Workforce Availability

Protecting Your Investment in Productivity and Safety
Amid an Evolving Global Workforce

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Historically, a growing labor pool has fueled global economic growth. Today, that fuel supply is in decline around the globe as manufacturers and industrial operators contend with the issue of workforce availability — a result of an aging and evolving workforce. This challenge threatens to reduce economic growth by 40 percent, barring a significant acceleration in productivity. It also affects the safety of both older and younger workers in significant ways.

At the same time, the Internet of Things and evolving technology — specifically the convergence of information technology (IT) and operations technology (OT) systems – is transforming manufacturing and industrial operations through deeper visibility, greater connectivity and nearly unlimited potential for improvement. However, with rapid advancements in technology come new demands on the workforce. New skills are needed to enable IT/OT convergence and to take advantage of new technology. And these skills are not easily found in today's workforce.

> *"The average age in my department is 60."*
>
> **Engineering manager, large enterprise industrial manufacturing company**

With these profound demographic changes and technology skills gaps, successful manufacturers and industrial operators will have to reconsider machinery and facility design methodologies, worker training, technology implementation and safety issues in significant ways. Those that implement changes early to mitigate risks, improve efficiencies and adopt new technology will ultimately prevail in a global economy.

The Evolving Global Workforce

Workforce challenges resulting from aging workers leaving the workforce and being replaced by less experienced, early career workers – if they can be replaced at all – are being felt around the world.

In the U.S.:

- **One-third of workers are over age 50** and the average age of a highly skilled manufacturing worker is 56 – a group that may swell to 115 million workers by 2020[1].
- Skilled trades also have **far fewer 65-and-older workers than the labor force as a whole,** meaning that many skilled workers aren't holding off on retirement and the skilled worker shortage will continue for the foreseeable future.
- The U.S. could face a **shortfall of about 875,000** machinists, welders, industrial-machinery operators and other highly skilled manufacturing professionals by 2020[2].

In China:

- The **over-65 population is expected to reach 210 million** by 2030 and account for one-fourth of the country's population by 2050[3].
- As the number of college graduates increases and wages rise, **Chinese factories are struggling to fill positions** and are increasingly turning to robots to help keep operations running[4].
- **China recently abolished its one-child policy,** driven in large part by fears that an aging population could jeopardize the country's economic growth[5].

In Europe:

- **The EU employment rate for people aged 55 to 64 rose to 46 percent** in 2009 as countries seek to prolong people's working lives. However, this is still far below the general employment rate of 69 percent.
- The Europe 2020 Strategy **aims to increase the employment rate** to 75 percent for people aged 20 to 64. But for this to happen, European citizens will need to work longer and pension reforms will be required to facilitate extending older workers' time in the workforce[6].

"Over the next decade nearly 3 and a half million manufacturing jobs will likely need to be filled. The skills gap is expected to result in 2 million of those jobs going unfilled." [1]
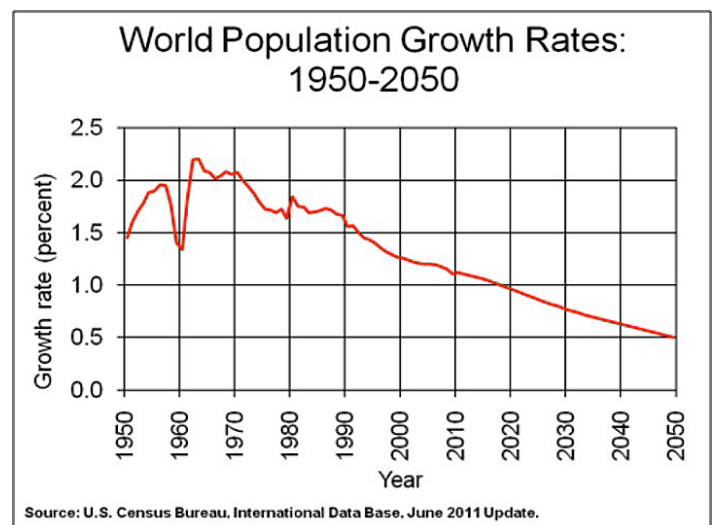
[1] The Skills Gap in U.S. Manufacturing 2015 and Beyond, Deloitte, 2015

World Population Growth Rates: 1950-2050
Source: U.S. Census Bureau, International Data Base, June 2011 Update.

"Long the world's factory floor, China will soon confront a serious labor shortage, forcing scores of Western brands to remake their operations. The changes will mark a new chapter in the history of globalization, where automation is king and nearness to market is crucial."

Source: 2050 - Demographic Destiny, Wall Street Journal, November 22, 2015

[1] Heidkamp, Mabe, & DeGraaf, 2012
[2] The Boston Consulting Group, The U.S. Skills Gap: Could It Threaten a Manufacturing Renaissance? Aug. 28, 2013
[3] Burkitt, 2015
[4] Cheaper Robots, Fewer Workers, New York Times, April 24, 2015
[5] China Abandons One-Child Policy, Wall Street Journal, October 30, 2015
[6] European Agency for Safety and Health at Work

In Latin America:

- **Birth rates have plummeted** from 5.98 children per woman in 1960 to 2.20 children per woman in 2010[7], significantly shrinking the future talent pools in these countries.

Because the availability of skilled workers is shrinking globally, methods such as offshoring and workforce relocation become less effective. The problem must be dealt with by increasing both productivity and safety, as well as addressing human resource issues.

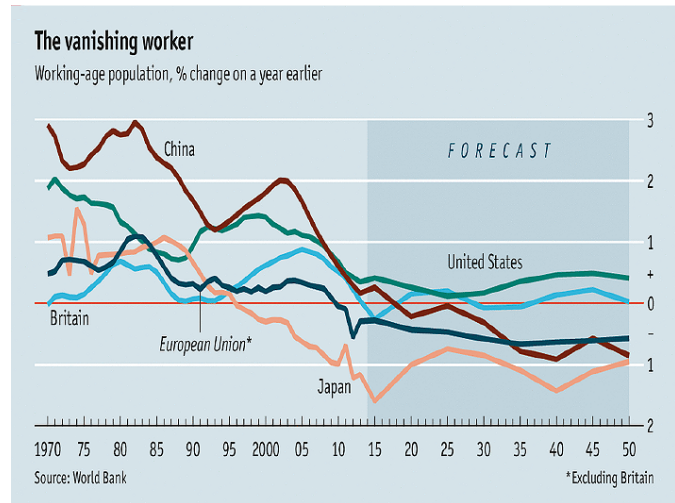## The Impact on Productivity and Safety

The global GDP growth rate is expected to decline from 3.6 percent per year between 1964 and 2012 to only 2.1 percent for the next 50 years. It would take 80 percent faster productivity growth to compensate for the projected decline[8].

Skilled worker shortages have emerged as a threat to growth and productivity in multiple industries and regions around the world.

In Canada, the mining industry will need to hire more than 106,000 workers between 2016 and 2025 based on the current economic climate and forecasted business outlook. Nearly half of those workers will be needed to fill the jobs of retiring workers[9]. The challenge is more pronounced in Australia, where labor shortages have already contributed to the decline in mining productivity in recent years.

Meanwhile, global oil and gas executives have listed skills shortages as their No. 1 or No. 2 barrier to growth in three of the last four years[10].

In the manufacturing sector, 82 percent of U.S. executives surveyed by Deloitte and The Manufacturing Institute said they believe the skills gap will impact their ability to meet customer demand, while 78 percent believe it will impact their ability to implement new technologies and increase productivity[11].

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[7] Schleier, 2012

[8] James Manyika, 2015

[9] Canadian Mining Industry Employment, Hiring Requirements and Available Talent, Mining Industry Human Resources Council, 2015

[10] A Balancing Act: The Outlook for the Oil and Gas Industry in 2015, DNV-GL, 2015

[11] The Skills Gap in U.S. Manufacturing 2015 and Beyond, Deloitte, 2015

The vanishing worker
Working-age population, % change on a year earlier

Source: World Bank   *Excluding Britain

"We've had a lot of new projects that have come online and we haven't had the population and the skills growth in Australia to support those from existing resources."

Phil de Courcey, CEO, Resources and Engineering Skills Alliance

Source: Skills Shortage Still Hurting Miners, Australian Mining, March 21, 2013

How Aging Affects Our Ability to Work

- *Decreases in range of motion, flexibility and dexterity can pose increasing challenges requiring precision movements.*

- *Recognition and analysis of hazards, and reaction to those hazards, can take longer.*

- *Lifting or carrying can become more challenging, making older workers more prone to musculoskeletal and repetitive stress injuries.*

Worker safety is a more complex issue. Older workers are at higher risk for certain types of injuries. Even those who maintain healthy lifestyles can experience changes in skeletal muscle strength, vision and cognitive abilities, which can impact their job performance. Older workers may also take longer to recover from injuries than younger workers.

Younger and less experienced workers, on the other hand, are more frequently injured and tend to have more acute, serious injuries. Several studies show that younger workers (under age 25), and in particular those with less than one year on the job, have much higher injury rates. This is attributed to inexperience, cognitive and developmental characteristics, hesitance to ask questions, misjudging risks and failure to recognize workplace dangers.

A Safe Work Australia report found the injury rate for workers under age 25 was 18 percent higher than for those aged over 25, and 20 percent of all work-related injuries experienced by Australian workers were incurred by workers 25 and younger.

Another issue of concern is maintaining a strong safety culture amid pressures to increase production.

There is a strong tendency for workers who are under such pressure to take shortcuts. But shortcuts can be self-defeating. An injury resulting from a shortcut can easily cost much more in lost production and revenue than the small increase in production that the shortcut hoped to achieve.

Manufacturers and industrial operators must be very clear on the expectation that safety and quality are strongly held values, and that the objective is the safe production of quality product. A safe work environment should embrace **the three Cs:**

Culture: worker behavior
Compliance: processes and procedures
Capital: technologies that help protect workers from injury

Creating a True Safety Culture

Shawn M. Galloway, president of ProAct Safety and an expert on the topic of excellence in safety cultures, shares his take on safety culture:

Too often we hear well-intended leaders voicing the desire to move safety from being perceived as a priority to a value and integrate safety into the fabric of operational activities. It is not that easy. Culture is not the 'way we do things around here,' nor is it 'what people do when no one is looking.' Culture is what is common within a group. It is also a unique combination of influences on beliefs and behaviors.

All operations have an existing culture specific to safety. The challenge isn't in creating a 'safety culture'; rather, it is in influencing and controlling the climate and chemistry that result in the desired strong safety culture. Culture is a byproduct and cannot be directly managed.

In 'STEPS to Safety Culture Excellence℠,' we provided a comprehensive roadmap that guides organizations through the development and execution of a strategy for excellence in both safety and culture.

Strategy is a framework of choices an organization makes, tradeoffs to determine how to capture and deliver value. In other words, strategy is, 'How will we win and create value over time?' In efforts to improve safety culture, there can be a tendency to do more rather than focus and do better.

With the changes in workforce dynamics and availability of internal resources to create substantial and sustainable improvements in safety performance and culture, we must be more strategic in our choices. This includes determining what we will not do, or will stop doing. Zero injuries is the byproduct of the value of safety excellence, not the focus or final goal. If those impacted by our cultural improvement efforts do not see them as efficient and value-adding, we might disengage the very people we are trying to engage.

Empowering a More Connected Workforce

The skills gap also must be considered in the context of the changing technology landscape.

Manufacturing and industrial operations have evolved far beyond the days of the assembly line when factory workers labored side by side, completing dedicated repetitive jobs. In fact, industrial operations will more radically change in the next five years than they have in the last 20, and the Internet of Things (IoT) is a catalyst in this shift.

As global pressures continue to grow, companies need to find innovative ways to use advancing Internet-ready technologies to meet demand. Rockwell Automation calls this The Connected Enterprise.

The Connected Enterprise is creating new opportunities for manufacturers and industrial operators to increase productivity and reduce safety risks, and can even help address the challenges of today's evolving workforce. But the convergence of existing systems and the adoption of new technologies that enable this transformation are also placing new burdens on workforces.

IT and OT roles that have long remained separate are now blending, requiring additional skills and training for both individuals and teams. To this end, workers on the plant floor must increasingly become experts in areas such as networking technology, data analytics and industrial security.

Organizations should embrace the new era of information-enabled manufacturing and industrial production. But they must also consider the restructuring of roles and responsibilities that need to accompany such a significant transformation, and they should take an active role in ensuring workers have the skills and knowledge necessary. This can help make the transition seamless and verify they're getting the most from their connected operations.

What Can be Done?

Workforce availability is a long-term, multifaceted challenge. There is no single or short-term fix. But there are five key steps you can take to better prepare your operations and empower your workers to cope with the challenge ahead:

- **Improve machinery design** to address ergonomics and safety risks for a more diverse workforce, including older and younger workers
- **Build a Connected Enterprise** to improve productivity and efficiency
- **Train workers** to manage knowledge transfer and develop new skills to enable IT/OT convergence and take advantage of new technology
- **Leverage vendors and suppliers** to augment core competencies with less frequently required skills
- **Engage your community** to improve the skills and availability of young workers, and improve your reputation as an employer

Improve Machinery Design

Improve ergonomics and safety for older and younger workers

Machinery design must be improved for a changing, more diverse workforce. This includes accommodating the physical demands of older workers and the safety requirements of younger, inexperienced workers.

Older workers require physically less strenuous interaction with machinery, including reduced lifting, bending, twisting and repetitive actions. Younger and inexperienced workers require more passive safety systems to help mitigate risks in the event of an inappropriate action, such as placing a hand or another body part in a hazardous position.

In addition, a more diverse workforce requires that machinery be designed for a wider range of workers – male and female, tall and short, right-handed and left-handed, or those with disabilities – to support a more diverse workforce.

These combined factors require a significant rethinking in how machinery is designed, specified and built.

Hazard assessments should take into account not only the traditional hazards, but also ergonomic and usability issues for a broad range of workers. Engineers performing assessments, building functional specifications and designing machinery need to assess all potential operator and maintenance technician movements as part of the process. Some questions and considerations to keep in mind:

- Do operators have to lift materials? Could lifting be avoided by designing the machine differently?
- Most injuries occur during nonstandard operation, such as maintenance. Many safety assessments are performed considering only standard operator functions. Do maintenance technicians have to bend or twist awkwardly when servicing the machine? Are technicians exposed to hazards during maintenance? How can these operations be performed more safely, more ergonomically and more efficiently?

Contemporary safety systems, integrated with machinery control systems, can be very effective in mitigating risks while providing for effective and productive machinery operation. These systems are not as prone to nuisance shutdowns as older hardwired systems, which helps improve productivity and safety. They also are more ergonomic, reducing the probability that workers will override the systems and put themselves at risk.

"This is a significant factor, having workers unfamiliar with the hazards of the industry and the jobs. It does create a larger burden on industry to train them both on the job and safety."

Bill Wilkerson,
Cincinnati area director, OSHA

Source: "Lack of safety training, experience blamed for rise in work fatalities" Dayton Daily News

Studies by Aberdeen Group have shown that best-in-class manufacturers have 5 to 7 percent higher OEE and 2 to 4 percent less unscheduled downtime than their peers.

Best-in-class performers also had significantly fewer accidents and fewer repeat incidents.[1]

[1] *Aberdeen Group, "Risk Management Approach for Improving Safety and Productivity," October 2010*

In addition, machinery design strategies such as safe-speed monitoring and zone control can provide alternative protective measures to lockout tagout procedures. This helps reduce physical demands put on workers and helps keep a machine running longer for improved productivity.

Machine builders should consider both ergonomics and passive safety systems when designing machinery, and manufacturers and industrial operators should demand machinery designs that accommodate the needs of a more diverse workforce and the physical limitations of aging workers. The evolution of machinery design will require time, but such requirements should be built into all new machinery specifications.

Build a Connected Enterprise

Improve productivity and identify risks

The Connected Enterprise consists of industrial operations that are smart, secure and connected, from sensors and machinery in one location, up to the enterprise, and across the entire supply chain. Seamless information-sharing spans people, processes and technologies across global and remote operations, which enables better collaboration, faster problem-solving, and improved innovation and productivity.

When it comes to helping you adjust to workforce challenges, The Connected Enterprise can aid in a number of ways:

- **Reduced Job Complexity:** Worker-specific instructions and other contextualized production information can help reduce complexity for younger, less experienced workers. This information can be collected from machinery and delivered to workers in real time, in a context relevant to each employee. In addition, collecting information from experienced employees and integrating it into workflow instructions can help preserve critical tribal knowledge. Conversely, the ability to record processes can help you more quickly identify a problem if an operator makes a mistake. That information can also be passed back to the operator as a method for sharing best practices and optimizing end-to-end processes.
- **Easier Information Access:** Using mobile devices can help deliver critical production information to younger workers in a format they are familiar with. The devices can also deliver information to older workers with "anytime, anywhere" convenience to help reduce physical demands.
- **Reduced Travel Demands:** Your oldest employees may also be your most knowledgeable employees, which often means they're in high demand. With remote-access technology, these employees can offer their expertise to sites around the world from a central location or command center, or even from home. This can reduce travel demands and improve work-life balance for older workers who may otherwise be considering retirement. In addition, enabling workers to remotely monitor the operations of an isolated mining location, for example, can help attract and retain younger workers who want to live in a more desirable metropolitan area rather than near the mine.

The Connected Enterprise: From Concept to Completion

Discussing and theorizing The Connected Enterprise is one thing. Designing and operationalizing it is another.

Rockwell Automation has developed The Connected Enterprise Execution Model to help guide you on your journey. It includes five key stages:

Stage 1: Assessment

Stage 2: Secure and Upgraded Network and Controls

Stage 3: Defined and Organized Working Data Capital

Stage 4: Analytics

Stage 5: Collaboration

A detailed examination of these steps is available in the Rockwell Automation white paper, "Key Considerations for Operationalizing the Connected Industrial Enterprise."

- **Greater Labor Utilization:** Manufacturers and industrial operators have always sought greater efficiencies in their operations in order to do more with their existing employees – and that's especially important now. A Connected Enterprise can introduce greater efficiencies across your operations so you can better utilize employees. This can include capitalizing on your data to keep lines running longer and reduce maintenance demands, using third-party remote-monitoring services when local talent isn't available, and using cloud and virtualization services to reduce IT demands.

From a safety standpoint, a Connected Enterprise can help you identify risks and gain new insights into where safety-related shutdowns and incidents are taking place – and where further assessment and mitigation might improve worker safety. Collection and analysis of information can expose the particular locations, applications and operations where risks are higher.

> *"Instead of the dashboards on static monitors or on just a laptop or desktop, you've now got that information on a handheld device, so you can use it in small groups to improve collaboration. You can even take a screen shot of a dashboard and text or email it to someone else and ask questions."* [1]
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> *Jon Riechert, senior corporate engineer for innovation, Tyson Foods*
>
> [1] *Control Global, June 2, 2015*

This insight goes well beyond simple identification of where injuries are currently taking place in a single facility to include identification of common applications across an enterprise where injuries, near misses and safety shutdowns are taking place, affecting both worker safety and productivity. This can include analyzing factors such as raw-material chemistry, mill speed or specific processes that use hazardous substances.

Once the problems are identified, solutions can be implemented to reduce safety incidents or improve productivity. Lockout tagout locations might be identified and analyzed to see if there are opportunities for alternative measures that can improve productivity.
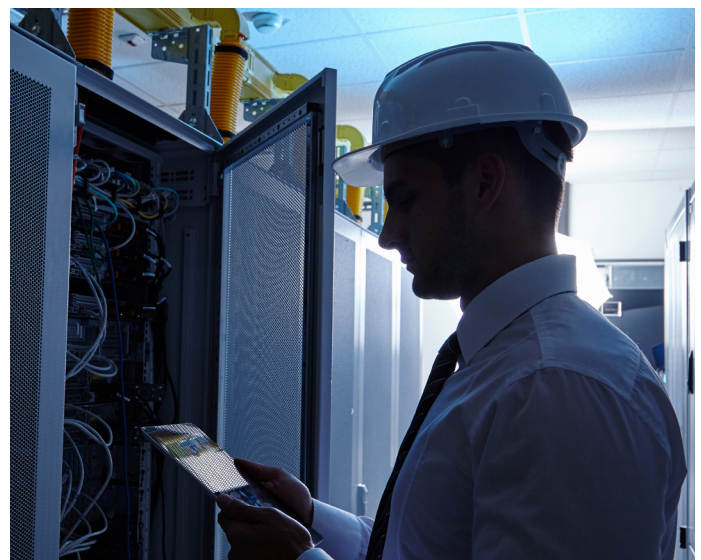

Zurich Insurance Group, a global insurance company focused on risk management for businesses and individuals, also recommends measuring and analyzing data that can help predict incidents, which can help to identify preventive measures that need to be put in place to better understand and manage risk. Some of the things Zurich Insurance Group recommends measuring include:
- Housekeeping audit results
- Safety audits completed
- Hazard corrections completed
- Safety training attendance
- Employee engagement survey results

> ## *Remote Monitoring in Oil & Gas*
>
> *Oil and gas operators are using remote-monitoring technology, including sensors and cellular or wireless connections, to supervise their wells and other operations from a single, centralized location. This can be much more efficient than employees traveling across sites and manually checking on remote wellheads, pump stations and storage sites.*

Use Training

Improve worker knowledge and competency

As experienced workers retire and younger workers take their place, and as new technologies emerge in industrial facilities, the management of knowledge becomes critical to your survival.

Knowledge management in an evolving workforce requires a multifaceted approach. The "tribal knowledge" of older, more experienced workers must be preserved and passed on to younger, less experienced workers. Younger workers also need to acquire the technical skills and knowledge necessary to maintain equipment and troubleshoot problems to help increase uptime.

It's worth reviewing your training program and evaluating whether it addresses some of these key elements for retaining and building knowledge management:

- Establish a formal program to **document standard processes and procedures** to help maintain consistency through the coming transition. The program should also help employees identify exceptions to those processes and procedures, as well as know when issues should be escalated.
- **Conduct an analysis of job skill and knowledge levels** to confirm your workers have the knowledge and abilities to perform at the desired level. The analysis should target specific job categories and focus on tasks that affect worker performance. Skills assessments can be targeted to specific job responsibilities. Rockwell Automation provides assessments and training for those involved in automation and controls, which can then be used to develop tailored training plans to equip workers with the specific skills and knowledge they need.
- Skills will undoubtedly range from a foundational, to an intermediate, to a mastery level depending on each employee's experience. **Embed a sustainable and flexible competency-improvement program** in your organization to continually improve productivity and profitability throughout the enterprise.

Creating In-House Experts for a Global Production Overhaul

A U.S. automotive giant seeking to create a common automation platform for the production of its vehicle platforms knew the effort required more than deploying new state-of-the-art equipment. It required equipping plant-floor electricians with the knowledge and new skills necessary to operate and troubleshoot the totally transformed controls system.

The automaker tapped Rockwell Automation to develop a unique "train-the-trainer" program, in which the company's electricians became subject-matter experts on the new equipment, enabling them to train their peers. A program was developed that was customized to the automaker's new controls architecture and designed to be sustainable for use across plants for the foreseeable future. Custom simulation workstations also were developed to replicate the entire suite of new controls, and other integrated hardware and software that electricians would operate.

Rockwell Automation has trained more than 30 in-house trainers for the rollout of new controls in multiple North American plants. In turn, those trainers have taught more than 1,500 electricians how to operate, maintain and troubleshoot new integrated control architecture in their home plants.

Workers who will be responsible for designing, managing and maintaining a Connected Enterprise also must be supported with the necessary IT/OT skills and knowledge.

IT/OT training and certification services are increasingly being sought as manufacturers and industrial operators redefine workers' roles and responsibilities as IT/OT convergence takes hold in their facilities.

Cisco® and Rockwell Automation are taking the lead in developing **training courses** and certification to address this need. The Managing Industrial Networks with Cisco Networking Technologies (IMINS) course gives workers the foundational skills they need to manage and administer networked industrial control systems, and the Managing Industrial Networks for Manufacturing with Cisco Technologies (IMINS2) course delves deeper into topics such as EtherNet/IP™, wireless technology implementation and advanced troubleshooting. These courses prepare workers to receive the **Cisco Certified Industrial Networking Specialist and Cisco Certified Network Associate Industrial (CCNA Industrial) certifications.**

> *73 percent of industrial producers say transferring knowledge from experienced workers is a primary challenge to ensuring the availability of knowledgeable, skilled workers in their organization.*
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> *Source: TechValidate survey of 537 Rockwell Automation customers.*

The Industrial IP Advantage, an educational community supported by a coalition of like-minded industry leaders, also offers a **series of e-learning courses** for IT and OT professionals. The courses are scenario-based and interactive, and provide training in critical areas such as logical topologies, protocols, switching and routing infrastructure, physical cabling, and wireless.

Rockwell Automation is also actively working with Cisco and other organizations to support the Industry Talent Consortium, a group of employers, academia, industry change agents and human capital solution providers working with employers to identify skills gaps, provide training and certification programs, and connect employers with skilled workers.

Leverage Vendors and Suppliers

Augment your core competencies

Some specialized skills are only occasionally required. For these skills, it makes sense to keep your workers focused on their primary responsibilities and leverage technical services from industry experts for special projects. Consulting and assessment services, systems integration services and even some specialized maintenance services might best be provided by vendors with a deep knowledge base in the area of need.

In other instances, such as when a manufacturer or industrial operator has limited resources or can't find the talent locally, external services can help augment an existing workforce. In this case, it might be beneficial to let a vendor supply a trained, qualified embedded resource to optimize a storeroom, or to conduct preventive maintenance activities and quickly diagnose and troubleshoot issues when they arise.

> ### *Addressing Aging Workforce Challenges with Training*
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> *Southwest Baking Company's most knowledgeable maintenance technician was on the verge of retirement, and the company didn't have anyone to fill that role. To help address this challenge, the company decided to invest in the future of its most junior employee by enrolling him in a 12-week intensive training program called the Accelerated Skills Academy (ASA) from Rockwell Automation. After completing the program, the employee had the knowledge and skillset needed to handle any job in the plant.*
>
> *"A year ago, he wouldn't have been left alone in the plant," said Rob Wroblewski, plant engineer. "Today, he has the knowledge and skillset to handle any job."*

Some other examples of external services that can help you address workforce availability challenges include the following:

Machinery safety assessments require deep understanding of applicable safety standards, machinery hazards and mitigation techniques. These skills aren't easily developed in most industrial facilities, and may not be needed on a day-to-day basis. Third-party safety assessments can confirm compliance with standards, help reduce injury risks and improve productivity.

This is also an area where outside expertise can offer a valuable fresh perspective. Internally conducted safety assessments may overlook potential hazards on machinery that employees are familiar with and on which no one has previously been injured. But an external expert taking a fresh look at the machine might identify the hazards.

Network services also may not be available in-house or needed on a daily basis. This can include network assessment, design, implementation and validation. At the same time, using outside partners for continuous network monitoring and maintenance can help organizations better manage their networks and help improve uptime.

Remote support and remote monitoring services can provide continuous machine monitoring, data collection and 24/7 live support to help immediately identify and quickly resolve technical issues. This can be especially valuable for critical processes, round-the-clock operations and operations that are based in remote locations.

Data integration and contextualization is an emerging service that is increasingly becoming important for manufacturers and industrial operators that seek to capture the value of The Connected Enterprise and deliver real-time contextualized information to workers. Collecting the wealth of data supplied by a connected environment and turning it into actionable information can help identify opportunities to increase productivity.

Taking Plant Support Off-Site

The Centria Coating Services facility in Cambridge, Ohio, required support capabilities for its recently modernized production lines. Being located in a rural area, however, made finding the right talent a challenge.

The company decided to utilize the TechConnect℠ Application Support from Rockwell Automation. A kiosk with a high-speed data logger was installed at the site that feeds real-time data to a secure, dedicated surveillance site, where a remote team can monitor the plant operations as if they were on-site.

The Rockwell Automation remote team of trained engineers monitors approximately 2,500 data points from across the plant's operations in real time. The team can remotely address issues or immediately notify on-site staff. The site experienced a 50 percent reduction in maintenance downtime, and had a positive personal impact on plant workers.

"The need for me to come in on weekends and nights to address maintenance or stoppage issues has dramatically reduced," plant engineer Tye Long said. "My quality of life has improved immensely since we deployed this support program in Cambridge."

Engage Your Community

Improve the skills and availability of young workers, and improve your reputation as an employer

Employers can no longer rely on schools as a key source of workers, as many career-bound students possess different skills and experiences than previous generations. They are more likely to be comfortable working with computers and modern technology, and less likely to have mechanical experience gained from working on tractors or cars.

Younger people also are less inclined than previous generations to envision themselves working in manufacturing and industrial operations. They perceive industrial jobs as boring and unsafe, rather than high-tech, safe and sustainable.

Manufacturers and industrial operators must take it upon themselves to alter these perceptions. They need to demonstrate the new face of manufacturing and industrial operations, and communicate the wide array of interesting and financially rewarding jobs that are available. Manufacturers and industrial operators need to create a passion for these skills early in the education process – showing that manufacturing can be a rewarding career, as well as fascinating and fun.

More than generating interest, manufacturers and industrial operators must also ensure that these young workers are equipped with the interdisciplinary skills needed for modern industrial environments. These skills include the ability to communicate and operate in a collaborative and connected work environment.

Engagement in communities and with youth educational programs is critical for creating and preparing future workers for the modern industrial environment.

Rockwell Automation, for example, is a strategic partner with FIRST, a nonprofit organization that helps young people build science, engineering and technology skills. FIRST activities mirror what Rockwell Automation employees do every day, including working as a team to solve problems and develop solutions with limited resources, and the company has hired several FIRST alumni.

60 percent of industrial workers say their company experiences high/very high challenges in trying to attract young people into their field.

Source: Plant Services 2015 Workforce Survey

"Our company and the customers we serve are proof that engineering activities can no longer be siloed by discipline. Today, everything is connected. We need engineers who can direct the development of integrated systems, not just standalone products."

Keith Nosbusch, CEO and chairman, Rockwell Automation

Manufacturers and industrial operators also need to change their perception of potential employees, bringing in more underrepresented groups – including minorities and women. This isn't simply about race or gender equity. In a global and competitive environment, manufacturers and industrial operators need every bright mind focused on new solutions. A diverse workforce keeps our perspectives fresh and transforms ideas into innovation. Creating a diverse workforce must become a business priority for every company.

Summary

The world's workforce is rapidly evolving – in age, needs and expectations. The issue is profound, global and inescapable.

As your workforce evolves, you'll need to provide an infrastructure that improves workers' lives. This infrastructure must include a safe working environment, comfortable working conditions, flexibility, training and knowledge that can sustain not only their own futures, but yours as well.

Manufacturers and industrial operators that start adopting programs now to address these changes will find themselves with a long-term competitive advantage and better situated to take on the challenges of an evolving business environment.

"Targeting the influencers of young people with up-to-date, accurate and non-stereotypical information about the range of engineering and STEM-related careers is essential in persuading students to persist with STEM throughout school, university, apprenticeships and employment." [1]

[1] Engineering UK 2015: The State of Engineering, 2015

Resources

How to assess and improve your company's safety program:
http://marketing.rockwellautomation.com/safety-solutions/en/SafetyManagement/ToolsandDownloads/Video_smi_introductory

How to design and operationalize a Connected Enterprise:
http://www.rockwellautomation.com/global/innovation/connected-enterprise/operationalizing.page

Rockwell Automation and Cisco – Managing Industrial Networks Training and Certification:
http://www.rockwellautomation.com/global/services/training/certificate.page

Industrial IP Advantage Training:
http://www.industrial-ip.org/training

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