

SUCCESSFULLY INTEGRATING ROBOTICS INTO MANUFACTURING PROCESSES

A blue and white industrial robotic arm is shown in a factory setting. The arm is positioned diagonally across the frame, with its base on a metal platform. The background is slightly blurred, showing other industrial equipment and a person in a blue shirt. The overall color scheme is dominated by blue and white.

INTRODUCTION

The manufacturing landscape is no longer the domain of just large corporations; small and medium-sized manufacturers (SMBs) are increasingly adopting robotics to stay competitive. Due to technological advancements and cost reductions, robotics, once seen as a luxury affordable only to large corporations, is now within reach of smaller enterprises. With this shift comes an opportunity for SMBs to level the playing field and compete more effectively. However, successful integration requires careful planning and execution.

Adopting robotics is not a one-size-fits-all solution. It requires a strategic approach, particularly for SMBs where resource allocation and business alignment are critical. This e-book explores how SMBs can build a robust tech framework to support robotics integration, ensuring successful implementation and sustained competitive advantage.

The first e-book in our Get Started in Robotics series, [Plotting a Course](#), outlines the importance of fully evaluating the financial factors of implementation as well as the cultural implications of introducing robots to your employees before embarking on a robotics implementation. This e-book will focus on integrating robotics into your existing manufacturing processes.

THE RISE OF ROBOTS AT SMBS

Historically, the automotive sector led the charge in robotic integration. Over recent years, however, there has been a seismic shift. Industries such as consumer electronics and high-tech sectors are adopting robotics at unprecedented rates, outpacing traditional leaders. This trend underscores a democratization of robotics, extending its reach from larger to smaller businesses, often with fewer than 50 employees.

According to a white paper by ROBO Global entitled “[Automation Isn’t Just for the Fortune 500](#),” the global robotics market is predicted to skyrocket from \$65 billion in 2021 to \$180 billion by 2027. A significant portion of this growth will come from SMBs in manufacturing, so it is time to consider adding robotics to your production processes.

Robotics benefit SMBs by enabling them to enhance operational efficiency, a critical factor in optimizing production. Robotics also reduce reliance on manual labor for repetitive tasks, minimizing human error and ensuring consistent product quality. Reducing dependency on skilled labor is especially important to SMBs, often located in more rural areas that struggle to find and retain skilled talent.

These automated systems can work tirelessly, increasing production speed and throughput and enabling smaller manufacturers to meet growing customer demands effectively. By integrating robotics, SMBs can streamline operations, leading to substantial cost savings on labor and materials, further strengthening their financial footing.



People: Organizational Structure

Integrating robotics into the manufacturing process requires defining a new organizational structure with the necessary capabilities to support this transition.



Robotics Engineers

Specialize in designing, programming, and integrating robotics solutions tailored to manufacturing needs.



Manufacturing Engineers

Understand manufacturing processes, equipment, and workflows. They collaborate with robotics engineers to integrate robots into existing systems.



Process Technicians

Operate and maintain robots on the shop floor, ensuring smooth operation and troubleshooting any issues.



Safety Experts

Ensure compliance with safety standards and regulations when implementing robotics in manufacturing.



Data Analysts

Analyze manufacturing data to identify opportunities for optimization and continuous improvement using robotics.



Change Management Specialists

Facilitate organizational change and support workforce transition to robotics-enabled manufacturing.

ASSEMBLING THE TROOPS

People are a crucial aspect of any robotics implementation. Adopting robotics automation in manufacturing requires a varied group of people with a diverse set of skills that are crucial for effective integration, operation, and maintenance of new

systems. These skills emphasize the need for a comprehensive understanding of both technical and analytical aspects of robotics automation. Developing these competencies within your workforce is essential for leveraging the full potential of robotics in manufacturing and achieving long-term success.



INCORPORATING ROBOTICS INTO EXISTING WORKFLOWS

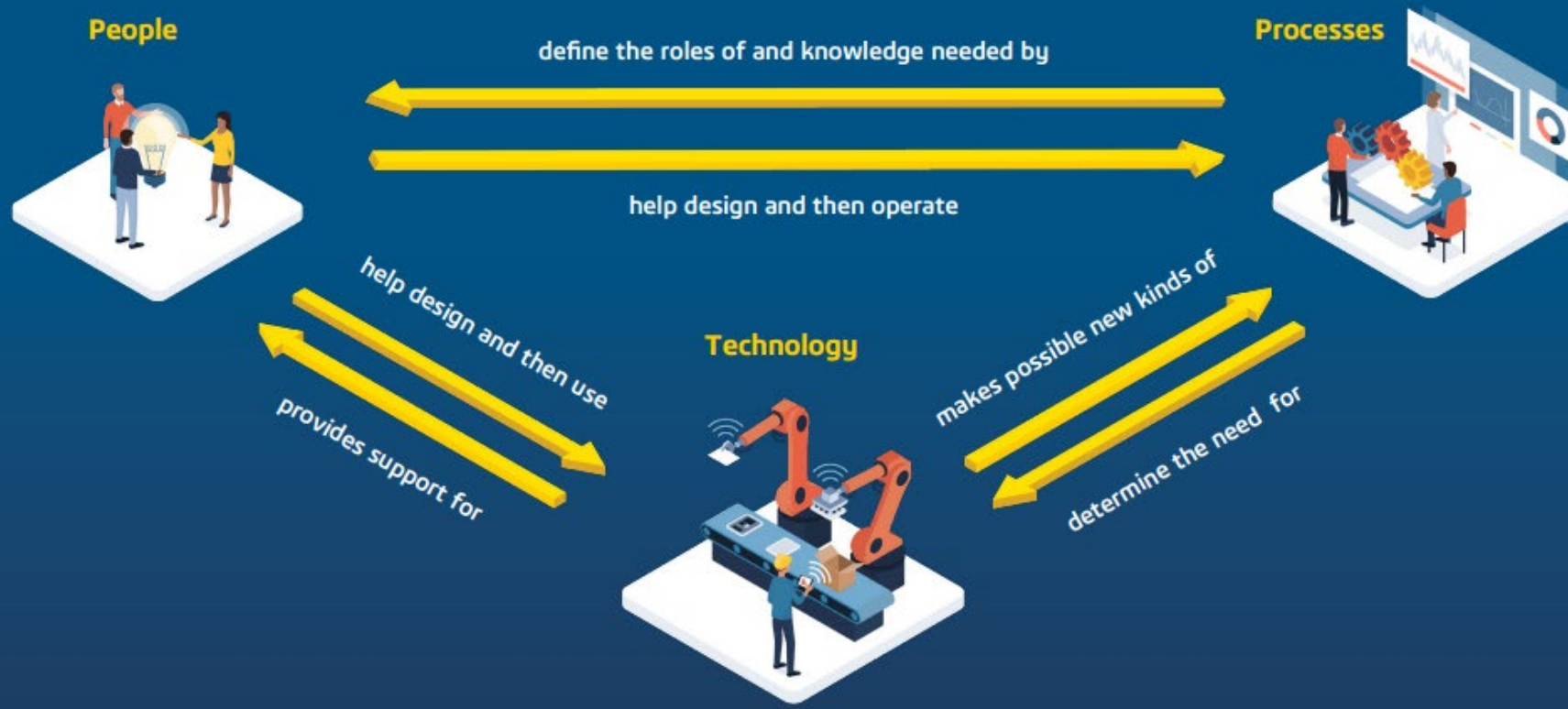
Once the business model has been validated with a complete financial analysis and cultural issues have been addressed, the next step is to incorporate robotics into the existing manufacturing processes, ensuring that it complements rather than disrupts existing workflows and technology infrastructure.

To maximize the benefits of robotics integration, process optimization should be accompanied by mapping out existing workflows, identifying key areas for improvement, and redesigning processes to accommodate robotic systems. Your shop floor personnel, machinists, and CNC operators must also be involved, as they can often help identify production bottlenecks. Streamlined processes

enhance efficiency and enable seamless collaboration between human workers and robots.

The incorporation of robotics into existing processes should follow the widely recognized people, process, and technology (PPT) framework. This framework emphasizes the interconnected roles of people, processes, and technology in successful implementation. People are essential for designing, operating, and supporting the technology, and their roles and knowledge must be clearly defined. Technology, in turn, enables new processes and provides the tools needed to enhance productivity.

Processes are designed with input from people and technology, ensuring efficiency and effectiveness. By adopting this holistic approach, manufacturers can ensure a seamless integration of robotics that leverages human expertise, technological advancements, and optimized processes to achieve operational excellence.



Some Key Considerations

Workflow Analysis and Optimization

- **Current Workflow Assessment:** Understanding the existing workflows is imperative before you start planning a robotic implementation. Map out processes to identify areas where robotics could bring the most efficiency without causing unnecessary disruption.
- **Process Bottlenecks:** Pinpoint current bottlenecks or repetitive tasks that could benefit from automation. Introducing robots in these areas can have the most immediate impact.
- **Customization:** Many workflows are unique, so ensure that the robots can be customized or reprogrammed to suit specific needs rather than forcing the workflow to adapt to the

robotic system.

- **Human-Robot Collaboration:** Consider how robotics will interact with human workers. Collaborative robots (cobots) can complement human tasks and work alongside employees without extensive safety enclosures.

Scalability and Flexibility

- **Scalable Solutions:** Ensure the robotics solution is scalable and can grow with your production needs. Some robotics solutions might suit current production volumes but could be inefficient or cost-prohibitive when scaling up.
- **Modularity:** Look for modular robotic systems that allow you to add components as needed. This prevents over investing upfront and provides flexibility for future changes.



Integration With Existing Technology Infrastructure

- **Software and Control Systems:** The robotics system should integrate seamlessly with your existing software and control systems (e.g., ERP, MES). This reduces downtime and avoids extensive rewiring or reprogramming.
- **Data Connectivity:** Robotics should be able to connect to your data infrastructure for real-time monitoring, predictive maintenance, and performance analytics. Consider whether your current network can support the data throughput needed for robotics.
- **IoT and Industry 4.0 Readiness:** If you have IoT-enabled machinery or are moving toward Industry 4.0, ensure the robotics are compatible with this digital transformation for future-proofing.
- **Leveraging a technology ecosystem:** The **3DEXPERIENCE®** platform is a unified, cloud-based tech platform — the first to be purpose-built for product development. Platforms like the **3DEXPERIENCE** platform allow you to streamline operations more easily by providing the insights needed to enhance productivity and optimize robotic workflows.

Physical Space and Infrastructure Requirements

- **Space Constraints:** Depending on the type of system being installed, robotics can require significant floor space within your production facility. Ensure adequate space in your facility or plan for reconfiguring existing setups.
- **Electrical Infrastructure:** Robotics often require more robust power sources. Assess whether your facility's electrical infrastructure can handle the additional load or if upgrades are needed.
- **Environmental Conditions:** Certain types of robots have specific environmental requirements (e.g., temperature, humidity) or constraints. Ensure that your production environment is suitable.

By addressing these factors, small and medium-sized companies can ensure a smoother transition to robotics, enhance production efficiency, and future-proof their operations.

ADDRESSING COMMON CONCERNS

Implementing robotics involves overcoming several hurdles, particularly for SMBs with limited resources. Common concerns include these:

Initial Investment Costs:

- While costs are decreasing, upfront investments remain substantial.
- Consider leasing options or collaborative models to mitigate financial burdens.

Workforce Resistance:

- Address fears of job displacement through transparent communication and upskilling initiatives.
- Highlight the role of robotics in eliminating mundane tasks, allowing employees to focus on strategic activities.

Integration and Alignment:

- Ensure that robotics systems align with existing workflows and production goals.
- Engage cross-functional teams early in the process to foster buy-in and collaboration.



THE PATH FORWARD FOR SMBS

For small and medium-sized manufacturers, the path to successful robotic integration involves not only a strategic vision but also tactical execution. By conducting thorough due diligence, planning for organizational shifts, and adopting a holistic approach to implementation, SMBs can harness the power of robotics to transform their operations.

Robotics is not merely a tool for increased efficiency — it is a catalyst for innovation and growth. The rewards can be substantial for SMBs willing to invest the time and resources in understanding and adopting automation. This proactive approach to integrating robotics will not only enhance competitiveness but also position SMBs as leaders in the future landscape of manufacturing.

In conclusion, integrating robotics into SMB manufacturing processes is feasible and essential for staying relevant in a fast-paced market. By leveraging technology, reimagining organizational structures, and adopting a thorough implementation strategy, SMBs can bridge the gap between ambition and reality, achieving operational excellence and sustained growth. Be sure to download the third e-book in this Get Started in Robotics series, [Building a Tech Framework for Robotics](#).



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