



Expert Insights

# Empowering autoworkers through AI

Digital tech for enhanced skills and productivity

IBM Institute for  
Business Value



## Experts on this topic



### **Peter Rusko**

Transform Operations Lead,  
Global Automotive,  
Aerospace & Defense Industries  
[linkedin.com/in/peterrusko](https://www.linkedin.com/in/peterrusko)  
[Peter.Rusko1@ibm.com](mailto:Peter.Rusko1@ibm.com)

Peter Rusko, a member of IBM Global Automotive, Aerospace, and Defense team is responsible for IBM industry solutions for automotive manufacturing, supply chain, and enterprise functions. He works on numerous digital transformation initiatives and has engaged with many clients in Europe, Asia, and North America. In 2018, Peter led the development of a new industry-specific solution: a set of AI and AR-enabled tools designed for operators, technicians, and engineers in automotive factories.



### **Noriko Suzuki**

Global Automotive CoC,  
Industry Consultant  
Global Business Services  
[linkedin.com/in/norikosuzuki](https://www.linkedin.com/in/norikosuzuki)

Noriko Suzuki is a senior automotive industry consultant at IBM with over 20 years of experience. Her focus areas are in automotive manufacturing, product development, and new value creation enabled by emerging technologies. She is passionate about leveraging IBM's global automotive capabilities to deliver maximum value to automotive customers.



### **Daniel Knoedler**

Director Global Sales Automotive,  
Aerospace & Defense Industries  
[linkedin.com/in/daniel-knoedler-b91860170](https://www.linkedin.com/in/daniel-knoedler-b91860170)  
[KNOEDLER@de.ibm.com](mailto:KNOEDLER@de.ibm.com)

Daniel Knoedler is the Director of Global Sales in IBM's Automotive, Aerospace, and Defense organization. Daniel has a broad industry and services background and has been with IBM for 20 years. In his IBM career, Daniel has worked with globally operating automotive and aerospace clients throughout Europe, Asia Pacific, and North and South America.



### **Cornelia Oswald-Stephan**

Sales Leader, Talent  
and Transformation, IBM  
[linkedin.com/in/cornelia-oswald-stephan-9248b53](https://www.linkedin.com/in/cornelia-oswald-stephan-9248b53)  
[cornelia.oswald@de.ibm.com](mailto:cornelia.oswald@de.ibm.com)

Cornelia Oswald-Stephan is an experienced consultant and sales leader for Talent and Transformation Services. She is an expert in digital solutions for Talent Acquisition, Talent Development and HR Operations, Cognified and Automated Business Process Outsourcing Solutions. Cornelia works with industrial clients to provide the best solutions to address actual manufacturing challenges

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## Key takeaways

### **Today's big opportunity:**

In automotive manufacturing, empower human workers with AI and digital technology, don't replace them.

### **Meeting the skills crisis:**

AI and digital technology can help organizations find, retain, and train skilled workers.

### **The key to productivity:**

The right AI-enabled experiences can help workers feel happier, be more productive and be safer in the factory environment.

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## Automation's relentless march

The auto manufacturing industry may seem to be an icon of robotic automation that has led to great efficiency improvements. And in fact, since the early days of robotic welders, the industry has rapidly adopted and expanded automation as the primary way to increase efficiency. In the US alone, 52,000 industrial robots were installed from 2010 to 2016.

The appetite for increased automation shows little sign of abating. In our analysis, 87 percent of industry executives said more automation would be useful and practical in their facilities. Ninety-one percent say it would increase throughput at their facilities if they could enable robots and other automated machinery to self-calibrate and be proactive with issues, demonstrating the industry's ongoing desire to extend automation and infuse it with artificial intelligence (AI).

While it might be tempting to extrapolate this trend and assume that complete "lights out" automation is both near and a direct path to the utmost in efficiency, auto manufacturers have discovered something surprising. In the words of Elon Musk, a leading innovator in the automotive world, "excessive automation was a mistake... humans are underrated."<sup>1</sup>

Focusing only on automating machines, processes, and data to continuously reduce production hours-per-vehicle, while leaving out the human factor, turns out to miss a huge opportunity.<sup>2</sup> Viewed another way, the data above showing that 91 percent of executives want robots to be able to self-calibrate and resolve issues proactively sounds as if they wish robots could do—but are so far unable—what humans already do so well: adapt to the unexpected.

## As COVID-19 has shown, the auto industry now faces a new source of disruption: a sudden shift in where and how work must get done.

Adaptability is critical in a complex environment like an auto manufacturing plant. We know unexpected issues and challenges will arise. The combination of the human ability to adapt and apply experience and judgment to these challenges, combined with automation applied to repetitive tasks, is a powerful approach. Even the company that had touted “lights-out” manufacturing devoid of humans has come to see this.<sup>3</sup> In fact, many in the auto industry are finding that a machine-to-human-to-machine model promises to provide not just an immediate path to increasing productivity, but, in fact, a viable longer-term strategy.

As auto manufacturers face a continued need for productivity improvement, then, humans may be a large part of the answer.

### What humans bring to the table

Toyota, for example, believes that having humans in the manufacturing mix is the key to enabling ongoing innovation and process improvement. Practically speaking, once a process is automated with a robot, the efficiency improvement is locked in and does not increase. With human interaction, however, new ideas surface for continual improvement.<sup>4</sup>

At Ford’s truck plant in Kentucky, US, human ingenuity is a key element in keeping the line running.<sup>5</sup> According to Ford executives, manufacturing plants of this size and complexity require daily problem-solving in real time that can’t be done by robots or automated systems. They require humans with experience who are able to use that experience to adapt to unexpected events.

The human factor, therefore, remains an essential part of the production environment, and will be at least for the foreseeable future. Automation will, of course, continue as further opportunities to automate are uncovered, enabling workers to focus on higher value processes. Overall, though, the simpler, repetitive manufacturing jobs have largely been automated away. A clear trend is apparent: more and more manufacturers are focusing on using digital tools and AI to augment human ability on their production lines.

This aligns with our experience in applying AI to real-world problems and opportunities. AI on its own is powerful, but the combination of AI and human capabilities proves far more powerful, because each contributes unique strengths to augment the other. Where AI can be trained to be a stellar pattern matcher, finding connections that would elude most

humans, it tends to not be as good at adapting to new circumstances and applying lessons learned to entirely new domains—something common to the human experience. Where humans can generalize, imagine novel solutions and apply a lifetime’s worth of common sense, AI can analyze almost endless streams of data without tiring and, when properly trained, is unencumbered by human bias.

AI-powered cobots (collaborative robots), often used in logistics processes, are a perfect example of this augmenting human ability. They are specifically designed for machine-to-human interaction. The AI in the cobots helps humans better “sense” their environment, and also further optimizes working procedures and actions according to actual conditions and constraints.

### How AI and digital technologies can help: Skills and talent<sup>6</sup>

In the auto industry, the rapid pace of change makes various worker skills quickly become obsolete. It’s not surprising then, that in our Automotive 2030 study, manufacturing had the highest need for reskilling across all function areas. And, 82 percent believe that enabling new ways to work will be critical to the success of their company. In the same study, an industry executive commented, “Major instability in the automotive industry will be created due to lack of skills.”<sup>7</sup>

While our research indicates, generally speaking, that enterprises should focus on behavioral skills, auto industry execs express a specific concern over a lack of technical skills in their workforce. For example, the advent of electric cars brings less mechanical complexity, but much more digital complexity, more software-intensive vehicles, and new manufacturing processes. Industry 4.0 and e-mobility workers need completely new skills that were unthinkable years ago: 3D-printing, for example (see Figure 1). In the growing interaction between humans and machines, human workers need different knowledge—a kind of common language to orchestrate them all.

And the COVID-19 pandemic has introduced a new source of disruption: a sudden shift in where and how work must get done. Production lines may be instantly shut down in some regions. Companies may choose to transfer production to factories in unaffected areas, but smoothly handing off projects from one team to another requires extensive sharing of expertise.



**Figure 1**  
Skills for success



Source: Automotive 2030 Executive Survey. Q: What workforce skills are/will be critical to your organization's success? Select 6.

At the same time, many companies are experiencing the massive retirement of technical experts—with on-the-floor experience and problem-solving exiting with them. Newer employees may lack the experience of senior generations whose tacit knowledge may be lost in the next few years. This knowledge and expertise is a valuable business asset that must be captured and retained by corporations. Moreover, some auto companies are finding it increasingly difficult to attract and hire young talent, resulting in a so-called war for talent.<sup>8</sup>

All these challenges require OEMs and suppliers to rethink and redefine their skills and talent framework to reflect the actual challenges and needs. Once the new framework is in place, they can analyze the gaps. And once they know the gaps, they have basically two options: reskill employees, or acquire new skills externally (see Figure 2).

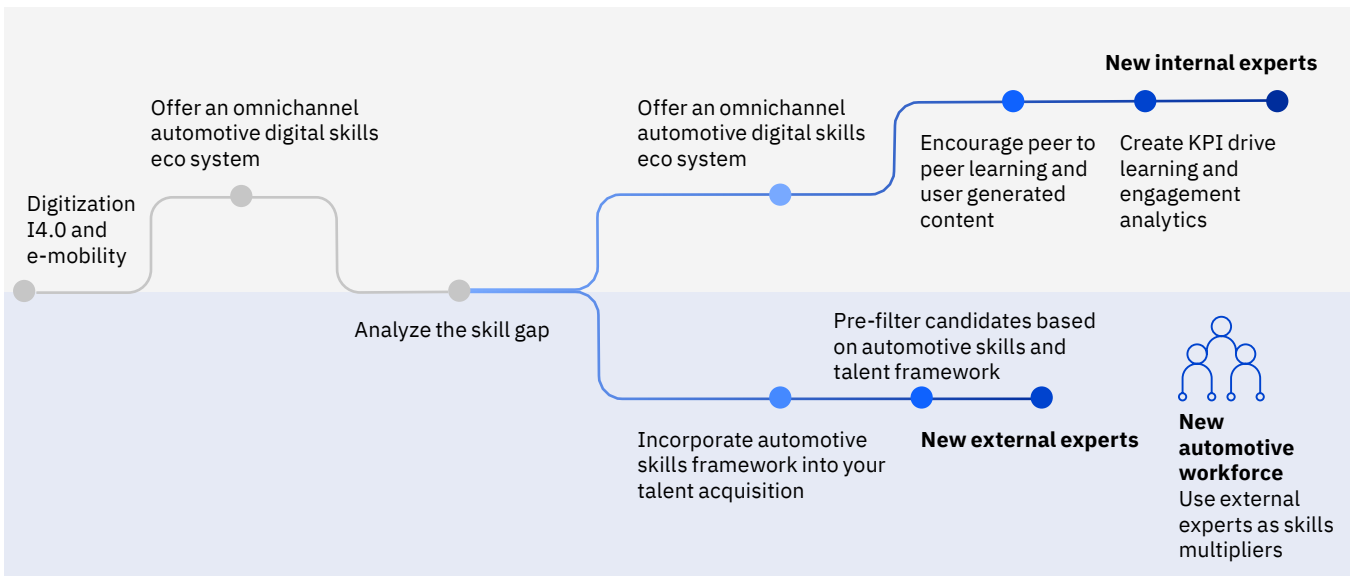
**Reskill employees.** The automotive industry is predicted to spend USD 33 billion over the next 10 years to reskill employees.<sup>9</sup> Identifying new skills requirements will be ongoing as the industry's business model and product mix change. Once identified, the new skills training will need to be developed and made available on AI-driven platforms designed for continuous learning and personalization at scale. The best of these platforms will echo the personalization, cross-device and location integration, and engaging experience design workers are becoming accustomed to in their everyday lives on their personal devices.

Also, the pace of change and adoption of new technology implies that a one-time reeducation to a new set of skills is not enough. An ongoing learning program can help workers keep their skills apace with new technologies. This will likely give rise to hundreds of thousands of automotive workers spending millions of hours in training to keep up with these new methods, including the manufacture of electric cars.<sup>10</sup>

As we learned in our Auto 2030 study, 82 percent of automotive executives plan to incorporate new ways to work—such as design thinking, co-creation, agile and data-driven decision making—as part of their organization's culture. Seventy-three percent want to implement agile teaming to drive rapid skills transfer and development. Eighty-one percent want to build continuous learning platforms and workflows, and 72 percent will use digital platforms to match their skills supply with demand.

**Figure 2**

AI can help with both options



**Acquire new talent.** While “reskill instead of replace” is the preferred strategy, automakers will also need to hire new talent to augment their existing skills. In order to attract the people they need, executives will need to take steps to improve their talent acquisition processes: eliminate hiring bias, optimize hiring speed, create compelling digital candidates experiences, and employ predictive hiring, to name just a few.

Fortunately, AI can help. For example, the candidate experience can be greatly improved by using AI and intelligent workflows—data-driven workflows integrated across an enterprise that have AI embedded in them. These same capabilities also help new hires get up-to-speed quickly.

A major European OEM is using AI to build the right human capital for its organization. With hundreds of candidates going through its recruitment process every month, an AI digital assistant now guides candidates through the data entry process in a user-friendly way. The company worked with AI experience designers to create an AI assistant that allows job applicants to apply for a job through a virtual conversation rather than by filling out extensive paper

forms. The solution gives recruiters clear visibility of skills and recruitment data, and can easily help advance the application to the next steps in the hiring process.

An important differentiator in competing for talent is an employer’s brand. A great candidate experience must be backed up by a great work experience—and the reputation for providing one. AI and digital tech can support such a work experience.

For instance, AI can enable new ways of learning, augment peer-to-peer learning, as well as help make accessible user-generated content. It can also automatically curate content. Using AI and digital technologies, a company can reimagine all its touchpoints with the employee, simplifying and personalizing them while also empowering workers.

A recent research study shows that a happier human is more productive.<sup>11</sup> Work satisfaction and experience—a sense of purpose and contribution, ease of navigating complex technical environments—are essential elements of a motivated workforce. And an improved retention rate contributes to training productivity.

In their everyday lives, people are using the latest digital tools to share, collaborate and stay in touch—why shouldn't tools like these follow them to work?

## How AI and digital technologies can help: Productivity

While many automotive companies acknowledge that humans are an integral component of the production environment—an asset, not a liability to be automated away—existing tools, capabilities and approaches will not suffice. In today's manufacturing plants, workers are often frustrated with an overwhelming amount of information or, ironically, a lack of the information needed to solve problems. They waste hours looking for information hidden in disparate systems, which could be easily addressed with a natural language AI-based system.

This reveals both an immediate need and opportunity: while humans can be essential elements of the modern manufacturing system, they need the right tools, and they need new skill sets. Equipping them with digital tools and AI assistance can help them function at their best in a production environment. For example, of the executives earlier cited, 89 percent say plant operators would benefit from additional digital work instructions, process explanations, and manuals—voice-enabled, where appropriate—on production lines. Overall, 49 percent of executives say that digital initiatives will deliver high value in manufacturing automation over the next 10 years.<sup>12</sup>

For the most part, auto workers cannot be at their best if they are encumbered with clunky, outdated analog tools—or even rudimentary, stand-alone digital ones. Providing digitally- or AI-enabled tools integrated into the company's workflow can greatly extend their capability. They will also quickly expect this kind of enhanced experience.

In their everyday lives, people are using the latest digital tools to share, collaborate and stay in touch—why shouldn't tools like these follow them to work? During the COVID-19 pandemic, for example, daily usage of one type of videoconferencing tool soared over 300 percent.<sup>13</sup> And anyone with a smart phone or tablet has access to digitally augmented experiences and AI assistants. Having experienced the best of technology at home each day, stepping back into the Stone Age of personal productivity technology at work in the factory can only lead to frustration.

One multinational tier one supplier is implementing a smart factory concept globally. The company conducted extensive benchmarking on the best practices worldwide

and is introducing AI as one of the key enabling technologies. For example, natural language AI facilitates expertise sharing in factory operations, providing access to previous repair and maintenance records, tips and advice, and other related data.

Additionally, this company has had in place a digital innovation organization to foster new ways for engineers to work and implement agile development processes in automotive software development.

Manufacturing may have been considered exempt from new approaches to remote work and a distributed workforce, and the new digital tools and skills it demands. But in today's reality of uncertainty, many of these same digital tools and approaches—especially AI-powered technologies—will become a basic requirement for any auto company hoping to be resilient in the face of disruption.

As the pandemic has also shown, responding to such an outbreak can create a sudden need to enforce social distancing and to regulate the occupancy of production facilities. This means enabling factory workers to work more autonomously to reduce exposure and apply safety guidelines. Faced with working in solo conditions, technicians, mechanics, and service repair personnel will now have to depend upon their own experience or potentially overwhelming documentation to resolve issues and provide service.

But simply saying workers need digital tools and AI is the easy part. How are leading companies thinking about this? How are they actually doing it?

One major global automotive OEM has been evaluating the use of augmented reality (AR) to face various manufacturing challenges. In addition to “classical” use cases where AR enables distant collaboration, they explored new areas, such as quality inspection. Typically, the quality inspection process involves several people exchanging information via a paper-based or digital protocol. It takes time to describe the defect and its location accurately. AR uses advanced models of the vehicle and its components to allow technicians, inspectors, and engineers to register an issue linked to the exact position of the defect, then share it with others (see also sidebars “Major German OEM: Finding answers fast,” and “Two major OEMs: Augmenting human senses with AI”).

## A large German OEM: Finding answers fast

A large German original equipment manufacturer (OEM) discovered its technicians and engineers had a productivity problem. In order to find answers related to equipment failure, repair procedures, machine updates and configuration adjustments, and the application of a new technology for a new project, they had to search a confusing sea of documentation—over 150,000 documents in more than 50 different formats, four languages, located in three separate systems. Adding insult to injury, with all that effort, they often couldn't find the answers they needed.

The company evaluated using an AI-powered knowledge exploration tool in its main production plant. Once implemented, it increased productivity of skilled engineers by 6.7 percent and reduced issue resolution time by 10 minutes per incident.

## Two major OEMs: Augmenting human senses with AI

Quality inspection is a challenging task. It requires concentration and precision, as the auto industry's quality criteria are very high. It demands speed as the cycle time of production lines sets challenging constraints. Sophisticated AI-enabled visual quality inspection systems can significantly help by augmenting the human senses. AI-enabled vision never tires, is not distracted and provides consistent problem identification, eliminating subjectivity.

A premium brand automotive manufacturer, supplied with wheel rims from various suppliers, must ensure consistent quality. But while wheel rim optical defects typically measure about a millimeter, they can easily be much smaller—on the order of 0.3 mm. Moreover, this manufacturer cares about defects in all parts of the wheel, including the inner part that's not visible when the wheel is on the car. This OEM and its suppliers are revolutionizing the inspection process with an AI-enabled solution that uses input from multiple camera technologies and helps the human inspectors quickly identify the defects.

A major US-based automotive OEM struggled to maintain consistent assembly operations of newly engineered vehicles resulting in lost production, rework and scrapped parts. In order to resolve this issue, the OEM equipped quality inspectors with an AI-enabled visual quality inspection tool. The very first station deployed prevented 32 vehicle mis-builds in the first 30 days.



## How AI and digital technologies can help: Health and safety

It's clear that as COVID restrictions on production are lifted and workers return to the shop floor, protecting their safety and health is critical. Automotive plants and production lines face specific challenges. Despite massive automation, there are still hundreds or thousands of people working in locations with highly optimized space usage. Unlike heavy industries, such as steel, most of the workers in automotive plants are not normally equipped with personal protective equipment (PPE).

Countermeasures to fight pandemics will tighten regulations in manufacturing and introduce new technologies in the automotive plants, such as thermal cameras or entrance disinfection gates.<sup>14</sup> AI and digital tech can help.

AI-enabled visual inspection systems can monitor social distancing, proper use of PPE, and occupation levels. AI and IoT systems can dynamically optimize environment conditions (temperature, humidity). Virtual assistants can provide adequate and timely information on health and safety procedures, risks and actual situations to employees.

## Action guide

### *Empowering autoworkers through AI*

While OEMs and top-tier suppliers are beginning to use AI to upskill workers and improve their employee experience, providing these capabilities at scale will be the key to better productivity. Just as workers in automotive factories have always been equipped with physical tools, digital and AI-tools—at scale—will further enable them in three key areas:

**1. Overcome the growing skills gap.** Start by redefining your skills and talent framework. Introduce a skills-driven employee experience supported by personalized learning and a recruiting platform with an intelligent virtual agent as its entry point. Enhance the candidate experience with intelligent workflows, technology and recruitment services delivery built around a talent acquisition platform.

**2. Empower workers to work more autonomously with higher confidence.** Start by giving them tools that allow them to collaborate easily with colleagues in different locations. Also, introduce AI assistance using natural language interactions to perform equipment troubleshooting and diagnoses. Pilot AI-enabled visual and acoustics inspection tools to augment human senses and intuition, such as for operators, technicians and engineers who perform daily ad hoc inspections. Unlock the collective knowledge and expertise of the entire organization by capturing, maintaining, and applying tacit knowledge buried in documents and living in people's minds. Then apply it at scale.

**3. Protect workers.** Use AI to track and recommend appropriate safety measures, such as social distancing when appropriate or the use of PPE. Following a work disruption, use AI-assisted curation of timely information on health and safety procedures and risks to manage the safe return of employees to the work site.

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Armonk, NY 10504  
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