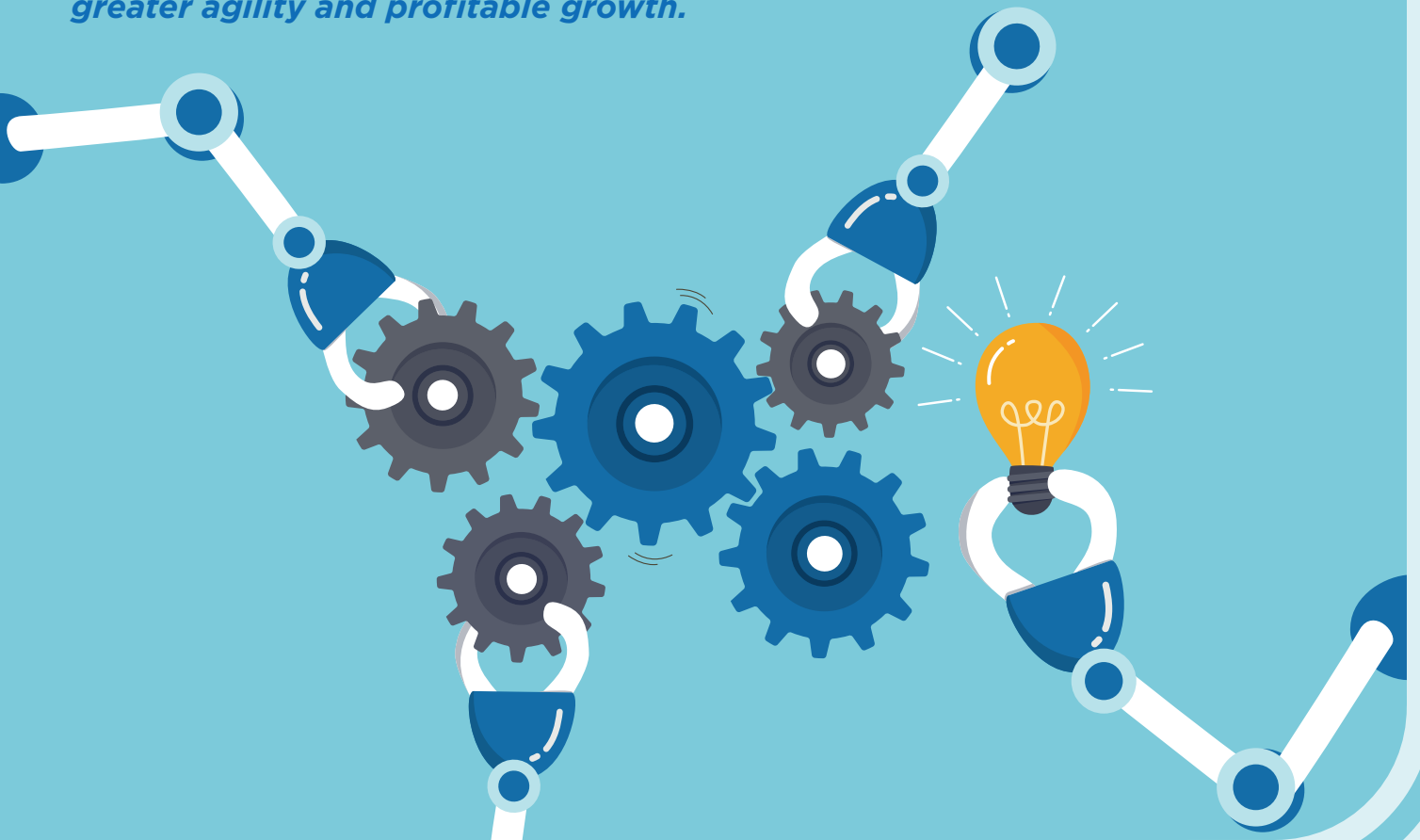


ASSEMBLING THE SMART FACTORY:

DIGITAL MANUFACTURING IN THE FACTORIES OF THE FUTURE

Discover how manufacturers have embraced smart manufacturing to achieve greater agility and profitable growth.



OXFORD
ECONOMICS



Introduction

Manufacturing and technology innovation has often gone hand in hand, enabling manufacturers to grow more intelligently, efficiently, and profitably. This trend rings especially true for midsize manufacturers with more limited resources. They depend on technology and robust data flows to move quickly and compete with larger rivals. And as new industry players disrupt traditional ways of creating and delivering goods, staying on the forefront of the technology curve may mean the difference between thriving and going bust.

How will manufacturers stay competitive in a complex, constantly changing market? In collaboration with SAP, Oxford Economics conducted a survey of 2,100 executives across the world, including 310 executives in manufacturing-related fields and industries.

Manufacturing organizations are more focused on growth, in some form or another, than any other top business priority. Whether it means increasing their market share, overall revenue, profitability, or customer volume, growing the business outweighs all other objectives. Rounding out their top five priorities is innovation (Figure 1).

Top Ten Business Priorities

Figure 1: What are your organization’s top business objectives for the next two years?

Respondents could select up to five responses.



Create resilient, scalable operations

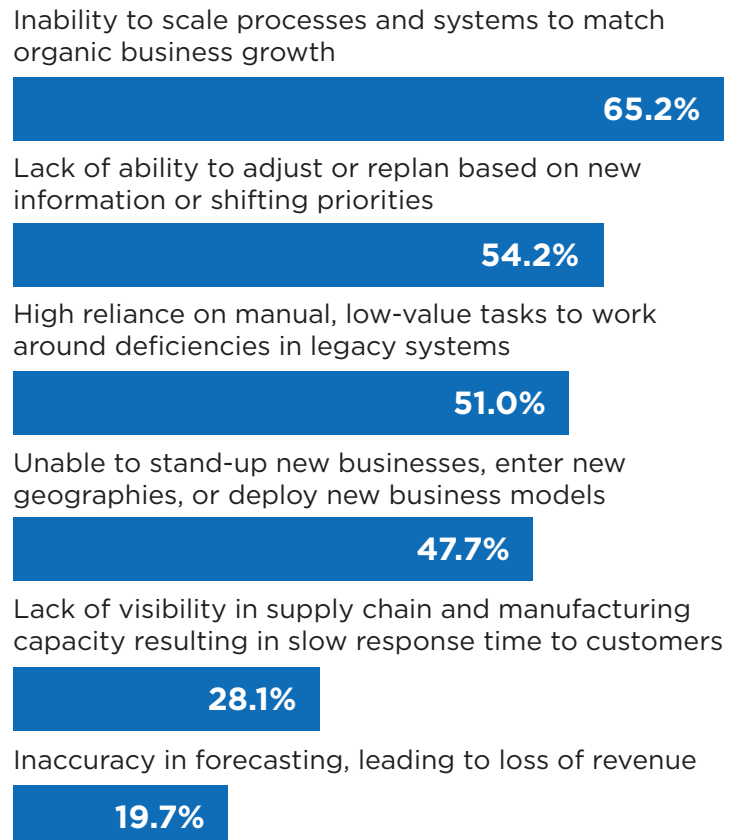
Midsized manufacturers are concerned about their ability to support their growth ambitions. Growth necessitates a greater volume of work which means both systems and processes need to be simplified in order to scale to meet the demands of a larger organization.

Scalability is a major concern among midsized manufacturers, as many feel they do not have the capacity or resources to keep up with order volume and logistical requirements as they grow. More than a third of respondents (37%) cite an inability to scale as a general risk for their business. Part of this is due to limitation in their IT infrastructure; 65% report an inability to scale processes and systems to match organic business growth (Figure 2).

The constantly changing manufacturing ecosystem—particularly materials substitution and other supply chain changes—is fragile and easily broken by vendor delays and price movements in the raw materials market. Respondents are concerned about the impact of cheaper imports of similar or lower quality on their competitiveness. Growth also requires the ability to react quickly to opportunities and challenges. Current technology capabilities fall short, with over half of respondents unable to make speedy adjustments when new information comes in. This could be due to a high reliance on low-value and manual processes: over half say they are unable to work around deficiencies in legacy systems.

Figure 2: Which of the following IT infrastructure challenges are having the greatest negative impact on your business's ability to scale?

Respondents could select up to three responses.



How do you plan to stay competitive?

“Flexibility, scalability, and adaptability will most certainly be critical to staying competitive in the IT hardware business.”

A CEO at a Taiwanese high-tech hardware company

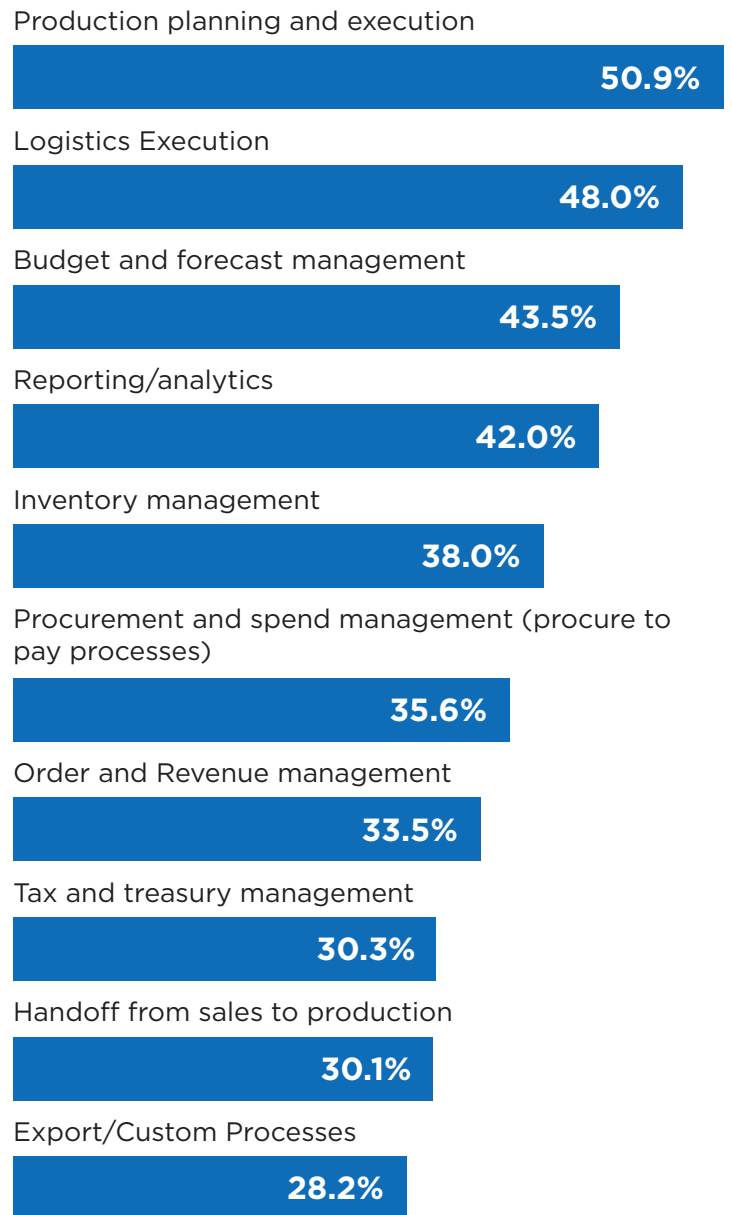
Manufacturing executives must simplify and automate operations to overcome scalability struggles and IT infrastructure challenges. Due to the manual nature of many industry processes, executives are unable to achieve greater operational efficiencies. Processes like production planning and execution, logistics execution, and budgeting/forecasting take up significant resources and workforce time—which diverts organizational attention away from innovation (Figure 3). The executives who launch initiatives that improve operational efficiency will strengthen their ability to manage such vulnerabilities. But all of this starts with shoring up deficiencies in manufacturing and supply chain processes.

How do you plan to stay competitive?

“Focusing on optimizing the supply chain, which comprises streamlining the supply chain in order to reduce delivery times and costs associated with inventory.”

A Chief Purchasing Officer at an Italian automotive firm

Figure 3: Which of the following processes require the most amount of time to complete?
Respondents could select up to three responses.



Though inventory management isn't at the top of the most time-consuming tasks, it is the area that respondents see could most benefit by improving manufacturing and supply chain processes. Other areas of focus include

improving the accuracy of delivery estimates and the ability to identify risks in the supply chain (Figure 4). These undertakings will help manufacturers adapt to demand fluctuations and meet the needs of their customers.

Figure 4: Which areas of your business can most benefit from improving your manufacturing and supply chain processes?

Respondents could select all responses that applied.

Better track inventory levels and anticipate/quickly adapt to demand fluctuations

55.7%

Improve accuracy of delivery estimates and proactively communicate to customers

51.7%

Better identify potential risks in the supply chain (e.g., supplier disruptions, geopolitical issues)

50.9%

Optimize working capital, reduce carrying costs, and identify cost saving opportunities

49.9%

Improved collaboration with suppliers

45.4%

Monitor the flow of raw materials and components needed for production

39.8%

Track and manage transportation routes efficiently

39.1%

Ensure compliance with ethical and environmental standards and regulatory requirements

34.6%

Assess the feasibility of new product introductions and identify potential challenges early in the process

24.8%

Identify inefficiencies and bottlenecks

11.3%

Accelerate innovation

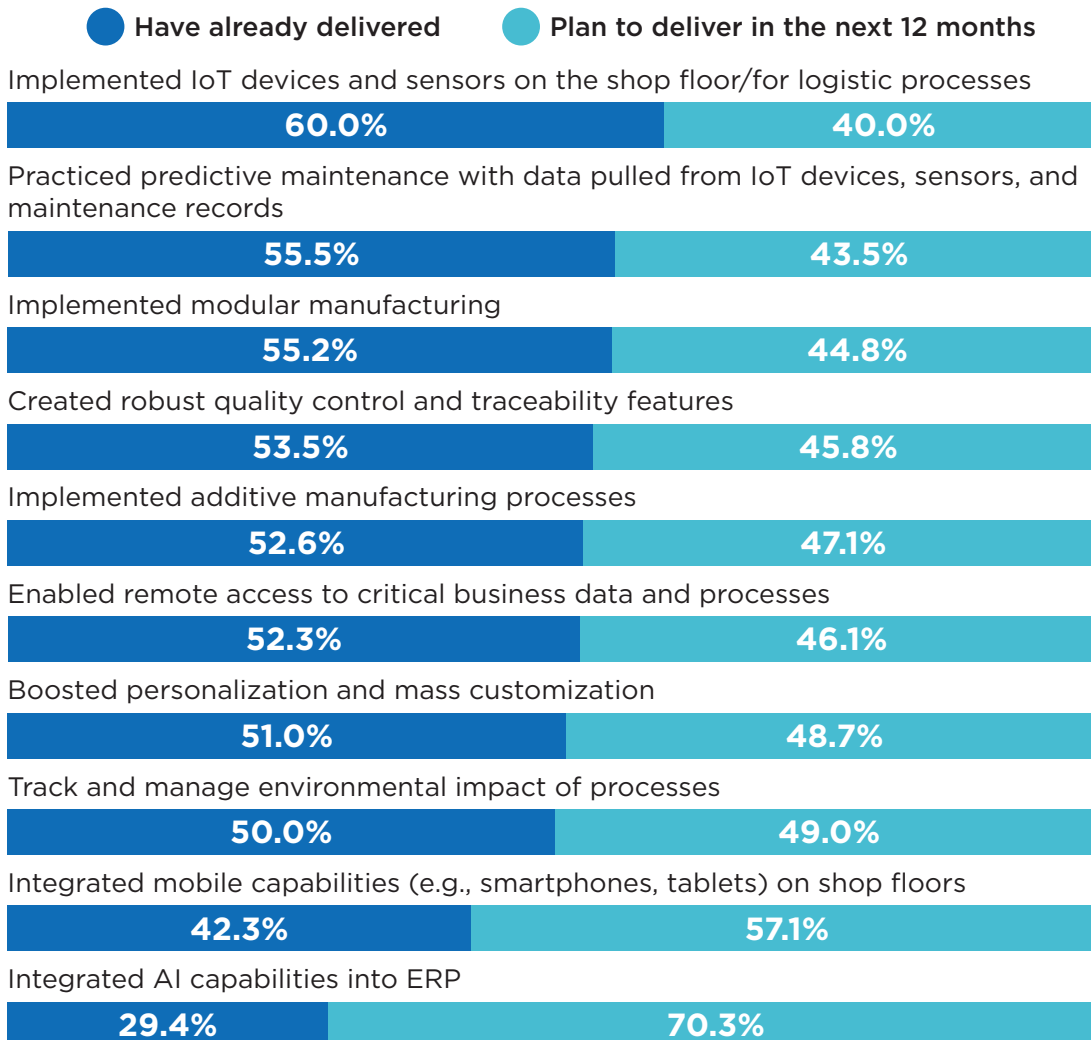
To establish profitable and sustained performance, manufacturers must continually innovate products, services, and processes to drive customer demand. Over one-third of manufacturers in our survey say innovation is a priority, and building a culture that emphasizes change and innovation is a necessary first step.

In the coming years, manufacturers are concerned about being disrupted by new innovations, rendering their offerings obsolete (39% dub this a significant risk). But beyond

product and service innovation, respondents are also looking to optimize how they innovate processes and operations. Roughly half of manufacturing executives say their organizations have already implemented various types of technology innovations in their search for smart manufacturing excellence. Internet of Things (IoT) technology and sensors have long been a priority for these types of operations and, paired with predictive maintenance capabilities, they can help organizations operate more efficiently. (Figure 5).

Figure 5: Which of the following types of manufacturing technology innovations have you delivered? Which do you plan to deliver in the next twelve months?

Respondents selected a response for each topic.



Looking ahead, AI offers a plethora of new opportunities for innovation, but manufacturing executives may not yet have a firm grasp on the technology's most beneficial use cases. Some demonstrate confusion about what is even considered AI: 29% say they have specifically integrated AI into ERP capabilities, yet only 20% say their organization has AI in place at all.

Adoption of AI is still relatively low across the industry, but executives are looking for a deeper understanding of its application, its impact, and scalability. Once core competencies are addressed, manufacturers expect AI to drive innovation priorities and improve manufacturing operations. They are optimistic about the potential of AI to differentiate their businesses and help them to improve*:

- products and services **(87%)**
- how they market and sell **(75%)**
- supply chain management by optimizing logistics network, warehouse, inventory, and parts **(78%)**
- procurement and networks digitization, including automating sourcing, risk identification, optimize payments **(78%)**
- manufacturing activities with quality inspections and predictive maintenance to reduce stock outs and improved quality **(67%)**

If manufacturers can replicate the success they've had implementing IoT, sensors, and predictive maintenance, efforts to rollout more advanced technologies like AI should also yield great results.

**Moderate and significant impact responses combined*

How do you plan to stay competitive?

“Staying abreast of the most recent breakthroughs in artificial intelligence and technological advancements is integral.”

A direct report to a CCO at a Mexican industrial manufacturing company

Optimize by increasing visibility

Getting the most out of innovation investments requires clearer operational and financial transparency. With the right data and framework, AI tools can support better analysis, forecasting, and decision making.

Manufacturers see a great deal of value from improved data transparency. They envision improvements in inventory optimization, cost control, financial forecasting, and more—and as manufacturers expand, knowing how much product is in stock and the location of the product will be critical. (Figure 6).

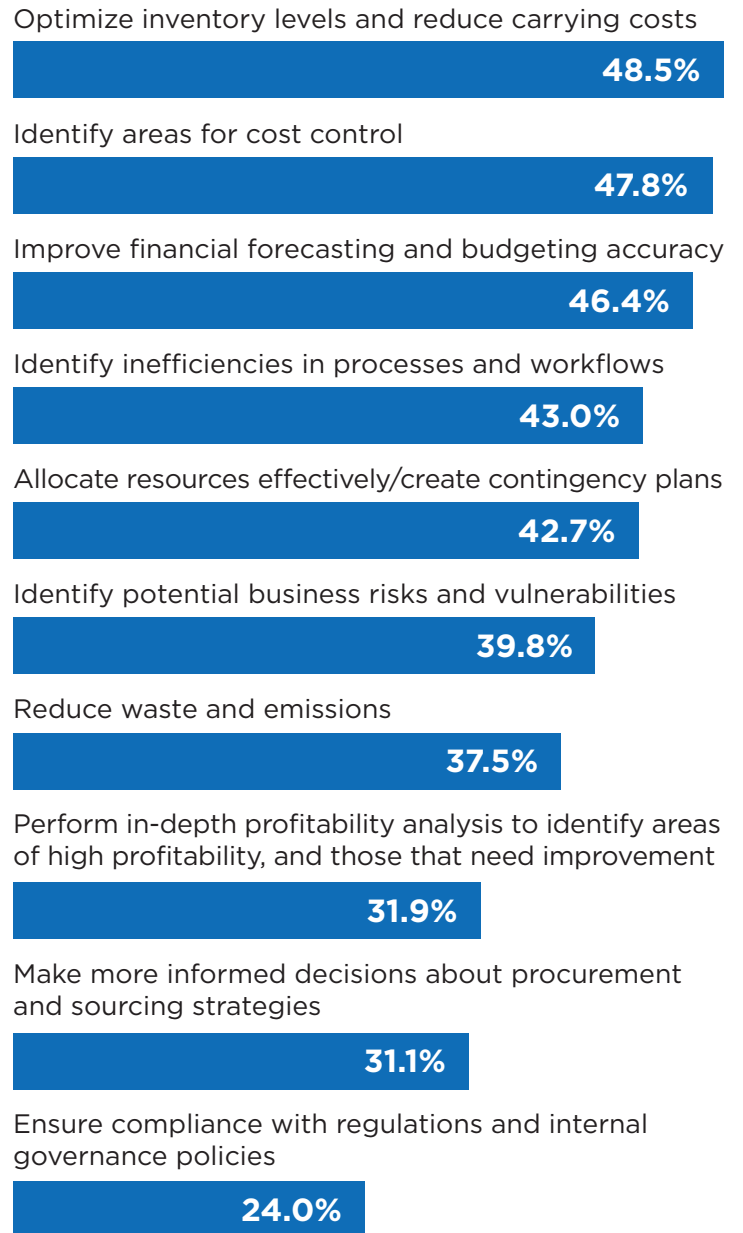
How do you plan to stay competitive?

“Our object is to invest in supply chain visibility tools to monitor and respond to issues in real-time.”

A Chief Purchasing Officer at a Brazilian automotive firm

Figure 6: In your opinion, which of the following business activities would benefit the most from greater operational and financial visibility?

Select the top three.



Similarly, manufacturers see the value of boosting visibility across their business network—anticipating improvements such as accurate forecasting demand, cost reduction strategies, and product quality monitoring. (Figure 7).

How do you plan to stay competitive?

“Our goal is to encourage a culture of data sharing and cross-functional problem solving to drive innovation and efficiency.”

A direct report to the Chief Data Officer at a German High-Tech hardware company

Figure 7: In your opinion, which of the following business responsibilities would be most improved by gaining real-time insights across your business network?

Select all that apply.

Accurately forecast demand

57.7%

Conduct cost analyses and implementing cost reduction strategies

56.1%

Monitor product quality at each stage of production and identify any defects or deviations from standards

54.8%

Implement predictive maintenance strategies

50.6%

Better identify areas of inefficiency and allocate resources effectively

49.7%

Gain customer insights

48.7%

Accurately forecast finances and budgets

27.7%

Gain insights and take action into inventory levels (safety stock, reorder points), demand patterns, and production capacity

27.4%

Innovate on new products, create new business models and processes

15.8%

To reap these benefits, manufacturers must integrate processes and data. Respondents say well-integrated processes will help keep data accurate, share knowledge across the business, drive innovation, and increase automation (Figure 8).

Creating clear, visible, and connected data flows will help optimize AI applications and bring manufacturing and operations functions closer together. Access to data means more accurate predictions from automation tools, more informed decision-making, and drive improved business outcomes overall.

How do you plan to stay competitive?

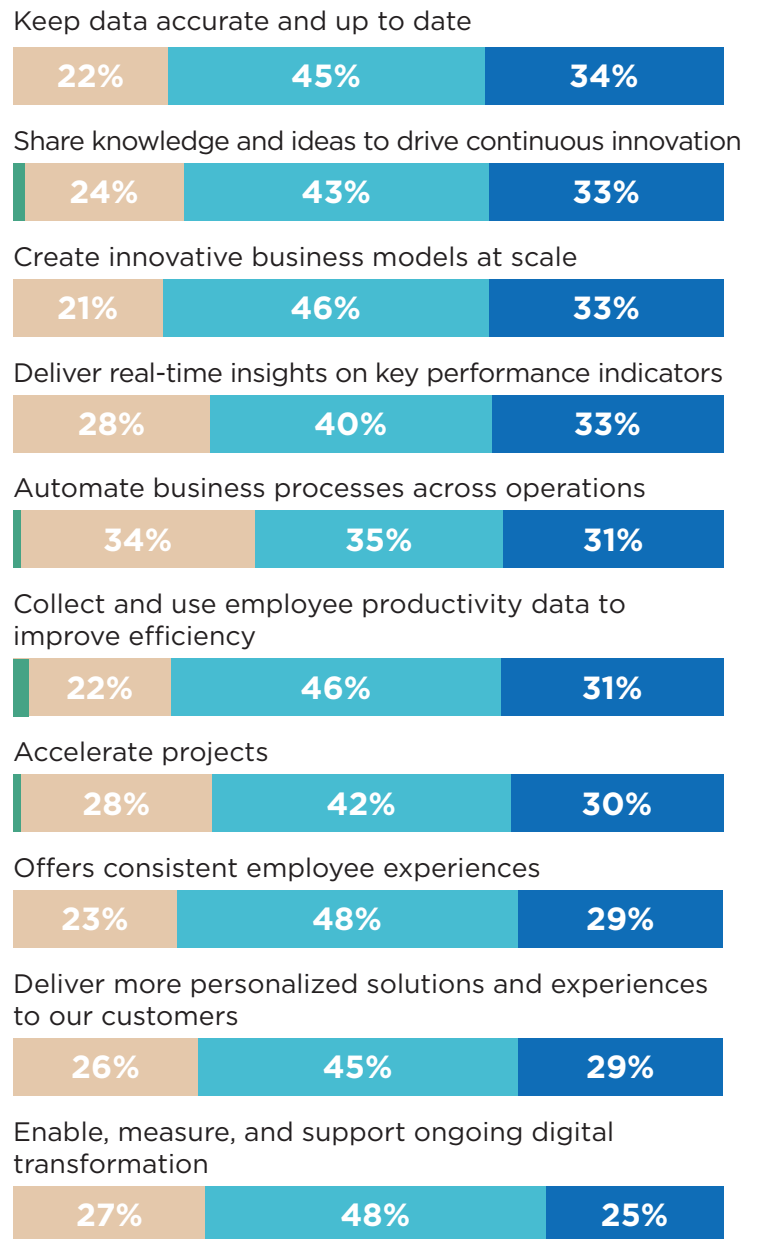
“We will leverage data analytics and foster innovation to meet evolving customer demands.”

A direct report to the Chief Sustainability Officer at a South Korean Industrial Manufacturing firm

Figure 8: To what extent does the integration of processes and data across your organization help you achieve the following business outcomes?

Select one per row.

- To a significant extent
- To a moderate extent
- To a minimal extent
- Not at all



Conclusion

Smart manufacturing relies on proven technology and data integration. To stay competitive, executives across manufacturing industries must pursue the following initiatives:

1. Reduce operational complexities.

Automating operational processes and increasing end-to-end visibility means boosting efficiency and consolidating system control. Organizations that can successfully remove process roadblocks and build a more resilient manufacturing ecosystem will be able to respond to supply chain disruptions faster. They will also be able to improve the quality and timely delivery of products.

2. Make innovation a focal point.

The ability to seamlessly adopt new business

models and emerging technologies quickly and sustainably may be the difference between thriving and going bust for growth-oriented manufacturers. Executives should embrace continuous innovation with the support of solutions with built-in best practices.

3. Streamline production.

As automation becomes more engrained at all levels of the manufacturing process, uniting operational, supply chain, and financial data to derive insights will be faster and easier to act upon. Leveraging embedded collaboration tools, real-time data integration, and predictive planning models will help drive decision making, unplug material bottlenecks, and increase adaptability.

About SAP

SAP is a market leader in enterprise application software. We help companies of all sizes and industries run at their best. With 80% of our customers being small and midsize companies, SAP is the growth engine that can take you anywhere —no matter where you take your business next. Our cloud ERP gives customers the confidence to be up and running quickly with technology that allows them to keep growing effectively and efficiently. We can scale to support the most extensive product lines, complex service offerings, and ambitious sustainability goals, helping you stay ahead of the competition. Our advanced analytics, AI, and Internet of Things (IoT) technologies turn customers' businesses into intelligent enterprises. Our end-to-end suite of applications and services enables our global customers across 25 industries to operate profitably and adapt continuously. Please contact your SAP partner to learn more.

About Oxford Economics

Oxford Economics is the world's foremost independent economic advisory firm. Covering over 200 countries, over 100 industrial sectors and 8,000 cities and regions, we provide insights and solutions that enable clients to make intelligent and responsible business decisions faster in an increasingly complex and uncertain world. For more information, visit <https://www.oxfordeconomics.com/>

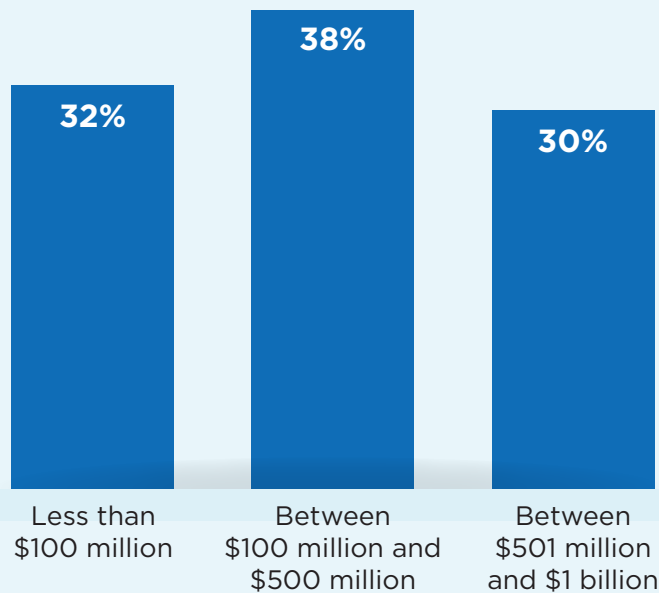
Respondent breakdown

This report focuses on the responses of 379 executives from manufacturing-related organizations across the following segments:

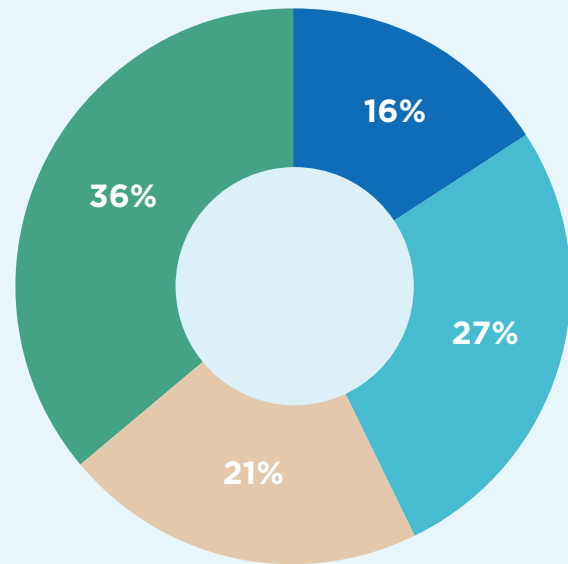
■ **Executive titles:** Chief Executive Officer, Chief Operating Officer, Chief Financial Officer, Chief Marketing Officer, Chief Purchasing Officer, Chief Technology Officer, Chief Information Officer, Chief Digital Officer, Chief Product Officer, Chief Sustainability Officer, Chief Procurement Officer, and their direct reports.

■ **Sectors:** Industrial Manufacturing, High-Tech hardware (non-semiconductors), Mill Products (primary and fabricated metals, paper, packaging, building materials), Consumer Products, and Automotive.

■ **Revenue (USD):**



■ **Company size:**



- Between 200 and 499 employees
- Between 500 and 999 employees
- Between 1,000 and 2,499 employees
- Between 2,500 and 5,000 employees

■ **Locations:** Australia, Austria, Brazil, Canada, China, Denmark, Finland, France, Germany, India, Indonesia, Ireland, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Saudi Arabia, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States

■ **Dates fielded:** October - November 2023