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High performance. Delivered.

Machine Dreams

Making the most of the
Connected Industrial Workforce

About the research

Accenture interviewed 512 respondents across all major industrial countries in North America, Western Europe and Asia. Our sample included factory directors, engineering and R&D heads, operations and HR managers, as well as C-suite executives. More than half were from the industrial equipment industry, with the rest split between automotive and construction equipment. All respondents were involved in setting their company's strategy for the Connected Industrial Workforce. The interviews were conducted online in December 2015.

A workforce revolution

Imagine this. Instead of humans wielding tools, robots with human supervisors populate the factory floor. The robots perform not only basic tasks, but also key functions. Enabled by digital technologies, they collaborate with humans in real time and in a two-way exchange.

Science fiction? Far from it.

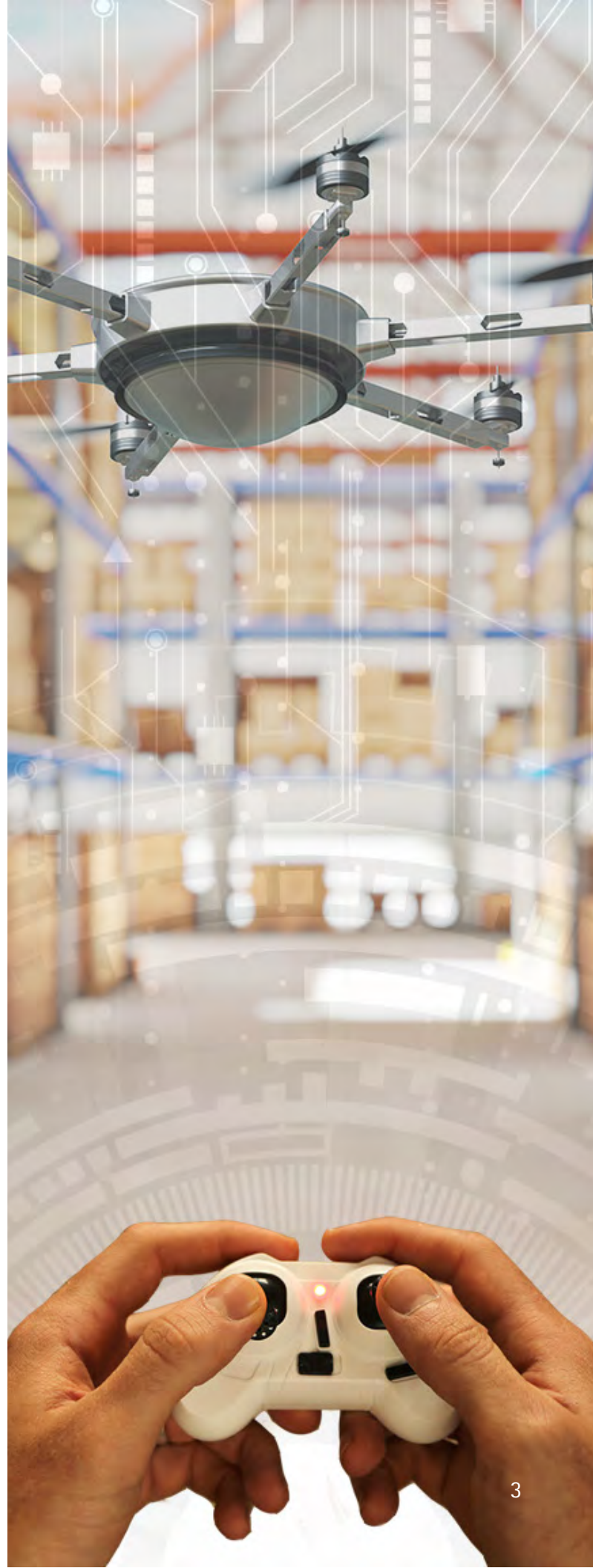
The digital revolution is transforming manufacturing. By bringing machines and artificial intelligence into the workforce, it is enabling an increasingly adaptable, change-ready, and responsive working environment: a Connected Industrial Workforce in which men and machines, working together, reinvent the production and service processes by which manufacturing outcomes are achieved.

This Connected Industrial Workforce promises to boost manufacturing productivity exponentially, as well as improving operational efficiency, and enhancing safety and risk management. Furthermore, as labor costs in such previously low-wage countries as China continue to rise, the Connected Industrial Workforce offers manufacturers an opportunity to mitigate the impact on the competitiveness of plants located in these geographies.

Indeed, in 2020, we estimate that the Connected Industrial Workforce could be helping to unlock as much as €500 million in profitability for an automotive manufacturer with annual revenues of €50 billion.

But how prepared are today's manufacturers to embrace such a workforce? Are they investing in the right capabilities to drive it? Who are the leaders? What do they do differently?

Accenture determined to find out. And our investigations—a survey of more than 500 senior executives and managers in the world's leading automotive, construction, and industrial equipment markets (see *About the research*)—revealed some concerns.



More lag than lead

Our research clearly shows that few companies are yet doing enough to make the Connected Industrial Workforce a reality.

True, fully 85 percent of the manufacturing executives we interviewed expect human-machine-centric environments to be commonplace in their plants by 2020, and they also recognize the benefits such plants promise to deliver. More than half of respondents expect a Connected Industrial Workforce to drive significant productivity improvements, for example. What's more, an overwhelming majority describe it as an essential element of their business strategy, and 62 percent say they want to lead in setting its agenda. Over the next five years, they plan to spend significantly more of their R&D budgets on building the capabilities—mobile and tracking technologies, analytics and robotics—that support and sustain a Connected Industrial Workforce (see Figure 1).

Yet only 22 percent of respondents have actually implemented measures designed to realize the potential of a Connected Industrial Workforce. As many as 85 percent still describe themselves as digital followers or laggards, rather than leaders.

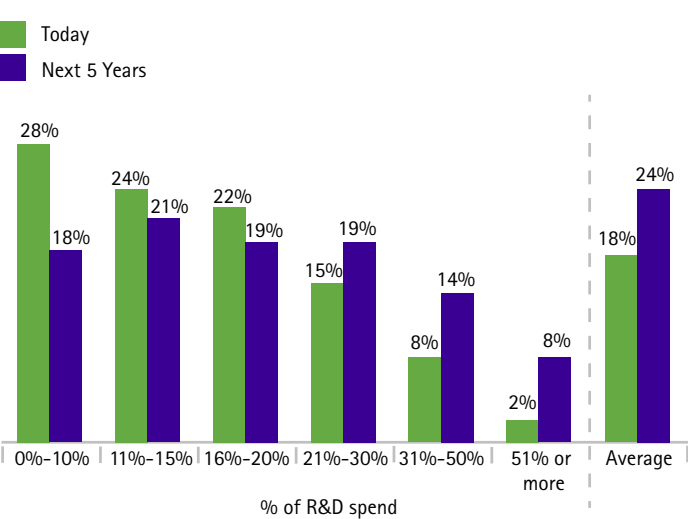
There are, to be sure, significant differences in both perceptions of and preparedness for the Connected Industrial Workforce across industrial sectors—and automotive is well ahead (see *Taking pole position*, page 5).

For most manufacturers, however, technical concerns still hold back implementation. Network, data and Cloud security worries loom large; and more than two thirds consider a shortage of skilled human workers to be a high or medium risk—far outweighing employment law or labor union objections (see Figure 2).

Figure 1: Investing in a Connected Industrial Workforce

Current and future Connected Industrial Workforce budget

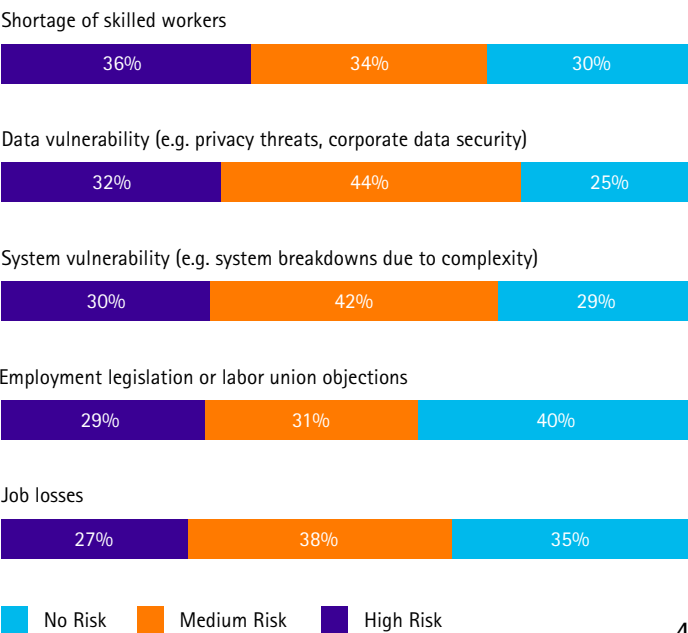
Connected Industrial Workforce budget as % of annual R&D spend



Today, companies spend on average 17.6% of their R&D budget on Connected Industrial Workforce. In 5 years, it will increase to 23.6%.

Figure 2: Skills and security are key concerns

Importance of each risk associated with the Connected Industrial Workforce



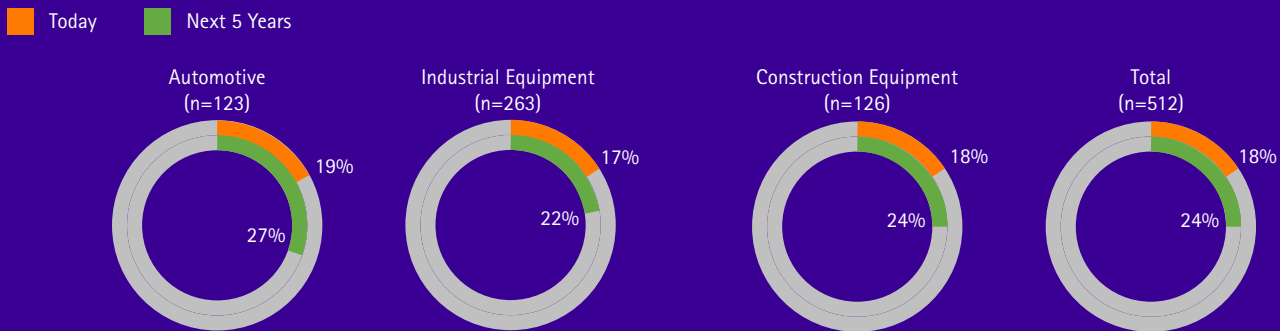
Taking pole position

When it comes to implementing the Connected Industrial Workforce, the automotive industry leads. The sector is investing more in this workforce revolution.

Automotive invests more in the Connected Industrial Workforce

Current and future Connected Industrial Workforce budgets

Connected Industrial Workforce budget as % of annual R&D spend

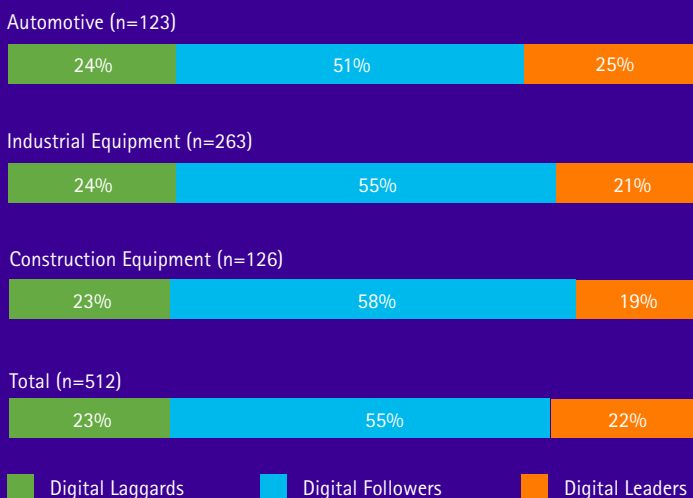


The Automotive industry is leading in investing in the Connected Industrial Workforce and continuing to increase their advantage within the next 5 years.

Largely, we believe, because the automotive industry is also more digitally disrupted.

Automotive leads the way towards digitization

Industry assessment



Since the automotive business is disrupted from several angles, they already realize the huge potential of a digital automotive industry.

What leaders do differently

So what distinguishes those few companies that are implementing mature solutions with confidence?

A clear implementation strategy is a key differentiator. Digital leaders plan to increase investments to *implement* the Connected Industrial Workforce by 10 percent over the next five years. Digital followers will increase their investments by a similar proportion—but only to *define* their strategy.

The leaders, moreover, have a clear focus for their investments. Autonomous guided vehicles—mobile robots that move materials around a facility or warehouse—already account for half such spending, and will continue to account for much of it in future. But over the next five years leaders also plan to boost their investments in both collaborative robots (or cobots) and such augmented reality devices as smart glasses and helmets (see Figure 3).

ABB's YuMi robots, for example, remove barriers to collaboration because they can operate without safety fencing or cages and their compact size allows

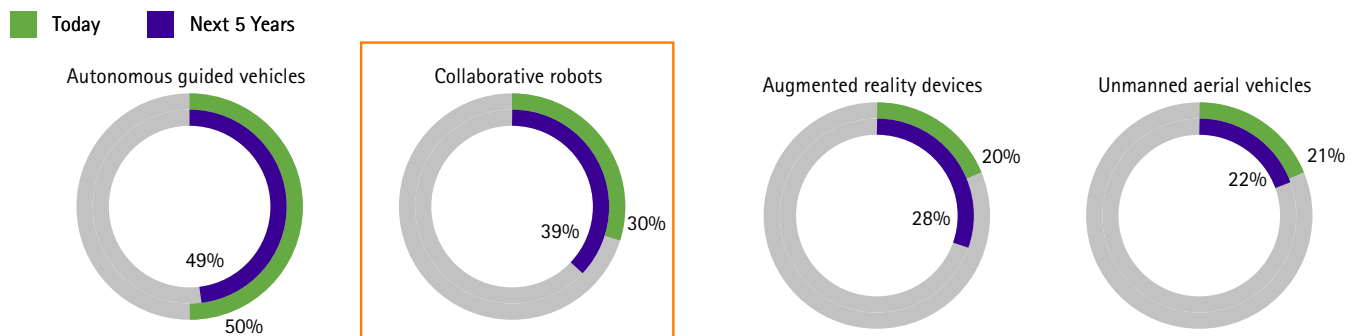
seamless integration on the shop floor. What's more, the robots don't need humans with programming skills to operate; they are programmed intuitively¹.

Meanwhile, Accenture delivered with Airbus a proof of concept, using the latest wearable technology, to help Airbus operators reduce the complexity of assembling cabin seats and decrease the time required to complete this task. Using contextual marking instruction, the smart glasses display all required information for an operator to help mark the floor faster and reduce errors to zero. In addition, the eyewear technology, implemented by Accenture, also offers interactivity by granting the professional access to features including barcode scanning, data retrieval from the cloud, voice command and augmented reality.

Plainly, as cobots take on more and more specialized tasks (see Figure 4) the digital leaders are moving rapidly toward the human-machine-centric manufacturing envisioned above.

Figure 3: More money for Cobots

Current and future investments of Digital Leaders in Hardware

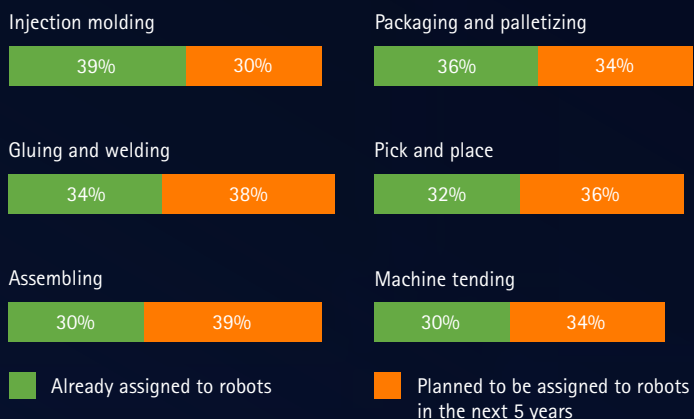


Today and in future, half of the Digital Leaders invest in autonomous guided vehicles.

In the next 5 years, more Digital Leaders will start investing in collaborative robots and augmented reality device.

Figure 4: Cobots will become more specialized

Assigned tasks to collaborative robots*

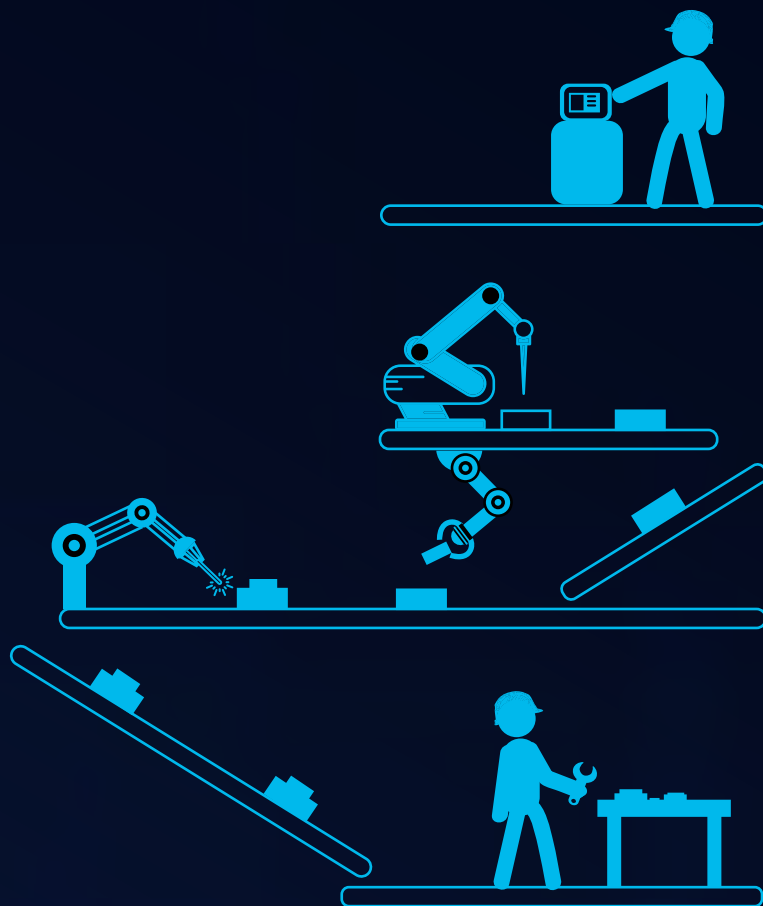


*Note: Only respondents who employ collaborative robots.

Today, injection molding is the most commonly assigned task to Cobots.

The highest potential is seen in assembling with 39% of companies who plan to assign this task to cobots in the next 5 years.

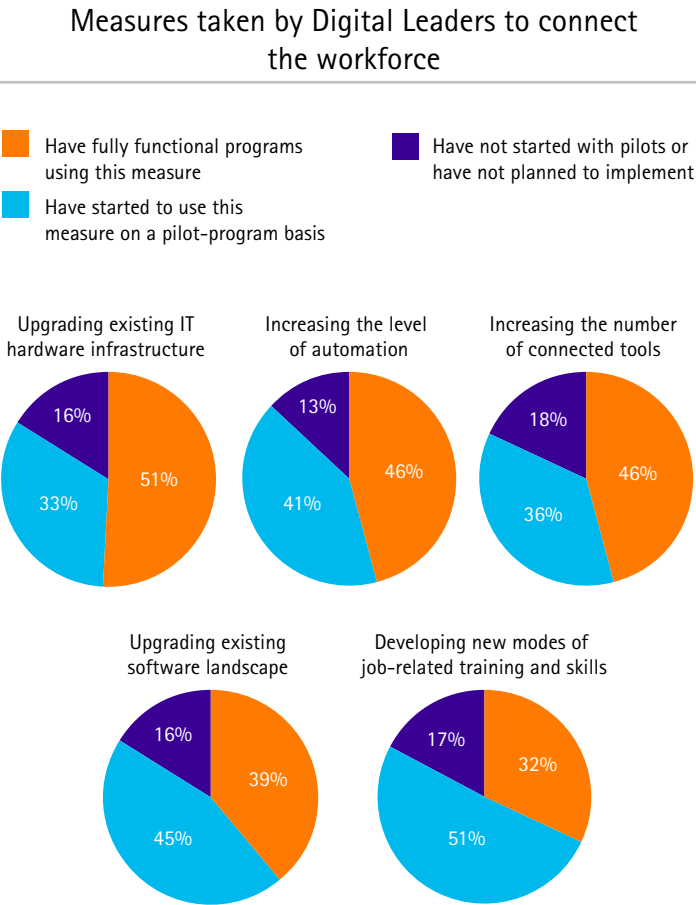
In the next 5 years, gluing and welding will be the most common task assigned to Cobots with 72%.



In their efforts to tackle the security concerns they cite as their biggest challenge—a worry for 43 percent of digital leaders, versus 34 percent of respondents overall—leaders are also investing heavily in upgrading their existing IT infrastructure to help ensure a securely connected workforce. Most, moreover, are also piloting (or have already implemented) programs designed to close the skills gap (see Figure 5).

Figure 5: Digital Leaders are connecting the workforce

Measures to “connect” the workforce



More than 80% of companies leading in digitization have already implemented or are currently piloting relevant measures.

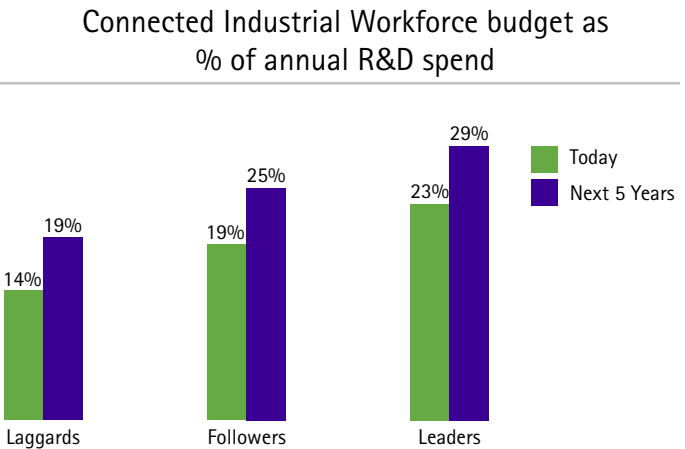
Half of Digital Leaders have already invested in upgrading their IT hardware infrastructure and in connecting their devices.

By automating some production lines to the point where they can run unsupervised for several weeks, Siemens' "lights out" manufacturing plant, for example, takes the big German engineer a step closer toward its end goal of creating a fully self-organizing factory. Significantly, however, the plant still requires 1,150 employees to support it; they just have different roles, many of them focused on programming, monitoring and machine maintenance.²

All of which means that leaders are spending almost twice as much as laggards on the Connected Industrial Workforce—and will continue to raise the bar over the next five years (see Figure 6).

Figure 6: Digital Leaders spend more

Current and future Connected Industrial Workforce budget



Today, companies leading in digitization spend almost double the amount than Digital Laggards.

Due to continuously increasing investments of leading companies in the next 5 years, the Digital Followers risk to further lag behind.

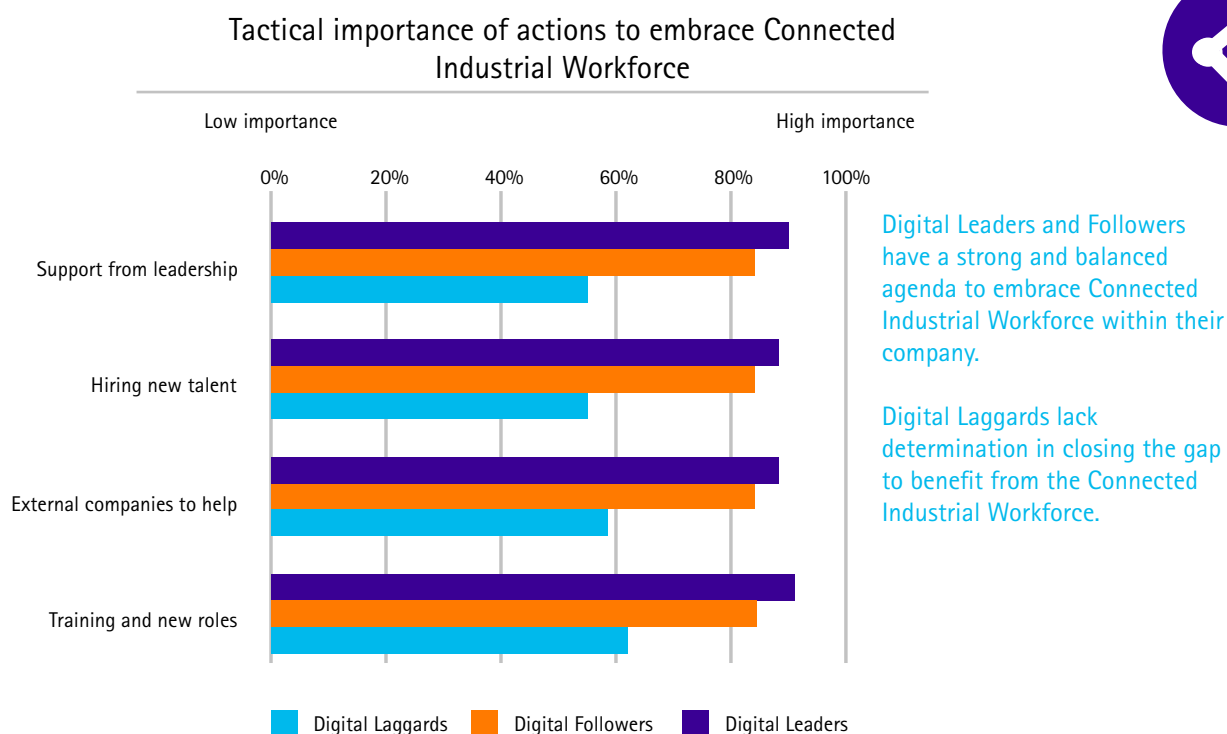


Catching up

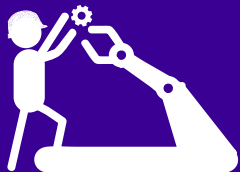
Right now, laggards (and to a lesser extent followers as well) clearly lack the confidence to implement a Connected Industrial Workforce. This is a deficit that may threaten their competitiveness, especially as they also display the lowest levels of senior leadership support, the least interest in hiring new talent, and lack a sense of urgency when it comes to seeking help externally or investing in training for new workforce roles (see Figure 7).

Figure 7: The Digital Laggards' confidence deficit

How to embrace the Connected Industrial Workforce



They can, however, take steps to close the gap. And the following recommendations will help get them started:



Envision the full promise of the Connected Industrial Workforce.

Recognize that seamless human-machine interactions can increase operational efficiency as well as productivity, driving better visibility and enhanced responsiveness, as well as better collaboration within the company and beyond it.



Define the specific benefits that apply to you.

Could you harness analytics capabilities to improve visibility and drive better insights, for example? Could you envision extending seamless connectivity to a wider ecosystem? Be bold in your thinking. Leading companies already are.



Identify and address what's holding you back.

Do your legacy IT systems need upgrading? How much will you need to spend to boost data and systems security? How severe is your skills gap?



Raise your game.

Follow the leaders by dedicating higher proportions of your R&D budget to building a Connected Industrial Workforce.



Define your journey and who owns it.

You need the full support of senior leadership, and a governance structure that clearly defines roles, responsibilities and ownership. Engage all stakeholders in your strategic plan, identify the value you expect to drive and track it appropriately.



Identify new job profiles.

You need people with cross-functional and inter-disciplinary skills: programmers, analytics and data scientists, machine-coordination and maintenance experts. Build, train or hire to acquire these skills.

As manufacturing transforms, so does the manufacturing value chain. Barriers to entry are lowered, making it easier for agile new, cross-industry competitors to elbow out incumbents too slow to adapt. But the Connected Industrial Workforce also opens exciting new possibilities: higher productivity, improved operational efficiency, enhanced safety and risk management, and a chance to mitigate the effects of rising labor costs in previously low-cost geographies.

It's vital that manufacturers move quickly to build new business models robust enough to rise to these challenges. Now is the time to start your journey toward a Connected Industrial Workforce.

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¹<http://www.abb.com/>

²"Germany Develops 'Smart Factories' to Keep an Edge," Marketwatch, October 27, 2014. "Manufacturing: Self-Organizing Factories," Siemens, 2015.

About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world's largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With approximately 373,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.

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