



**Pennsylvania Manufacturers' Association**

August 7, 2019

**Industrial Internet of Things in the Fourth Industrial Revolution**

Testimony before the:  
Senate Communications and Technology Committee  
Blue Spruce Lodge  
1128 Blue Spruce Road  
Indiana, Pennsylvania

Submitted by:  
David N. Taylor, President & CEO

In modern manufacturing, everything is connected in this, the Fourth Industrial Revolution (4IR). This connected future is what the manufacturing industry calls, “the industrial internet of things (IIoT).” The IIoT is the extension of Internet connectivity into physical devices, manufacturing equipment, and plant functions. Embedded with electronics, sensors, and other forms of hardware with Internet connectivity, these devices can communicate and interact with others over the Internet, and they can be remotely monitored and controlled.

However, without broadband Internet access, the ability to connect modern manufacturing plants to the IoT is limited. Because of this limitation, industrial investors will likely look to locations where high-speed Internet connections are readily available, as opposed to locations where this vital infrastructure is not yet developed. This will surely lead to rural and technologically underserved areas of Pennsylvania falling even further behind as they will be unable to attract business investments that could reshape and revitalize entire communities and regions.

The Manufacturing Institute, the social impact arm of the NAM, drives programs and research to promote modern manufacturing and jumpstart new approaches to growing manufacturing talent. They released a study in partnership with PricewaterhouseCoopers in late-May 2019 titled, “*Navigating the Fourth Industrial Revolution to the Bottom Line*,” with a focus on the IIoT, automation, and technology-driven manufacturing industry growth.

The report includes a statement in the summary that proves investments are coming in this 4IR, but that technology will be a key focus in industrial growth. The report states:

*While manufacturers recognize the potential value of advanced technologies and digital innovation—particularly robotics, the Industrial Internet of Things (IIoT), cloud computing, advanced analytics, 3D printing, and virtual and augmented reality—they are still deliberating how and where to invest and balancing the hype with their own level of preparedness. Meanwhile, they’re also well aware of the significant changes 4IR will bring to a new manufacturing workforce—that is, one that is increasingly symbiotic and increasingly beneficial for many workers and manufacturers alike.<sup>1</sup>*

---

<sup>1</sup> Manufacturing Institute, PricewaterhouseCoopers. “Navigating the fourth industrial revolution to the bottom line,” May 23, 2019. [http://www.themanufacturinginstitute.org/Research/Disruptive-Innovations-in-Manufacturing/~/\\_media/952806202DCF43278A8152AE8D4222ED.ashx](http://www.themanufacturinginstitute.org/Research/Disruptive-Innovations-in-Manufacturing/~/_media/952806202DCF43278A8152AE8D4222ED.ashx)

According to the same report, nearly half of manufacturers surveyed in the study reported that they are in the early stages of a smart factory transition, 31 percent report that adopting an IoT strategy in their operations is “extremely critical”, while 40 percent report that it is “moderately critical.” More significant is the fact that, “Manufacturers do expect the transition to accelerate in the coming years—73 percent are planning to increase their investment in smart factory technology over the next year.”<sup>2</sup>

The 4IR may make some nervous as it could easily be perceived that technology and machines will be replacing physical jobs on the manufacturing plant floor. While it is undeniable that manufacturing employment has declined over the past two decades as automation and industrial innovations have replaced some functions of individual workers, manufacturing output has remained steady both in Pennsylvania and the United States. According to Federal Reserve Economic Data, in January of 1990, there were 964,300 manufacturing jobs in our Commonwealth compared to 565,200 in June of this year (2019).<sup>3</sup> However, throughout the past two decades, manufacturing as a percentage of gross state product has remained fairly constant, between 11 and 13 percent.<sup>4</sup>

While manufacturing employment has declined, at any given time there are usually more 6,500 jobs that are unfilled on the manufacturing plant floors throughout Pennsylvania. In 2018, there were over 77,000 vacant manufacturing positions. Jobs in the today’s manufacturing industry are highly skilled, extremely collaborative, and are family-sustaining wage jobs. In the latest data set available, the National Association of Manufacturers determined the average wage of a manufacturing worker in Pennsylvania was \$73,730.71, in 2017.<sup>5</sup> It’s clear that one key driver of the 4IR is a lack of a trained manufacturing workforce, but manufacturers have adapted by deploying cutting-edge technology, enhanced systems, and advanced automation to continue to meet the needs of customers.

But the 4IR and IIoT represent the next wave of the manufacturing workforce. According to the aforementioned Manufacturing Institute report, “Manufacturers do expect the transition to accelerate in the coming years—73 percent are planning to increase their investment in smart factory technology over the next year.”<sup>6</sup>

---

<sup>2</sup> Ibid.

<sup>3</sup> Federal Reserve Bank of St. Louis, Federal Reserve Economic Data. “All Employees: Manufacturing in Pennsylvania,” July, 2019. <https://fred.stlouisfed.org/series/PAMFG>

<sup>4</sup> Federal Reserve Bank of St. Louis, Federal Reserve Economic Data. “Value Added by Private Industries: Manufacturing as a Percentage of GDP,” <https://fred.stlouisfed.org/series/VAPGDPMA>

<sup>5</sup> National Association of Manufacturers. “2019 Pennsylvania Manufacturing Facts,” 2019. <https://www.nam.org/state-manufacturing-data/2019-pennsylvania-manufacturing-facts/>

<sup>6</sup> Manufacturing Institute, PricewaterhouseCoopers. “Navigating the fourth industrial revolution to the bottom line,” May 23, 2019. <http://www.themanufacturinginstitute.org/Research/Disruptive-Innovations-in-Manufacturing/~media/952806202DCF43278A8152AE8D4222ED.ashx>

Chad Moutray, Chief Economist at the National Association of Manufacturers recently said:

*According to the World Economic Forum, we could create 133 million jobs by 2022 if workers are given significant reskilling and the next generation of workers is trained properly. Technological change can be a plus for manufacturing workers if we undertake the right approach now. Technology isn't a threat – technology is an enabler. It's actually helping us do our jobs, helping us get to where we need to go, and then enabling that next generation.*<sup>7</sup>

Nationally and globally, the amount of capital being invested in the IIoT in the 4IR is astounding. Since 2012, \$650 billion has been invested in 4IR technologies globally; nationally, the number of IoT connected devices will triple to 21 billion devices in 2025 compared to the 7 billion that were connected in 2018; and global IoT sensors markets was valued at \$9.5 billion in 2018, but industry experts expect this market to total almost \$66 billion by 2027.<sup>8</sup>

There is no doubt, the 4IR is here. The question is: what amount of this growth will Pennsylvania be able to capture given the access or a lack thereof to broadband and/or high-speed internet throughout the rural areas of our Commonwealth? Manufacturers will locate where their systems can be integrated and where they can gain access to the workforce that can build and sustain these highly advanced systems into the future. Pennsylvania can be a leader in this area and can make technology a tool of business attachment if and only if we can coordinate, both at the private and public level, the deployment of broadband Internet access throughout the Commonwealth.

---

<sup>7</sup> Moutray, Chad. "Report: Automation Offers Manufacturing Opportunities," May 23, 2019. <https://www.nam.org/new-report-shows-automation-offers-manufacturing-opportunities-5000/?stream=workforce>

<sup>8</sup> Manufacturing Institute, PricewaterhouseCoopers. "Navigating the fourth industrial revolution to the bottom line," May 23, 2019. <http://www.themanufacturinginstitute.org/Research/Disruptive-Innovations-in-Manufacturing/~media/952806202DCF43278A8152AE8D4222ED.ashx>