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NATIONAL TECHNOLOGY ADOPTION BENCHMARKING IN ADVANCED MANUFACTURING AND LOGISTICS:

Assessing Indiana's Progress in the Fourth Industrial Revolution

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Executive Summary

Overview

This report examines the complex dimensions of productivity, digitization and technology adoption, and talent deployment within Indiana's advanced manufacturing and logistics (AML) industries and benchmarks Indiana against seven competitor states through a series of economic and proxy measures for technology adoption. Analyses throughout the report emphasize the need to enhance productivity, digitization, and talent acquisition within Indiana's industrial landscape. The onset of the Fourth Industrial Revolution ("Industry 4.0") puts Indiana's largest industries at a critical juncture. The report's key findings and implications are categorized into three areas below and discussed at greater length in Section V.

Key Findings & Implications for AML Leaders and Stakeholders

Productivity & Digitization
- **Finding 1:** Productivity challenges and the lagging deployment of Industry 4.0-enabling roles across Indiana's AML subsectors emphasize and signal the need for continued technology adoption at Indiana firms.
- **Finding 2:** The challenges of gauging progress and benchmarking Industry 4.0-related technology adoption among AML firms support the need for continued industry surveys.
- **Finding 3:** Tech ecosystem firms are only just beginning to participate in both Conexus' Industry 4.0 survey efforts and its related programming—this should be a point of emphasis going forward.

Industry 4.0 Talent
- **Finding 4:** Industry 4.0-enabling talent development and deployment will continue to play a crucial role in Indiana's technology adoption leadership. The need for workforce and Industry 4.0-enabling talent with the right education and skills mix is a limiting factor for both current and future AML competitiveness and growth.

Industry 4.0 Policies & Programs
- **Finding 5:** Indiana's competitor states are not standing still on Industry 4.0 investments—across the U.S., states are supporting extensive infrastructure, programming, and initiatives aimed at advancing technology adoption, addressing workforce upskilling and reskilling, investing in key facilities and technology demonstration, and providing expertise and consulting on staging investments and effective implementation.

I. Introduction

The Importance of Advanced Manufacturing and Logistics to Indiana's Economy

Indiana has long represented a manufacturing, logistics, and transportation leader for the United States. Its advanced manufacturers employ more than half a million Hoosiers to produce an impressive variety of goods that span innovative biopharmaceuticals, automobiles and a diverse set of recreational "mobility" products, aircraft engines, industrial machinery, food and agricultural products, metals, polymers and plastics, and more.

Increasingly, Indiana is further diversifying its production mix and securing growth opportunities for emerging industries. Three Federal Technology and Innovation Hub ('Tech Hubs') designations were recently secured, which include the Hydrogen Hub (clean energy), the Microelectronics Commons (semiconductors and chips), and Heartland BioWorks (biotechnology), just to name a few strategic focus areas for the state moving forward.[1]

At the same time, Indiana has built complementary competencies and specialization in transportation, distribution, and logistics of the aforementioned goods that are exported across the globe. Indiana logistics firms partner with its manufacturers and move more than $650 billion in goods each year in the "Crossroads of America."[2] Put simply, Indiana is a state that knows how to make and move an impressive variety of goods to serve the global economy.

> The combined advanced manufacturing and logistics or "AML" industries represent a critical and outsized driver of the Indiana economy. In 2022, the industries represented 30% of total private sector jobs and 42% of economic output (GDP)—shares significantly above the national average and therefore representing a highly "specialized" and outsized contributor to the wealth and standards of living for Hoosiers.

The combined advanced manufacturing and logistics or "AML" industries represent for Indiana a critical and outsized driver of its economy. In 2022, the industries represented 30% of total private sector jobs and 42% of economic output (GDP)—shares significantly above the national average and therefore representing a highly "specialized" and outsized contributor to the wealth and standards of living for Hoosiers (Figure 1). This translates into family-sustaining average wages of nearly $71,000 in the AML industries, 21% above those for the average private sector worker in Indiana.

Figure 1: Advanced Manufacturing and Logistics Represents a Critical, Outsized Driver for Indiana's Economy

839,314	7.1%	30,731	$153B	$70,930
Jobs	**Job Growth Since 2017**	**Establishments**	**in State GDP**	**Avg. Wages**

Source: TEConomy Partners' analysis of Lightcast Data – Release 2023.2.

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1   See, for example: https://www.iedc.in.gov/events/news/details/2023/11/28/indiana-tech-hub-wins-will-surge-state-s-economy.
2   "The State of Indiana's Advanced Manufacturing Workforce," Conexus Indiana, 2022.

Productivity Challenges and the Digitization of the AML Industries

Maintaining and improving its competitiveness in the AML industries is vitally important for Indiana's economic growth, prosperity, and living standards of its residents. Productivity is at the core of industry competitiveness in a modern manufacturing sector that increasingly competes on a global basis where innovation and profit margins differentiate the firms that thrive and the firms that fade.

Against this backdrop, however, there are troubling indications that Indiana is lagging in key productivity measures within its AML industries. Several recent analyses—from the Brookings Institution, McKinsey & Co., and TEConomy Partners among others—find Indiana to lag in productivity growth both generally and within its manufacturing sector, and the data analyses conducted for this effort reach similar conclusions.[3]

While the highly skilled AML workforce is and will remain critical to the industry's productivity and overall success, modern manufacturing is increasingly embracing digital technologies and solutions. These solutions go beyond the relatively simplistic incorporation of a single computer, robot, or automation solution into single processes (as have been done over the last three to four decades), to instead utilizing a new wave of digital technologies to fully automate processes and decision-making across business functions, particularly in a production environment. This transformation, enabling increasingly "smart" manufacturing, is often referred to as the Fourth Industrial Revolution or "Industry 4.0."

> ## Defining Industry Productivity
>
> Within this report, productivity is defined as value-added per employee, where value-added is the industry's contribution to state Gross Domestic Product or "GDP". It represents how much of a given good can be produced and its associated "value added" by an individual firm.
>
> Overall industry productivity is ultimately based on its blend of labor and capital inputs and the value of the products manufactured.

The increasing adoption of digital technologies by manufacturers, and their ability to leverage data, artificial intelligence (AI) and machine learning (ML), automation, and cyber-physical systems, represents an ongoing, rapid, and monumental shift in the way in which AML firms compete in the modern global economy. As one would expect, this transformation has major implications for all facets of the manufacturing ecosystem, including innovation cycles, supply chains, infrastructure, workforce and talent dynamics, and customer engagement—all of which will have tremendous impacts on state competitiveness.

Indiana has rightly prioritized assisting its AML companies under its relatively new Manufacturing Readiness Grants program (MRG)—providing matching funds toward those small- and mid-sized enterprises (SMEs) that form critical elements of supply chains serving larger manufacturers and OEMs and often do not have the resources or know-how to get started or to effectively implement new technologies and digital solutions on the Industry 4.0 journey. Early measured impacts find the program is achieving significant scale and results. The state is advancing other, complementary initiatives and programs to enhance the ecosystem for technology adoption, foster workforce upskilling and re-skilling, incentivize collaboration across industry-government-academia, and more.

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3   Brookings Institution Metropolitan Policy Program, "State of renewal: Charting a new course for Indiana's economic growth and inclusion," February 2021. McKinsey Global Institute, "Rekindling US productivity for a new era."

Industry 4.0 Technology Adoption Reports and the Need to Look Outward to Assess Indiana's Progress

Conexus Indiana published a series of Industry 4.0 Technology Adoption Reports in collaboration with the Indiana University Kelley School of Business Center of Excellence in Manufacturing over a 3-year period (2020-2022), gathering near real-time intelligence from industry surveys. These surveys and resulting reports are vital to understanding the progress across the AML sector on the Industry 4.0 journey, including where challenges and opportunities remain for tech adoption.[4]

At the same time, however, Conexus and its partners in the AML ecosystem have an opportunity to turn the lens outward to better understand how the state is positioned in its tech adoption journey relative to other states and national averages. To this end, this study represents an exploratory research effort to understand the following:

- **Setting a baseline and benchmarking the competitive position and productivity of Indiana's AML sector relative to a set of key comparison states and U.S. averages** to understand, in part, the continued need for Industry 4.0 tech adoption.

- **Benchmarking Indiana's Industry 4.0 technology adoption progress versus key comparison states,** with a focus on developing comparable data, or in lieu of available data, determining key proxy measures regarding:
  - Progress in technology adoption.
  - Industry 4.0-enabling workforce and talent deployment.
  - The presence and capabilities of Indiana's "tech ecosystem" firms, including systems integrators, software providers, technology developers, and vendors that develop, sell, and/or integrate relevant Industry 4.0 technologies for the AML sector.

- **Inventorying and profiling Indiana and comparison states' implementation of Industry 4.0-related technology adoption programs and ecosystem initiatives** including:
  - Strategic efforts in Indiana and by other states to advance technology adoption among AML firms.
  - Programs or resources critical to Industry 4.0 implementation among AML firms, for example, workforce development and upskilling; Industry 4.0 assessment tools; etc.

These elements form the structure of this report, organized across three major sections. Ultimately the findings identify strategic implications and considerations for Conexus and other Indiana AML industry partners and stakeholders going forward—these key findings and potential implications are summarized in the final section of the report.

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4   Conexus Indiana and IU Kelley School of Business, "A Glimpse Into Indiana's Factory of the Future: Companies Scale-up Industry 4.0 Technology Investments to Enhance Efficiency and Optimize Productivity," 2022.

II. AML Industries Benchmarking:

Productivity Challenges for Indiana Highlight the Need for Industry 4.0 Technology Adoption

A first step in looking beyond Indiana is to understand the state's baseline position in its AML industries relative to a set of comparison states as well as developing a set of replicable and comparable industry sectors and subsectors. Seven states were selected to include those regional peers and competitors against which Indiana competes for AML development, typically in specific "sectors" and "subsectors" of the broader industry (see the callout below).

The seven comparison or benchmark states utilized for this and other assessments in this report are:

- Arizona
- Georgia
- Illinois
- Michigan
- North Carolina
- Ohio
- Tennessee

Indiana's Advanced Manufacturing and Logistics Industries Breakdown

Detailed analysis of the underlying sectors that make up the AML industries in Indiana were undertaken to define key and unique areas of strength for the state. Industry employment metrics including overall size, growth trends (including those versus the nation), and relative concentration (location quotients) at the 2-digit level of federal NAICS industry classification were utilized to define the AML sectors:

Advanced Manufacturing and Logistics Sectors
- Manufacturing
- Logistics
  - Freight Transportation and Logistics
  - Wholesale Distribution

Advanced Manufacturing and Logistics Subsectors
Subsectors are often oriented around either commonality of production inputs and markets (e.g., electronic components and products; metals manufacturing) or the "know-how" to leverage science and tech breakthroughs for innovative new products (e.g., life sciences, agbiosciences). The subsectors were carefully vetted with the Conexus team to ensure appropriate input into on-the-ground knowledge of individual firms and concentrations. The following 13 manufacturing and logistics subsectors were agreed-upon and defined at the 6-digit federal NAICS industry classification.

- Agbiosciences Manufacturing
- Aircraft/Aerospace Manufacturing
- Automotive/Motor Vehicle Manufacturing
- Consumer Products Manufacturing
- Electronic Components and Products Manufacturing
- Energy Manufacturing
- Freight Transportation and Logistics
- Furniture and Wood Products Manufacturing
- Industrial Machinery Manufacturing
- Life Sciences Manufacturing
- Metals Manufacturing
- Polymers/Plastics Manufacturing
- Wholesale Distribution

Setting the Context: Indiana Industry Performance & Benchmarking

The AML industries in Indiana are large and growing:

- **Manufacturing Sector:** Indiana's manufacturing sector overall is two times more concentrated than the national average and has grown its employment base by 1.8% since 2017, a pace just behind that for the U.S. (2.8% growth).[5]

- **Logistics Sector:**
  - **Freight transportation and logistics:** Employment within this industry is also highly specialized in its concentration in Indiana with a 42% greater concentration in the state relative to the national average but has lagged behind strong national growth since 2017—increasing by 27% in Indiana compared with 37% growth for the U.S.

  - **Wholesale distribution[6]:** The industry has just a 2% higher employment concentration relative to the U.S., but is gaining in its national market share with job gains reaching 8.6% since 2017 compared with just 1.3% growth for the U.S.

Indiana's total AML employment has increased by 7.1% since 2017, a rate behind that for the U.S. overall (8.7% growth). The industry is 62% more concentrated in Indiana relative to the U.S. as measured by a location quotient (LQ) of 1.62.

The breadth and variety of Indiana's AML industries are illustrated in Figure 2. The "bubble chart" plots three key employment-related metrics for each subsector—the relative employment size (size of each bubble); the relative employment concentration as measured by a location quotient on the vertical axis; and the recent growth trend on the horizontal axis.

High on the vertical axis are Indiana's most highly concentrated or "specialized" AML subsectors—designated as those with a state LQ that meets or exceeds 1.20, meaning they have a 20% or greater concentration of jobs in Indiana relative to the national average. Those in the upper right quadrant that are showing both relative specialization and recent net job growth can be considered "star" performers and include:

- Agbiosciences Manufacturing
- Automotive/Motor Vehicle Manufacturing
- Freight Transportation and Logistics
- Industrial Machinery Manufacturing
- Life Sciences Manufacturing
- Polymers and Plastics Manufacturing

Overall, 7 of 13 Indiana AML subsectors have increased employment since 2017 including the six listed above as well as the wholesale distribution subsector. Two sizable and specialized subsectors have seen net job declines since 2017—metals manufacturing and furniture and wood products.

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5   Employment analyses herein sourced from TEConomy Partners' analysis of Lightcast Data—Release 2023.2.
6   While not historically included in the Conexus definition of AML, Wholesale distribution (e.g., distribution centers) often bridges the gap between manufacturing and freight transportation and logistics, and therefore, it has been included throughout this report.

Figure 2: Indiana AML Subsectors—Employment Size (Size of Bubble), Relative Concentration (Location Quotient), and Recent Growth Trend, 2017-22

2022 Location Quotient

Automotive/Motor Vehicle Manufacturing

Metals Manufacturing

Polymers/Plastics Manufacturing

Life Sciences Manufacturing

Freight Transportation and Logistics

Furniture and Wood Products Manufacturing

Industrial Machinery Manufacturing

Consumer Products Manufacturing

Agbiosciences Manufacturing

Electronic Components and Products Manufacturing

Energy Manufacturing

Wholesale Distribution

Aircraft/Aerospace

Indiana Industry Cluster Employment Change, 2017-2022

Source: TEConomy Partners' analysis of Lightcast Data – Release 2023.2.

While a majority of the manufacturing subsectors are growing their employment base and clearly critical to Indiana's economy, the manufacturing and logistics sectors each lag in key measures of industry productivity with respect to overall levels of value-added activity per worker and demonstrate a mixed performance in recent productivity growth relative to the U.S. (Figure 3).

Figure 3: Indiana AML Productivity as a Share of the U.S. Average (US =100%) and Growth Relative to U.S. (Percentage Point Difference in Growth)

IN Productivity Relative to U.S., 2022

Manufacturing: 89%
Freight Transportation & Logistics: 92%
Wholesale Distribution: 87%
U.S. = 100%

IN Productivity Growth Relative to U.S. (Percentage Point Difference), 2017-2022

Manufacturing: -0.4%
Freight Transportation & Logistics: 5.3%
Wholesale Distribution: -3.7%
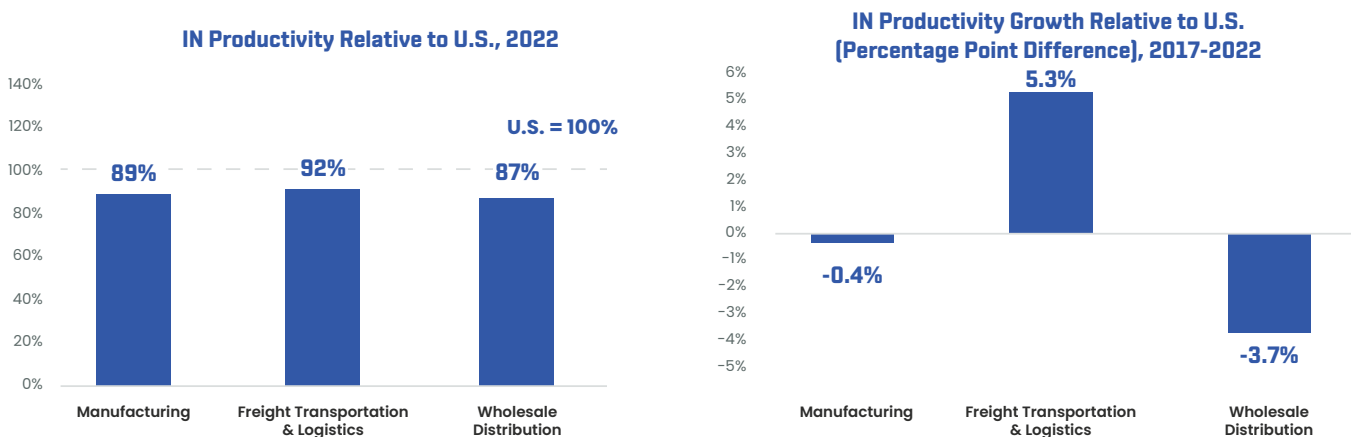
Source: TEConomy Partners' analysis of Lightcast Data – Release 2023.2.

Digging a level deeper, a majority of Indiana's manufacturing subsectors have productivity levels below the national averages for their respective industries (Figure 4). Only three of these subsectors significantly outperform their U.S. counterparts in productivity levels in the energy, metals, and aerospace manufacturing subsectors. Both life sciences manufacturing and closely aligned agbiosciences manufacturing essentially match the U.S. productivity levels, while the remaining six subsectors are lagging behind national averages.
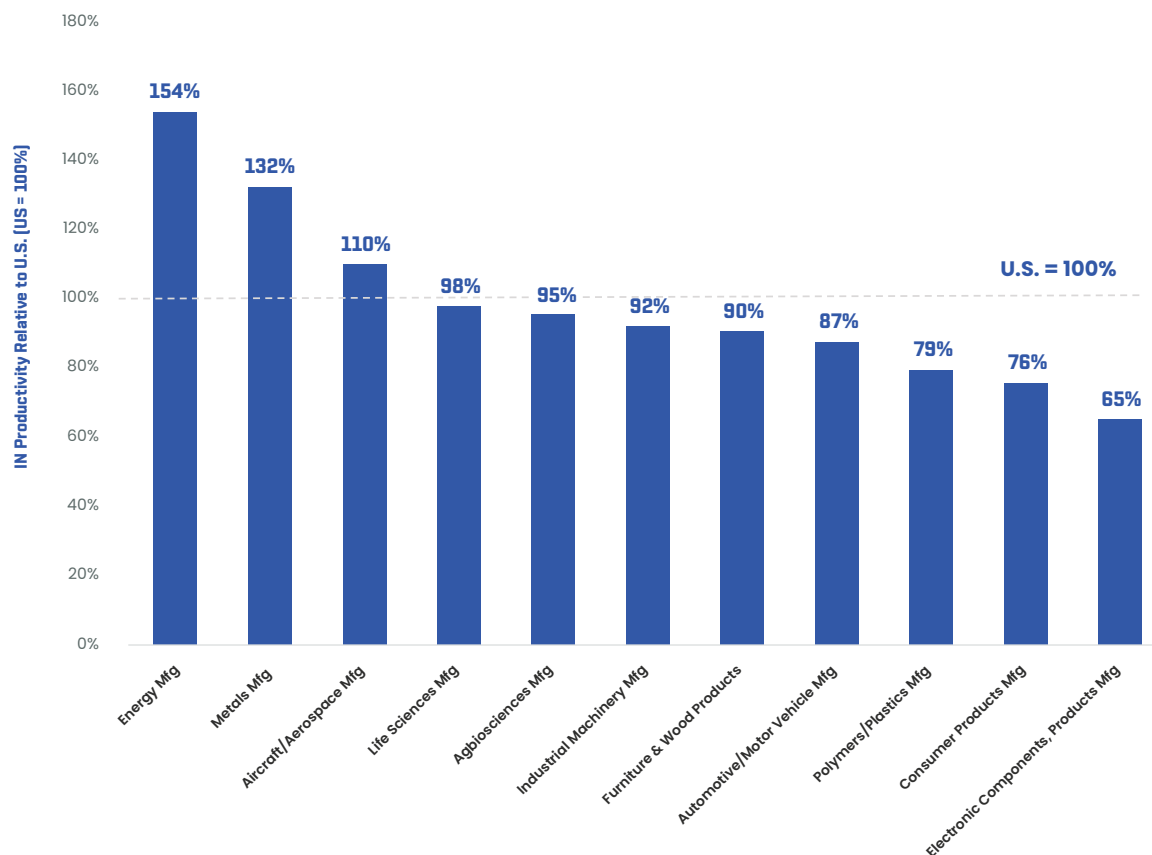
Many factors influence productivity, including the ultimate focus of the state's product mix and that product's value-added context compared with its national counterparts. For example, in aerospace manufacturing Indiana companies are producing highly valuable aircraft parts and components, including aircraft engines, and thus perform above many of their industry peers in other geographies on a value-added per worker basis. In the life sciences, the state's industry is a well-balanced portfolio, spanning both highly valuable therapeutic innovations and medical device manufacturing and thus performs close to the national average. In the automotive/motor vehicle manufacturing sector the product mix ranges from new cars off the assembly line to recreational vehicles and semi-trailers—a more diversified and unique product mix versus many comparison states. Therefore, automotive productivity measures can vary greatly with the large OEMs having implemented high levels of automation versus smaller suppliers that rely more heavily on manual processes.

In addition, there are employment and value-added dynamics that sometimes move counter to or not in lockstep with one another, affecting productivity metrics. While value-added or the contribution to Indiana's Gross Domestic Product (GDP) has increased in each of the AML subsectors overall since 2017, employment changes, like the state's product mix, can affect the productivity calculation in terms of both overall levels and recent changes. And where some subsectors have seen their employment decline, they have simultaneously increased their levels of value-added. Take, for example, the following:

- In metals manufacturing, employment declined in Indiana from 2017 through 2022 but value-added totals increased, combining to result in a significant boost to overall productivity.

- Similarly in aerospace manufacturing, Indiana's employment also declined and total value-added increased slightly, resulting in an increase in overall productivity during this 5-year period.

Each industry has its own unique underlying dynamics that affect productivity levels and growth, and it is difficult to isolate and truly decompose the multiple factors all combining to affect productivity measures. While a valuable exercise, this is not the focus of this report. The primary focus is to gain a better understanding of the competitive context for Indiana's AML industries as a whole, and where possible, identify where productivity-enhancing investments in digital technologies are most needed.

Figure 4: Indiana Productivity by Manufacturing Subsector as a Share of the U.S. Average (US =100%), 2022

In terms of productivity trends, four Indiana manufacturing subsectors have seen their growth outpace that of the U.S. since 2017, including:

- Metals (productivity growth 20 percentage points higher than U.S.)
- Industrial Machinery (productivity growth 8 percentage points higher than U.S.)
- Consumer Products (productivity growth 4 percentage points higher than U.S.)
- Energy (productivity growth 1 percentage point higher than U.S.)

Two subsectors matched the growth in national productivity since 2017—aerospace manufacturing and agbiosciences. Four sectors saw their productivity erode compared with the national sector:

- Automotive/Motor Vehicles (productivity growth 10 percentage points lower than U.S.)
- Polymers and Plastics (productivity growth 10 percentage points lower than U.S.)
- Furniture and Wood Products (productivity growth 4 percentage points lower than U.S.)
- Electronic Components and Products (productivity growth 1 percentage point lower than U.S.)

Across these subsectors Indiana sees mixed performance in both productivity levels and productivity growth relative to the seven comparison states (Table 1). Among some of Indiana's largest and most specialized subsectors such as automotive manufacturing; agbiosciences; polymers and plastics; and wholesale distribution, the state ranks in the middle to back of the pack in terms of both productivity levels and recent growth. In others, Indiana has a leading productivity profile in terms of levels of value-added per worker, but is not growing as fast as comparison states, such as for energy, aerospace, and life sciences manufacturing. In metals manufacturing, Indiana is leading its peers in both facets.

Table 1: Indiana's Ranking in AML Industries Productivity Levels and Growth Relative to the Seven Comparison States, 2022 (Rankings Out of 8 Total States, Including Indiana)

AML Sectors	Productivity Level: IN Rank	Productivity Growth Since 2017: IN Rank
Manufacturing	5th	5th
Logistics	8th	3rd

Subsectors	Productivity Level: IN Rank	Productivity Growth Since 2017: IN Rank
Agbiosciences Mfg.	4th	4th
Aircraft/Aerospace Mfg.	2nd	4th
Automotive/Motor Vehicle Mfg.	6th	6th
Consumer Products Mfg.	8th	3rd
Electronic Components, Products Mfg.	6th	1st
Energy Mfg.	1st	5th
Furniture and Wood Products Mfg.	5th	4th
Industrial Machinery Mfg.	7th	2nd
Life Sciences Mfg.	3rd	7th
Metals Mfg.	1st	1st
Polymers/Plastics Mfg.	8th	8th
Freight Transportation and Logistics	7th	2nd
Wholesale Distribution	8th	7th

Source: TEConomy Partners' analysis of Lightcast Data – Release 2023.2.

Considered all together, the productivity context for Indiana's AML industry, both compared with national averages and versus key comparison states, is concerning and makes a strong case for continued digital adoption. At the same time, it is made more urgent by a number of workforce and population challenges Indiana is facing. In TEConomy's recent strategic efforts with the IEDC on *Building an Economy of the Future* for Indiana, numerous workforce, talent, and population challenges were brought to the forefront based on a combination of data analyses and interview discussions with CEOs from leading Indiana companies, many of which are included within the AML industries.[7] The need for workforce and talent with the right education and skills mix was identified as among the top challenges or limiting factors for both current and future advanced industry-led growth. TEConomy's strategic conclusions regarding workforce and talent were summarized as follows:

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7   *Building an Economy of the Future: Indiana's Strategy for Advancing GDP Growth and Economic Prosperity, Phase II: Strategy and Action Plan*, prepared for the Secretary of Commerce and IEDC, July 2022

TALENT CONSTRAINED. Workforce availability and skills represent crucial concerns for Indiana and are the primary rate-limiting factor for economic growth. The challenge is multi-dimensional, and spans issues with overall performance in K-12 education, the percentage of the population seeking to achieve higher education credentials, and the retention and attraction of personnel with in-demand educational credentials and occupational skills. Indiana's ability to address each of the other strategic conclusions, in part, depends on solving the workforce skills challenge across the state.[8]

Based on these findings, TEConomy recommended a series of strategic priorities and specific actions to address the identified challenges for enhancing education and workforce development both broadly and in targeted areas relevant for key advanced industries. Recommendations focused around such areas as retaining postsecondary graduate talent; advancing productivity via a series of "Business 4.0" investments and initiatives; elevating student-industry connectivity; closing the supply/demand gaps in key sub-baccalaureate technical positions; and other, workforce- and talent-related recommendations.

In addition to the advanced technologies deployed as part of an Industry 4.0 ecosystem, employees that have the skill sets required to fully leverage digital tools and systems are critical to ensuring the long-term success of transitioning to an Industry 4.0 framework. Manufacturers face an especially competitive and challenging workforce landscape in attracting and retaining Industry 4.0-enabling jobs due to the combined challenges of limited supply, high-demand from and competition with other tech-driven industries for talent, and relatively large cohorts of existing workers that are likely to require upskilling.

With enhanced productivity a major strategic business driver for Industry 4.0 technology adoption, Indiana should consider this context in how and where it targets programmatic activities and interventions. Consider, for example, the deployment of the state's Manufacturing Readiness Grants where Conexus' 2022 impact assessment of the program highlighting the impacts in the program's first 2 years finds that:[9]

- Fabricated metals manufacturing has been the leading industrial recipient of MRG grant awards—which represented 14% of all funding awarded over the first 2-years; and this sector is a clear leader for Indiana in measures of productivity and productivity growth.

- By contrast, the automotive manufacturing and industrial equipment/machinery manufacturing subsectors have received 9% and 8% of MRG grant funding, respectively, but are lagging to a greater degree in productivity relative to both national and state peers.

- Last, because the MRG program was never designed to target or support Indiana's logistics or transportation companies specifically with tech adoption, these firms have received less than 2% of funding for various edge-cases. This offers a unique area for future program expansion.

It must be recognized that receiving MRG program funding is a result of several factors including programmatic awareness, intent to adopt appropriate technology, timing, budgets, and others. It should be noted that any Indiana manufacturer working to adopt technologies in the Industry 4.0 space is eligible for funding but small- to mid-sized companies are heavily favored. However, Conexus and the IEDC may want to utilize ongoing industry intelligence to understand where interventions might be better targeted going forward to address existing and/or widening productivity gaps and challenges.

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8   Ibid.
9   Conexus Indiana, "Manufacturing Readiness Grants Program: 2022 Impact Report."

III. Insights into Industry 4.0 Tech Adoption:

Indiana vs. Other States, U.S.

The extensive research effort undertaken to identify and report on comparable, state-by-state measures of Industry 4.0-related technology adoption by manufacturers has yielded virtually no results. However, the research team has identified several proxy measures for technology adoption that can be used to benchmark Indiana vs. other states and the United States on an ongoing basis.

As hypothesized based on TEConomy's prior research and strategy work in this space, no one entity, national or otherwise, is tracking progress of digital implementation among manufacturers on a comparable state level in real-time. Just some of the research avenues explored by this assessment are shown in Figure 5.

Figure 5: Data Sources Explored for Insights Into Tech Adoption—Resulting in Key "Proxy" Measures, Analyses

Workforce: Job Posting Analytics, Skill Demands	**Workforce: Industry "Staffing Patterns"**	**Industry Clusters:** Productivity, Other Key Metrics	**Annual Survey of Manufacturers (Census Bureau)**
Annual Business Survey (Census Bureau)	**Multifactor Productivity**	**NIST MEP National Network**	**State Surveys on 4.0 Tech Adoption**
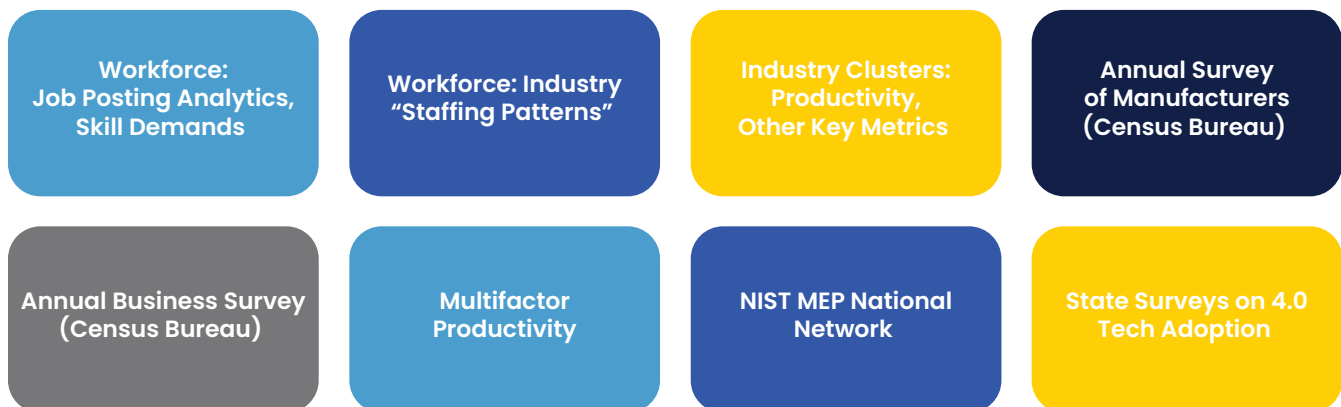
As a result of data non-comparability, looking beyond Indiana to gauge relative progress on technology adoption is severely hindered. Proxy measures of implementation therefore are required as a window into the focus and capability of manufacturers, in Indiana and among the set of comparison states, to implement Industry 4.0-related technologies. These included:

- Job postings requesting key Industry 4.0 skillsets; and
- Job postings mentioning key Industry 4.0-related concepts; and
- Deployment of Industry 4.0-enabling workforce/occupations.

After evaluation of multiple proxy indicators for technology adoption, findings suggest that Indiana firms lag the U.S. and comparison states in Industry 4.0-related investments and talent deployment.

Tech Adoption and Talent Deployment Insights from Manufacturing Sector Job Postings

Useful insights on Industry 4.0-related investments and priorities are embedded within corporate job postings but also pose unique limitations for researchers to drill down into specifi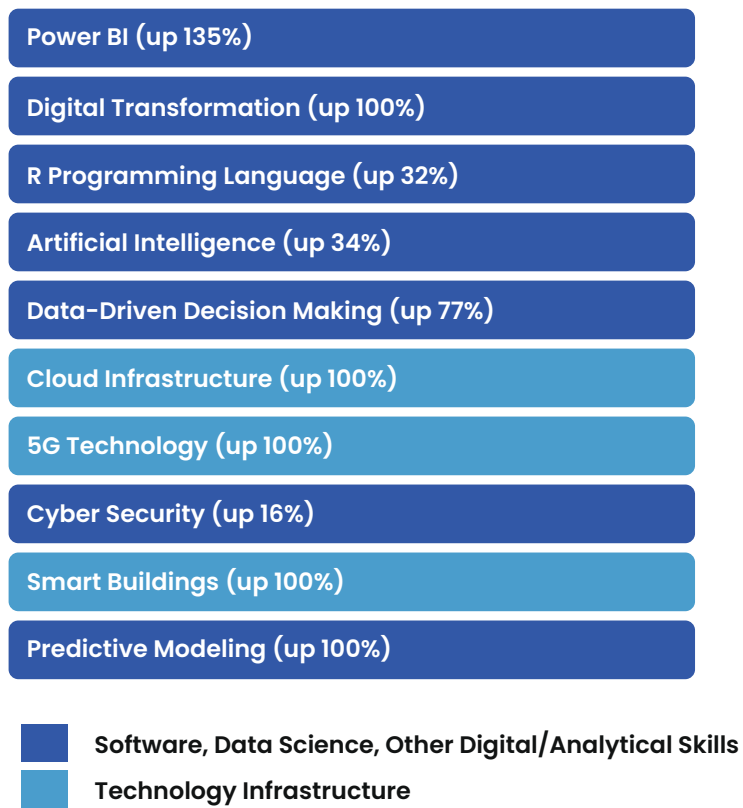c tech capabilities. Lightcast, formerly Emsi, captures near real-time job posting data from an extensive set of sources and performs key data cleaning steps such as de-duplication of postings for the same position to enable detailed analysis of required skill sets, education and experience, keywords, and more among a "unique" set of postings.

The degree to which software, data sciences, and other digital and analytical skill sets are rising in importance and among the leading "hot" skills areas for U.S. manufacturing companies is both remarkable and confirms the significant extent to which Industry 4.0 technologies are being implemented. The skill areas shown in Figure 6 help first set the context and highlight the rapid rise of Industry 4.0-related skills and talent demand. Since early 2020, U.S. manufacturers are mentioning the areas shown in Figure 6 at rapidly rising rates and prioritizing not only key digital skills but also talent competencies related to technology infrastructure such as cloud computing, 5G technology, and smart building applications. The digital and increasingly "smart" manufacturing factory has truly arrived.

Figure 6: Setting the Context: Fastest-Growing Areas of Expertise/Skills Areas Mentioned in <u>National</u> Manufacturing Job Postings Related to Industry 4.0 Technologies (Based on Change from Jan. 2020 through Oct. 2023)

Power BI (up 135%)

Digital Transformation (up 100%)

R Programming Language (up 32%)

Artificial Intelligence (up 34%)

Data-Driven Decision Making (up 77%)

Cloud Infrastructure (up 100%)

5G Technology (up 100%)

Cyber Security (up 16%)

Smart Buildings (up 100%)

Predictive Modeling (up 100%)

■ Software, Data Science, Other Digital/Analytical Skills
■ Technology Infrastructure

Note: Expertise/skills areas are presented in descending order based on the increase in raw number of national job postings in which they appear over this time period. Skills areas for which growth rates are shown to be 100% represent areas in which there were no instances of appearing in manufacturing job postings in January 2020.

Source: TEConomy Partners' analysis of Lightcast, Job Posting Analytics 2023.4

Similarly, querying key Industry 4.0-related skills mentioned in recent job postings can yield insights into the demand for talent required for tech adoption and implementation, as well as the extent to which state firms are prioritizing these investments at a broad scale. An analysis was conducted of state-by-state and U.S. manufacturing industry job postings during the last 2 years using the following skill demands, which are closely related to Industry 4.0 technologies, implementation, and deployment spanning:

- Additive Manufacturing (3D Printing)
- Advanced Analytics, Data Analysis, Collection, Visualization
- AI and Machine Learning
- AR/VR Technologies
- Computer and Machine Vision
- Industrial Internet of Things (IIoT)
- Predictive Analytics
- Predictive Maintenance
- Robotics

Indiana is lagging behind most comparison states and the nation in its share of manufacturing industry job postings that require any, or some combination of these skill sets (Figure 7).

Figure 7: Share of Total Manufacturing Job Postings Requesting Key Industry 4.0-Related Skill Sets, Indiana and Comparison States, Last 2 Years*
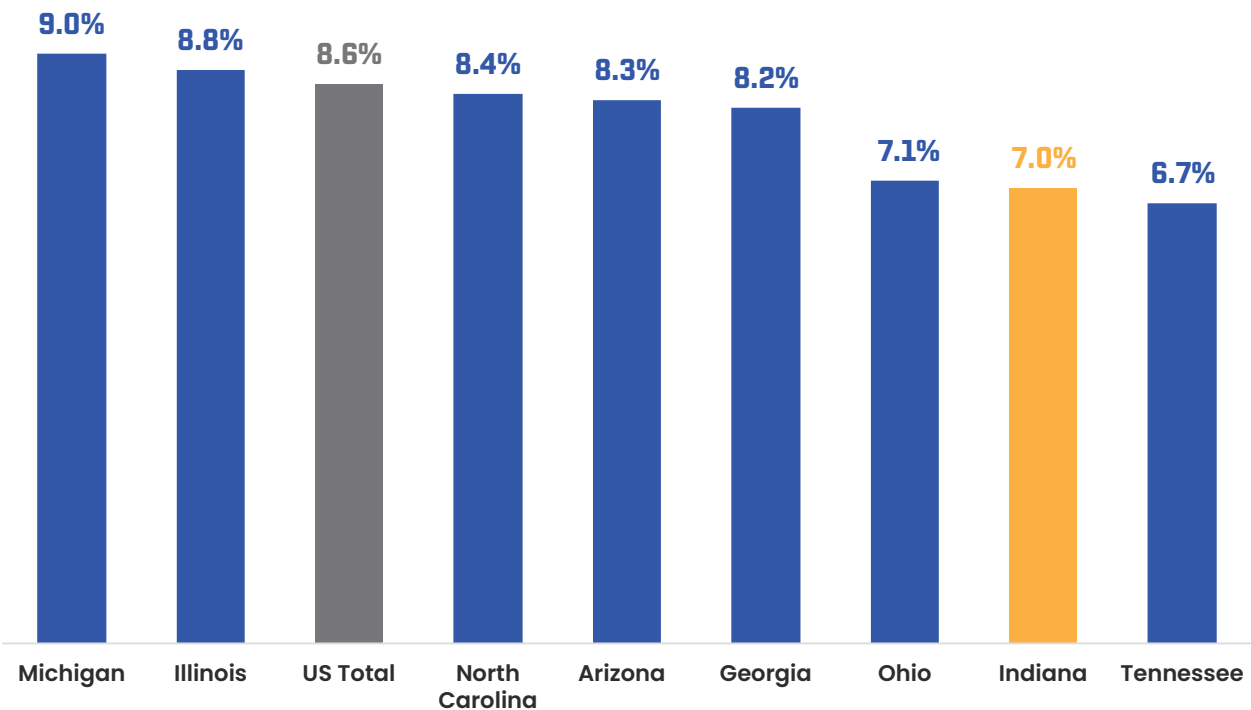
*Includes unique job postings from October 2021 through October 2023.

Source: TEConomy Partners' analysis of Lightcast, Job Posting Analytics 2023.4.

In addition to skills-focused queries, the job postings database allows for queries that light up keywords and phrases throughout a job posting. Most job postings include a company description and explain how the specific position will contribute to broader company goals. A keywords search can be leveraged to gauge how companies describe and perceive themselves and what their aspirations are as it relates to Industry 4.0 initiatives and talent development. To that end, the following keywords were utilized in a complementary approach to determine if manufacturing job postings could form a proxy measure related to Industry 4.0 technologies, implementation, and deployment spanning:

- Cyber-Physical
- Data Analytics
- Digital Transformation
- Industrial Internet of Things (IIoT)
- Industry 4.0
- Manufacturing 4.0
- Smart Factory
- Smart Manufacturing

Similar to the skills-based analysis, Indiana firms are lagging behind the U.S. and comparison states in their mention of industry 4.0-related investments and hiring context in recent job postings (Figure 8).

Figure 8: Share of Total Manufacturing Job Postings Requesting Key Industry 4.0-Related <u>Keywords</u>, Indiana and Comparison States, Last 2 Years*

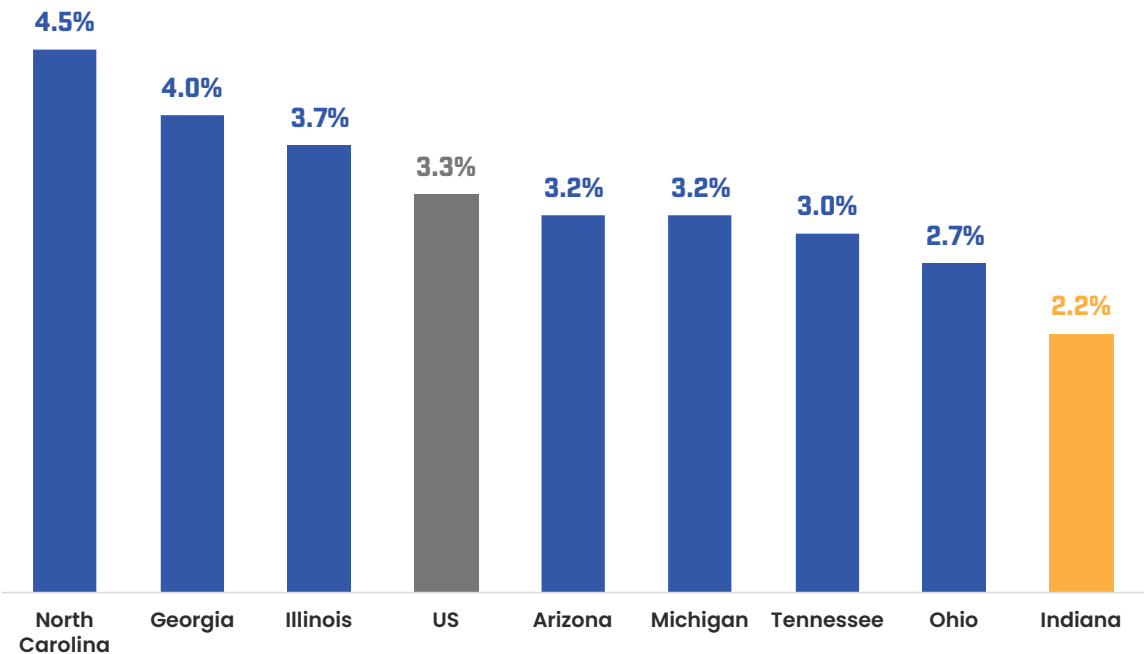*Includes unique job postings from October 2021 through October 2023.

Source: TEConomy Partners' analysis of Lightcast, Job Posting Analytics 2023.4.

Insights from Manufacturing Sector Staffing—the Deployment of Industry 4.0-Enabling Roles

Industry 4.0 "enabling" occupations develop, deploy, and/or support the digitization and automation applications that are most closely related to the concepts of Industry 4.0. TEConomy has developed a set of those occupations and roles best aligned with these characteristics, corroborated from national strategy work in the space including in-depth industry interviewing as well as job posting analytics. Table 2 groups into segments and provides occupational examples of these enabling roles.

Table 2: Industry 4.0-Enabling Occupational Segments and Corresponding Examples

Industry 4.0-Enabling Occupational Segments	Example Occupations in Segment
Business Analytics	Management Analysts, Market Research Analysts
Computer Hardware & Networking	Information Security Analysts, Network and Computer Systems Administrators
Computer Software	Software Developers, Applications, Computer Programmers
Digital Systems	Computer Systems Analysts, Database Administrators
Engineering Technicians	Aerospace Engineering and Operations Technicians, Industrial Engineering Technicians
Engineers	Mechanical Engineers, Industrial Engineers
Modeling & Data Science	Statisticians, Mathematicians
Operations & Logistics	Logisticians, Operations Research Analysts, Industrial Production Managers
Scientific Technicians	Chemical Technicians, Ag and Food Science Technicians
Scientists	Chemists, Materials Scientists

Source: TEConomy Partners, LLC.

Many AML firms primarily leverage their existing employees to implement new technology solutions, not relying solely on hiring new expertise. Industry "staffing patterns" analysis allows for isolating employment among these key enabling occupations within the AML industry and can be performed on a state-by-state basis. Figure 9 presents the shares of Industry 4.0-enabling occupations deployed across state sectors—Indiana is again lagging its peer and competitor states in the AML industry's utilization of these key occupations for innovation and tech deployment. Likewise, Indiana's 7% share of employment falls behind the nation's 10% average share. Leading states in these shares, such as Arizona and Michigan, have key sectors deploying large Industry 4.0-enabling workforce and talent bases—such as semiconductors and aerospace in Arizona, and the automotive industry with its large R&D assets in Michigan.

Figure 9: Deployment of "Industry 4.0-Enabling" Workforce in the AML Sector, Indiana and Comparison States, 2022

Total AML

Bar chart "Total AML" showing Industry 4.0-Enabling Occupations vs. All Other Occupations by state:
- IN: 7% Industry 4.0-Enabling, 93% All Other
- AZ: 13%, 87%
- GA: 8%, 92%
- IL: 9%, 91%
- MI: 12%, 88%
- NC: 9%, 91%
- OH: 9%, 91%
- TN: 7%, 93%
- U.S.: 10%, 90%

Legend: ■ All Other Occupations ■ Industry 4.0-Enabling Occupations
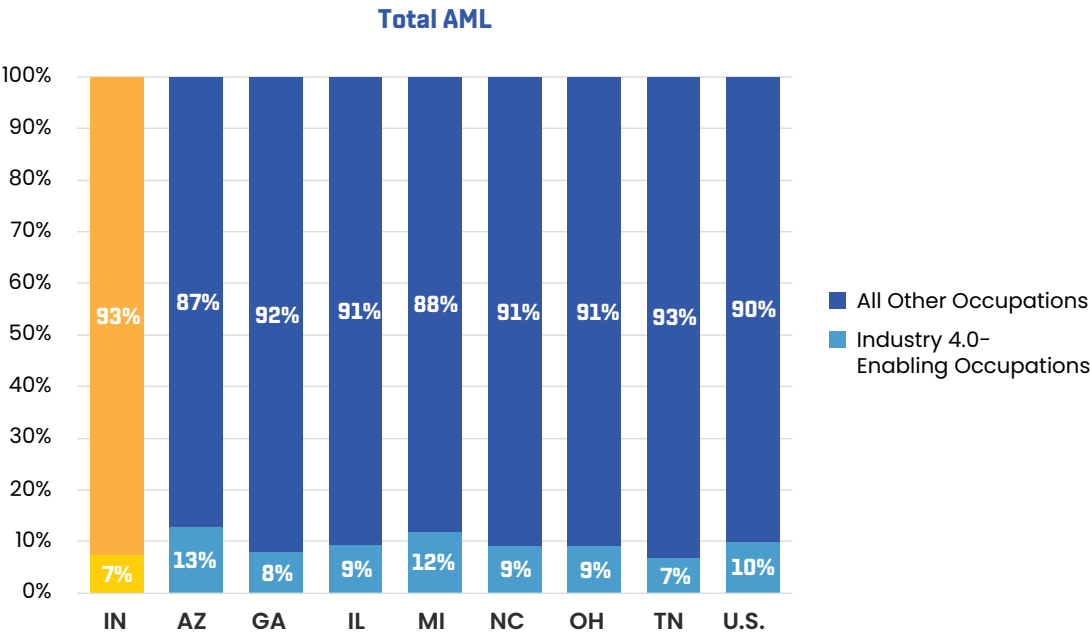
Source: TEConomy's analysis of staffing patterns data from Lightcast (Datarun 2023.4).

Within the AML industry, isolating the manufacturing component tells a similar story on leveraging the 4.0-enabling occupational base (Figure 10), where Indiana sits just behind most comparison states with its 9% share of industry jobs.

Figure 10: Deployment of "Industry 4.0-Enabling" Workforce in the Manufacturing Sector, Indiana and Comparison States, 2022

Manufacturing Only

Bar chart "Manufacturing Only" showing Industry 4.0-Enabling Occupations vs. All Other Occupations by state:
- IN: 9% Industry 4.0-Enabling, 91% All Other
- AZ: 20%, 80%
- GA: 9%, 91%
- IL: 12%, 88%
- MI: 14%, 86%
- NC: 11%, 89%
- OH: 11%, 89%
- TN: 9%, 91%
- U.S.: 13%, 87%

Legend: ■ All Other Occupations ■ Industry 4.0-Enabling Occupations
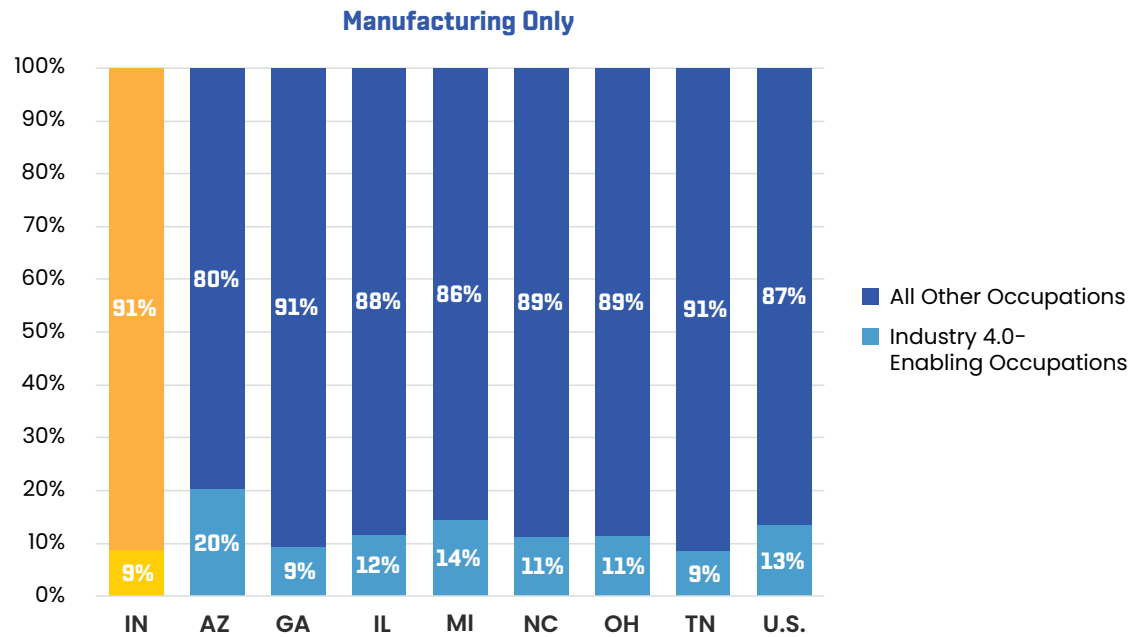
Source: TEConomy's analysis of staffing patterns data from Lightcast (Datarun 2023.4).

In Indiana's logistics sector, the share of Industry 4.0-enabling occupations is generally lower than the comparison set as well. The logistics enabling workforce sits at 5%, while other states range between 5% to 7%, including the 6% U.S. average.

Though Indiana deploys a lower share of its workforce in 4.0-enabling roles, examining the occupational composition of this state workforce sheds light on how the states enabling workforce differs from its peers. Figure 11 breaks down the shares by major occupational segment and finds Indiana is utilizing a relatively greater share of engineers, operations and logistics professionals, and engineering technicians relative to national averages and most comparison states. By contrast, Indiana's AML sector is less concentrated in its deployment of roles in business analytics, digital systems, and software. These findings suggest that while utilizing engineers to drive process improvement and product innovation, Indiana's AML firms may not be leveraging key facets of digitization and connected factory solutions to the same degree as other states' AML industries.

Indiana is utilizing a relatively greater share of engineers, operations and logistics professionals, and engineering technicians relative to national averages and most comparison states in 4.0-enabling roles.

By contrast, Indiana's AML sector is less concentrated in its deployment of roles in business analytics, digital systems, and software. These findings suggest that Indiana's AML firms may not be leveraging key facets of digitization and related insights gleaned from the resulting data outputs to the same degree as other state sectors.

Figure 11: Composition of Industry 4.0-Enabling Occupational Employment in the AML Sector—Indiana vs. Comparison States, 2022
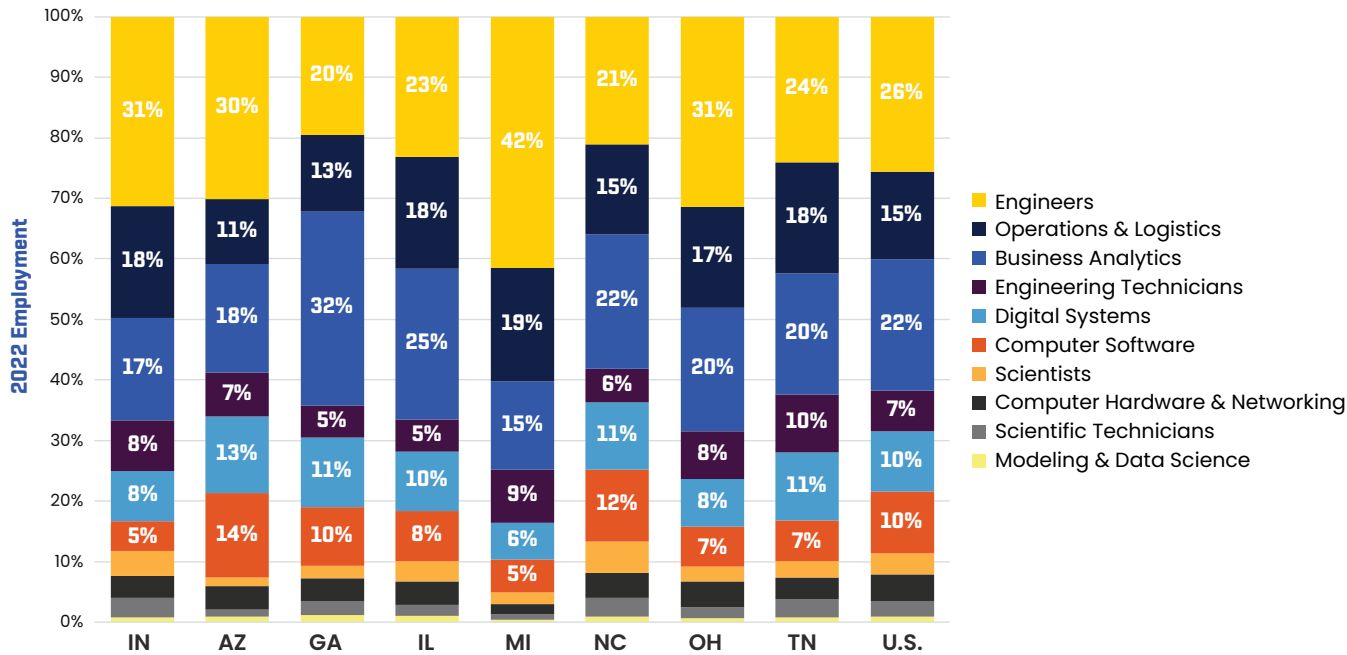
Indiana's Manufacturing Deployment of "Industry 4.0-Enabling" Workforce

Within Indiana's AML industries, among which subsectors does Indiana …

Deploy its largest share of 4.0-Enabling workforce?

- Aircraft/Aerospace Manufacturing (35% of employment)
- Electronic Components & Products (33% of employment)
- Life Sciences (21% of employment)

Deploy a greater/same share of 4.0-Enabling workforce vs. U.S. average?

- Furniture & Wood Products (3%, matching U.S. avg.)

Indiana is leveraging fewer professionals in the analytics, digital systems, and software capacities relative to its peers in the comparison set. However, its industry subsectors are not monolithic, and the state sees a higher share of Industry 4.0-enabling occupations within more tech-intensive segments such as aerospace, electronic components and products, and life sciences manufacturing relative to others. While Industry 4.0-related job postings and staffing patterns only represent proxy measures, they expose important insights—indicating that Indiana is lagging both national and comparison state rates of digital adoption. **As these positions are the most likely to drive innovation, leverage digital tools, and accelerate digitalization within the AML industries, Indiana must prioritize increasing awareness of these enabling roles among its firms and building a robust pipeline to ensure sustained progress towards Industry 4.0.**

Insights from Detailed AML Industry 4.0-Related Survey Efforts

Several states, including Indiana, are conducting detailed surveys to gauge Industry 4.0-related tech adoption and other facets of their respective manufacturing industries' digital transformation. The challenge in examining the resulting insights and key findings is one of comparability—namely, there is no coordination between or among states or national entities to ask similar questions in the same manner. Take, for example, the following questions asked of AML or manufacturing firms in recent state surveys regarding Industry 4.0-related technology adoption:

State/Entity Surveying	Questions on Overall Tech Adoption
Conexus Indiana (2022)	What is your company's level of interest in adopting Industry 4.0 technologies? (Please check one.) • We've successfully implemented one or more technologies. • Our first pilot project is underway. • We're still researching and planning what we are going to do. • We anticipate no foreseeable adoption of Industry 4.0 technologies.
IMEC – Illinois (2021)	Have you implemented or do you intend to implement advanced manufacturing technologies and processes? • [yes/no] – where 72% report "yes" "Progress" is then reported on the following scale: • No progress • Limited progress • Substantial progress • Fully integrated • Unsure/don't know Where a combined 37% report either "substantial progress" or "fully integrated"
CIRAS – Iowa (2021-22)	The high-level progress-related insight is reported as the following: • 87% of survey respondents started implementation of at least one Industry 4.0 technology or enabling technology. The report then highlights progress across a set of 4.0-related technologies using the following categories: • Implemented and being sustained • Implementation in progress • Plan complete and starting implementation • Implementation planning started

A set of surveys intended to assess and yield very similar insights already exist, but questions across the surveys range from "level of interest?" in adopting to "have you implemented, or do you intend to implement?" and "have you started implementing?". While comparability remains a challenge, there is a strong rationale for conducting detailed surveys of AML companies to glean insights that are otherwise unavailable.

Industry 4.0 Implementation Resources: Indiana's AML Tech Ecosystem Firms

AML firms typically begin or accelerate their digital transformation by partnering with technology solutions and/or integration firms that offer an array of products and services, spanning hardware, software, consulting, and more. These "tech ecosystem" firms offer the following types of services to enable smart manufacturing, some combining several into their solutions portfolio:

- **Hardware & Devices:** including sensors, devices, or gateways for Industrial Internet of Things (IIoT) driven automation; robotic solutions, other automated systems, etc.

- **Software & Applications:** including application developers, software developers and vendors, and cloud providers. Product examples include IIoT platforms, SCADA systems (Supervisory Control and Data Acquisition), edge computing solutions, worker safety applications, real-time analytics solutions, cybersecurity, etc.

- **Professional Services:** including systems integrators, business advisors to design, engineer, install, and support end-to-end solutions and digitalization.

In this admittedly simplified structure of a complex digital transformation journey, AML firms often leverage a network of technology partners as an extension of their in-house teams and expertise. This could be for hardware, software, or systems integration to deploy a new system or process at scale. It is important to recognize, in the context of the preceding findings around lagging indicators of Industry 4.0-enabling workforce deployment, that Indiana AML firms can augment both expertise and talent to be successful in their digital transformation journeys. This is particularly true for small- and mid-sized firms that do not have dedicated teams and leaders for technology adoption.

Sixty-four tech ecosystem firms were identified through this research effort as serving the Indiana AML sector in at least one of these capacities, offering products, services, and/or solutions to help enable Indiana's transition to an Industry 4.0 economy.[10] Solutions and service offerings of the group of firms were summarized and organized using Industry 4.0-related procurement areas assigned by Thomasnet—a leading product sourcing and supplier discovery database. The number of firms offering each of the specific areas are shown in Figure 12.

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10 Tech ecosystem firms were identified via a range of sources, including the online Thomasnet database; Hoovers D&B; Conexus Indiana; and broad-based web research. This list should not be considered exhaustive but rather illustrative of the numerous firms and range of solutions available to Indiana AML companies. See Appendix C to this report for a list of the firms identified.

Figure 12: Industry 4.0-Related Service Offerings to the Indiana AML Industries (Count of Firms Providing)

Category	Count
Automation	45
Robots	31
Controllers	26
Integration	24
Software	20
Sensors	17
Data Collection	17
Consulting	16
Machine Vision	16
Assembly	16
R&D	13
3D Printing	6
AI	6
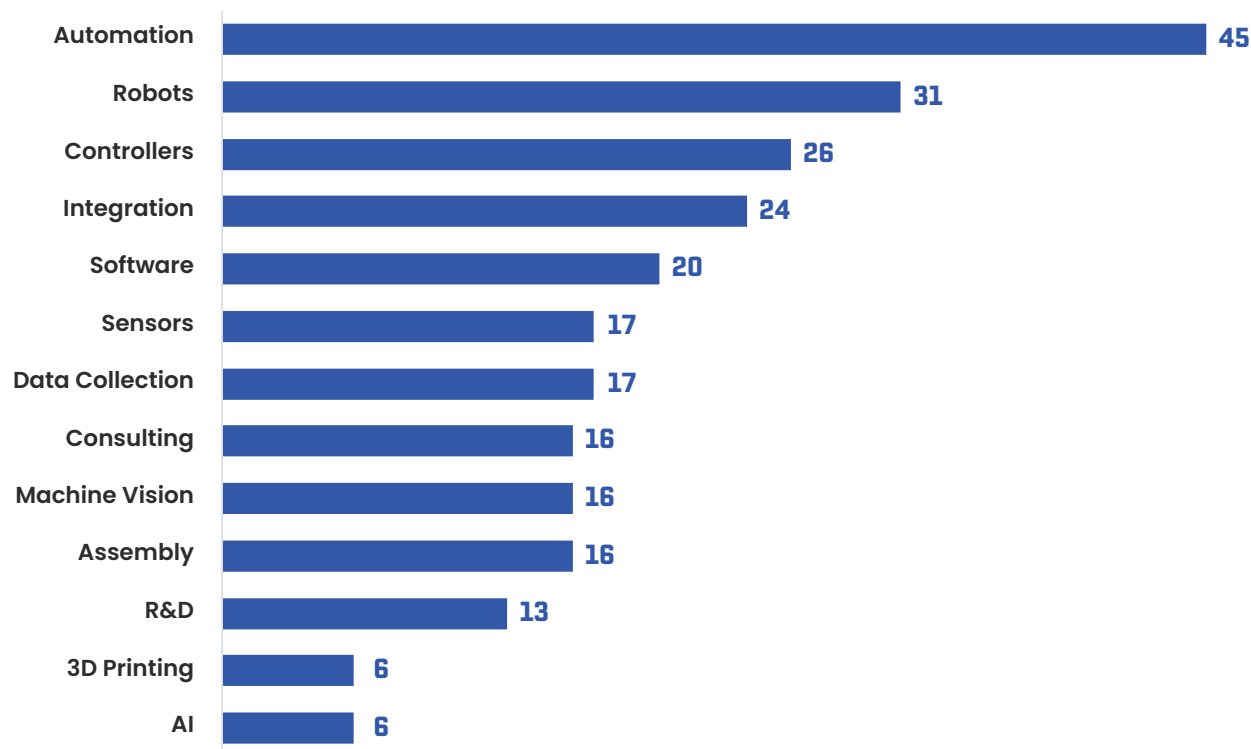
Source: TEConomy Partners analysis of Thomasnet; D&B Hoovers; Conexus Indiana; other sources.

The firms are primarily Indiana-based, with 84% headquartered within the state, and represent their own significant industrial segment with key contributions to Indiana's economy and enabling critical efforts on digital transformation in the AML industries. The AML subsectors served by the combined 64 tech ecosystem firms are listed in Table 3. Just a few examples of the types of firms and solutions identified include:

- **Bastian Solutions** (Carmel, IN) is a systems integrator working with companies on technology solutions in material handling equipment and information systems including innovative software and custom automation engineering. Bastian's history of solutions is varied and spans mobile robots, automated storage and retrieval systems (ASRS), automated guided vehicles (AGV), goods-to-person technology, sortation, and conveyor.

  - **AML Subsectors Served:** Agbiosciences, Aerospace, Automotive, Consumer Products, Electronic Components, Freight Transportation and Logistics, Industrial Machinery, Life Sciences, and Wholesale Distribution.

- **ClearObject** (Fishers, IN) is a technology provider and engineering services firm that assists companies with the implementation of new solutions across edge-based artificial intelligence (AI), generative AI, Computer Vision, Machine Learning (ML) Ops, Internet of Things (IoT), Cloud migrations, and complex data analytics.

  - **AML Subsectors Served:** Agbiosciences, Industrial Machinery, Life Sciences, and Wholesale Distribution.

- **Flexware Innovation** (Fishers, IN), recently acquired by Hitachi Global, is a systems integrator working to assist manufacturers in their digital transformation by providing best-in-class software development, automation engineering, manufacturing systems integration, business intelligence solutions, Internet of Things (IoT) devices, and specialized product development.

  - **AML Subsectors Served:** Agbiosciences, Automotive, Consumer Products, Industrial Machinery, Life Sciences, and Metals.

- **Telamon Robotics** (Carmel, IN) is a distributor and integrator of Techman collaborative robots (Cobots). In conjunction with its partner network, Telamon helps to assess, design, build and deploy customized solutions to accelerate cobot adoption across various business applications, including cutting, palletizing, machine tending, and sanding.

  - **AML Subsectors Served:** Automotive, Freight Transportation and Logistics, Furniture and Wood Products, Industrial Machinery, Metals, and Wholesale Distribution.

Table 3: Tech Ecosystem Firm Counts by AML Industry Subsector Served

AML Subsector	Tech Ecosystem Firm Count	Indiana Subsector Employment Size
Agbiosciences	13	55,004
Aircraft/Aerospace	12	7,086
Automotive/Motor Vehicle	29	142,285
Consumer Products	17	12,011
Electronic Components and Products	34	11,107
Energy	13	4,841
Freight Transportation and Logistics	20	159,933
Furniture and Wood Products	4	34,206
Industrial Machinery	38	17,511
Life Sciences	22	41,398
Metals	34	103,902
Polymers/Plastics	12	46,245
Wholesale Distribution	13	129,580

Source: TEConomy Partners; firm counts based on review of company websites.

Tech ecosystem firms represent a critical component of Indiana's Industry 4.0 ecosystem, enabling and accelerating tech adoption via expertise across a wide range of digital, advanced analytic, and sophisticated automation solutions. These firms employ top talent from Indiana universities and represent an important Industry 4.0-enabler for the state's AML industries.

IV. Enhancing AML
Tech Implementation:

State Policies & Programs to Address Challenges, Gaps

Manufacturers typically cite several common barriers or significant challenges related to technology adoption and implementation in the Industry 4.0 space, including but not limited to:[11]

- Significant costs and budget restrictions.
- Limited or lack of internal technical expertise.
- Integration with legacy systems.
- Little or limited understanding of expected return on investment (ROI).
- Understanding where and how to start the Industry 4.0 journey.

Recognizing consistent challenges and the high stakes for state or regional manufacturing competitiveness, states are increasingly tailoring and targeting economic development incentives and programs to assist the industry on its technology adoption journey.

These challenges tend to be even greater and more amplified for small- and mid-sized manufacturing enterprises (SMEs) operating with fewer resources and smaller budgets.

Recognizing these consistent challenges and the high stakes for state or regional manufacturing competitiveness, states are increasingly tailoring and targeting economic development incentives and programs to assist the industry on its technology adoption journey. In addition to state economic development and other government agencies, state Manufacturing Extension Partnership or "MEP" programs as well as private industry groups, trade associations, colleges and universities, and other advanced manufacturing ecosystem players are initiating their own programs, activities, and investments toward assisting manufacturers in tech adoption, associated workforce development, navigating vendors and technology integrators, sharing case studies, demonstrating technologies, and many more activities.

This section of the report highlights a sample of various efforts underway to accelerate the Fourth Industrial Revolution for manufacturers on a state-by-state basis. These programs and policies are also used as a framework to benchmark and compare Indiana against others. In limited instances, additional state examples beyond the benchmark set are used.

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11   As documented in annual Conexus surveys of Indiana AML companies as leading areas when asked about major or minor obstacles for Industry 4.0 tech adoption; and through consistent findings from TEConomy's state-level Industry 4.0 strategy efforts.

Industry 4.0-Related Policies, Programs, and Infrastructure: A Scan Across Indiana and Benchmark States

The scan of Industry 4.0-related programming and related efforts was organized across a set of key categories for each state as shown in Figure 13. A state receives a checkmark if a program or activity has been identified via an extensive web search. This scan, however, should not be considered comprehensive and is not an exhaustive record of every activity which might be included. The scan represents an effort to identify relatively significant activities that can reasonably be included under each banner. There are undoubtedly other significant activities that are not publicized via state, MEP, or ecosystem group websites and so are more challenging to find.

Indiana has established activity across all but one Industry 4.0 support area in at least some capacity and can be viewed as one of the leaders versus comparison states for broad-based activity to support the Industry 4.0 journey. **Many of the activities in Indiana—as they are in other states—are conducted independently across numerous organizations and are not necessarily part of a broad, coordinated, and integrated plan to seamlessly serve the AML sector and individual firms.**

Figure 13: Scan of Industry 4.0-Related Policies and Programs: Indiana and Selected Benchmark States

State	Grants for Tech Adoption	Innovation Vouchers	I4.0 Technology Assessments, Roadmaps	I4.0 Consortia for Networking, Events, Resources	Key Facilities for tech piloting, demonstration	Workforce Training & Education Dedicated Programs, Assets	Key University and/or Nat'l Mfg. Institutes
Indiana	✓	✓	✓		✓	✓	✓
Arizona						✓	✓
Georgia				✓			✓
Illinois		✓			✓		✓
Michigan	✓		✓	✓	✓	✓	✓
North Carolina						✓	✓
Ohio			✓	✓	✓	✓	✓
Tennessee		✓				✓	✓

Source: TEConomy Partners, LLC research. For Indiana programs, refer to Appendix B.
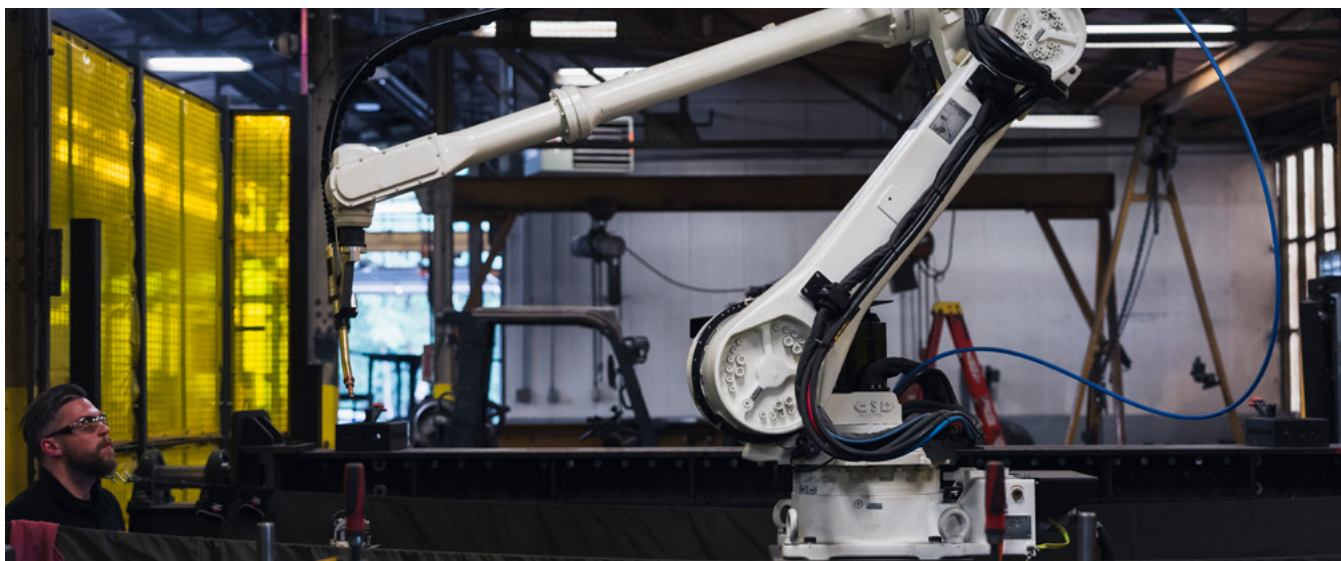
The following share examples of each type of program for Indiana and the comparison states to illustrate the types of activities initiated and supported.

Grants for Technology Adoption Related to Industry 4.0

Indiana Economic Development Corp. and Conexus Indiana – Manufacturing Readiness Grants (MRG) Program	The Indiana Economic Development Corporation (IEDC), in partnership with Conexus Indiana, launched the MRG program in 2020 to stimulate corporate investments directly in the Industry 4.0 space. Since then, the state has awarded 526 grants, which require a 1:1 match by companies, totaling $57 million. The projects are expected to generate a combined $813 million spend on new smart manufacturing technologies such as advanced robotics, cobots, machine vision, and more. Recognizing robust initial impacts, the state continues to allocate significant funding to the program—through 2022 the program was funded at $24 million and an additional $40 million has been allocated by the state legislature for the fiscal year 2024-2025 biennial budget.
Michigan Economic Development Corporation– Industry 4.0 Technology Implementation Grant	The MEDC competitive grant program provides a 50% reimbursement to Michigan manufacturers for qualifying Industry 4.0-related technology costs up to $25,000. MEDC ensures firms are ready for the investment via a completed Industry 4.0 Technology Assessment conducted by the Michigan Manufacturing Technology Center (MMTC). In total, 95 companies have received $2.2 million through the program at the end of 2022. The amount of increased revenue as a result of implementing these technologies is expected to be approximately $112 million, with an estimated 336 jobs created and 1,542 jobs retained. Additionally, these projects leverage $13.1 million in private investment from small manufacturers.
The Center for Advanced Manufacturing (CAM)– Massachusetts Manufacturing Accelerate Program (MMAP)	The MMAP program aims to help Massachusetts-based small to medium-sized manufacturers prepare their businesses to meet the demands of Industry 4.0 and the manufacturing of new technologies and innovations that align with key industries in the state. Grant funding can be used for capital expenditures under GAAP accounting methods and the maximum grant award per manufacturer is $200,000. Projects must be matched at a 1:1 minimum by the manufacturer, and like Indiana's MRG program, projects are judged by an independent panel of ecosystem experts.

Figure 14: Examples of State Industry 4.0 Tech Adoption Grant Programs

MICHIGAN ECONOMIC DEVELOPMENT CORPORATION

Industry 4.0 Technology Implementation Grant

- MEDC's Industry 4.0 competitive grant program **will provide 50% reimbursement for qualifying I4.0 technology costs up to $25,000**.
- Eligible technologies include hardware/software related to specified I4.0 categories.
- Must clearly define which technology will be implemented and establish a timeline, budget and anticipated outcomes of the project.
- Companies must be classified as a **Small Business**.
- Companies must complete an **I4.0 Technology Assessment** by the MMTC prior to award.

IOWA MANUFACTURING 4.0

MANUFACTURING 4.0 TECHNOLOGY INVESTMENT PROGRAM Innovative Technology Infrastructure Grants

- Provides grants that assist SMEs with the adoption and integration of smart technologies into existing operations in the state. Two types of grants are offered through this program (Requires 1:1 match):
  - **Mfg. Innovation Equipment Grants- Up to $50,000 grants**
  - **Mfg. IIoT Infrastructure Investment Grants- Up to $25,000** for the purchase of specialized hardware or software in the Industry 4.0 technology groups.

MADE IN ILLINOIS Productivity and Innovation Grants for Illinois Manufacturers

Made in Illinois Grant

- Illinois recently launched a grant program to support projects and key investments related to Industry 4.0 technologies aimed at "boosting capacity, accelerating production speed, and elevating quality standards."
- Provides matching grants to state manufacturers with between 5 and 250 employees up to $50,000 to fund productivity and innovation related projects.
  - Awardees required to match 100% if they have fewer than 100 employees and match 200% if they have between 100 and 250 employees.

Innovation Voucher Programs	
Indiana Innovation Voucher Program	Innovation Voucher programs incentivize collaboration between small businesses and the state's research and higher education institutions as well as key non-profit research organizations. The Indiana program, administered by the Applied Research Institute (ARI), provides matching grants to firms for up to $50,000 to conduct research for product development, simulations, studies, and more with the goal of developing new, innovative products and services, including those within Industry 4.0 domain areas.
Tennessee RevV	To leverage the extensive capabilities, facilities, and know-how of Oak Ridge National Laboratory and the University of Tennessee, the state has established RevV—a voucher program for Tennessee manufacturing companies to offset the costs of working with these leading-edge institutions on product development and process innovation, including the Industry 4.0 technology space. Since its inception, RevV, ORNL, and UT have assisted more than 40 companies across the state.

Industry 4.0 Technology Assessments and Roadmaps	
Purdue MEP Digital Manufacturing and Design Assessments	Indiana's MEP program, housed at Purdue University, has co-developed with the Chicago-based MxD National Manufacturing Institute a comprehensive assessment for manufacturers to enhance their digital workflow. The process, which includes a site visit and a half-day assessment, reviews five key areas: Enterprise Support Operations, Supply Chain Data Exchange, Design and Engineering, Digital Factory Floor, and Cybersecurity. A report is generated and the MEP will discuss available solutions specific to the company's needs.
Ohio MEP Digital Transformation for Manufacturers Assessment (DTMA)	The DTMA, targeted toward SME manufacturers seeks to assist firms to act and invest in digital transformation. The Assessment specifically helps manufacturers: quantify their current state of transformation; focus on areas of weakness and constraints; plan and collaborate to implement technology solutions; and to develop a foundation for continuous review.

Industry 4.0 Consortia for Networking, Events, and Resources

Georgia Manufacturing 4.0 Consortium

The relatively new Georgia Consortium, created with funding from the DoD Office of Local Defense Community Cooperation, represents an industry-academia-government consortium aiming to advance and deploy 4.0-related technologies into the market. The Consortium is designed to conduct research, offer workforce training, provide SME manufacturers with the ability to demonstrate and use advanced tools, learn how to drive changeovers, innovate on new products and processes and ultimately adopt Industry 4.0 technologies. While DoD funded the Consortium, membership is open to companies outside of the defense industry.

Automation Alley's I4.0 Knowledge Center (Michigan)

Michigan's Automation Alley is a non-profit technology business association and "Digital Transformation Insight Center" focused on innovation and automation and developing the skills and expertise for Michigan manufacturers to jumpstart or accelerate their digital transformation. Automation Alley brings together industry, academia, and government to enhance the ecosystem and provide access to extensive resources including events and networking and to act as a Knowledge Center for all involved.

Dedicated Facilities for Technology Piloting and Demonstration

Indiana's Digital Manufacturing Technology Center (DMTC), led by Purdue and Telamon Robotics

Purdue MEP and Telamon Robotics have partnered to establish the DMTC in Carmel as a showcase for advanced digital manufacturing technology solutions—offering companies access to demonstrations, training, and consulting expertise. The Center offers hands-on workshops, demonstrations, advanced training programs, seminars on technology deployment, and consulting around identifying and adopting the appropriate tech solutions for their needs.

Michigan Manufacturing Technology Center (MMTC) Industry 4.0 Technology Lab

To support Michigan manufacturers' digital technology adoption, MMTC has developed an Industry 4.0 Technology Lab at its Plymouth facility equipped with a fully functional suite of modern technology to introduce and expose client companies to Industry 4.0 innovations. Staffed with on-site experts, the Lab features relevant technologies such as 3D printing, cobots, simulation, and augmented reality innovations, and offers Michigan manufacturers a hands-on opportunity to learn about the technologies and their relevance for their respective business operations. MMTC has plans to develop two additional Industry 4.0 Labs at regional offices around the state.

Dedicated Industry 4.0-Related Workforce and Training Programs and Assets

Ivy Tech Smart Manufacturing & Digital Integration program (Indiana)

Ivy Tech, Indiana's statewide community college system, has established the Smart Manufacturing & Digital Integration program for students interested in manufacturing careers as Automation Integrators, Controls Technicians, Robot Technicians, and more firmly in the applied Industry 4.0 space. In the program, students learn, among other topics, how to: design, program, and troubleshoot PLC's, robots, and industrial software; utilize electrical and mechanical troubleshooting to diagnose, repair, and test failed components; and to determine safety protocols for working around computer-controlled machinery. The program contributes to both an associate degree as well as certificate credentialling.

Tennessee Industry 4.0 High School Diploma Distinction

In 2022, the Tennessee Department of Education established through legislation a new diploma distinction—the Industry 4.0 Diploma Distinction. The Distinction was developed for students interested in pursuing a career in this high-skill, high-demand area of manufacturing. The program requires students to regularly meet with a career coach via an American Job Center, to complete required coursework, and to enroll in Work-Based Learning or dual-enrollment courses.

Figure 15: Industry 4.0-Related Education and Workforce Training Program Examples
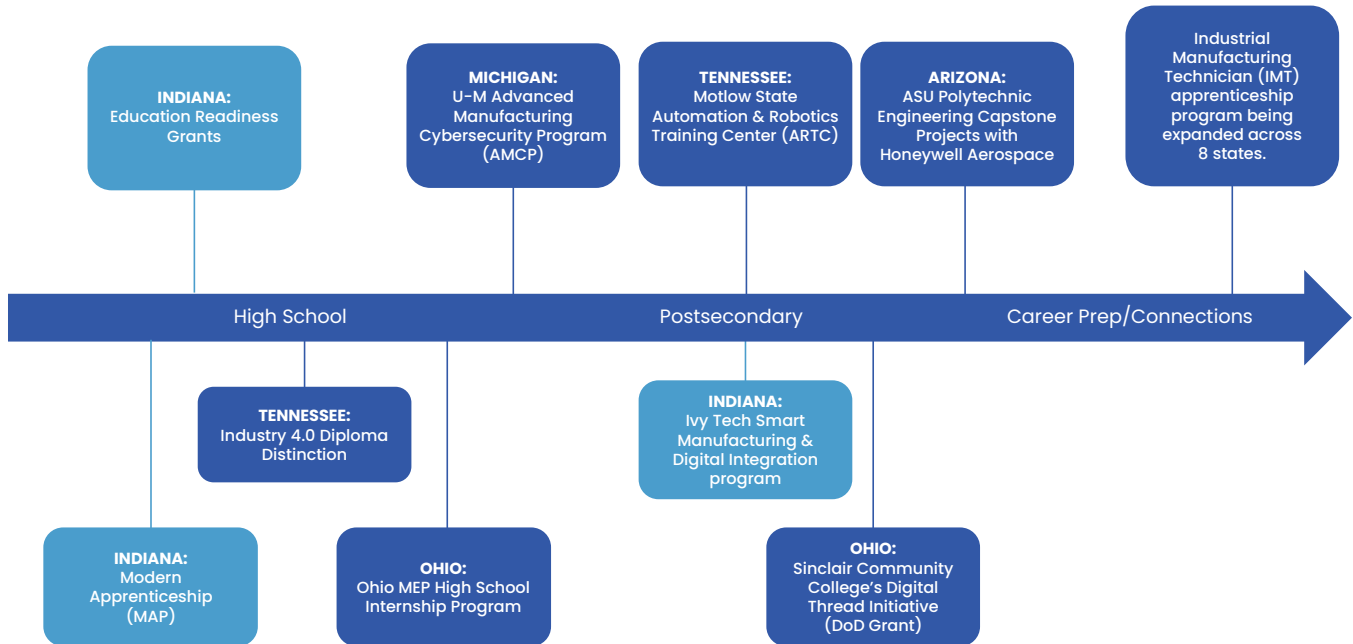
Source: TEConomy Partners, LLC.

Key University and/or National Manufacturing Institutes or Centers

University of Notre Dame iNDustry Labs

The iNDustry Labs at Notre Dame works directly and collaboratively with companies in the South Bend-Elkhart region, via the LIFT Network, to provide direct services and end-to-end support for the implementation of new technologies, systems, products, and strategies. Engagements with industry can span strategic and technical advisory services to applied R&D and testing to skills training and grant development services. iNDustry Labs utilizes Engineers in Residence or ENIRs to provide and facilitate services in the Industry 4.0 technology space including automation and robotics, data analytics and IT systems infrastructure, product and market diversification strategies, and talent solutions.

Smart Manufacturing Innovation Center (SMIC) at North Carolina State University

NC State and the Clean Energy Smart Manufacturing Innovation Institute (CESMII) launched in 2020 the SMIC with a focus on serving the paper and other forest products sector through academic collaborations to facilitate the industry's digital transformation, including with respect to advancing the Industrial Internet of Things (IIoT) and analytical innovation. The Center is focused on demonstrating smart manufacturing technologies and workforce training and research, and it includes a pilot paper plant for hands-on learning. Further, the pilot plant includes streaming of real-time data into classrooms to immerse students in analytics.

MAGNET, Northeast Ohio

The Manufacturing Advocacy and Growth Network, or MAGNET, in Northeast Ohio represents a more than three-decade commitment to providing regional manufacturers with expert guidance to succeed. Its current vision is for Northeast Ohio to be a global leader in smart manufacturing, as called for in its Blueprint for Manufacturing in Northeast Ohio across four pillars: talent, transformation, innovation, and leadership. MAGNET and its ecosystem partners play a significant role in advancing Industry 4.0 in manufacturing through various initiatives and programs aligned with these pillars.

MAGNET's team works to advance workforce development, career exposure, and to connect prospective employees with employers through its Workforce Connect Manufacturing Sector Partnership, its Early College Early Career team, and other initiatives advancing professional training programs spanning youth, adults, and upskilling pathways.

MAGNET's team provides consulting and advisory services to help regional manufacturers optimize their operations, improve efficiency, and innovate through the adoption of Industry 4.0 technologies and practices. The team works with companies to assess the most appropriate technologies for improvement and implementation and develops customized strategies for digital transformation.

As its name implies, MAGNET acts as a critical regional "Network" for Industry 4.0-related tours and technology demonstration. Its new headquarters—the Manufacturing, Innovation, Technology and Job Center, houses Industry 4.0 technologies and a sample factory floor and includes classroom space for area students, meeting spaces for the public, and hands-on career activities. MAGNET recently launched its "Lighthouse Tours" efforts in partnership with the region's Smart Manufacturing Cluster led by Team NEO, to showcase Industry 4.0-experienced manufacturers and their experiences with technology, how it has affected their workforce, and other impacts and insights.

MxD (Manufacturing times Digital), Illinois and National	MxD is one of 14 U.S. advanced manufacturing institutes aiming to improve the nation's competitiveness in the industry. MxD was established in Chicago and, as its name suggests, is squarely focused on the digital manufacturing associated with Industry 4.0. The Institute, in partnership with the DoD, focuses on R&D projects, workshops, and testbeds in predictive analytics and maintenance; agile, resilient supply chains; cybersecurity; digital fingerprinting; augmented reality; and digital twin. MxD operates a state-of-the-art innovation center with a 22,000-square-foot factory floor with some of the most advanced manufacturing technologies and equipment in the world. Leading global corporate partners use the Digital Factory of the Future for experimentation, training, and simulation. MxD cites more than 300 partners engaged.
The eXcellence in Manufacturing and Operations (XMO) initiative (Purdue University)	Purdue University is leading the U.S. manufacturing and operations resurgence, with pioneering strides in semiconductors, aerospace, defense, and biomanufacturing. The eXcellence in Manufacturing and Operations (XMO) initiative stands at the crossroads of this revitalization, shaping the nation's path forward. ***Programmatic elements are to be determined during Purdue's Indianapolis campus expansion.***

Indiana represents an early leader in economic development for Industry 4.0 through its significant investment in the Manufacturing Readiness Grants program. Several other states have since followed and have now implemented similar grant programs to support and help to de-risk Industry 4.0 technology adoption. In addition, as highlighted in figure 13, Indiana is "checking most of the boxes" with respect to some level of programmatic activity or investments across nearly all of the Industry 4.0 ecosystem domain areas presented in this section. But there is little indication that these various initiatives and programs are cohesively or seamlessly tied together with coordinated introductions and hand-offs for Indiana AML firms, particularly for small- and mid-sized firms that are often most in need of initial direction and assistance. There is an opportunity for Conexus and/or other Indiana organizations to lead a coordinated statewide Industry 4.0 Network to ensure a high-functioning ecosystem that maximizes the participation and return on the state's ongoing strategic investments.

There is no doubt that Indiana is moving the needle on Industry 4.0-related tech adoption—its MRG program has now awarded more than 500 grants to Indiana AML firms totaling $57 million, with projects expected to generate more than $800 million in capital expenditures on smart manufacturing and factory modernization, and with significant new dollars allocated to continue the program. These investments will take time, however, to be implemented and fully leveraged for enhanced output and digitization at Indiana's AML firms. The available productivity data presented herein for 2022 already represent a lag from the present and as new data become available, it will be important to continue to monitor Indiana's relative position and performance.

V. Key Findings & Implications for AML Leaders and Ecosystem Stakeholders

The AML industries are vital for Indiana's economic prosperity–present and future–and their ability to leverage and harness the benefits of the digital transformation and emerging technologies is critical for the state's continued competitiveness. Indiana is investing significantly to jumpstart or accelerate Industry 4.0 technology adoption through several programs and initiatives. While this study does not represent a comprehensive industry or technology strategy for Indiana, key findings point to strategic implications for the state's AML leaders and breadth of ecosystem stakeholders, including Conexus.

Productivity & Digitization

Finding: Productivity challenges and the lagging deployment of Industry 4.0-enabling roles across Indiana's AML subsectors emphasize and signal the need for continued technology adoption at Indiana firms.

Implications:

- Indiana's productivity levels and growth are lagging the nation and key comparison states and reinforce the importance of Indiana's MRG program and other support services in accelerating technology adoption. Technology adoption programs, like MRG, should be further supported going forward with the impacts measured and documented.

- Detailed sector and subsector analyses within the AML industries signal areas of potential greater need for MRG and other related investments—specifically those large, strategically important manufacturing areas for Indiana that are lagging or falling behind their peers in productivity. Conexus and its AML ecosystem partners should utilize this research and target specific subsectors moving forward.

- Indiana, through its strategic MRG program investments and other Industry 4.0 programs and initiatives, is appropriately committing to longer-term productivity enhancements. In terms of the MRG program itself, the initial investments were made in 2020, and the 2022 productivity data presented herein already lag to an extent—it will take time to see significant changes in high-level sectoral productivity metrics. It will take time to yield impacts, particularly for those impacts to reach the size and scale needed to move the needle across Indiana's large AML industries.

Finding: The challenges of gauging progress and benchmarking Industry 4.0-related technology adoption among AML firms support the need for continued industry surveys. There is currently no substitute for regularly surveying Indiana firms—as Conexus and the IU Kelley School of Business Center for Excellence in Manufacturing have done in recent years. A certain level of detail and nuance is required to understand and track progress of Industry 4.0 and to set strategic directions for the state.

Implications:

- Conexus should examine response rates among its subsectors and conduct targeted outreach on the importance of participation to ensure enhanced representation within the survey. Currently, the logistics or "TDL" segment of the AML sector is underrepresented. In 2022, just 9% of respondents were from the transportation sector (and the category did not exist in the prior two surveys). Furthermore, there were no respondents from the logistics or wholesale distribution sectors. These firms are vital to Indiana's competitiveness in the full context of the AML industries, thus, understanding their progress in Industry 4.0 is equally important.

- This effort has revealed a lack of comparable, state-by-state measures to benchmark progress in Industry 4.0 tech adoption more broadly (i.e., national context). Indiana can represent an important voice for advocacy in proactively raising this issue with national manufacturing associations and other leaders including within the national NIST-MEP network and perhaps better coordinate survey efforts among constituent organizations.

Finding: Tech ecosystem firms are only just beginning to participate in both Conexus' Industry 4.0 survey efforts and its related programming—this should be a point of emphasis going forward.

Implications:

- This effort has identified 64 tech ecosystem firms serving the Indiana AML industry. These firms are critical to supporting tech adoption and accelerating implementation, yet they are not specifically targeted by Conexus Indiana or others for programming or enhanced development. Conexus should consider convening tech ecosystem firms for focus group discussions to further support, for example, entrepreneurial development in this space, talent gaps faced by these firms, ways in which to connect and build awareness for this vital network, and more.

- Tech ecosystem firms can support Industry 4.0 tech deployments and identify use cases of technology implementations. Tech ecosystem firms could partner with Conexus to document those use cases through a series of case studies to help AML firms better understand the associated ROI.

Industry 4.0 Talent

Finding: Industry 4.0-enabling talent development and deployment will continue to play a crucial role in Indiana's technology adoption leadership. The need for workforce and Industry 4.0-enabling talent with the right education and skills mix is a limiting factor for both current and future AML competitiveness and growth.

Implications:

- Indiana firms are not yet hiring levels of Industry 4.0 talent seen nationally. Workforce-centered analyses in this study find Indiana is lagging both the nation and most key competitor states in both its demand for and deployment of Industry 4.0-enabling talent and skills. Assessment of AML industries' job postings and their current occupational staffing mix finds that Indiana's AML industries are demanding relatively fewer professionals with the skills to implement and leverage digital transformation. These are not only proxy measures for tech adoption more broadly, but also a measure of where the industries stand on their Industry 4.0 journey.

- A critical source of this Industry 4.0-enabling talent is embedded within Indiana's tech ecosystem firms that continue to partner with AML firms on a consistent basis. In working more closely with tech ecosystem firms, Conexus and its university partners should ultimately ensure a robust talent pipeline is available and that education/training programs are accessible and responsive to the needs of these firms.

- As Conexus has found in its annual tech adoption surveys, Industry 4.0 technology implementation is changing the nature of existing jobs, with significant implications for the incumbent workforce. Meeting the needs for incumbent worker training is part of an evolving, skills-based education and training agenda that Indiana is now embracing, with alternative credentialling increasingly in the form of certificates, badges, "stackable" credentials, apprenticeships, and other approaches to be supported.[12] But ultimately, industry firms will drive demand for talent to enable its digital transformation. Therefore, industry must be a proactive partner that informs and participates in education programming and curriculum development.

Industry 4.0 Investments and the Changing Nature of AML jobs

"Rather than eliminating jobs, automation is reorienting the workforce away from monotonous, routine tasks that can be limiting factors for production and toward opportunities for systems thinking, troubleshooting and programming."

Conexus Indiana, *2022 Industry 4.0 Technology Adoption Report*

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12   See, for example, "Employers and Ivy Tech partner for affordable, free college and skills training," at https://www.wfyi.org/news/articles/employers-and-ivy-tech-partner-for-affordable-free-college-and-skills-training.

Policies & Programs

Finding: **Indiana's competitor states are not standing still on Industry 4.0 investments—across the U.S., states are supporting extensive infrastructure, programming, and initiatives aimed at advancing technology adoption, addressing workforce upskilling and reskilling, investing in key facilities and technology demonstration, and providing expertise and consulting on staging investments and effective implementation.**

Implications:

- Today, most programs, initiatives, and investments in the Industry 4.0 ecosystem in Indiana are operating independently and do not appear to be particularly well coordinated and seamless in their engagement or support for AML firms. While Indiana, as highlighted in the prior section, is "checking nearly every box" with respect to supporting programs and investments, these efforts are not collaborative or connected in a way that can truly move the needle for AML's digital transformation. Conexus and its partners should convene regularly to map and promote the state's Industry 4.0 assets and programs and to better coordinate the array of support elements documented in this study. There is also an opportunity for Conexus and/ or other organizations to lead a coordinated statewide Industry 4.0 Network to ensure a high-functioning ecosystem that maximizes the participation and return on the state's ongoing strategic investments.

> ### A Need for a Connected, Statewide Industry 4.0 Network for Indiana
>
> There is an opportunity for Conexus and/or other organizations to lead a coordinated statewide Industry 4.0 Network to ensure a high-functioning ecosystem that maximizes the participation and return on the state's ongoing strategic investments.

- Indiana should investigate and consider implementing additional programming for areas in which the state currently has gaps or needs. While this will require a more in-depth strategic effort and evaluation, one example could be efforts to leverage in-state expertise at Indiana's research institutions and among its entrepreneurial ecosystem (i.e., hardtech) to develop and support more innovative technologies for the fourth industrial revolution. Michigan's i4.0 Accelerator, as one example, is actively recruiting both early and later stage innovative tech ecosystem firms to grow and enhance its in-state innovation and tech solutions portfolio.

VI. Conclusion

Indiana has committed impressive and significant resources toward assisting its manufacturing and logistics firms in alleviating what they most typically report as their greatest hurdles to technology adoption—costs and limited budgets. The MRG program is one of the largest, if not the largest, state-funded grant program for Industry 4.0-related tech adoption nationally and is moving the needle across hundreds of Indiana SME firms. At the same time, key partners in the Industry 4.0 ecosystem, including Conexus, Indiana's colleges and universities, its non-profit research institutions, its Purdue MEP program, and others are working toward mitigating challenges faced by AML firms related to innovative research, education and talent development, tech demonstration, consulting, and more.

But there is clearly more work to be done to support this journey as proxy measures used in this report indicate that Indiana is behind its peers in some key aspects of tech adoption and Industry 4.0-enabling workforce deployment. To not only gain ground on other states, but surpass them in the coming years, will take a coordinated and collaborative effort among economic development stakeholders, academic institutions, the public sector, and most importantly, the AML industry.

Appendix A: Defining Indiana's AML Industries

Table A-1: NAICS-Based Definition of Indiana AML Industries and Detailed Subsectors

NAICS Code	NAICS Description
Agbiosciences Manufacturing	
333111	Farm Machinery and Equipment Manufacturing
333241	Food Product Machinery Manufacturing
325199	All Other Basic Organic Chemical Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325312	Phosphatic Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325315	Compost Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
311221	Wet Corn Milling
311224	Soybean and Other Oilseed Processing
311225	Fats and Oils Refining and Blending
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
311211	Flour Milling
311212	Rice Milling
311213	Malt Manufacturing
311230	Breakfast Cereal Manufacturing
311313	Beet Sugar Manufacturing
311314	Cane Sugar Manufacturing
311340	Nonchocolate Confectionery Manufacturing
311351	Chocolate and Confectionery Manufacturing from Cacao Beans
311352	Confectionery Manufacturing from Purchased Chocolate
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311412	Frozen Specialty Food Manufacturing
311421	Fruit and Vegetable Canning
311422	Specialty Canning
311423	Dried and Dehydrated Food Manufacturing
311511	Fluid Milk Manufacturing
311512	Creamery Butter Manufacturing

NAICS Code	NAICS Description
311513	Cheese Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311613	Rendering and Meat Byproduct Processing
311615	Poultry Processing
311710	Seafood Product Preparation and Packaging
311811	Retail Bakeries
311812	Commercial Bakeries
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311821	Cookie and Cracker Manufacturing
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour
311830	Tortilla Manufacturing
311911	Roasted Nuts and Peanut Butter Manufacturing
311919	Other Snack Food Manufacturing
311920	Coffee and Tea Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311942	Spice and Extract Manufacturing
311991	Perishable Prepared Food Manufacturing
311999	All Other Miscellaneous Food Manufacturing
312111	Soft Drink Manufacturing
312112	Bottled Water Manufacturing
312113	Ice Manufacturing
312120	Breweries
312130	Wineries
312140	Distilleries
Aircraft/Aerospace Manufacturing	
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing

NAICS Code	NAICS Description
Automotive/Motor Vehicle Manufacturing	
333618	Other Engine Equipment Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336390	Other Motor Vehicle Parts Manufacturing
336110	Automobile and Light Duty Motor Vehicle Manufacturing
336120	Heavy Duty Truck Manufacturing
336211	Motor Vehicle Body Manufacturing
336212	Truck Trailer Manufacturing
336213	Motor Home Manufacturing
336214	Travel Trailer and Camper Manufacturing
Consumer Products Manufacturing	
325611	Soap and Other Detergent Manufacturing
325612	Polish and Other Sanitation Good Manufacturing
325613	Surface Active Agent Manufacturing
325620	Toilet Preparation Manufacturing
333991	Power-Driven Handtool Manufacturing
335131	Residential Electric Lighting Fixture Manufacturing
335132	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335139	Electric Lamp Bulb and Other Lighting Equipment Manufacturing
335210	Small Electrical Appliance Manufacturing
335220	Major Household Appliance Manufacturing
337910	Mattress Manufacturing
337920	Blind and Shade Manufacturing
339116	Dental Laboratories
339910	Jewelry and Silverware Manufacturing
339920	Sporting and Athletic Goods Manufacturing
339930	Doll, Toy, and Game Manufacturing
339992	Musical Instrument Manufacturing
339993	Fastener, Button, Needle, and Pin Manufacturing
339994	Broom, Brush, and Mop Manufacturing

NAICS Code	NAICS Description
339995	Burial Casket Manufacturing
339999	All Other Miscellaneous Manufacturing
Electronic Components and Products Manufacturing	
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334519	Other Measuring and Controlling Device Manufacturing
334610	Manufacturing and Reproducing Magnetic and Optical Media
335314	Relay and Industrial Control Manufacturing
333242	Semiconductor Machinery Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
Energy Manufacturing	
324110	Petroleum Refineries
324199	All Other Petroleum and Coal Products Manufacturing
325193	Ethyl Alcohol Manufacturing
333132	Oil and Gas Field Machinery and Equipment Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335910	Battery Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335932	Noncurrent-Carrying Wiring Device Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
Freight Transportation and Logistics	

NAICS Code	NAICS Description
492110	Couriers and Express Delivery Services
492210	Local Messengers and Local Delivery
493120	Refrigerated Warehousing and Storage
493130	Farm Product Warehousing and Storage
481112	Scheduled Freight Air Transportation
481212	Nonscheduled Chartered Freight Air Transportation
482110	Rail transportation
483111	Deep Sea Freight Transportation
483113	Coastal and Great Lakes Freight Transportation
483211	Inland Water Freight Transportation
484110	General Freight Trucking, Local
484121	General Freight Trucking, Long-Distance, Truckload
484122	General Freight Trucking, Long-Distance, Less Than Truckload
484210	Used Household and Office Goods Moving
484220	Specialized Freight (except Used Goods) Trucking, Local
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance
493110	General Warehousing and Storage
493190	Other Warehousing and Storage
488210	Support Activities for Rail Transportation
488310	Port and Harbor Operations
488320	Marine Cargo Handling
488330	Navigational Services to Shipping
488390	Other Support Activities for Water Transportation
488490	Other Support Activities for Road Transportation
488510	Freight Transportation Arrangement
488991	Packing and Crating
488999	All Other Support Activities for Transportation
541614	Process, Physical Distribution, and Logistics Consulting Services
561910	Packaging and Labeling Services
Furniture and Wood Products Manufacturing	
321113	Sawmills
321114	Wood Preservation
321211	Hardwood Veneer and Plywood Manufacturing
321212	Softwood Veneer and Plywood Manufacturing
321215	Engineered Wood Member Manufacturing
321219	Reconstituted Wood Product Manufacturing
321911	Wood Window and Door Manufacturing

NAICS Code	NAICS Description
321912	Cut Stock, Resawing Lumber, and Planing
321918	Other Millwork (including Flooring)
321991	Manufactured Home (Mobile Home) Manufacturing
321992	Prefabricated Wood Building Manufacturing
321999	All Other Miscellaneous Wood Product Manufacturing
337110	Wood Kitchen Cabinet and Countertop Manufacturing
337121	Upholstered Household Furniture Manufacturing
337122	Nonupholstered Wood Household Furniture Manufacturing
337126	Household Furniture (except Wood and Upholstered) Manufacturing
337127	Institutional Furniture Manufacturing
337211	Wood Office Furniture Manufacturing
337212	Custom Architectural Woodwork and Millwork Manufacturing
337214	Office Furniture (except Wood) Manufacturing
337215	Showcase, Partition, Shelving, and Locker Manufacturing
Industrial Machinery Manufacturing	
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333120	Construction Machinery Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing
333248	All Other Industrial Machinery Manufacturing
333310	Commercial and Service Industry Machinery Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333912	Air and Gas Compressor Manufacturing
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333993	Packaging Machinery Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
333998	All Other Miscellaneous General Purpose Machinery Manufacturing
Life Sciences Manufacturing	
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing

NAICS Code	NAICS Description
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325413	In-Vitro Diagnostic Substance Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
Metals Manufacturing	
331110	Iron and Steel Mills and Ferroalloy Manufacturing
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel
331511	Iron Foundries
331512	Steel Investment Foundries
331513	Steel Foundries (except Investment)
332111	Iron and Steel Forging
331221	Rolled Steel Shape Manufacturing
331222	Steel Wire Drawing
332114	Custom Roll Forming
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing
332216	Saw Blade and Handtool Manufacturing
332311	Prefabricated Metal Building and Component Manufacturing
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332321	Metal Window and Door Manufacturing
332322	Sheet Metal Work Manufacturing
332323	Ornamental and Architectural Metal Work Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332431	Metal Can Manufacturing
332439	Other Metal Container Manufacturing
332510	Hardware Manufacturing
332613	Spring Manufacturing
332618	Other Fabricated Wire Product Manufacturing
332710	Machine Shops

NAICS Code	NAICS Description
332721	Precision Turned Product Manufacturing
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332911	Industrial Valve Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
332991	Ball and Roller Bearing Manufacturing
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
332811	Metal Heat Treating
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
333511	Industrial Mold Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333517	Machine Tool Manufacturing
333519	Rolling Mill and Other Metalworking Machinery Manufacturing
333992	Welding and Soldering Equipment Manufacturing
331313	Alumina Refining and Primary Aluminum Production
331314	Secondary Smelting and Alloying of Aluminum
331315	Aluminum Sheet, Plate, and Foil Manufacturing
331318	Other Aluminum Rolling, Drawing, and Extruding
331410	Nonferrous Metal (except Aluminum) Smelting and Refining
331420	Copper Rolling, Drawing, Extruding, and Alloying
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)
331523	Nonferrous Metal Die-Casting Foundries
331524	Aluminum Foundries (except Die-Casting)
331529	Other Nonferrous Metal Foundries (except Die-Casting)
332112	Nonferrous Forging
332117	Powder Metallurgy Part Manufacturing
Polymers/Plastics Manufacturing	
325130	Synthetic Dye and Pigment Manufacturing
325211	Plastics Material and Resin Manufacturing
325212	Synthetic Rubber Manufacturing
325220	Artificial and Synthetic Fibers and Filaments Manufacturing
325510	Paint and Coating Manufacturing

NAICS Code	NAICS Description
325520	Adhesive Manufacturing
325991	Custom Compounding of Purchased Resins
326111	Plastics Bag and Pouch Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
326160	Plastics Bottle Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326199	All Other Plastics Product Manufacturing
326211	Tire Manufacturing (except Retreading)
326212	Tire Retreading
326220	Rubber and Plastics Hoses and Belting Manufacturing
326291	Rubber Product Manufacturing for Mechanical Use
326299	All Other Rubber Product Manufacturing
Wholesale Distribution	
423820	Farm and Garden Machinery and Equipment Merchant Wholesalers
424910	Farm Supplies Merchant Wholesalers
423110	Automobile and Other Motor Vehicle Merchant Wholesalers
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
424210	Drugs and Druggists' Sundries Merchant Wholesalers
424420	Packaged Frozen Food Merchant Wholesalers
424430	Dairy Product (except Dried or Canned) Merchant Wholesalers
424440	Poultry and Poultry Product Merchant Wholesalers
424450	Confectionery Merchant Wholesalers
424460	Fish and Seafood Merchant Wholesalers
424470	Meat and Meat Product Merchant Wholesalers
424480	Fresh Fruit and Vegetable Merchant Wholesalers
424490	Other Grocery and Related Products Merchant Wholesalers
424510	Grain and Field Bean Merchant Wholesalers
424520	Livestock Merchant Wholesalers
424590	Other Farm Product Raw Material Merchant Wholesalers
424810	Beer and Ale Merchant Wholesalers

NAICS Code	NAICS Description
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers
423510	Metal Service Centers and Other Metal Merchant Wholesalers
423130	Tire and Tube Merchant Wholesalers
423140	Motor Vehicle Parts (Used) Merchant Wholesalers
423210	Furniture Merchant Wholesalers
423220	Home Furnishing Merchant Wholesalers
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers
423390	Other Construction Material Merchant Wholesalers
423410	Photographic Equipment and Supplies Merchant Wholesalers
423420	Office Equipment Merchant Wholesalers
423430	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers
423440	Other Commercial Equipment Merchant Wholesalers
423460	Ophthalmic Goods Merchant Wholesalers
423490	Other Professional Equipment and Supplies Merchant Wholesalers
423520	Coal and Other Mineral and Ore Merchant Wholesalers
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers
423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers
423690	Other Electronic Parts and Equipment Merchant Wholesalers
423710	Hardware Merchant Wholesalers
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers
423740	Refrigeration Equipment and Supplies Merchant Wholesalers
423810	Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers
423830	Industrial Machinery and Equipment Merchant Wholesalers
423840	Industrial Supplies Merchant Wholesalers
423850	Service Establishment Equipment and Supplies Merchant Wholesalers
423860	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers
423910	Sporting and Recreational Goods and Supplies Merchant Wholesalers
423920	Toy and Hobby Goods and Supplies Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
423940	Jewelry, Watch, Precious Stone, and Precious Metal Merchant Wholesalers
423990	Other Miscellaneous Durable Goods Merchant Wholesalers
424110	Printing and Writing Paper Merchant Wholesalers
424120	Stationery and Office Supplies Merchant Wholesalers
424130	Industrial and Personal Service Paper Merchant Wholesalers

NAICS Code	NAICS Description
424310	Piece Goods, Notions, and Other Dry Goods Merchant Wholesalers
424340	Footwear Merchant Wholesalers
424350	Clothing and Clothing Accessories Merchant Wholesalers
424410	General Line Grocery Merchant Wholesalers
424610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers
424690	Other Chemical and Allied Products Merchant Wholesalers
424710	Petroleum Bulk Stations and Terminals
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
424920	Book, Periodical, and Newspaper Merchant Wholesalers
424930	Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers
424940	Tobacco and Tobacco Product Merchant Wholesalers
424950	Paint, Varnish, and Supplies Merchant Wholesalers
424990	Other Miscellaneous Nondurable Goods Merchant Wholesalers
425120	Wholesale Trade Agents and Brokers

Appendix B: Indiana's Industry 4.0-Related Policies and Programs

Table B-1: Scan Conducted by TEConomy Partners, LLC, in 2024 to Gather Intel on Indiana's Industry 4.0-Related Policies and Programs (not inclusive of all programs)

Policy/Program	Lead/Sponsor Organization(s)	Program Type*	Program Description
Digital Manufacturing and Design Assessments	**Purdue MEP**	I4.0 Assessments; MEP Assistance, Consulting	Through collaboration with MxD (formerly Digital Manufacturing and Design Innovation Institute), Purdue MEP has co-developed a comprehensive assessment to help manufacturers identify and close gaps in their digital workflow. This offering consists of a site visit and a two-to-four-hour assessment of a manufacturing company's capabilities. The process reviews a company's capabilities across five different assessment areas: Enterprise Support Operations, Supply Chain Data Exchange, Design and Engineering, Digital Factory Floor, and Cybersecurity. From this assessment, a summary report is generated and used to discuss the available solutions that can be leveraged for your company.
Indiana Innovation Voucher Program	**Applied Research Institute (ARI), IEDC**	Innovation vouchers	Innovation Vouchers are used to leverage Indiana's research and higher education institutions, as well as approved non-profit research organizations to provide small businesses access to industry experts and research leaders. This grant matches a company's funding for up to $50,000 and can be utilized for product development, simulations, studies, and more – all to help entrepreneurs in the State of Indiana develop innovative products and services.
I4.0 Tech Adoption Reports	**Conexus Indiana, IU Kelley School of Business Center for Excellence in Manufacturing**	Measuring/ Tracking I4.0 Tech Adoption	Surveys were conducted in collaboration with Indiana University Kelley School of Business Center for Excellence in Manufacturing, between 2020 and 2022. The studies analyzed responses from nearly 600 Indiana manufacturers over 3 years, and key findings show that cobots, cybersecurity, sensor technology and Internet of Things (IoT) are the top four technologies manufacturers expect to adopt in the next five years. Furthermore, Industry 4.0 technology implementations and pilot projects increased year-over-year: 58% of companies have now successfully implemented or piloted an Industry 4.0 technology, which is a 176% increase from 2020. Only 4% of companies reported no foreseeable adoption of these technologies, an 87% decrease from 2020.

Policy/Program	Lead/Sponsor Organization(s)	Program Type*	Program Description
MEP I4.0 Assistance	**Purdue MEP**	MEP Assistance, Consulting; University Centers	The MEP National Network is a long-standing public-private partnership that delivers proven solutions and assistance to U.S. manufacturers. They are focused on helping small and mid-sized manufacturers for a geographic region and centers are located in all 50 states.
Manufacturing Readiness Grants	**Indiana Economic Development Corp. and Conexus Indiana**	Tech adoption (Grant Program)	Launched in 2020, the Manufacturing Readiness Grants program was created to stimulate private sector investments to modernize Indiana's manufacturing industry. They help manufacturers make innovative capital investments in smart manufacturing within their Indiana operations—leveraging technologies from advanced communications to cobots to the Industrial Internet of Things (IIoT) and beyond. Since 2020, a total of 526 awards totaling $57 million have been awarded to companies in 79 counties, prompting proposed projects with combined budgets of $668 million.
iNDustry Labs at Notre Dame	**Notre Dame**	Tech Adoption Assistance; Applied R&D; Workforce/ education; Univ Ctrs	iNDustry Labs addresses pressing needs within industry leveraging the University's expertise, talent, and resources to catalyze the next great era of prosperous innovation. It provides cutting-edge expertise, technologies, workforce development programs, and innovation-based facilities for collaboration across higher education and community and industry partners in support of a more prosperous, resilient, and skilled region. The four themes include: Automation & Robotics, Digitalization, Product & Market Diversification, and Training & Talent Solutions.
Digital Manufacturing Technology Center (DMTC)	**Purdue MEP and Telamon Robotics**	Tech demonstration facility	Recognizing the importance of advanced technology solutions, Purdue Manufacturing Extension Partnership (MEP) and Telamon Robotics have established the Digital Manufacturing Technology Center (DMTC). The Center was created to serve as a showcase for manufacturing technology, giving companies access to demonstrations, training, and consulting expertise. It also showcases advanced technology solutions that Indiana manufacturers will find affordable, accessible, and easy to use. Centrally located in Carmel, Indiana, the DMTC empowers Indiana manufacturers to harness the power of digital manufacturing technologies, transforming unrealized possibilities into new realities.
IN-MaC at Purdue	**Purdue CoE and Purdue Polytechnic**	Tech Demonstration facility; Hard Tech Innovation	Since its inception, IN-MaC has been a partnership between the Polytechnic Institute and the College of Engineering, and includes collaboration with Ivy Tech and Vincennes University, to help solve manufacturing challenges for Indiana-based companies.

Policy/Program	Lead/Sponsor Organization(s)	Program Type*	Program Description
Emerging Manufacturing Collaborative Center (EMC2)	**IEDC, 16 Tech, and EMC2**	Tech Demonstration facility; Workforce/ education	Founded through a public-private-partnership, EMC2 operates a 60,000 square foot (5,575 sq meter) manufacturing facility that serves as a platform for manufacturing capability forming, research and development, focused on technology insertion and adoption. EMC2 will allow new and existing manufacturers to utilize state-of-the-art equipment, including GE Additive's Binder Jet technology, to train employees, conduct third-party pilot manufacturing and increase awareness of products and software applications.
The eXcellence in Manufacturing and Operations (XMO) initiative	**Purdue University**	University Ctrs; Workforce/ education	Purdue University is leading the U.S. manufacturing and operations resurgence, with pioneering strides in semiconductors, aerospace, defense, and biomanufacturing. The eXcellence in Manufacturing and Operations (XMO) initiative stands at the crossroads of this revitalization, shaping the nation's path forward. This initiative fuels a contemporary renaissance in manufacturing, logistics, and supply chains, bolstering American resilience and prosperity. Rooted in Purdue's legacy of innovation, it melds physical, digital, and sustainable manufacturing realms to craft a trajectory to unmatched excellence.
Cobot Training Program	**VU, IEDC, Telamon Robotics, Purdue MEP**	Workforce/ education	Vincennes University continues to support Industry 4.0 in Indiana by developing the first collaborative robot training course at the Gene Haas Training and Education Center in Lebanon. Sponsored by the Indiana Economic Development Corporation and in partnership with Carmel-based Telamon Robotics and Purdue University Manufacturing Extension Partnership (Purdue MEP), it will help introduce cobots to Hoosier manufacturing companies. The training course, includes how to operate, program, troubleshoot and redeploy cobots.
Ivy Tech Smart Manufacturing & Digital Integration program	**Ivy Tech Community College**	Workforce/ education	At Ivy Tech, the Smart Manufacturing and Digital Integration Program is built to support the recognized needs of Industry 4.0. Students can complete the credentials needed for Smart Manufacturing & Digital Integration, which include: (1) design, program and troubleshoot computers, PLC's, robots and other industrial software; (2) utilize electrical and mechanical troubleshooting and communication skills to diagnose, repair, test and return to service failed components; and (3) describe the hazards associated with automated machines and determine appropriate safety methods for working around computer-controlled machinery.

Policy/Program	Lead/Sponsor Organization(s)	Program Type*	Program Description
Modern Apprenticeship (MAP)	**Ascend and Conexus Indiana**	Workforce/ education	Modern Apprenticeship (MAP) is a work-based learning program for Central Indiana high school students, giving them the hands-on career training they need to thrive in AML. It is a three-year program designed to prepare Marion County high school students for the workforce. Students benefit from $13/hour over three years and a semester's worth of college credit, debt-free.
Education Readiness Grants	**Conexus Indiana, Governor's Workforce Cabinet**	Workforce/ Education (Grants)	Conexus Indiana worked with the Governor's Workforce Cabinet's Office of Career and Technical Education to provide Education Readiness Grants for Indiana secondary schools. Education Readiness Grants help Indiana secondary schools prepare students for careers in the increasingly high-tech advanced manufacturing industry. Awarded grants enable school corporations and/or individual school sites to purchase Industry 4.0 technologies that define the future of advanced manufacturing. By aligning curricula and experiential learning through the adoption of smart technologies within industry, students will be ready to meet the needs of Indiana's advanced manufacturing and logistics employers.
Made @ Plainfield, Logistics 4.0 Innovation Hub	**Indiana State University and GEODIS**	Workforce/ education; Tech Demonstration facility	Conveniently located near Interstate 70 and the Indianapolis International Airport, the MADE@Plainfield facility is designed to meet specific education and training needs, offer flexible lab spaces for various courses, and provide much-needed community gathering space. ISU and GEODS have partnered on a Logistics 4.0 Innovation Hub. Through university resources, it helps train people in artificial intelligence, machine learning, and the management of logistics companies (i.e., supply chain management).
The Vincennes University Center for Applied Robotics and Automation (CARA)	**Vincennes University, Telamon Robotics**	Workforce/ education; Tech Demonstration facility	Vincennes University continues to support the future of Industry 4.0 in Indiana by developing a collaborative robot (cobot) lab at the Gene Haas Training and Education Center in Lebanon. VU's Center for Applied Robotics and Automation (CARA) encompasses unique labs with more than 32 cutting-edge cobots at the Vincennes Campus, Jasper Campus, and Gene Haas Training and Education Center. The cobot labs were supported by an $8 million grant from Lilly Endowment Inc.

Appendix C: Indiana's Industry 4.0 Tech Ecosystem Firms

Table C-1: Scan Conducted by TEConomy Partners, LLC, in 2024 to Identify Indiana's AML Tech Ecosystem Firms

Company Name	Headquarters Location	Company Website
A&A Custom Automation	Evansville, IN	http://www.aacustomautomation.com/
Ahaus	Richmond, IN	https://www.ahaus.com/
AIS Gauging	Terre Haute, IN	http://www.aisgauging.com/
Allied Automation	Indianapolis, IN	https://www.allied-automation.com/
Amatrol	Jeffersonville, IN	https://amatrol.com/
American Welding & Gas	Indianapolis, Lafayette, Plymouth, Terre Haute, IN	https://www.awggases.com/automation/automation
Analytical Engineering, Inc	Columbus, IN	https://www.aei-tech.com/
ANVL	Fishers, IN	https://anvl.com/
Arris Consulting	Elkhart, IN	https://arrisconsulting.com/welcome/
Aunalytics	South Bend, IN	https://www.aunalytics.com/
Auto Research Center	Indianapolis, IN	http://www.arcindy.com/
Automation & Control Services, Inc.	Schererville, IN	www.PLCexperts.com
Avance	Wilkinson, IN	https://www.avancedesign.com/
Bastian Solutions	Carmel, IN	https://www.bastiansolutions.com/
Bedford Machine & Tool Inc.	Bedford, IN	https://www.bedfordmachine.com/
Bermar Associates, Inc.	Troy, MI	http://www.bermarassociates.com/index.html
Blue Ridge Automation	Pendleton, IN	https://br-inc.tech/
Bristol Tool and Die	Bristol, IN	https://bristoltoolanddie.com/
Brownstown Quality Tool & Automation	Brownstown, IN	https://bqtd.com/
CIM Systems	Noblesville, IN	https://www.cimrobotics.com/
City Pattern and Foundry Company Inc.	Granger, IN	https://cpind.com/
Clear Object	Fishers, IN	https://www.clearobject.com/
Conversight	Indianapolis, IN	https://conversight.ai/
CVG - Commercial Vehicle Group	New Albany, OH	https://cvgrp.com/
D&D Automation	Terre Haute, IN	https://ddautomation.com/
Dial-X Automated Equipment	Albion, IN	www.dial-x.com
Elite Automation	Evansville, IN	https://eliteautomationusa.com/
Ellsworth Adhesives	Germantown, WI	https://www.ellsworth.com/
Embry Automation	Evansville, IN	https://www.embryenterprises.com/
Epson Automation	Los Alamitos, CA	https://epson.com/usa

Company Name	Headquarters Location	Company Website
ESCO Automation	Fishers, IN	https://theescogroup.com/
Finch Automation	Indianapolis, IN	https://finchautomation.com/
Flexware Innovation	Fishers, IN	https://www.flexwareinnovation.com/
Fluid Transfer Systems, Inc.	Novi, MI	https://ftsonline.net/
Glassboard	Indianapolis, IN	https://www.glassboard.com/
Glaze Tool and Engineering	New Haven, IN	https://www.glazetool.com/
Great Lakes Automation Services Inc.	McKean, PA	https://www.glasi.us/
Greenlight Guru	Indianapolis, IN	https://www.greenlight.guru/
Guide Engineering LLC	Fort Wayne, IN	http://www.guideeng.com
Hiltec USA	Eklhardt, IN	https://hiltec-usa.com/
Jennerjahn Machine, Inc.	Matthews, IN	https://www.jennerjahn.com/
LHP Engineering Solutions	Columbus, IN	https://www.lhpes.com/
Lincoln Electric	Cleveland, OH	https://www.lincolnelectric.com/en/
MCTD, Inc.	Michigan City, IN	https://mctdinc.com/
Millholland Conrad, Inc	Westfield, IN	https://www.millconinc.com/
NEFF Automation	Indianapolis, IN	https://neffautomation.com/
Photon Automation	Greenfield, IN	https://www.photonautomation.com/
Precision Control Systems of Indianapolis, Inc.	Indianapolis, IN	https://www.pcsoi.com/
QSI Automation Inc	Churubusco, IN	https://qsiautomation.us/
Robotic Solutions, LLC	Jasper, IN	https://roboticsolutions.net/
Rockwell Automation	Milwaukee, WI	https://www.rockwellautomation.com/en-us.html
RZ Automation, Inc.	Noblesville, IN	http://www.rzautomation.com/
Shop Floor IQ	Indianapolis, IN	https://www.shopflooriq.com/
Southlake Automation Inc	Merrillville, IN	https://southlakeautomation.com/
Stoeller Automation, Inc.	Frankfort, IN	www.stoeller.com
Sutton-Garten Co.	Indianapolis, IN	https://www.suttongarten.com/index.html
Synopsys, Inc.	Mountain View, CA	https://www.synopsys.com/
Tactile Engineering	Lafayette, IN	www.tactile-engineering.com
TCR Inc.	Wisconsin Rapids, WI	https://www.stampingsystems.com/
Telamon Robotics	Carmel, IN	https://telamonrobotics.com/
THG Automation	Indianapolis, IN	https://thgautomation.com/
Thompson Machining Services	Brookville, IN	https://www.thompsonmachiningservices.com/
U.S. Automation LLC	Huntertown, IN	www.usautomationllc.com
Vibromatic Co., Inc.	Noblesville, IN	https://www.vibromatic.net/