



7TH ANNUAL

STATE OF SMART MANUFACTURING REPORT

SUPPLY CHAIN PLANNING EDITION

Responding to market
adversity with agility,
improved processes, and
technology adoption

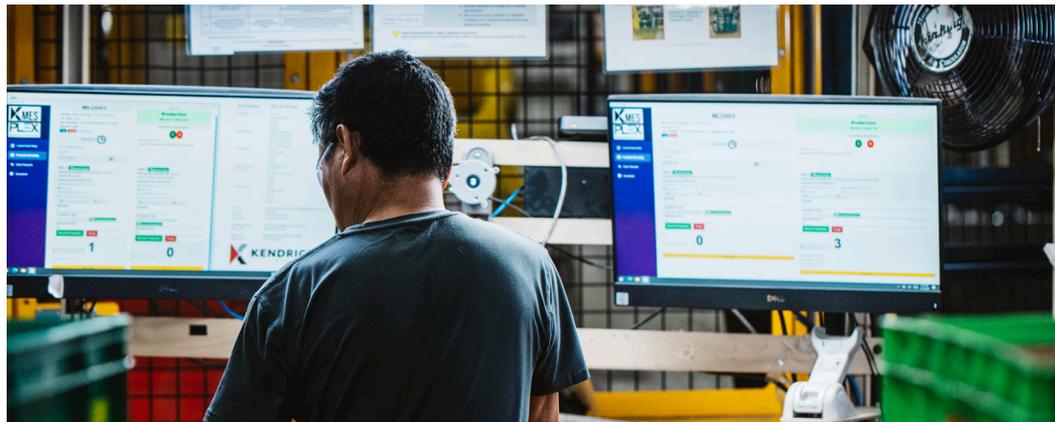


Supply chain disruptions continue to be an ongoing impediment to growth within the manufacturing sector.

The 2022 State of Smart Manufacturing Report uncovered the ongoing challenges manufacturers face within the supply chain crisis, and the struggle to regain control over critical commodities, supplier longevity, technology innovations, and logistical complexities.

This study from Plex Systems, a Rockwell Automation company, in collaboration with Hanover Research, surveyed 321 global manufacturers who communicated the need for agility, technology adoption, and improved processes to respond to market adversity.

With the findings and recommendations in this report, as well as the accompanying checklist found on **page 25** you can create your own action plan to use smart manufacturing solutions to address supply chain planning challenges.



SMART MANUFACTURING:

The intelligent, real-time orchestration and optimization of business, physical, and digital processes within factories and across the entire value chain. Resources and processes are automated, integrated, monitored, and continuously evaluated based on all available information as close to real time as possible.

MESA International

WHAT IS SUPPLY CHAIN MANAGEMENT?

Supply chain management (SCM) refers to the processes of creating and fulfilling demands for goods and services. It encompasses a trading partner community engaged in the common goal of satisfying end customers.

– Gartner® IT Glossary, “Supply Chain Management”, 2022

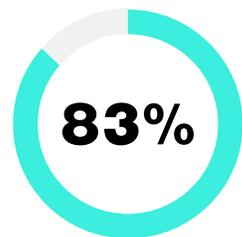
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SMART MANUFACTURING ADOPTION ACCELERATED BY 50%

Technology and automation are driving the next generation of manufacturing, and smart manufacturing adoption will continue to accelerate in 2022.

Modularization of software, which allows for incremental technology adoption, is gaining traction as manufacturers look to become more agile in the face of adversity.

- Smart manufacturing adoption **grew by 50% year-over-year.**
- Supply chain planning **ranks 2nd** in terms of organizational critical components.
- Barriers to entry are lower, leading to a higher level of adoption and a more **attractive ROI.**



of survey respondents believe smart manufacturing is a key to their organization's future success.

THE PANDEMIC EXPOSED A LACK OF COMPLETE SUPPLY CHAIN PLANNING SOLUTIONS

The 2021 and 2022 State of Smart Manufacturing Reports made clear that the pandemic exposed and exacerbated pre-existing conditions that manufacturers had previously tolerated or used band-aid solutions to address. The brittle nature of systems, processes, and supply chain solutions that had historically measured as “good enough” are no longer adequate.

- Modern **supply chain management solutions** need to account for the complexities of today.
- With over **800,000 unfilled manufacturing roles**, a new approach is needed to solve for the skilled worker shortage and its impact on supply chains.
- Risk mitigation requires **resiliency** built on alternate suppliers, constant monitoring, and vigilant cybersecurity.

ONCE OVER-HYPED TECHNOLOGIES ARE SOLVING TODAY'S PROBLEMS

Technologies that were once viewed as over-hyped and unlikely to contribute in a meaningful way are now deemed vital to success. Cloud, industrial hardened devices, and process automation are helping companies overcome challenges with the skilled worker shortage, supply chain management, and risk mitigation.

Additionally, machine learning/AI are gaining mainstream adoption to support supply chain planning complexities.

- **80%** of organizations' software usage objectives aim to connect people, systems, machines, and supply chains.
- **75%** of respondents view technology as a key solution to address workforce challenges
- **74%** of respondents are actively using or are planning to use machine learning/AI, especially to manage the complexities of supply chain planning.

TABLE OF CONTENTS

Staying competitive in 2022 and beyond 5

SECTION 1: The Current State of Supply Chain Planning 6

Industry obstacles and outlook 7

The acceleration of smart manufacturing adoption 8

Mission critical: Supply chain planning's importance 9

SECTION 2: Biggest Challenges for Supply Chain Leaders 10

What's impacting supply chain the most? 11

The shortcomings of traditional supply chain solutions 12

Supply chain planning challenges now and in the future 13

SECTION 3: The Future of Supply Chain Planning 14

Unlocking the future of supply chain with technology 15

Planned investment leans heavily to supply chain planning 16

How to recognize an effective supply chain planning solution 17

The continuity that comes with cloud 18

Perceived barriers to smart manufacturing adoption 19

SECTION 4: Taking Action 20

Five steps to starting on your road to adoption 21

Step 1: Identify key stakeholders and agree on your greatest need 21

Step 2: Make the business case for investment 22

Step 3: Research and select your solution(s) 22

Step 4: Design and deploy the solution(s) 23

Step 5: Manage change and drive adoption 23

Conclusion 24

Ten steps to technology adoption [checklist] 25

Survey Demographics and Firmographics 26

STAYING COMPETITIVE IN 2022 AND BEYOND



The last few years have not been kind to supply chain planning professionals. Tariffs, geopolitical tensions, a pandemic, numerous sea freight issues, and the war in Ukraine are some of the many issues that have affected global supply chains.

Today, business leaders are looking for answers to power business continuity despite the volatility around the world. The 2022 State of Smart Manufacturing Report asked 321 manufacturers how they are currently managing supply chain planning and how they expect to manage it in the future. Below are some of the key findings:

- **70%** of respondents are using supply chain planning systems that rely on spreadsheets and manual processes.
- Supply chain planning ranks **2nd** in terms of organizational critical components.
- **80%** of organizations' software usage objectives aim to connect people, systems, machines, and supply chains.

The stats above reveal an evolving story. One of the key findings from the main report was the acceleration of smart manufacturing adoption, which increased 50% year-over-year. Even if this pace decelerates significantly, seventy-five percent of manufacturers are expected to have adopted some component of smart manufacturing by next year.

The pace of change is so fast right now that it's important for businesses to adopt a modern supply chain planning solution just to keep pace with the competition. The companies that responded that their current solutions still rely on spreadsheets and manual processes are going to fall behind, while those that move towards digital, connected software solutions will reap the benefits.

Supply chain planning solutions pull in data from multiple sources in real time to provide the most accurate information possible and model different options when there is some form of disruption to the plan. This helps to better confront change and keep pace with supply chain volatility, from the cost of materials coming in to reforecasting and shipping out.

This report will help you benchmark your supply chain planning efforts and technology usage and uncover best practices to help your organization stay competitive and thrive not just today or tomorrow, but next year and every year thereafter. [Start your journey today.](#)

Ara Surenian

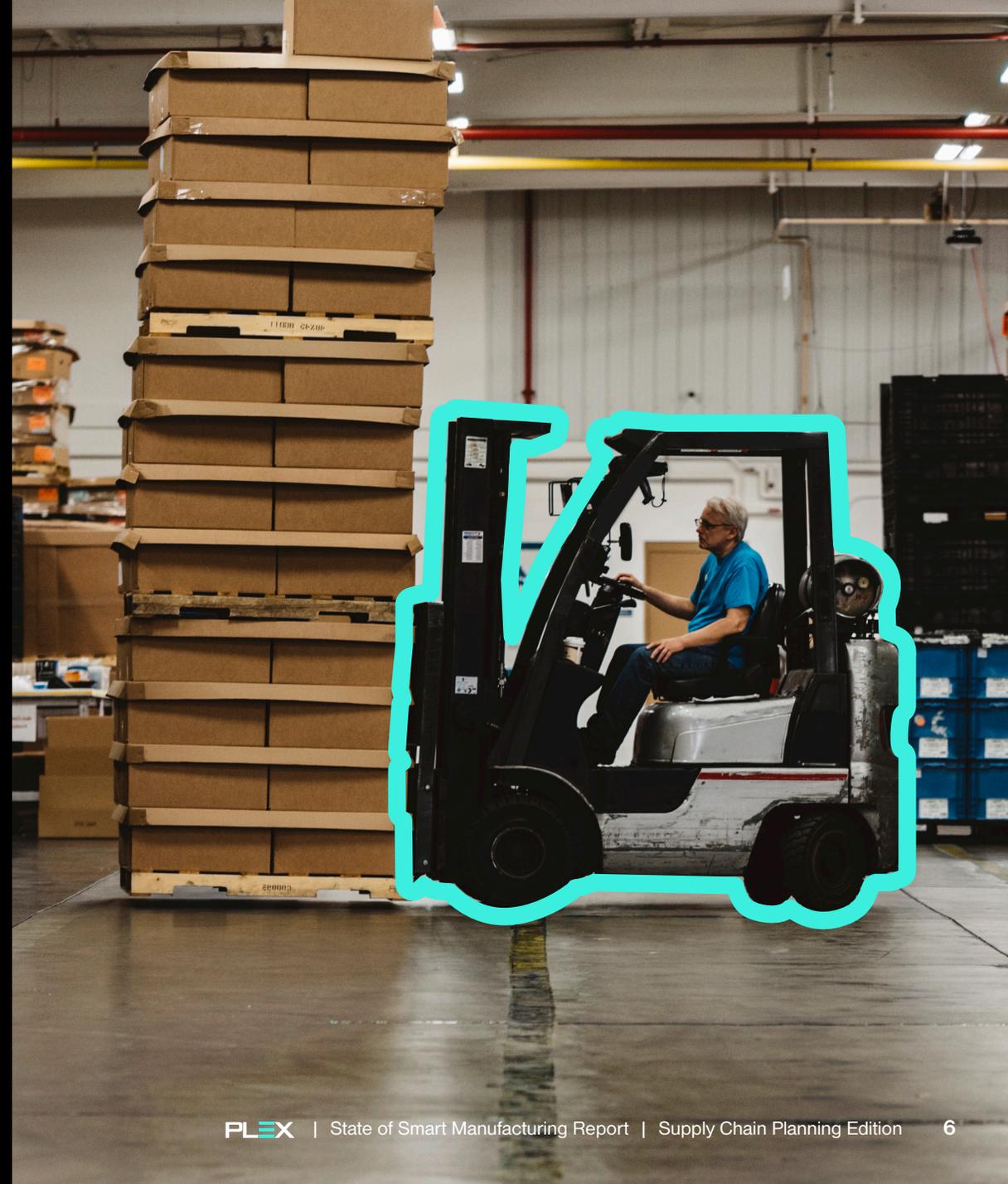
Ara Surenian, VP Product Management

Plex Systems, a Rockwell Automation Company

SECTION 1:

THE CURRENT STATE OF SUPPLY CHAIN PLANNING

Technology and automation are powering the leaders in today's manufacturing space while disruption is driving the next generation of supply chain planning innovation.



INDUSTRY OBSTACLES AND OUTLOOK

It's impossible to describe the current state of manufacturing without addressing one of the biggest factors impacting the world — 2020 and 2021 were defined by the devastating ripple effects of COVID-19.

The survey results from the last two years make this abundantly clear through the responses that ranked the pandemic as far and away the biggest obstacle facing manufacturers. But both surveys also made clear that the pandemic exposed and exacerbated pre-existing conditions, **particularly within supply chains**.

As a result, digital forecasting and planning where a manufacturer can plan and adjust all the way down to the work center is on the rise.

Adversity breeds innovation and manufacturers are quickly adapting their supply chain planning approach to bring in more technology and alignment across the entire organization.

Growth obstacles

■ 2021 Report — occurred during the worst part of the pandemic

■ 2022 Report — respondent's view at time of survey (Oct 2021)



Q: Which of the following are the biggest obstacle(s) to your organization's current growth as of calendar year Q3 2021? (n=321)

“Digital manufacturers benefited from a **26%** increase in their revenue performance index (RPI) and a **27%** increase in their profit performance index (PPI), whereas nondigital manufacturers experienced decreases of **9%** in RPI and **2%** in PPI.”

—Reid Paquin

Research Director, IDC Manufacturing Insights

IDC Technology Spotlight, sponsored by Plex, *The Importance of Manufacturing Automation for Digital Transformation*, doc #US48798322, January 2022

THE ACCELERATION OF SMART MANUFACTURING ADOPTION

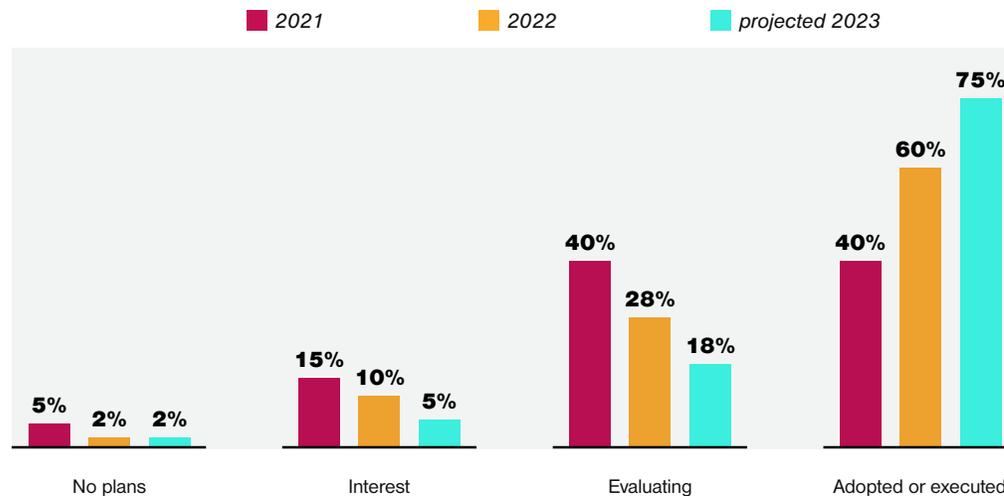
While adoption accelerated in the wake of the pandemic, this survey shows that it acted as a catalyst to force decisions along with the speed of adoption.

Supply chain planning technology adoption rates appear to be climbing; however, during times of turmoil the ability for organizations to respond quickly and maneuver seamlessly is still lagging.

50% year-over-year increase in smart manufacturing adoption rates

60% of all companies are now using either a fully integrated solution or have some components of smart manufacturing in adoption

75% of organizations will have some components of smart manufacturing in adoption by the end of 2022



Q: To what extent has your organization adopted smart manufacturing? (n=321)

KEY SOLUTIONS

Enterprise Resource Planning (ERP) automates front- and back-office processes, including financial management, revenue management, human capital, order management, billing, and inventory.

Manufacturing Execution System/Suite (MES) tracks and documents the transformation of raw materials into finished goods, providing real-time production management to drive enterprise-wide compliance, quality, and efficiency.

Quality Management System (QMS) standardizes and automates quality documentation, processes, and measurements.

Supply Chain Planning (SCP) combines data from multiple departments across the business to sync demand and supply forecasting to improve inventory accuracy and production management.

Production Monitoring provides seamless connectivity to machines on the plant floor, delivering transparent, real-time operational KPIs and dashboards to drive continuous improvements.

Asset Performance Management (APM) combines process, operational, and machine-level data through dashboards to monitor machine and plant health, ensuring optimal uptime, throughput, and maintenance needs.

MES Automation and Orchestration connects your MES to the plant edge to control information flow, processes, and workcenter setup.

MISSION CRITICAL: SUPPLY CHAIN PLANNING'S IMPORTANCE

While all aspects of smart manufacturing are similarly desired, production monitoring and supply chain planning took the top ranks as “mission critical components” that organizations need to operate successfully.

Solutions like these can also bring quick time-to-value and help set the stage for a manufacturing execution system (MES) and/or enterprise resource planning (ERP) implementation.

Modular technology makes it possible to incrementally adopt solutions and achieve value quickly. For example, typical supply chain planning solutions only take four months for implementation.

How do mission-critical smart manufacturing solutions rank?

Production Monitoring **24%**

Supply Chain Planning **22%**

Quality Management System **21%**

Manufacturing Execution System **21%**

Enterprise Resource Planning **19%**

Asset Performance Management **16%**

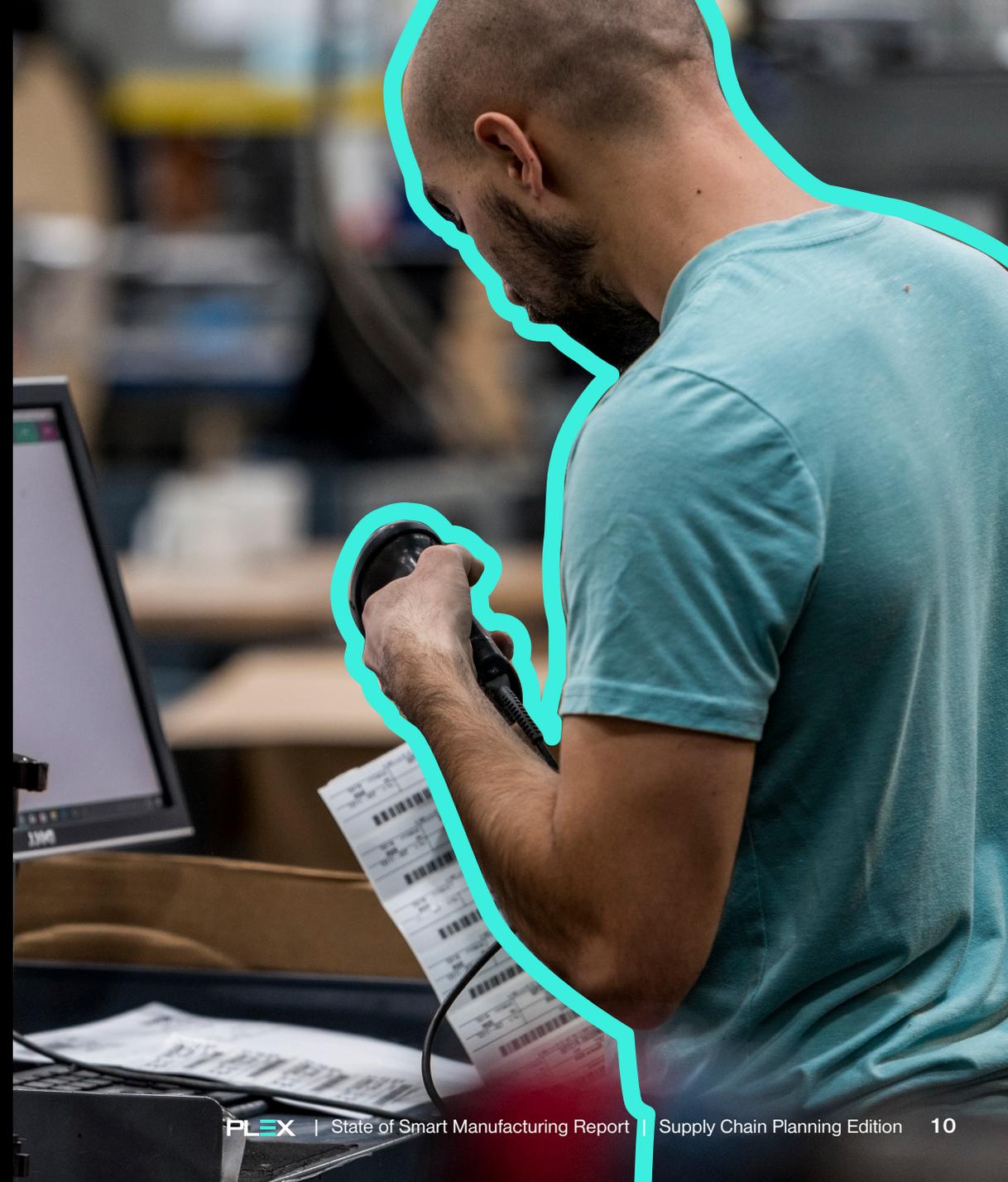
Q: Over the last year, how big of a role has each of the listed components of smart manufacturing played in your organization's operations? (n=321)

SECTION 2:

THE BIGGEST CHALLENGES FOR SUPPLY CHAIN LEADERS

The COVID-19 pandemic has exposed the depth of lingering obstacles in the manufacturing industry and made it impossible to ignore them any longer.

It has also exposed the brittle nature of systems, processes, and supply chain solutions that had historically measured as “good enough” until the test of global change.



WHAT'S IMPACTING SUPPLY CHAIN THE MOST?

At the time of this survey, COVID-19, the skilled worker shortage, and cybersecurity ranked with an outsized influence on global supply chains. The impact from these big 3 challenges has caused limited availability of raw materials, negatively impacted logistics and planning, and triggered regulations including government closures, border closures, and ongoing quarantine lockdowns.

Currently, geopolitical uncertainty and natural disasters are also impacting supply chains by creating surges in demand, disruptions in availability and deliverability, material shortages, and increasing costs. There have also been numerous issues with sea shipments, including the Felicity Ace (carrying luxury cars) sinking and The Ever Forward (carrying 12,000 cargo containers) running aground.

Disruption is one certainty amidst all the uncertainty in supply chains, and the importance of planning for this is paramount.



COVID-19



Shortage of skilled workers



Cyber security



War/Geopolitical uncertainty



Natural disasters

“The coming months could turn out to be critical for supply chain leaders. Some companies will build upon the momentum they gained during the pandemic, with decisive action to adapt their supply chain footprint, modernize their technologies, and build their capabilities. Others may slip back, reverting to old ways of working that leave them struggling to compete with their more agile competitors on cost or service, and still vulnerable to shocks and disruptions.”

McKinsey & Company:

*How COVID-19 is reshaping supply chains
November 23, 2021*

Authors:

Knut Alicke is a partner in McKinsey's Stuttgart office, Richa Gupta is an associate partner in the New Jersey office, and Vera Trautwein is an expert in the Zurich office

THE SHORTCOMINGS OF TRADITIONAL SUPPLY CHAIN SOLUTIONS



70%

of respondents are using supply chain planning systems that rely on spreadsheets and manual processes

However, that won't be enough going forward. No matter how sophisticated these types of solutions might be, manual processes – or solutions tied to manual processes – will never respond as quickly as reality is changing. They also can't effectively explode requirements through a bill of materials (BOM) or distribution network.

Further, the capability to connect demand and supply through execution is critical to ensuring a holistic view of demand and supply across an organization and through the supply chain. Only a dedicated supply chain technology tied to machine learning can handle this level of computation.

Supply chain planning solutions pull in data from multiple sources in real time to provide the most accurate information possible. This better meets changing needs and keeps pace with supply chain nuances, from the cost of materials coming in to reforecasting and shipping out.



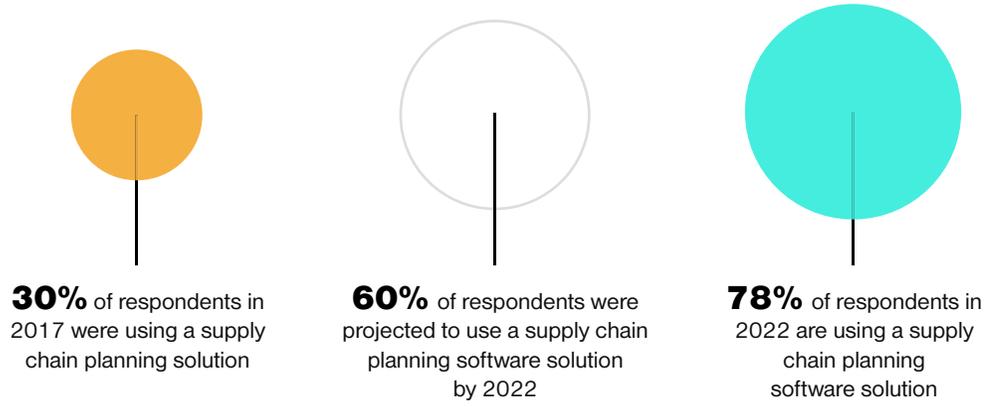
41%

of respondents use supply chain planning solutions to meet ESG specific initiatives through greater efficiency and less waste

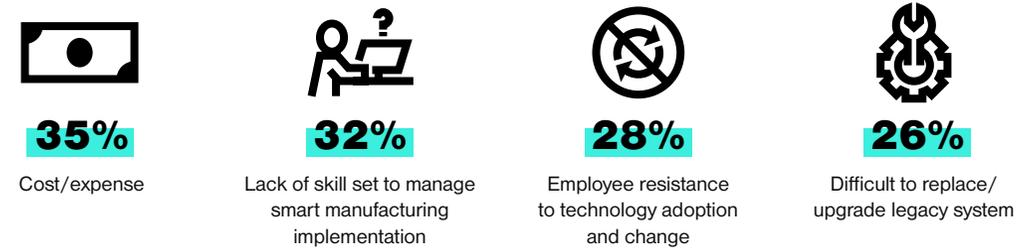
Q: What technologies has your company invested/does your company plan to invest in that you feel directly support your organization's ESG/sustainability efforts? (n=321)

SOLVING FOR SUPPLY CHAIN PLANNING CHALLENGES NOW AND IN THE FUTURE

While adoption of supply chain planning solutions has increased, it's important to assess whether your current solution accounts for the increasingly complicated supply chain going forward.



Cost was cited as the top barrier to adopting a supply chain planning software solution. However, as the headlines have shown over the past year, many companies have borne the burden with expedited shipping costs, production delays, and decreased customer satisfaction that likely far outweigh the cost of a system implementation.



“Before adopting a cloud-based supply chain planning solution from Plex Systems, we were often in danger of overestimating our inventory and short-shipping a customer, or underestimating inventory and building more product unnecessarily. Now we get accurate inventory which has had a huge effect on our bottom line.”

—Jeff Bender
Materials Manager, Coastal Automotive

SECTION 3:

THE FUTURE OF SUPPLY CHAIN PLANNING

On the surface, it's not always clear how beneficial a new technology will be. It just takes the right business case. Today, technology that was previously considered over-hyped is now solving some of the major challenges that supply chain leaders face.



UNLOCKING THE FUTURE OF SUPPLY CHAIN WITH TECHNOLOGY

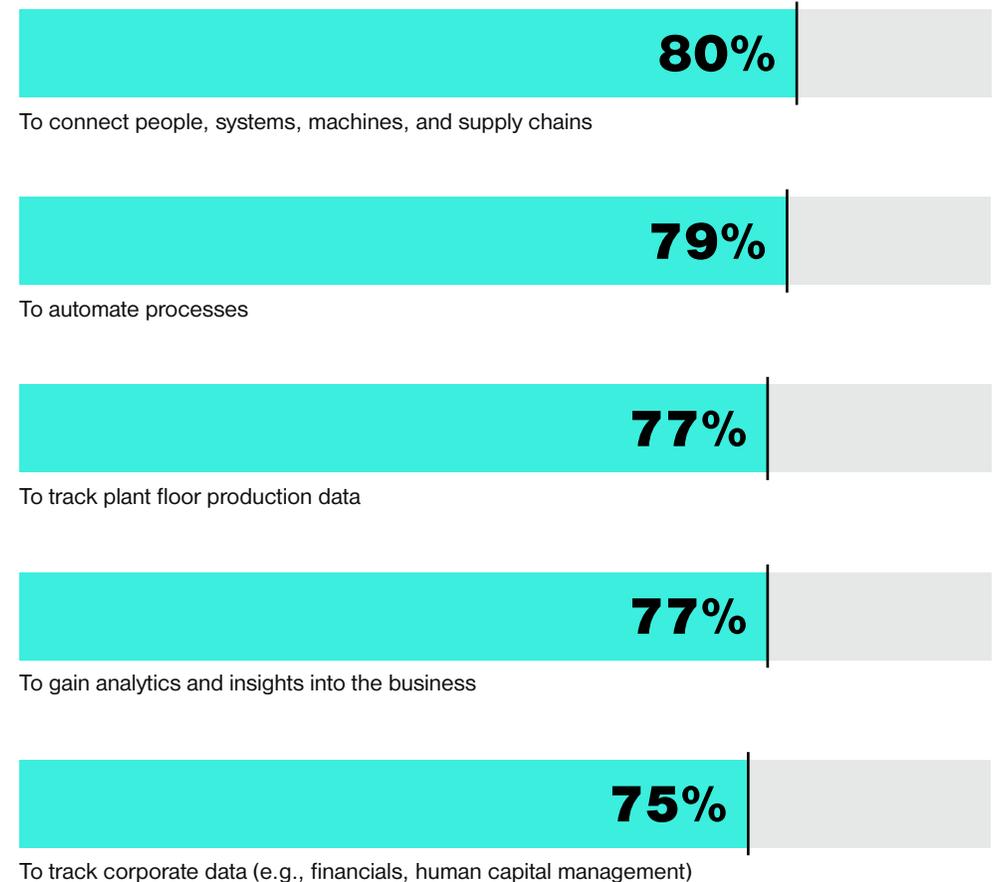
The discussion around technology is evergreen – leaders and operating professionals want to adopt the technology that will make their business better, provide an edge against the competition, and deliver an enhanced experience to customers.

Along this path, previously “over-hyped” technology has often grown to be essential to business. Take the internet, for example. Did every business expect that the internet would be essential for business when it was in its infancy? Likely not, because there were no practical use cases, availability and adoption varied, and many people didn’t see a sensible correlation between AOL/dial-up internet and business as they knew it.

But here we are, living in the age of cloud computing (once considered over-hyped itself), beginning to see the correlation of next-generation technology that is pushing through the hype to find mainstream use cases and adoption due to lower barriers to entry in availability, durability, and usability.

The next frontier in supply chain planning is the connection of machine data to increase forecast accuracy. Using artificial intelligence and machine learning to improve forecasting is not new – weather forecasts rely heavily on this technology. By implementing machine learning into supply chain planning, the accuracy of forecasting in demand planning can increase 5-10%, enabling reductions in inventory and improvements in revenue.

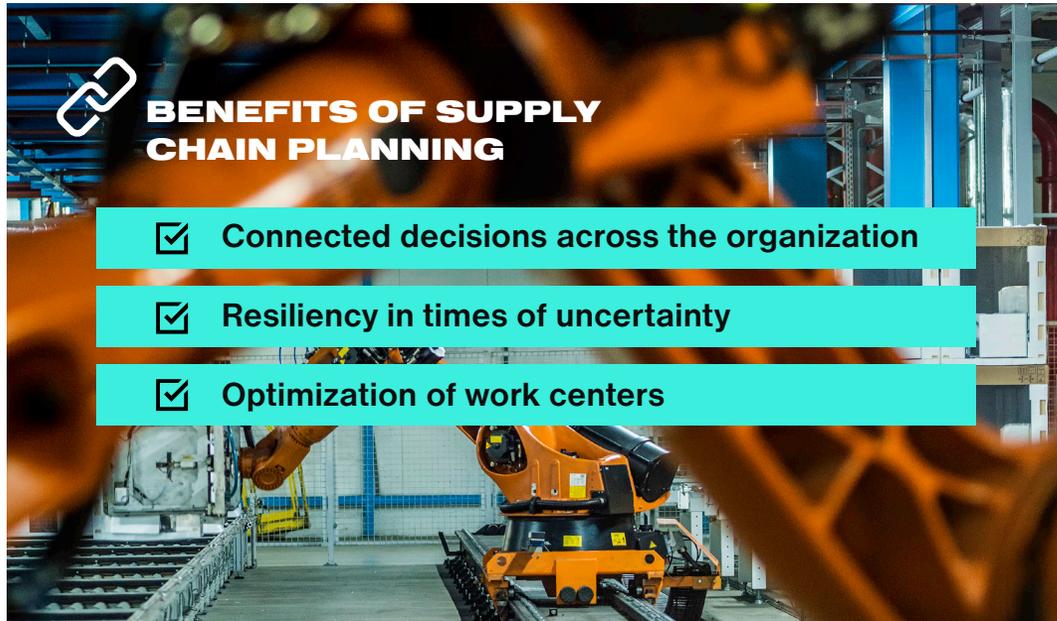
Organization’s software usage objectives



Q: For which of the following business or operational activities has your organization used software (e.g., enterprise resource planning systems, manufacturing execution systems, Industrial IoT, supply chain planning, analytics, quality management system) and/or hardware (e.g., sensors, servers, gauges) in the last 12 months? (n=321)

PLANNED INVESTMENT LEANS HEAVILY TO SUPPLY CHAIN PLANNING

Organizations are recognizing the value of smart manufacturing and their planned investment choices show the importance of technology for the future of manufacturing. Supply chain planning ranked as the second most popular choice for investment.



“Adopting and adapting new innovative technologies and technology themes (groupings) is helping establish a robust and resilient infrastructure for weathering business disruptions and keeping focus on business outcomes.”

—Gartner®, The 2022 Strategic Supply Chain Technology Themes, Christian Titze, Dwight Klappich, 25 March 2022, Revised 7 April 2022

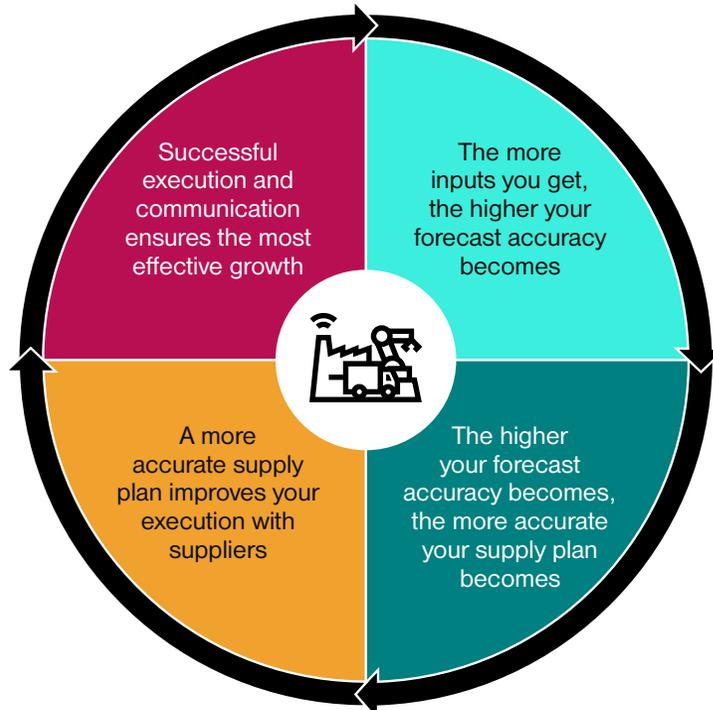
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HOW TO RECOGNIZE AN EFFECTIVE SUPPLY CHAIN PLANNING SOLUTION

An effective supply chain planning solution will:

- ☑ Take in machine learning and generate a better/optimal forecast
- ☑ Connect machine data for scheduling and executing that plan in the most optimal manner

Supply chain planning with machine learning creates a closed loop that is constantly improving



While you can't stop supply chain disruption in its tracks, you can mitigate some risk by **focusing on what you can control**

“An effective supply chain planning solution should be fast to implement, easy to use, and provide your business with achievable results. Less time, less effort, higher return.”

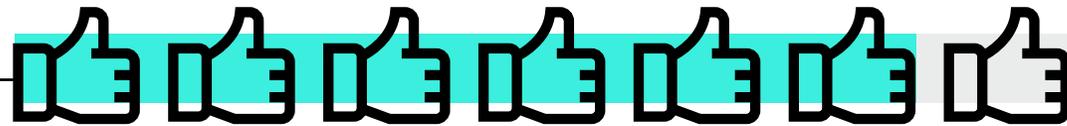
—Ara Surenian

Author, *Supply Chain Planning for Dummies*

THE CONTINUITY THAT COMES WITH CLOUD

Using a proven multi-tenant cloud SaaS solution limits risks and keeps you connected to your supply chain to make decisions in real-time from anywhere. Cloud technology also provides cybersecurity, can scale with your business, and is continuously improving with the latest iteration of software.

Effective supply chain planning solutions that are in the cloud make deciphering data simple and planning manageable. By uniting your organization and incorporating all planning variables across the supply network, businesses can accurately forecast and solve inventory problems quickly and proactively.



85% of respondents communicated their overall optimism for smart manufacturing

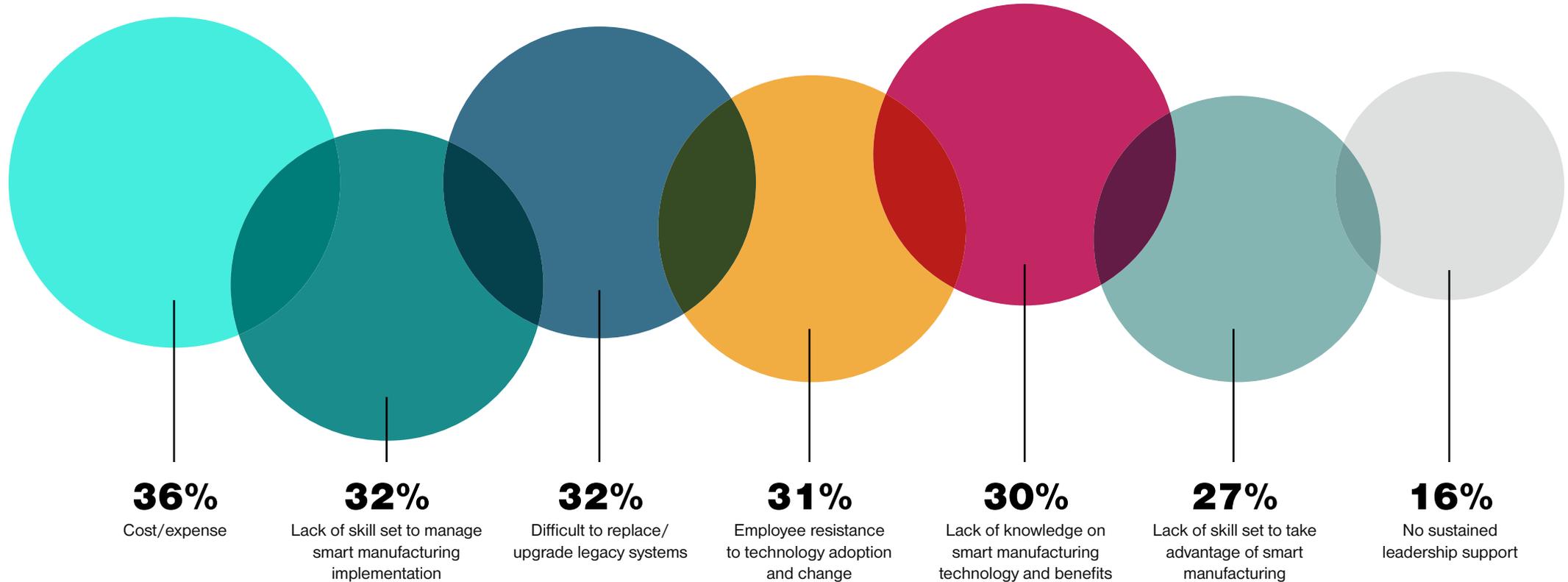
WHY USE CLOUD TECHNOLOGY

- ☑ Relieve the strain on hiring for IT
- ☑ Free up resources for more value-adding business functions
- ☑ Enable business continuity
- ☑ Provide risk mitigation and high-grade security
- ☑ Widen access to skilled workforce with remote accessible data

PERCEIVED BARRIERS TO SMART MANUFACTURING ADOPTION

If smart manufacturing technology is the answer to the industry’s biggest challenges, what’s stopping some companies from adopting it? Manufacturers are already dealing with a limited talent pool and shifting business priorities due to challenges across the workforce and supply chain, all the while trying to balance the right approaches to risk mitigation.

Barriers to adopting smart manufacturing



Q: What are the barriers to adopting smart manufacturing? (n=321)

SECTION 4:

TAKING ACTION

Smart manufacturing enables manufacturers to adapt to a changing market and unlock long-term opportunities by connecting and automating their supply chain.

Use the information in this report to help your business — and your people — regardless of where you are in the technology adoption process.



GETTING STARTED GUIDE



Identify key stakeholders and agree on your greatest need



Make the business case for investment



Research and select your solution(s)



Design and deploy the solution(s)



Manage change and drive adoption



STEP 1

IDENTIFY KEY STAKEHOLDERS AND AGREE ON YOUR GREATEST NEED

Gather the people connected to this change – both decision makers and system users. Diverse perspectives clarify the solutions needed, whether disconnected systems, people, processes, supply chains, unexpected downtime, poor quality, lack of visibility, control, and/or something else.

KEY QUESTIONS TO ANSWER:

- Where are your information gaps?
- Have you assembled the key stakeholders?
- What are the operational challenges you're trying to solve?



STEP 2

MAKE THE BUSINESS CASE FOR INVESTMENT

Develop your business case by highlighting increased control, efficiency, and savings gained. Gather requirements and include the importance of adaptability, security, and risk mitigation.

KEY QUESTIONS TO ANSWER:

- What does success look like?
- What risks should be considered and mitigated?
- Which use cases offer the right balance of value creation and time-to-value?



STEP 3

RESEARCH AND SELECT YOUR SOLUTION(S)

Do the work. There are many solutions available, and it is important to do your research. Narrow your potential solutions and review the following questions with the key stakeholders.

KEY QUESTIONS TO ANSWER:

- Will the solution provide the desired efficiency?
- Will it be able to support you in the future?
- Does the solution meet your requirements and business objectives?

**STEP 4****DESIGN AND DEPLOY THE SOLUTION(S)**

Select an implementation partner and create the map that you will follow for a successful process. Once created and agreed on by your key stakeholders, begin deployment.

KEY QUESTIONS TO ANSWER:

- Does the design fit your needs?
- Is there a timeline and achievable ROI?
- Have the key stakeholders reviewed and agreed on the plan?

**STEP 5****MANAGE CHANGE AND DRIVE ADOPTION**

To effectively integrate the change that smart manufacturing will bring into your culture, you will need sponsorship, messaging, and accountability.

KEY QUESTIONS TO ANSWER:

- Who will be your adoption champion(s)?
- What is your adoption communication/messaging plan?
- How will you adapt your culture through change management?

CONCLUSION

To achieve positive, enduring change, be thoughtful about your **approach**. Set and track goals for continuous improvement and decide how you will best measure adoption success early in the process. Each organization is different, and the points laid out here will help to ask the right questions in pursuit of answers that will guide your mission.

ABOUT PLEX

Plex Systems, a Rockwell Automation Company, is the leader in cloud-delivered smart manufacturing solutions and has been helping manufacturers improve their businesses for decades. Plex has resources and deep industry expertise in defining business value from technology, and we're ready to assist manufacturers in adopting smart manufacturing technology and processes to achieve their business goals.

Learn how to achieve your business goals using smart manufacturing at [Plex.com](https://www.plex.com)

TEN STEPS TO TECHNOLOGY ADOPTION [CHECKLIST]

Check: Steps:

Notes:

	Identify key stakeholders and agree on your greatest need	
	Establish effective governance with key stakeholders	
	Make the business case for investment by aligning technology, strategy, and metrics/KPIs	
	Create a communications plan that will sustain the vision for future desired outcomes	
	Research and select your solution(s)	
	Assess your current capabilities, risks, and opportunities; benchmark yourself against your competitors	
	Design and deploy the solution(s)	
	Prioritize changes that address the problem(s) you are solving, have the best ROI, and/or eliminate the most risk	
	Establish and implement an organizational change management program and drive adoption	
	Adopt a continuous improvement mindset and support it with messaging that highlights what you've learned, what can be more efficient, and how people drive change	

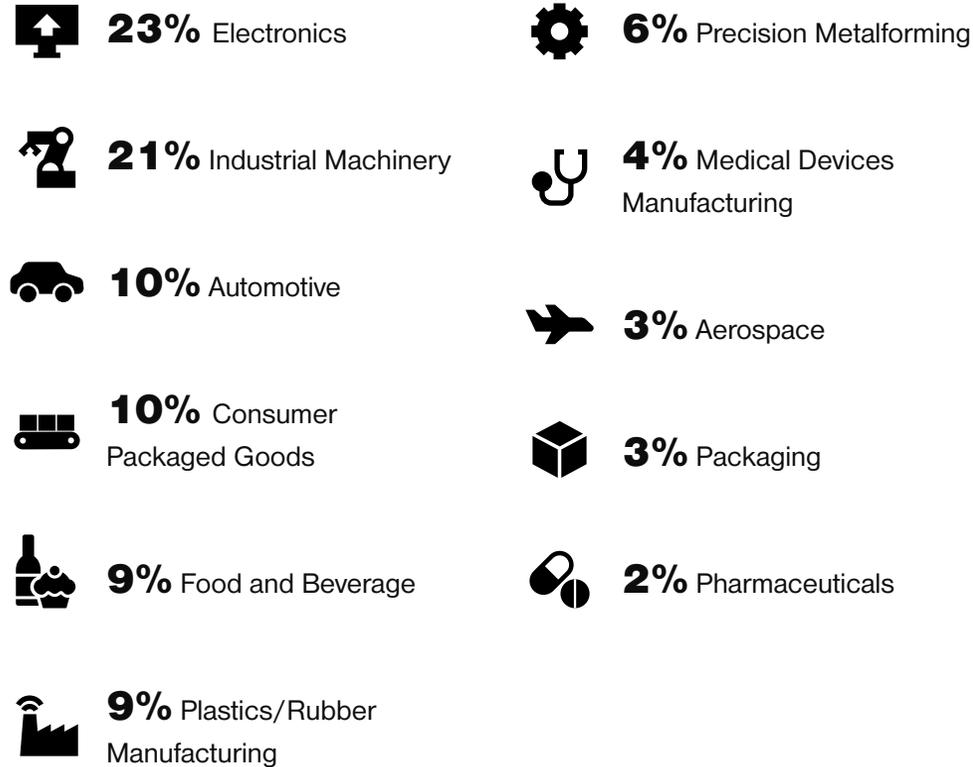
SURVEY DEMOGRAPHICS AND FIRMOGRAPHICS



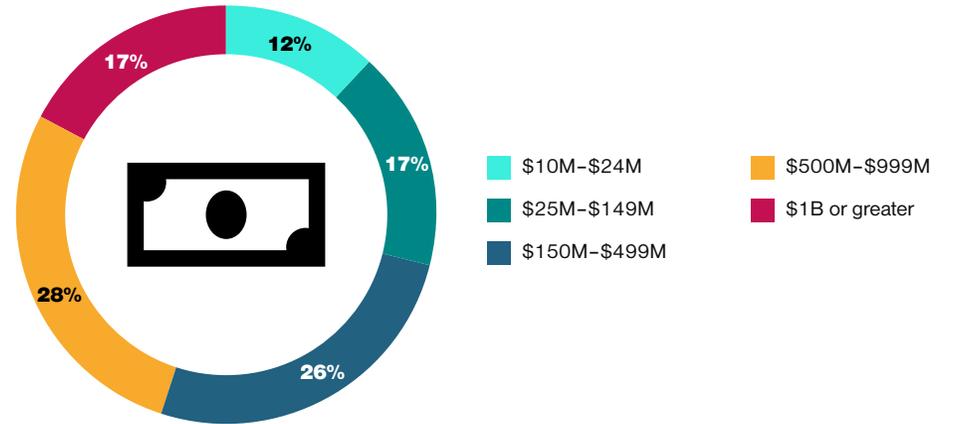
SURVEY DEMOGRAPHICS AND FIRMOGRAPHICS

All survey data collected in October 2021

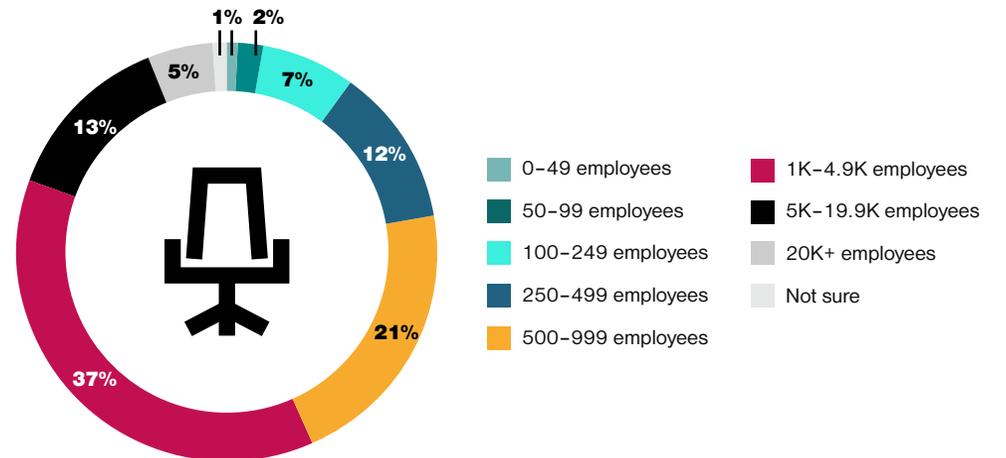
Industry



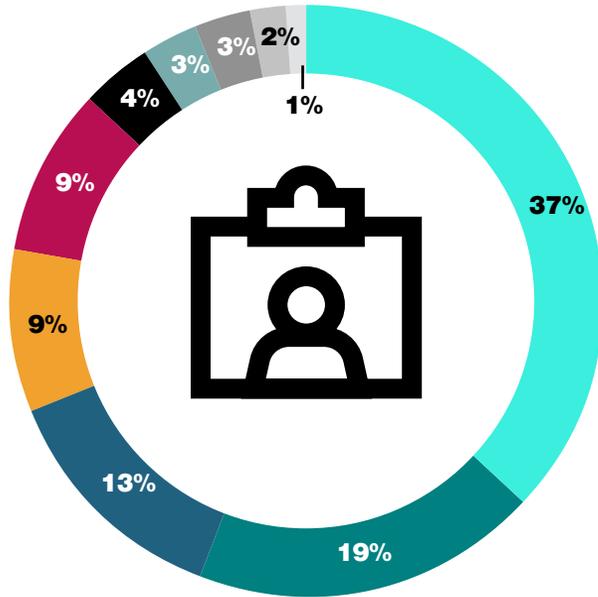
Organization's annual revenue



Organization size

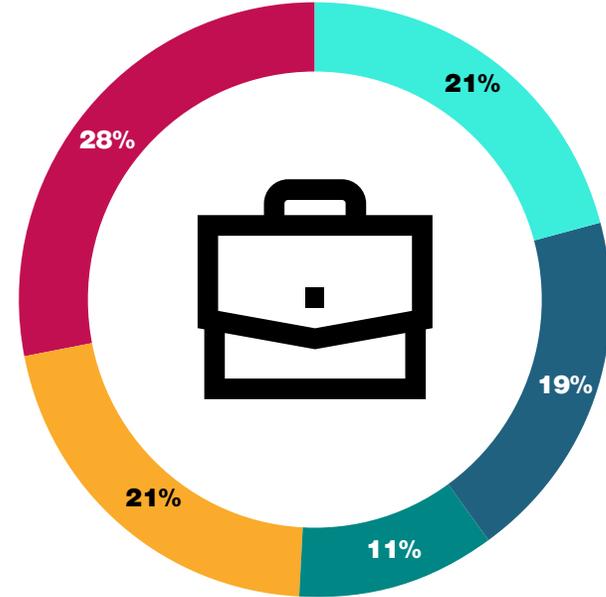


Job title



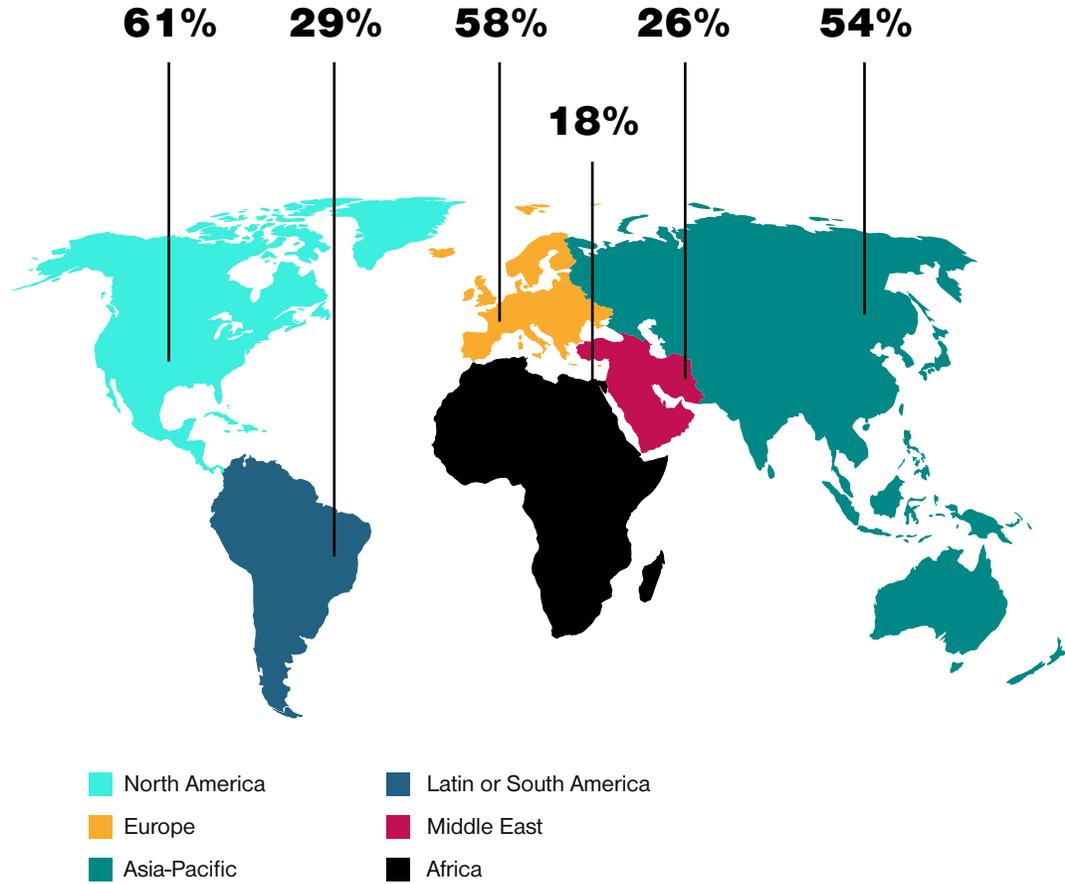
- IT
- Manufacturing
- Operations
- Supply chain
- Engineering
- Quality
- Marketing
- Human resources
- Sales
- Other

Job level



- C-Suite
- Manager
- Vice President
- Director
- Head of Department

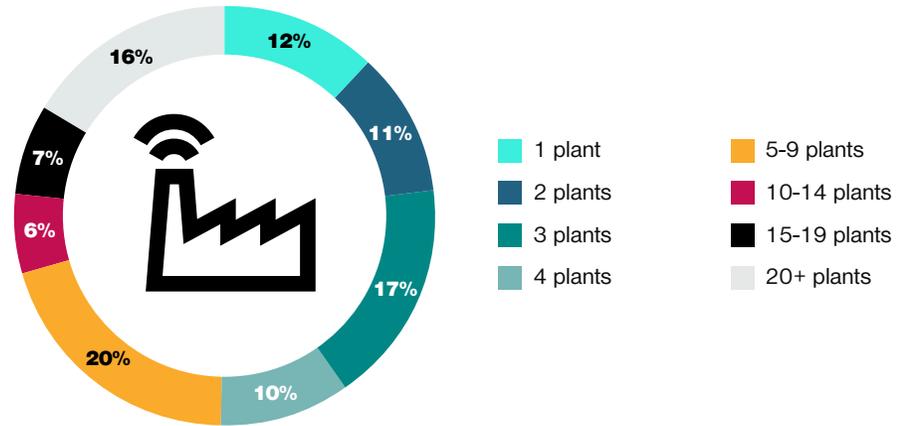
International regions served



Organizational reach



Number of plants





**Rockwell
Automation**

PLEX

