnover: Hidden Costs Go Beyond Financial to Impact Productivity and Culture," 2019.

51. Katie Akin, "Iowa Employers Are Getting \$25 Million from the State to Help Pay for Employee Child Care," *Des Moines Register*, May 18, 2022.



Photo credit: Schroeder Industries



Game Changer 3: Unleash the Power of Manufacturing to Drive Regional Prosperity

Manufacturing is a powerful engine for regional economic growth. For every \$1.00 spent in manufacturing, there is a total impact of \$1.76 to the overall PA economy.⁵²

For every manufacturing job in PA, 2.5 workers rely on the spin-off impacts from these companies, including workers hired directly by the firm or their suppliers as well as jobs created when companies provide consumer goods and services to those workers.⁵³

Every \$1.00 of income earned by manufacturers translates to nearly \$2.17 of labor income recycled into the Pennsylvanian economy.⁵⁴

Manufacturing is a critical foundation for the economy in almost every region of the state. Smart regional policy involves complementing state efforts to invest in the local manufacturing base. Regional investments are important to Pennsylvania, first, due to the varied concentration of differing manufacturing sub-sectors by region, and second, because Pennsylvania's economic and workforce delivery models have a strong regional footprint.



For every \$1.00 of income earned by manufacturers translates to nearly

\$2.17

of labor income recycled into the Pennsylvanian economy

Manufacturing is not monolithic across Pennsylvania, from food processing centers in south central to gas processing and plastics in the west. Oil and gas extraction equipment manufacturers can be found in northwestern Pennsylvania.

52. Lightcast: Pennsylvania Economy Overview, Q2 2022 Data Set.

53. Ibid.

54. Ibid.

Life sciences and aerospace are critical contributors to the economic success of the southeast. Highly automated steel and ferrous metal production continues in the southwest. Sawmills and packaging manufacturers are vital to central and eastern Pennsylvania. Machine shops dot the landscape across the commonwealth. Manufacturing activity is ever present in local communities, but it has a unique feel and flavor in different parts of Pennsylvania, making the state diverse yet reliant on a few sectors that have large boom and bust cycles. The key to success will be building on these unique regional strengths and finding new ways to bring together sectors in unique ways that lead to innovative new opportunities.

Pennsylvania also has a long-established model of delivering services to companies through regional public-private partners that should be primed to build on local strengths, bring together sectors in unique ways, and customize policy and programs that can respond to each region's unique regional manufacturing base. All too often the lack of communication and coordination between the commonwealth and regions, across regions, and between partners in the same region have impeded attempts at collaboration. Pennsylvania does not need a new program to improve regional collaboration – it needs a serious commitment from the commonwealth to encourage and reward regional collaboration through existing vehicles.

Why does it matter for Pennsylvania citizens?

Some 14,000 manufacturers can be found in almost every community across Pennsylvania. These firms offer jobs paying family-sustaining wages for adults who may not choose a traditional four-year college path. Their success is critical, not only because they provide employment for many local citizens, but they also contribute to the local tax base, charitable giving, and civic leadership. These small firms serve as the face of manufacturers in many community halls across the commonwealth.

Top actions to unleash the power of manufacturing to drive regional prosperity:

8

Raise the visibility and impact of regional, private sector-led partnerships.

9

Strengthen regional manufacturing workforce pipelines.

10

Help local leaders better understand how the development process impacts manufacturing investment.



Photo credit: Pennsylvania Department of Community and Economic Development



How would it work?

- Strengthen Pennsylvania's industry partnership model.
- Connect more manufacturers to industry-led partnerships.
- Fund regional manufacturing liaisons.



Raise the visibility and impact of regional, private sector-led partnerships.

Manufacturers need a simplified economic development ecosystem.⁵⁵ In recent focus groups, manufacturers raised the complexity of economic development support from the state – acknowledging that the commonwealth has a lot of resources, but that it takes a lot of work to tap into them. Pennsylvania needs to transition from a “no wrong door” network of referrals to a “one right door” for manufacturing support. It already has a model in place to do that through Next Gen Industry Partnerships.

In 2017, Pennsylvania adopted the Next Generation Sector Partnership model to launch regional, industry-led partnerships. The hallmark of Next Gen partnerships is that they are industry-led and community-supported, bringing together a diverse array of public partners to respond to the collective needs of a specific industry in a specific region. Next Gen partnerships are meant to be a mechanism for stronger, more efficient public-private collaboration at the regional level. They are meant to be a single table where industry can collectively sit with public partners to address competitiveness issues facing manufacturing. There are currently at least nine manufacturing Next Gen Industry Partnerships in Pennsylvania.

Pennsylvania has had mixed success implementing the model. In some regions, industry partnerships are a powerful vehicle for manufacturers to collaborate with public partners on solutions to shared economic development and workforce issues. The MADE in Central PA partnership is one example of a successful industry partnership.

⁵⁵ See “The Ecosystem of Partners Responsive to Manufacturing” for a more robust overview of what this ecosystem is and could be.

The partnership has resulted in increased collaboration with local high schools and career and technical education programs, a regional campaign to market the Central Pennsylvania region, and a streamlined platform for public partners to share resources with manufacturers.⁵⁶

Why does it matter for Pennsylvania manufacturers?

But, across the commonwealth, there have also been challenges and missed opportunities – times when industry partnerships are run as a program instead of as an authentic mechanism for industry-led solutions, where the agenda is driven by service providers, or where turf wars get in the way of coordination.

To make the Next Gen industry partnerships a better solution for Pennsylvania manufacturers, the commonwealth should consider carefully designed state policies that would boost the involvement of economic development partners at the regional level and expand the reach of each partnership to include more manufacturers.



How would it work?

Strengthen Pennsylvania's industry partnership model: There is an opportunity to use the industry partnership as a demand assessment to trigger state agency funding, which would redirect funding and programs to be more responsive to what companies need and improve coordination between state level agencies. This would entail elevating industry partnerships from a siloed program at the Department of Labor and Industry to a coordinated mechanism for multiple state agencies to fund industry-identified solutions that go beyond workforce issues to include those related to supply chain, transportation, childcare, and other concerns. One approach might be similar to New York, which consolidated economic development funding requests to all state agencies into one application submitted by a public-private Regional Council that coordinates with local partners to ensure that proposed projects are connected to the region's priorities.⁵⁷

Connect more manufacturers to industry-led partnerships: The existing industry-led partnerships touch only a fraction of the commonwealth's manufacturers. Elevating industry partnerships as a demand mechanism for state agency funding should entail a concerted effort to increase the membership of these partnerships, including boosting the representation of startup companies in the partnerships.

Fund regional manufacturing liaisons: In addition to funding for industry-identified solutions, industry partnerships need funding to support operations, especially if they are charged with reaching more manufacturers in the region. One important part of

56. "Partnership Examples," Next Generation Sector Partnership Community of Practice (Institute for Networked Communities), <https://www.nextgensectorpartnerships.com/partnership-examples>.

57. "Consolidated Funding Application," NYS Consolidated Funding Application (State of New York), <https://apps.cio.ny.gov/apps/cfa/>.

operations is building capacity or creating a role for a manufacturing liaison for the partnerships to act as a “navigator,” connecting companies with relevant state and regional programs and resources.

Which organizations could be involved?

To be successful, manufacturers must drive the agenda of the partnerships, but they must be joined in implementation by the public partners with the programs to respond to their priorities – which will likely include IRCs, regional PREP networks (including Local Development Districts, Small Business Development Centers, and others), economic development organizations, chambers of commerce, workforce boards, community colleges, high schools, manufacturing associations that are active in economic and workforce development, and others.



Photo credit: Pennsylvania Department of Community and Economic Development



How would it work?

- Connect the allocation of state funding for regional training partners to their effectiveness in creating robust manufacturing career pathways that respond to manufacturers' needs.
- Fund statewide programs that nurture interest in manufacturing careers throughout the student lifecycle.



Strengthen regional manufacturing workforce pipelines.

Creating a robust pipeline of talent for the manufacturing sector requires statewide programming as well as a community-based approach that ensures manufacturing jobs and careers are viable options for all students and job seekers. For example, career awareness and exploration programs can be adopted by school districts statewide, but more effective programs will feature local manufacturers who can show up in the classroom and offer students the opportunity to visit their workplaces, who can provide work experiences, and who can otherwise enhance work-based learning. Successful youth-serving programs will also engage K-12 and postsecondary instructors as well as the parents and trusted advisors of students who may be interested in a manufacturing career. Finally, manufacturing careers cannot be limited to only those candidates who identify an interest in high school – more adults need to be offered opportunities to work in manufacturing while they are studying at community colleges or otherwise preparing for a career transition.

Additionally, K-12 programming, onboarding for new recruits, and ongoing job training must be linked to college credits and opportunities to pursue certificates and degrees. These links to further education support working and learning through college and career. Community colleges can create connective tissue for high school students as well as adult learners, ensuring that potential and existing manufacturing workers complete high school and, if desired, can bring college within reach. One approach is a 2+2+2 technical education model with a path from community and technical high schools to community college to a 4-year degree. One successful example of this approach is the BAS in Technical Leadership (BASTL) established by Bloomsburg University and

Lehigh County Community College, which now includes Reading Area Community College. It serves working adults who have associate degrees (mostly in technical fields) and earn their bachelor's degrees to move into other professional positions or management. Manufacturers often provide tuition support and participants can take classes at their local community college or remotely. This connection to further education will help make manufacturing careers more attractive to young people and adults transitioning careers.

Why does it matter for Pennsylvania manufacturers?

The talent needed for industry modernization (automation) and maintenance of operations depends on inquisitive frontline operators and technicians who can be recruited and trained locally. Without a strong brand or networks to recruit talent from out of state, most manufacturers rely on their local labor markets to supply talent, and on their own in-house resources to train. The need is currently acute, but it will be ongoing as technologies continue to shift. Manufacturers rely heavily on local institutions as a key source to identify and train new talent. If demographics are shifting due to out- or in-migration, training institutions and manufacturers will need to adapt.

Unfortunately, manufacturing talent pipelines eroded badly due to decades of neglect nationwide and significant job losses that occurred in the sector during the 2000-2009 decade. Many manufacturing-dependent communities disinvested in technical training pathways because available jobs for graduates were few and far between.

Re-starting or reinvigorating those programs has been challenging, but they are badly needed and must be re-aligned with modern expectations for college and career as they rebuild. New manufacturing communities need to invest in initiatives designed to re-establish these talent pipelines. In some cases, these efforts may need to activate higher education institutions that have little or no history of serving the manufacturing sector, overcoming outdated prejudices about the sector's value. The prejudices are based on the disinvestment and job losses of the 2000s and not the current economic output and actual high tech job opportunities. In these cases, industry partners will need to help in attracting and orienting faculty and instructors to serve a sector that is in dire need of the talents of those potential educators.



Manufacturing talent pipelines eroded badly

due to decades of neglect nationwide and significant job losses that occurred in the sector



How would it work?

Connect the allocation of state funding for regional training partners to their effectiveness in creating robust manufacturing career pathways that respond to manufacturers' needs:

The networks of educators, employers, and advisors that are needed to create robust regional talent pipelines must be prioritized and supported by the state (as a coordinator) through efforts focused on connecting career and technical education (CTE) program students located in school districts or college service areas within reasonable commute times to work sites.

There may be a need for bridge programs between high school and colleges and pre-apprenticeship programs that lead to employment or further paid training. It is difficult to predict who, in any given community, will be the leading champion for the work to create more robust pathways (the organization knitting together different organizations and offerings at the regional level) – sometimes Chambers play that role, sometimes high school CTE program instructors, sometimes school district administrators, sometimes colleges, and sometimes groups of employers. They should all be connected through an active Next Gen Industry Partnership.

Fund statewide programs that nurture interest in manufacturing careers throughout the student lifecycle – from middle school through high school and beyond:

Pennsylvania funds some individual career exploration programs, but there is neither a statewide systematic approach nor statewide coverage to support career education and exploration in schools. Intermediaries like the Partnership for Career Development and the York County Alliance for Learning have been providing programs, services, and support to school districts to support a more systematic approach that also provides for access to programs and equity for students to engage in these types of programs that are critical for the future manufacturing workforce. Intermediaries like these should be funded across regions. These intermediaries can partner with industry to identify initiatives that align with student interests and learning techniques at various ages so that future workers, now ages 12 through 21, can engage in manufacturing career exploration and work-based learning where appropriate. Pennsylvania should also evaluate existing regional manufacturing sector competitions for middle/high school students (e.g., BotsIQ in SW PA, What's So Cool About Manufacturing) and create stronger connections from those programs to high school programming and manufacturing job placement. The Manufacturers Resource



Photo credit: Pennsylvania Department of Community and Economic Development

Center's Dream Team manufacturing ambassador program could be expanded to support the Dream Team members (young technical talent at local companies who visit local high schools) in creating better funded programs at their former high schools and colleges so that more students and job seekers can follow their path to manufacturing careers.

Which organizations could be involved?

Designing and coordinating regional manufacturing workforce pipelines that operate at the scale of the labor market and serve manufacturing communities will require champions working in and across K-12 and college, including counselors, instructors, career advisors, and Pennsylvania's intermediate unit network. Intermediaries like the Partnership for Career Development and the York County Alliance for Learning could be scaled across the state to partner with industry to identify and evaluate career exploration programs. Generating support for student engagement with regional manufacturing workforce pipelines will require community outreach, parent education, mentorship, and other programming.

The Department of Community and Economic Development can also play a role in setting up the support structures for identifying champions and for program evaluations that assess the impacts achieved by participating partners.



Photo credit: Cambridge-Lee Industries



How would it work?

- Simplify the development process for manufacturers.
- Provide incentives to communities that are making a concerted effort to align land use and permitting with the needs of manufacturers.
- Provide a training program for local leaders.



Help local leaders better understand how the development process impacts manufacturing investment.

Companies are uncomfortable with uncertainty, and a local planning and development process that is opaque to companies presents many questions about how long and how much it will take to meet all local pre-development demands. Companies are already dealing with a wide variety of headwinds – increased cost of living, Pennsylvania’s relatively higher costs, the possibility of recession, supply chain uncertainties, and regulatory processes that are often seen as confusing, opaque, or unnecessary.

Why does it matter for Pennsylvania manufacturers?

In the Council’s recent survey of manufacturers in the state, only about 15 percent of companies indicated that Pennsylvania’s regulatory environment was a significant hindrance to their business. Mostly, their concerns were related to utilities, worker benefits, environmental and code enforcement, or “business unfriendly” municipalities. During focus group discussions, the most frequently raised issues related to the time-consuming and confusing nature of local land use and building permitting. As one expert interviewee noted, Pennsylvania has a fragmented permitting system that is unlike other states. With more than 2500 local cities, boroughs, and townships as well as hundreds more water utility and school districts, each has its own process for reviewing development proposals. Inconsistency across the government entities and lack of clarity about the process for development review creates uncertainty for companies seeking to make investments.



How would it work?

Simplify the development process for manufacturers: Other states have found ways to unify and simplify their development process by reducing the number of entities with jurisdiction over the review process. It is probably not feasible to integrate or standardize the development process across the multitude of Pennsylvania jurisdictions. However, educating leaders on the impact their rules have on company decision-making could help make the process seem less byzantine to companies seeking to expand or grow.

The goal is to set the “tone at the top” by developing a more collaborative environment in the interaction between state and local leaders about how to meet the needs of manufacturers. That means shifting culture among some commonwealth and local officials about how to focus zoning, permitting and regulatory processes less on monitoring and more on collaborative compliance – meaning that the process focuses more on helping companies better understand what they should do to meet requirements before inspections happen and focus on trying to help companies make pre-emptive decisions rather having to take corrective actions after a project is completed.

Provide incentives to communities that are making a concerted effort to align land use and permitting with the needs of manufacturers: We recommend that communities establish a one-stop shop or facilitate one-stop permitting for industrial uses. Instigating a statewide collaborative consultation process that provides independent review and feedback to municipalities, school boards, water authorities, and others on their permitting processes could help identify the most significant issues. Pennsylvania could provide incentives to communities that are making a concerted effort to respond in ways that better align their land use and permitting processes with the needs of manufacturers seeking to expand or grow.

Develop a training program for local leaders: At the state level, Pennsylvania should develop a sustained training program for local leaders that helps them learn more about how their policies impact manufacturers (and other businesses) seeking development permits, how to mitigate known and perceived risks, how to identify and resolve conflicts among neighbors, and how to communicate their development policies clearly. The Pennsylvania Municipal Planning Education Institute provides a foundation for this program. An educational collaboration between the PA Chapter of the American Planning Association and the PA State Association of Boroughs, the Institute serves



*Photo credit: Pennsylvania
Department of Community and
Economic Development*

the more than 1800 local planning commissions and offers a foundational program designed to help volunteer planning commissioners learn their responsibilities. At the same time, the CCIM Institute also has a development specialty track that has been created for real estate professionals. It would be valuable to develop a review and certification process that engages with private enterprises and their representatives to ensure that local planning requirements are reasonable and well communicated.

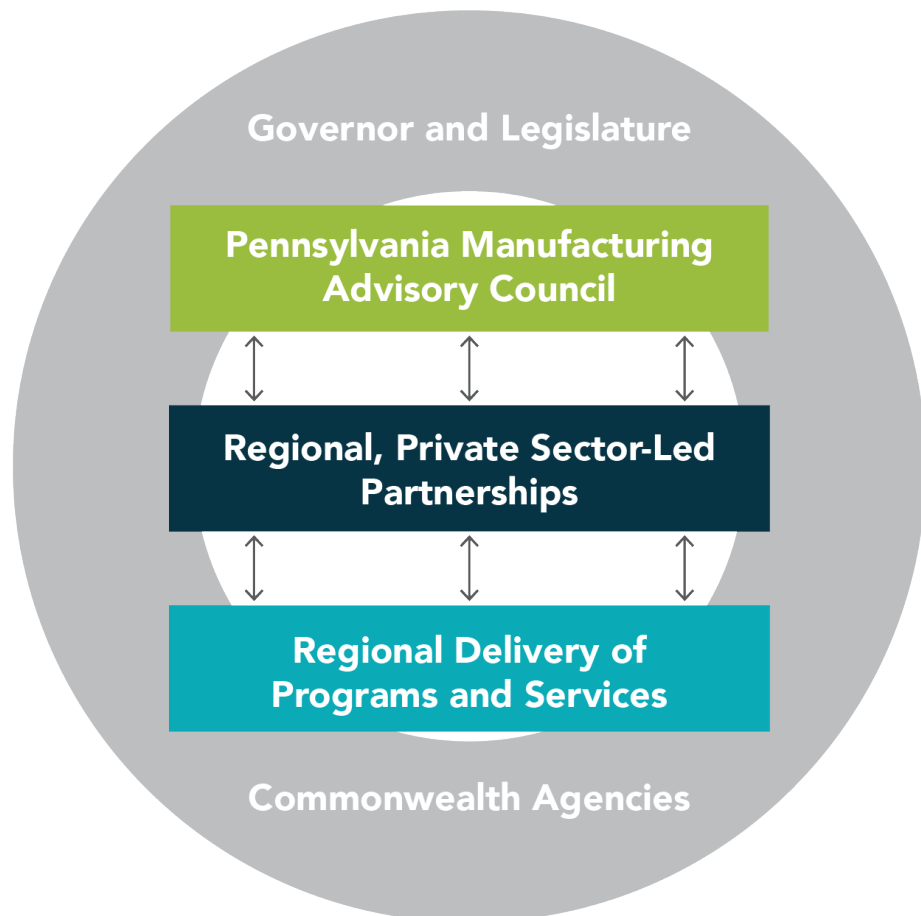
Which organizations could be involved?

The Department of Community and Economic Development and the Department of Environmental Protection could work closely with an array of stakeholders, including groups like Pennsylvania Local Development Districts, the Governor's Action Team, state and regional manufacturing industry associations, private industry experts such as developers, county commissioners, and others with a direct interest in the quality development to design and/or adapt available educational programs targeted to elected and appointed officials (including planning commissioners) as well as to provide technical assistance designed to increase the clarity of local zoning and land use policies as well as to improve communication about those policies with manufacturers.

The Ecosystem of Partners Responsive to Manufacturing

Pennsylvania has an extensive service provider network charged with supporting manufacturing. The Governor and Legislature provide the vision for Pennsylvania's efforts and these service providers offer hands-on technical support. An ecosystem – the collection service providers, policies, and funding support – is in place to support manufacturers, but organizations in that ecosystem are both underfunded for a robust effort to transform the commonwealth's manufacturing base and lack coordination of efforts in support of a common vision. The Manufacturing Advisory Council can play an important role advising the Governor and Legislature while also offering expert insights to the network of organizations already operating in the manufacturing support ecosystem, including regional and private-led partnerships that adapt strategies to meet local needs as well as the front-line organizations that work with manufacturers and their workers directly every day. Following is a vision for how these ecosystem partners might work together more effectively to support the Governor's vision and address the most significant challenges facing manufacturers doing business in the commonwealth.

A More Effective Ecosystem to Support Pennsylvanian Manufacturing



Pennsylvania Manufacturing Advisory Council: A sustained and unified voice to advise the Governor and legislature on the needs of manufacturers. To fully position the Council as industry-led, the Playbook recommends that the Governor's office should lead a process to transition the Council to majority private sector membership.

Regional, Private Sector-Led Partnerships: A mechanism for stronger, more efficient public-private collaboration at the regional level, and the "one right door" for manufacturers to engage the entire ecosystem of support. Examples include the Berks County Advanced Manufacturing Partnership, JARI Cambria/Somerset Advanced Manufacturing, MADE in Central PA, North Central PA Manufacturing Industry Partnership, Pennsylvania Steel Alliance, Southeastern Pennsylvania Manufacturing Alliance, South Central Manufacturing Industry Partnership, Southwest Corner Advanced Manufacturing Next-Gen Sector Partnership, Tri-County Manufacturing Industry Partnership, West Fayette Manufacturing, and Westmoreland-Fayette Manufacturing Industry Partnership. The Playbook recommends creating a role for a manufacturing liaison for manufacturing industry partnerships who could act as a navigator, connecting companies with relevant state and regional programs and resources.

Regional Delivery of Programs and Services: Responsive to the priorities of regional, private sector-led partnerships spanning economic development, workforce development, education, and other areas. Economic development organizations include the Ben Franklin Technology Partners, Certified Economic Development Organizations, Industrial Resource Centers, Partnerships for Regional Economic Performance (which include Industrial Development Organizations, Local Development Districts, Small Business Development Centers), Life Science Greenhouses, and others. Workforce development and education organizations include local workforce boards, community colleges, career and technical education, high schools, Pennsylvania's intermediate unit network, and other workforce or education intermediaries. Other organizations that provide important regional services to manufacturers include regional manufacturing associations, chambers of commerce, and planning commissioners.

Commonwealth Agencies: The Playbook identifies an opportunity to use the industry partnership as a demand mechanism for state agency funding, which would redirect funding and programs to be more responsive to what companies need and improve coordination among state level agencies, including the Department of Community and Economic Development, Department of Labor and Industry, Department of Education, Department of Human Services, Department of Transportation, Department of Environmental Protection, among others.

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**Indicates industry member of Council*

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