LETTER FROM THE EXECUTIVE DIRECTOR

Automation is increasingly becoming part of our everyday lives, from self-adjusting thermostats to cars that parallel park themselves. 18 years ago, when Automation Alley was founded, most of us didn’t own cell phones, and autonomous cars seemed more like science fiction than a reality we’d experience in our lifetime. Technology is evolving, and so is Automation Alley.

Perhaps even more profound than the impact of automation on consumer goods is its impact on manufacturing. In 2016, Automation Alley launched an initiative around Industry 4.0, also known as the fourth industrial revolution. Industry 4.0 represents the convergence of the digital and physical technologies disrupting manufacturing: the Industrial Internet of Things, autonomous robotics, advanced materials, additive manufacturing, big data, cybersecurity, cloud computing, and modeling, simulation, and visualization.

This year’s Technology Industry Report was designed to tell us whether America’s technology and manufacturing industries are ready for Industry 4.0. The report reveals how these two industries are approaching the fourth industrial revolution: Do they embrace it, fear it or ignore it?

We discovered both technology and manufacturing executives lack awareness of Industry 4.0. And even for the companies who are beginning to transition to this new era of manufacturing, barriers to technology adoption remain. Clearly, there is much work to be done. Encouragingly, the results show that Automation Alley member companies are better positioned for the coming revolution than their national counterparts.

Southeast Michigan is at a crucial point in its history. From the time of Henry Ford, this region has been home to the most cutting-edge manufacturing technology in the world. Now we have the opportunity to lead the nation in the Industry 4.0 revolution, creating jobs and attracting investment along the way. We have the skills and expertise to make it happen. Together, we can ensure that Southeast Michigan remains the global leader in manufacturing technology for decades to come.

Tom Kelly
Executive Director
Automation Alley

FOREWORD BY JEFFREY KRAUSE

Running factories from our mobile phones, robots that learn, and 3-D environments brimming with information — that’s Industry 4.0.

And Southeast Michigan is perfectly positioned to ride the wave of the fourth industrial revolution. But, while we boast a well-trained workforce of engineers and innovators, have we done all our homework? What new skills will Industry 4.0 require? Are we attracting future talent early enough?

These are questions that organizations like Automation Alley and SME are working to answer — for Southeast Michigan and beyond.

In our region, we have historically driven advanced manufacturing technology, and we take pride in our highly skilled workforce — especially our engineers.

But, with the advent of “smart manufacturing,” it isn’t just the advanced technology that makes this revolution unique; the people who comprise it have to be “smarter” to keep pace. And, that requires a different set of skills than in the past.

That’s where organizations like Automation Alley and SME can work together, to team up and play a significant role. We are here to equip people — and their companies — to be ready for Industry 4.0.

Technology makes manufacturing more attractive and interesting, and we’re fortunate that the next generation so quickly grasps it. But it is essential that we get this technology into the hands of students and the current workforce. With 2 million manufacturing jobs predicted to go unfilled by 2025, there is so much opportunity, but we must take ownership to ensure we drive awareness and engagement among potential talent.

Once you read this report, you’ll see that our rich heritage of advanced manufacturing has positioned us well to lead this new revolution. Now, we must take action to ensure we invest not only in new technology, but also in our people.

Jeffrey Krause
CEO
SME
There’s a revolution happening in the manufacturing industry. Just as the things we build are becoming smart—our phones, our watches and our cars—so too is the way we build them.

Welcome to Industry 4.0, also known as the fourth industrial revolution.

Industry 4.0 represents the convergence of digital and physical technologies currently disrupting the manufacturing industry.

This year, Automation Alley, a nonprofit association serving technology and manufacturing-focused businesses across Southeast Michigan, conducted a survey of technology and manufacturing executives across the country—including Automation Alley members—to determine their knowledge of Industry 4.0 and whether they are ready for rapid changes ahead as technology transforms manufacturing.

This report highlights where communication gaps exist between technology and manufacturing executives, the lack of company resources dedicated to technological advancements and how Automation Alley members are ahead of the curve when it comes to the development and adoption of Industry 4.0 technologies.

Automation Alley publishes the Technology Industry Report annually to provide valuable insights into the future of the tech and manufacturing industries, both locally and nationally.

Since Automation Alley began publishing this report more than a decade ago, businesses and government have used it for business planning and business and talent attraction. We hope you find it to be a valuable tool as you develop plans and goals for 2017 and beyond.

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THE INDUSTRY 4.0 TRANSFORMATION
The manufacturing industry in America is moving rapidly to embrace technology as a critical part of its processes. Our survey found that manufacturers expect to invest more in technological advancements in 2017. In fact, 85% of national manufacturing executives said their company plans to increase existing budgets for technological advancements, while a third of them plan to increase their budgets by 10% to 15%.

In addition, more than half of all national manufacturing executives reported that their company has a dedicated budget for Industry 4.0 technologies. The top three technologies in which companies currently invest are the cloud, cybersecurity and big data and analytics. According to national manufacturing executives, production and R&D are the areas that are mostly likely to experience the greatest impact from these technological advancements.

What areas of your organization have the highest adoption of or potential for technological advancement?

<table>
<thead>
<tr>
<th>Area</th>
<th>U.S. manufacturing executives say:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>73.2%</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>54.9%</td>
</tr>
<tr>
<td>Distribution</td>
<td>28.1%</td>
</tr>
<tr>
<td>Procurement</td>
<td>24.4%</td>
</tr>
<tr>
<td>Supply chain</td>
<td>17.1%</td>
</tr>
<tr>
<td>After sales/service</td>
<td>15.9%</td>
</tr>
<tr>
<td>Other</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

How do you expect your company’s budget for technological advancements to change in 2017?

U.S. manufacturing executives say:

- 85.4% Stay the Same
- 12.2% Increase
- 2.4% Decrease

AUTOMATION ALLEY PERSPECTIVE

In contrast to the national manufacturing executives’ priorities, the top areas of Industry 4.0 technology investment for Automation Alley manufacturing members are: The Industrial Internet of Things and simulation (both at 42%), followed by autonomous robots, horizontal and vertical system integration, and the cloud (all at 33%).

Which technologies does your company currently invest in?

- The Cloud: 54.9%
- Cybersecurity: 51.2%
- Big data and analysis: 39%
- Horizontal and vertical system integration: 37.8%
- Additive manufacturing: 36.6%
- The Industrial Internet of Things: 35.4%
- Autonomous robots: 32.9%
- Simulation: 28.1%
- Augmented reality/ virtual reality: 18.3%
MANUFACTURING EXECUTIVES BELIEVE ADOPTING INDUSTRY 4.0 TECHNOLOGIES WILL INCREASE THEIR COMPETITIVENESS

The vast majority (88%) of national manufacturing executives believe technological advancements can be beneficial to their competitiveness. The top technologies manufacturing executives believe will improve their competitiveness in 2017 are the cloud, big data and analytics, additive manufacturing and cybersecurity. The top three benefits of technological advancements, according to our survey, are increased productivity, increased efficiency and reduced cost.

Which technologies will improve your competitiveness in 2017?
U.S. manufacturing executives say:

- The cloud: 62%
- Big data and analytics: 60.6%
- Additive Manufacturing: 58%
- Cybersecurity: 57.3%
- Autonomous robots: 56%
- The Industrial Internet of Things: 54.7%
- Horizontal and vertical system integration: 55.3%
- Simulation: 46.7%
- Augmented reality/virtual reality: 35.4%

What are the benefits of technological advancements for U.S. manufacturers?

- Increased productivity: 86.7%
- Increased efficiency: 85.3%
- Reduced cost: 80%
- Increased product quality: 76.6%
- Accelerated production: 75.3%
- Increased efficiency: 75%
- The Industrial Internet of Things: 64.3%
- Autonomous robots: 64.3%
- The cloud: 57.2%
- Horizontal and vertical system integration: 57.2%
- Simulation: 46.5%
- Additive Manufacturing: 46.4%
- Big data and analytics: 46.5%
- Augmented reality/virtual reality: 21.4%

AUTOMATION ALLEY PERSPECTIVE

Automation Alley manufacturing executives have a very different view of which technologies would improve their competitiveness in 2017.

Which technologies will improve your competitiveness in 2017?

- Autonomous robots: 75%
- The Industrial Internet of Things: 64.3%
- The cloud: 57.2%
- Simulation: 46.5%
- Additive Manufacturing: 46.4%
- Big data and analytics: 46.5%
- Augmented reality/virtual reality: 21.4%
Only slightly more than half of the national manufacturers surveyed have a dedicated budget and process to support the adoption of new technologies. National manufacturing executives reported that the top barriers to technological advancements within their organizations are cost, uncertainty about which technology supplier has the best solution, and employees who are reluctant to change.

How would you best describe the technological advancements within your organization?

- **52%** “We believe technological advancements are important, and have a dedicated budget and process to support the adoption.”

- **24%** “We talk about technological advancements, but there is no formal plan to map out the process.”

- **16%** “We are not really focused on technological advancements as we believe they will occur organically.”

- **8%** “We are interested in technological advancements, but we fear they may be disruptive.”

- **4%** “We are interested in technological advancements, but we fear they may be disruptive.”

- **46%** “Lack employees with adequate skills to adapt to technological advancements.”

- **54.7%** “Cost for technological advancement is too high.”

- **52.7%** “Uncertain about which technology supplier has the best solution.”

- **47.3%** “Employees are reluctant to change.”

- **21%** “We talk about technological advancements, but there is no formal plan to map out the process.”

- **7%** “We are not really focused on technological advancements as we believe they will occur organically.”

The survey results show that the Automation Alley manufacturing executives tend to be more prepared for the Industry 4.0 transformation than their national counterparts.
MANUFACTURING WILL DRIVE REVENUE TO THE TECH INDUSTRY IN 2017

The technology industry sees the manufacturing industry as a key area for growth and believes revenue driven by the manufacturing industry will increase in 2017. Among national technology executives whose company has customers from the manufacturing industry already, the majority believe their company will drive more revenue from this segment in 2017. Even among national technology executives whose company did not have manufacturing customers already, 41% of them expect to see company revenue come from this segment in 2017. Additionally, among executives whose company has customers from the manufacturing industry already, 62% consider the manufacturing industry a key sector in which their organization plans to grow in the next three years.

How do you expect your company revenue driven by the manufacturing industry to change in 2017?
U.S. technology executives say (by current customer breakdown):

- All respondents: 59% Increase
- Respondents whose company has customers from the manufacturing industry: 71% Increase
- Respondents whose company does not have manufacturing customers already: 41% Increase

AUTOMATION ALLEY PERSPECTIVE

Automation Alley technology executives see even more opportunities for growth in the manufacturing industry than their national counterparts. 9 out of 10 Automation Alley technology executives already have customers from the manufacturing industry. Additionally, 88% said they anticipate revenue driven by the manufacturing industry increasing in 2017, and 79% consider the manufacturing industry to be a key sector in which their organization plans to grow in the next three years.

Is the manufacturing industry a key sector in which your organization plans to grow in the next three years?
U.S. technology executives say (by current customer breakdown):

- All respondents: 42% Yes
- Respondents whose company has customers from the manufacturing industry already: 62% Yes
- Respondents whose company does not have customers from the manufacturing industry already: 14% Yes
INDUSTRY 4.0 KNOWLEDGE & READINESS
INDUSTRY 4.0 IS A NEW CONCEPT FOR BOTH THE MANUFACTURING AND TECHNOLOGY INDUSTRIES

Only about a quarter of all national manufacturing executives and slightly more than a third of technology executives have heard of the term Industry 4.0.

Percentage of national executives who have heard of the term Industry 4.0:

Manufacturing: 27%
Technology: 32%

AUTOMATION ALLEY PERSPECTIVE

Automation Alley executives are significantly more familiar with the term Industry 4.0 than their national counterparts.

Percentage of Automation Alley executives who have heard of the term Industry 4.0:

Manufacturing: 68%
Technology: 67%
THE MANUFACTURING INDUSTRY IS NOT READY FOR AN INTEGRATED INDUSTRY 4.0 TRANSFORMATION

After reading the definition of Industry 4.0, only 23% of national manufacturing executives said Industry 4.0 is an initiative within their organization. When asked for an estimated timeline to complete the entire Industry 4.0 transformation, 33% of national manufacturing executives said it would take 3-5 years. Nonetheless, 21% of national manufacturing executives said it would take more than 10 years for their organization to complete the entire Industry 4.0 transformation.

Is Industry 4.0 an initiative within your organization?
U.S. manufacturing executives say:

- Yes: 23.3%
- No: 76.7%

AUTOMATION ALLEY PERSPECTIVE

Automation Alley manufacturing executives are slightly more prepared for Industry 4.0 than their national counterparts. 29% of Automation Alley manufacturing executives said Industry 4.0 is an initiative within their organization. When asked for an estimated timeline to complete the entire Industry 4.0 transformation, 29% of Automation Alley manufacturing executives said it would take 1-3 years. Only 11% said the process would take more than 10 years.

How long will it take your organization to complete the entire Industry 4.0 transformation?
U.S. manufacturing executives say:

- 0-1 years: 2.7%
- 1-3 years: 24.7%
- 3-5 years: 33.3%
- 5-7 years: 12.7%
- 7-10 years: 6%
- 10+ years: 20.7%

Total percentage may not equal 100% due to rounding.
THE TECHNOLOGY INDUSTRY IS NOT READY FOR AN INTEGRATED INDUSTRY 4.0 TRANSFORMATION

While most national technology executives surveyed recognize the potential financial benefits of Industry 4.0, only a few technology players have dedicated solutions for this transformation. After reading the definition of Industry 4.0, 39% of national technology executives indicated their organization currently has or plans to develop products or services dedicated to Industry 4.0.

- 65% of national technology executives said Industry 4.0 will have at least some impact on their organization financially.
- 79% of national technology executives said Industry 4.0 will have at least some impact on the technology industry in general.

**Does your organization currently have or plan to develop products or services dedicated to Industry 4.0?**

U.S. technology executives say:

- **39%** Yes

**How much financial impact will Industry 4.0 have on your organization?**

U.S. technology executives say:

- **65%** Very much, quite a bit or some impact
- **35%** Very little or none

AUTOMATION ALLEY PERSPECTIVE

In comparison to the national findings, more Automation Alley technology executives report that their companies have solutions to support Industry 4.0, and more are convinced that it will benefit them financially. After reading the definition of Industry 4.0, about 67% of Automation Alley technology executives in Southeast Michigan indicated that their organization currently has or plans to develop products or services dedicated to Industry 4.0. Additionally, 93% believe Industry 4.0 will have at least some financial impact on their organization, and 98% believe Industry 4.0 will have at least some impact on the technology industry in general.

**How much financial impact will Industry 4.0 bring to the technology industry in general?**

U.S. technology executives say:

- **79%** Very much, quite a bit or some impact
- **21%** Very little or none
Both national manufacturing and technology executives agree on the top barriers to the manufacturing industry’s implementation of Industry 4.0 technologies. However, the results show the technology industry needs to better understand pain points among manufacturers.

**Barriers for technological advancement in the manufacturing industry, according to technology and manufacturing executives:**

<table>
<thead>
<tr>
<th>Poor previous technology adoption experience</th>
<th>Lack of vision around innovation among the leadership team</th>
<th>Lack of awareness of the importance of technology advancement</th>
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<tbody>
<tr>
<td>43%</td>
<td>53%</td>
<td>51%</td>
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<tr>
<td>Technology</td>
<td>Manufacturing</td>
<td>Technology</td>
</tr>
<tr>
<td>25%</td>
<td>38%</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>35%</td>
<td>39%</td>
<td>39%</td>
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Automation Alley commissioned Airfoil Group, a marketing and public relations firm based in Royal Oak, Mich., to conduct an online survey of 150 senior technology executives and 150 senior manufacturing executives in the United States between Oct. 26 and Nov. 1, 2016.

Additionally, Airfoil Group conducted a study among Automation Alley members who are senior executives in the technology and manufacturing industries in Southeast Michigan between Oct. 26 and Nov. 28, 2016.

For this study, a senior executive is defined as a professional who has a supervisor/lead and above job title. In addition, the Southeast Michigan area in this study refers to the following eight counties that Automation Alley represents: Genesee, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne.

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2675 Bellingham Drive
Troy, MI 48083-2044

Phone: 248.457.3200
Toll free: 800.427.5100
Fax: 248.457.3210
info@automationalley.com

automationalley.com

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