



POSITION PAPER

Automation Drives the Global Quest for Resilient Supply Chains

The global pandemic and political instability have forced many manufacturers to shift their operations closer to home as they seek to increase efficiencies and reduce supply chain risks. Many are relying on automation technologies to enable and accelerate this change, as reflected in these wide-ranging examples:

- In warehouses, robots are used to pick and pack orders, load and unload trucks and move inventory.
- In factories, robots are used to perform tasks such as welding, painting and assembly.
- In transportation, self-driving vehicles are being tested for use in shipping and delivery.
- In logistics, artificial intelligence is used to optimize routing and scheduling.
- In customer service, chatbots are used to answer customer questions and resolve issues.

OFFSHORING AND ONSHORING

Manufacturers have long been pressured by the need to drive down costs to compete in the global marketplace. One well-known strategy has been to move operations to countries where lower costs of labor, raw materials and compliance might be achieved.

This offshore strategy has been effective at reducing product costs and maximizing corporate profits for many companies. However, even as long ago as 1988, a study from *Harvard Business Review* noted that offshoring was seen by many to carry public perception negatives – and that many manufacturers had been able to utilize automation to achieve similar or even better results in their home countries. The study cites an auto manufacturer that grew its reliance on programmable robots, and other consumer goods manufacturers that embraced new technologies and manufacturing methods to improve quality and cost effectiveness.¹ The trend continues to this day. As an example, the factory automation and industrial controls market in Germany, which is forecast to grow by more than 10% annually to 2026, is driven by manufacturers who rely on collaborative robots (or *cobots*) for safe operations in their German plants.²

Over time, however, global supply chains have grown more complex for many companies, with economies of scale achieved by focusing more and more manufacturing on fewer locations. In recent years, these global supply chains have been seriously tested by the pandemic, political upheavals such as BREXIT, changes to policy affecting import/export taxes and international conflicts. Many countries have realized that high levels of offshoring make their key manufacturing sectors highly dependent on other countries, creating vulnerability from a strategic perspective. In addition, labor and raw material costs have increased such that the savings from offshoring may no longer be as significant. Consequently, many manufacturers have looked to “onshoring” or “reshoring” to centralize activities closer to their home markets. Accelerating this change in strategy are the increasing efficiencies offered by automation in its many forms.

TRENDS IN MANUFACTURING SUPPLY CHAINS

Several key trends are evident as manufacturers have strived to shorten and strengthen their supply chains, starting with a greater focus on *uptime* considerations in plant designs. While a traditional plant uptime is 95%, even a 1% increase in uptime can be a major boost to the bottom line, helping improve the case for onshoring a facility. Automation techniques such as high-fidelity process simulation and digital twins are directly contributing to a reduction in capital employed and operating income lift.³

Another trend is a focus on modularization, which is a methodology to build more cost-effective facilities by shifting more work from construction to fabrication facilities. In addition to lower costs, this brings many safety and environmental benefits.⁴

As a result of recent supply chain disruptions, new approaches to demand forecasting and planning are finding favor, moving away from traditional methods using predefined models and historical demand. Artificial Intelligence, specifically machine learning, can take historical demand and apply new data from a diverse range of sources to better predict future demand.⁵

Other enabling technologies are enhancing supply chain management. Blockchain's inherent immutability capabilities make it ideally suited to support traceability in manufacturing processes. The data relating to these processes comes from conventional sources as well as new ones, including internet-of-things (IoT) devices and digital twins.⁶

Growth in contract manufacturing is another clear trend. Pharmaceutical manufacturing has long relied on contract development and manufacturing organization partners to handle production, especially with new drugs where future sales volumes are uncertain. This approach provides a cost-effective alternative to the expensive infrastructure of drug manufacturing.

In the baked-goods sector, the contract manufacturing market, which totaled \$19.92 billion USD in 2022, is anticipated to grow at a compound annual rate of 11.9% to 2030. In the automotive sector, an Austria-based company is the world's largest vehicle contract manufacturer, producing over 3.7 million vehicles to date for brands in Germany, the UK, and Japan – and is planning to build an electric vehicle plant in the US. Chemical contract manufacturing is a long-standing arrangement, with major companies in Europe and the US providing services for many decades. Brewing and distilling is another long-term user of contract manufacturing services. An example is the UK, which consolidated beer brewing in the late 1980s from hundreds of regional locations into mega breweries.⁷ This trend has continued as the brewing and distilling industry has continued to consolidate.

Reflecting these trends, over 60 percent of European and US manufacturing companies expect to onshore or reshore part of their Asia production in the next three years, according to BCI Global. Most of these cases involve limited volumes and/or critical parts and products.⁸ Notably, several nations have taken steps to reduce their dependence on external sources for critical manufacturing components and materials. The *CHIPS (Creating Helpful Incentives to Produce Semiconductors) and Science Act of 2022*, for example, calls for the investment of more than \$230 billion in semiconductor manufacturing in the US, as well as investment in high-tech research.⁹

HOW AUTOMATION SUPPORTS SUPPLY CHAIN RESILIENCY

The International Society of Automation (ISA), a member association of automation professionals from across the globe, believes that manufacturers can optimize their efforts to adapt and strengthen their supply chains by:

- Adopting flexible manufacturing principles to allow for more dynamic responses to changes in production demands, raw material availability and ongoing shortages of skilled labor, providing greater resilience during periods of crisis.
- Embracing the wider use of technologies, such as IoT, robotics, blockchain and artificial intelligence, in their automation strategies to mitigate differences in cost from onshore to offshore, while increasing accuracy, supply chain visibility and customer satisfaction.
- Recognizing and following industry standards that advance interoperability, quality assurance and safety throughout the supply chain.
- Adopting industrial automation and control systems cybersecurity standards and conformity assessment programs to protect their operations against operational impacts from intentional and unintentional incidents – and to protect their intellectual property.

WHAT DECISION MAKERS CAN DO

Manufacturers and other decision makers – including those in industry, government, and academia – can help to deliver the many benefits of automation more effectively through several key steps, including:

- Supporting the ongoing development of industry standards addressing key aspects of people, processes and technology in automation systems.

- Encouraging educational institutions to increase the availability of degree programs, courses and training aligned to prepare future automation professionals.
- Supporting the adoption of certification and certificate programs to strengthen the skills and knowledge of the automation professionals we all depend on.

WHERE TO START

As a non-profit, international professional association, ISA develops widely used safety and performance standards for automation; provides education, training and certification programs for automation professionals; publishes books and technical articles; and provides networking and career development programs for automation professionals worldwide.

ISA is the primary developer of a widely used series of international consensus standards addressing the security of industrial automation and control systems. The ISA/IEC 62443¹⁰ standards provide a flexible and comprehensive framework to address and mitigate current and future security vulnerabilities in those systems. These standards are among numerous ISA standards and guidelines that support manufacturing and supply chain efficiency and safety.¹¹

CONCLUSION

Whether manufacturers continue to maintain offshore operations or work toward onshoring, resilient supply chain management that is efficient, sustainable, and safe will depend upon automation technologies and people working together to bring the most creative and innovative solutions to bear. Manufacturers and policy makers alike should be focused on preparing the global workforce to meet the need for engineers and technicians.¹² This demand for qualified staff is already high and will only continue to grow as technologies progress, creating a vital need to educate more people to be well versed in automation technologies as well as the industry standards and conformance programs that support the automation field.

As part of its commitment to education and certification of automation professionals, ISA actively supports global efforts to establish competency programs for automation professionals. An example is the Automation Competency Model¹³ developed by the US Department of Labor. This model defines the key skills, knowledge and abilities that automation professionals need from entry levels to advanced career levels and is updated regularly to ensure that emerging technologies are addressed, recognizing that the automation profession is constantly evolving.

ABOUT ISA

The International Society of Automation (ISA) is a non-profit professional association founded in 1945 to create a better world through automation. ISA empowers the global automation community through standards and knowledge sharing, driving the advancement of individual careers and the overall profession. ISA develops widely used global standards; certifies professionals; provides education and training; publishes books and technical articles; hosts conferences and exhibits; and provides networking and career development programs for its members and customers around the world.

RESOURCES

- isa.org/standards 138+ standards for automation, cybersecurity, and more
- isa.org/training Unbiased, real-world training courses, personnel certifications, and certificates that help engineers and technicians take the next step in their automation career
- isa.org/join Membership in ISA offers unparalleled access to technical discussions and resources
- isa.org/events Network, hear best practices, and be part of the automation community dialogue at ISA events

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