THE STATE OF TECHNOLOGY IN THE MANUFACTURING INDUSTRY

ABiresearch®
THE TECH INTELLIGENCE EXPERTS℠

The State of Technology in the Manufacturing Industry

Attitudes, adoption rates, and insights from an international survey of manufacturing professionals.

GERMANY

UNITED STATES

MALAYSIA
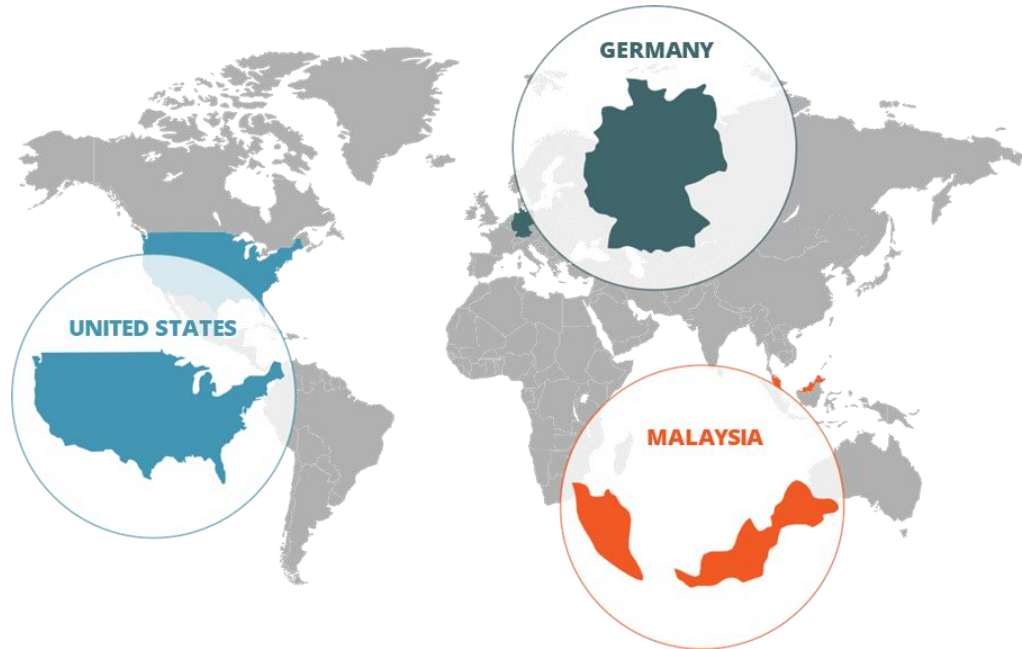
Innovation is the cornerstone of success in the manufacturing industry, making a robust technology strategy essential. ABI Research's semiannual Manufacturers' Technology Adoption & Attitudes Survey can be part of that strategy.

The survey was conducted in June 2024 and included 461 manufacturing decision-makers, with participants from the **United States** (155), **Malaysia** (153), and **Germany** (153).

This whitepaper highlights key takeaways from the survey.

GOT QUESTIONS OF YOUR OWN?

ABI Research invites you to become a sponsor of our next Manufacturers' Technology Adoption & Attitudes Survey. As a sponsor, you'll have the unique opportunity to include your own questions and gain access to tailored, actionable knowledge that will inform your decision-making and strategic planning. It's a unique way to gain a competitive edge in the rapidly evolving industrial and manufacturing landscape.
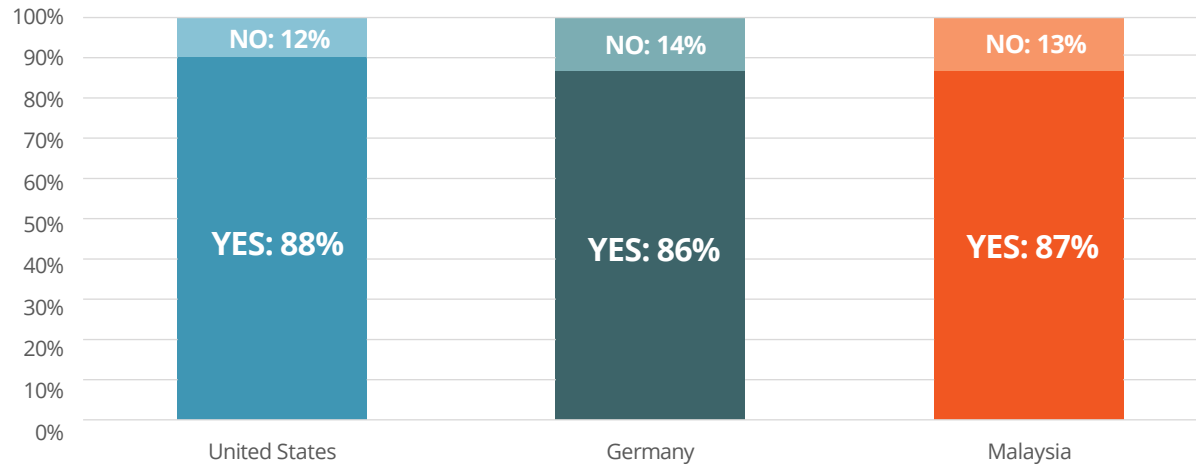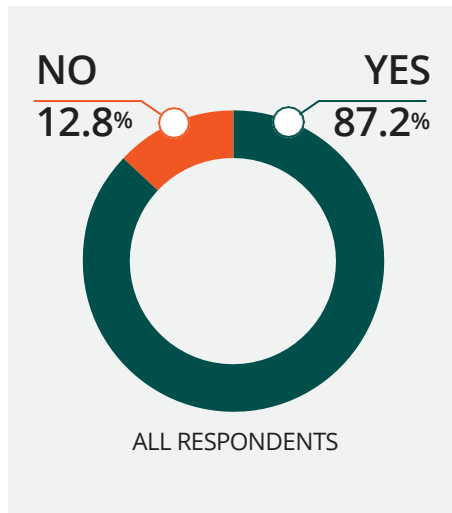
LEARN MORE

THE BIG PICTURE

KEY TAKEAWAY

Manufacturing professionals expect to make more use of technology to support their operations in the coming years.

DO YOU BELIEVE THAT THE NEXT 5 YEARS WILL WITNESS MORE TECHNOLOGICAL CHANGE IN MANUFACTURING THAN THE PAST 10 YEARS?

NO
12.8%

YES
87.2%

ALL RESPONDENTS

United States
NO: 12%
YES: 88%

Germany
NO: 14%
YES: 86%

Malaysia
NO: 13%
YES: 87%

(Source: ABI Research)

87.2%
OF RESPONDENTS

expect they will be making more use of technology to support their operations in the coming years. Technological change will be a feature of their working lives.

THE BIGGEST DIFFERENCE WHEN IT COMES TO DIGITALIZATION EXPECTATIONS IS THE SIZE OF THE MANUFACTURER.

100%
LARGE
(>25K Employees)

97%
MEDIUM
(5K- 25K Employees)

71%
SMALL
(<5K Employees)
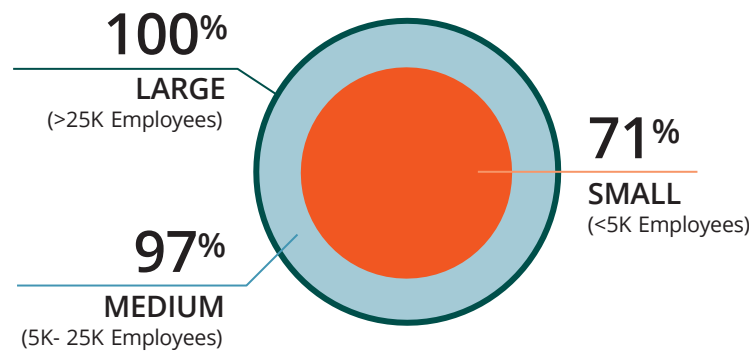
100% of large manufacturers and 97% of medium manufacturers agree that the next 5 years will see more technological change than the past decade. Just 71.8% of small manufacturers felt this way.

CLOUD COMPUTING OPINIONS

KEY TAKEAWAY
Cloud solutions and real-time collaboration go hand-in-hand.

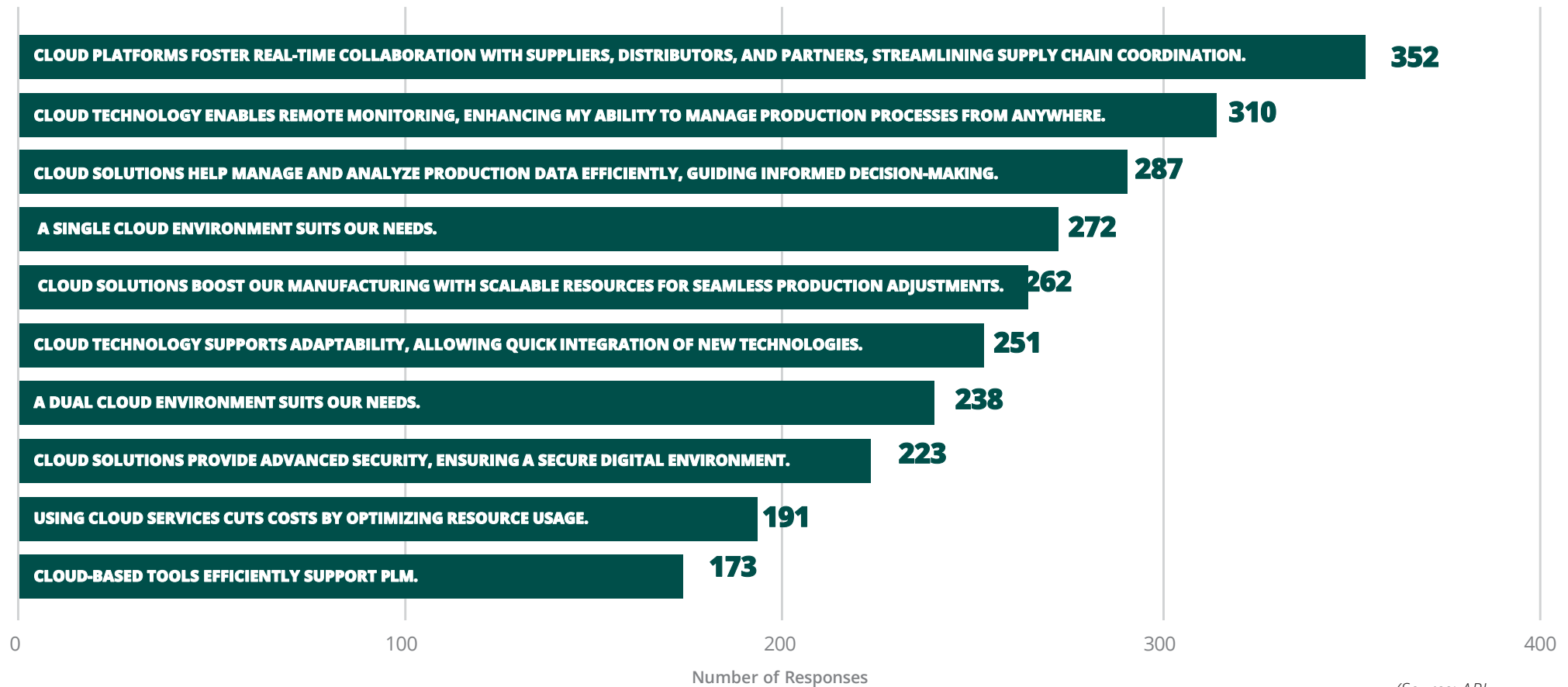### CLOUD COMPUTING OPINIONS, ACCORDING TO MANUFACTURERS

Opinion	Number of Responses
CLOUD PLATFORMS FOSTER REAL-TIME COLLABORATION WITH SUPPLIERS, DISTRIBUTORS, AND PARTNERS, STREAMLINING SUPPLY CHAIN COORDINATION.	352
CLOUD TECHNOLOGY ENABLES REMOTE MONITORING, ENHANCING MY ABILITY TO MANAGE PRODUCTION PROCESSES FROM ANYWHERE.	310
CLOUD SOLUTIONS HELP MANAGE AND ANALYZE PRODUCTION DATA EFFICIENTLY, GUIDING INFORMED DECISION-MAKING.	287
A SINGLE CLOUD ENVIRONMENT SUITS OUR NEEDS.	272
CLOUD SOLUTIONS BOOST OUR MANUFACTURING WITH SCALABLE RESOURCES FOR SEAMLESS PRODUCTION ADJUSTMENTS.	262
CLOUD TECHNOLOGY SUPPORTS ADAPTABILITY, ALLOWING QUICK INTEGRATION OF NEW TECHNOLOGIES.	251
A DUAL CLOUD ENVIRONMENT SUITS OUR NEEDS.	238
CLOUD SOLUTIONS PROVIDE ADVANCED SECURITY, ENSURING A SECURE DIGITAL ENVIRONMENT.	223
USING CLOUD SERVICES CUTS COSTS BY OPTIMIZING RESOURCE USAGE.	191
CLOUD-BASED TOOLS EFFICIENTLY SUPPORT PLM.	173

Number of Responses

(Source: ABI Research)

CLOUD COMPUTING OPINIONS

76%
OF MANUFACTURERS

surveyed agree that the cloud can foster real-time collaboration with key stakeholders to streamline supply chain coordination.

KEY TAKEAWAY

U.S. manufacturers are less enthused about cloud computing's ability to improve efficiency via scalability.

UNITED STATES
49%

GERMANY
62%

MALAYSIA
60%

Less than half (49%) of U.S.-based manufacturers agreed or strongly agreed that cloud solutions boost manufacturing efficiency with scalable resources for seamless production adjustments.

German and Malaysian manufacturers are more confident in cloud's ability to augment operational efficiency, with about 6 in 10 respondents in these countries agreeing with the statement.
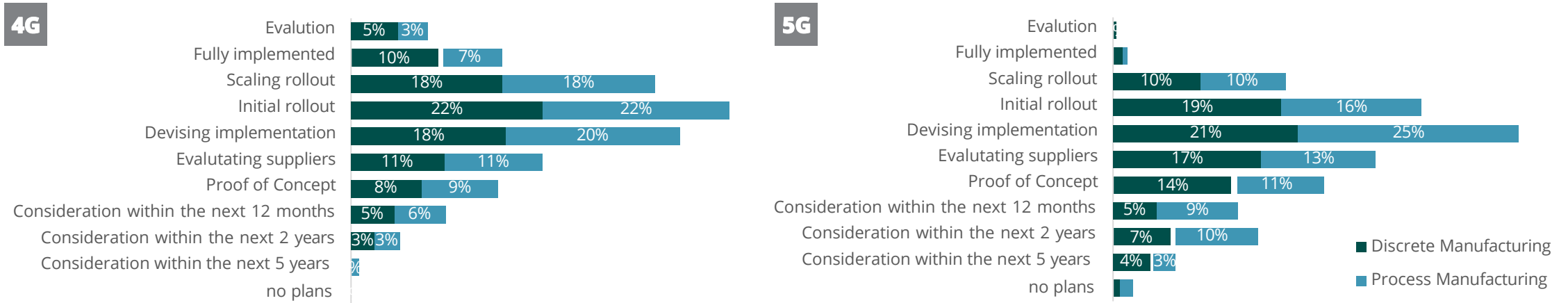
(Source: ABI Research)

ABI research

KEY TAKEAWAY

Private 5G is still nascent in the manufacturing space.

ROLLOUT PLANS FOR PRIVATE 4G AND 5G BY MANUFACTURING VERTICAL

4G

	Discrete Manufacturing	Process Manufacturing
Evalution	5%	3%
Fully implemented	10%	7%
Scaling rollout	18%	18%
Initial rollout	22%	22%
Devising implementation	18%	20%
Evalutating suppliers	11%	11%
Proof of Concept	8%	9%
Consideration within the next 12 months	5%	6%
Consideration within the next 2 years	3%	3%
Consideration within the next 5 years		
no plans		

5G

	Discrete Manufacturing	Process Manufacturing
Evalution		
Fully implemented		
Scaling rollout	10%	10%
Initial rollout	19%	16%
Devising implementation	21%	25%
Evalutating suppliers	17%	13%
Proof of Concept	14%	11%
Consideration within the next 12 months	5%	9%
Consideration within the next 2 years	7%	10%
Consideration within the next 5 years	4%	3%
no plans		

■ Discrete Manufacturing
■ Process Manufacturing

(Source: ABI Research)

44% OF MANUFACTURERS

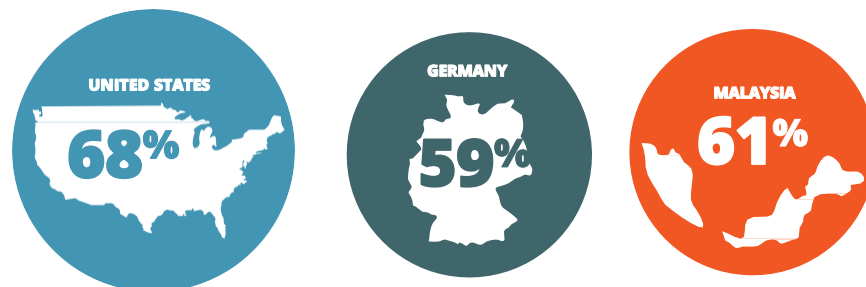are in the initial rollout of enterprise 4G, making it the largest proportion.

75% OF MANUFACTURERS

are either devising implementation or evaluating suppliers.

KEY TAKEAWAY

U.S.-based manufacturers see enhanced security as a key benefit of private wireless.

UNITED STATES
68%

GERMANY
59%

MALAYSIA
61%

(Source: ABI Research)

More than two-thirds of U.S. manufacturers agree that private cellular technology offers robust security measures, safeguarding manufacturing data and ensuring a secure production environment.
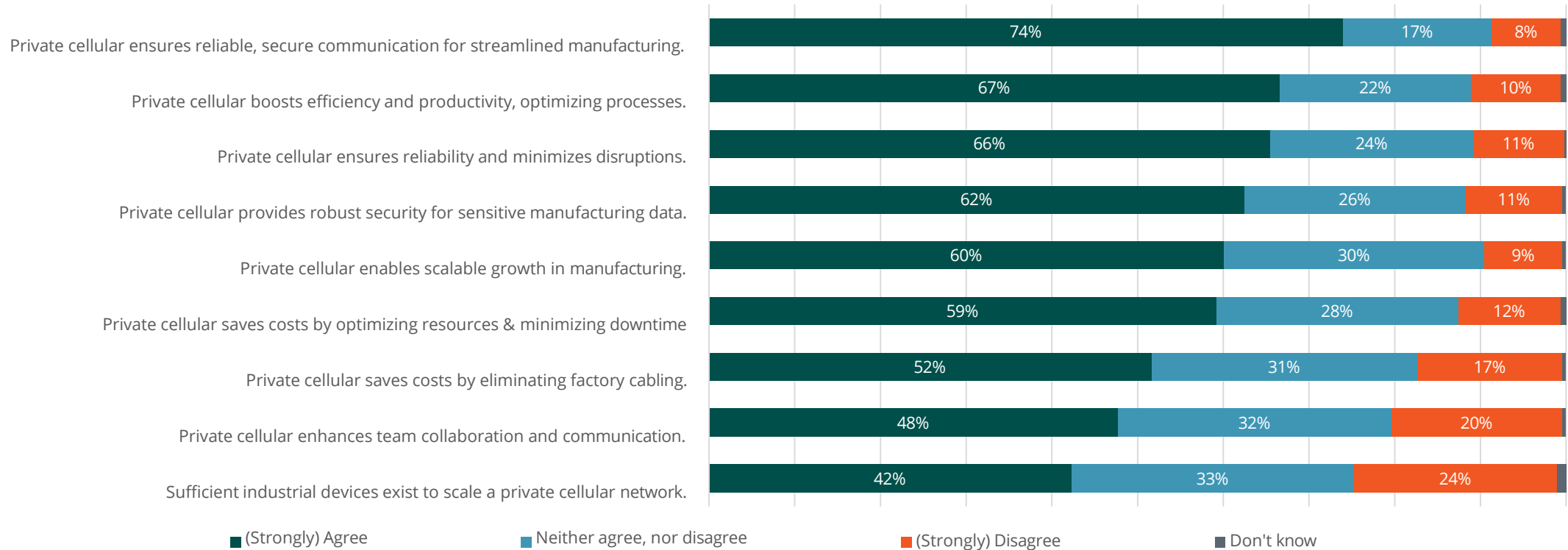
For German and Malaysian counterparts, the number was **59%** and **61%**, respectively.

KEY TAKEAWAY

Manufacturers appreciate the reliability, security, and efficiency of private cellular.

PERCEPTION TOWARD PRIVATE CELLULAR NETWORKS

Private cellular ensures reliable, secure communication for streamlined manufacturing. — 74% / 17% / 8%
Private cellular boosts efficiency and productivity, optimizing processes. — 67% / 22% / 10%
Private cellular ensures reliability and minimizes disruptions. — 66% / 24% / 11%
Private cellular provides robust security for sensitive manufacturing data. — 62% / 26% / 11%
Private cellular enables scalable growth in manufacturing. — 60% / 30% / 9%
Private cellular saves costs by optimizing resources & minimizing downtime — 59% / 28% / 12%
Private cellular saves costs by eliminating factory cabling. — 52% / 31% / 17%
Private cellular enhances team collaboration and communication. — 48% / 32% / 20%
Sufficient industrial devices exist to scale a private cellular network. — 42% / 33% / 24%

■ (Strongly) Agree   ■ Neither agree, nor disagree   ■ (Strongly) Disagree   ■ Don't know

(Source: ABI Research)

74% OF MANUFACTURERS

agree/strongly agree that private cellular provides the reliability and security needed for streamlining manufacturing operations.

67% OF RESPONDENTS

show their appreciation for the efficiency and productivity boosts afforded with a private cellular network.
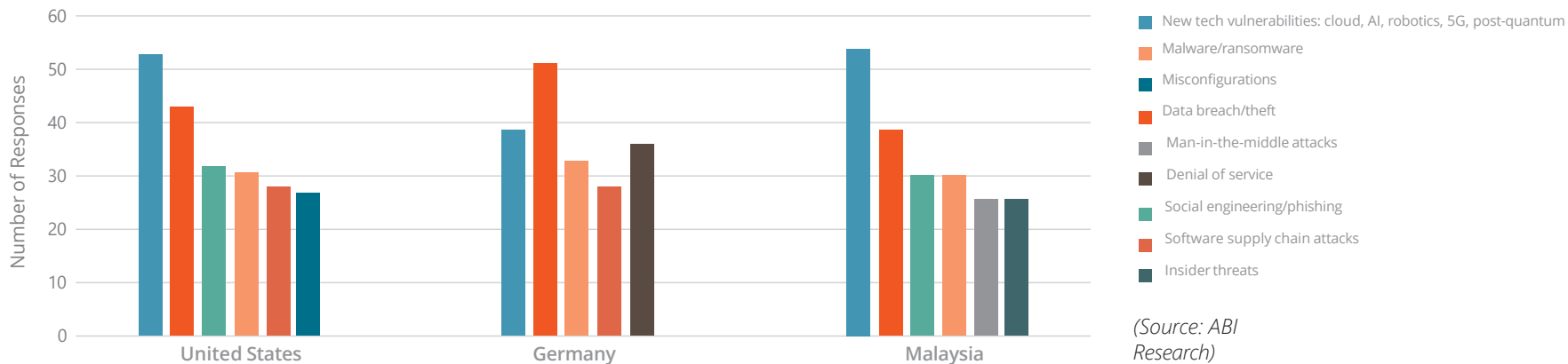
KEY TAKEAWAY

In the event of a cybersecurity attack, all three countries are concerned about losing data, but U.S. manufacturers are more concerned about staff safety after an attack.

United States pie chart:
- Fear the issue isn't resolved
- Reputational damage
- Risk of missing customer orders
- Staff safety as a result of a breach
- Losing data

Germany pie chart:
- Staff safety as a result of a breach
- Halting operations
- Reputational damage
- Losing data

Malaysia pie chart:
- Regulatory fines
- Staff safety as a result of a breach
- Reputational damage
- Fear the issue isn't resolved
- Impact on stock price
- Losing data

(Source: ABI Research)

TOP CYBER RISKS FACING YOUR ORGANIZATION

Legend:
- New tech vulnerabilities: cloud, AI, robotics, 5G, post-quantum
- Malware/ransomware
- Misconfigurations
- Data breach/theft
- Man-in-the-middle attacks
- Denial of service
- Social engineering/phishing
- Software supply chain attacks
- Insider threats

X-axis: United States, Germany, Malaysia
Y-axis: Number of Responses (0–60)

(Source: ABI Research)

While U.S. and Malaysian firms rank new tech vulnerabilities (e.g., cloud, AI, etc.) as the top cyber risk facing their organization, German firms ranked data breach/theft #1.

Close to 35% of U.S. and Malaysian respondents are most worried about new technology risks. For German manufacturers, that number is just 25%.
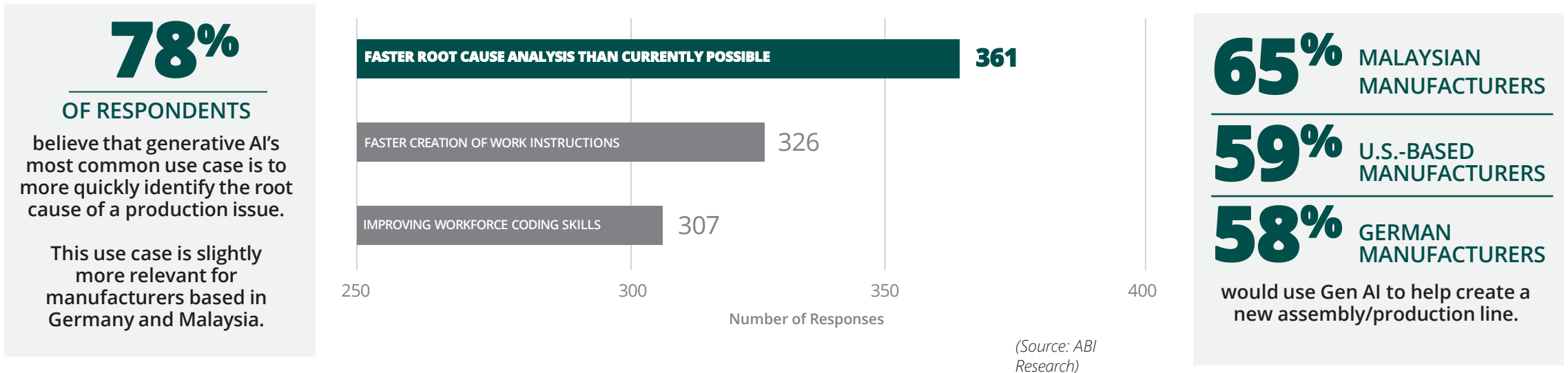
KEY TAKEAWAY

### Identifying production issues is the top generative AI use case.

TOP GEN AI USE CASES, ACCORDING TO MANUFACTURERS

78%

OF RESPONDENTS

believe that generative AI's most common use case is to more quickly identify the root cause of a production issue.

This use case is slightly more relevant for manufacturers based in Germany and Malaysia.

FASTER ROOT CAUSE ANALYSIS THAN CURRENTLY POSSIBLE — **361**

FASTER CREATION OF WORK INSTRUCTIONS — 326

IMPROVING WORKFORCE CODING SKILLS — 307

250   300   350   400

Number of Responses

(Source: ABI Research)

65% MALAYSIAN MANUFACTURERS

59% U.S.-BASED MANUFACTURERS

58% GERMAN MANUFACTURERS

would use Gen AI to help create a new assembly/production line.

KEY TAKEAWAY

German manufacturers are more skeptical of generative AI's ability to fix coding issues than American companies.

UNITED STATES

52%
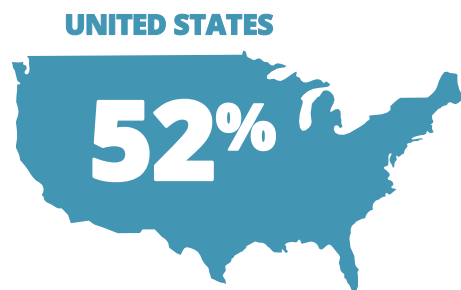
52% of U.S.-based manufacturers agree or strongly agree that generative AI can help them fix bugged software code more quickly than currently possible. This is a much higher number than the 37% of German-based firms who agree.
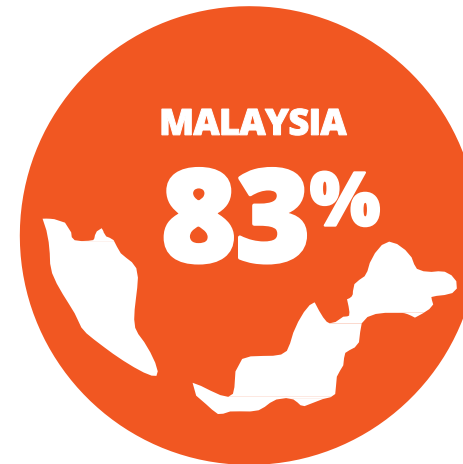
GERMANY

37%
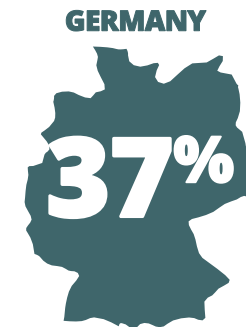
(Source: ABI Research)

INDUSTRIAL METAVERSE

KEY TAKEAWAY

Manufacturers turn to the industrial metaverse for experimenting with new product designs.

PERCENTAGE WHO AGREE THE INDUSTRIAL METAVERSE CAN AID IN NEW PRODUCT DEVELOPMENT

UNITED STATES
73%

GERMANY
82%

MALAYSIA
83%

(Source: ABI Research)

New product design was the top use case of the industrial metaverse for **GERMAN** and **MALAYSIAN** manufacturers. In the **U.S.**, the top use case was staff training and upskilling.

72% MALAYSIAN MANUFACTURERS

59% U.S.-BASED MANUFACTURERS

54% GERMAN MANUFACTURERS

agree that the industrial metaverse could improve collaboration among teams.

79%

OF RESPONDENTS

agree that the industrial metaverse could help experiment with new product designs.
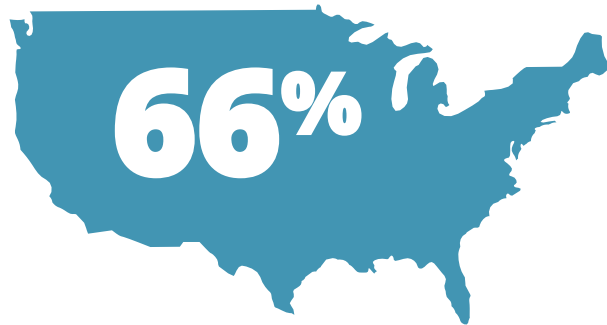
IT/OT COLLABORATION & OPERATIONS

KEY TAKEAWAY
IT and OT departments need to work together to tackle manufacturing challenges, but...

39% ... JUST 39% OF RESPONDENTS STATED THAT THEIR IT AND OT TEAMS COLLABORATE TO SOLVE ISSUES.
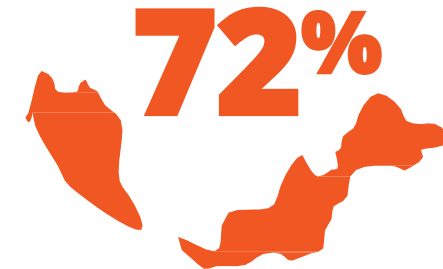
UNITED STATES
66%

GERMANY
62%

MALAYSIA
72%

66% of U.S.-based manufacturers have the capability to collect and analyze data in near real time.

62% of German manufacturers have the capability to collect and analyze data in near real time.

72% of Malaysian firms have the capability to collect and analyze data in near real time.
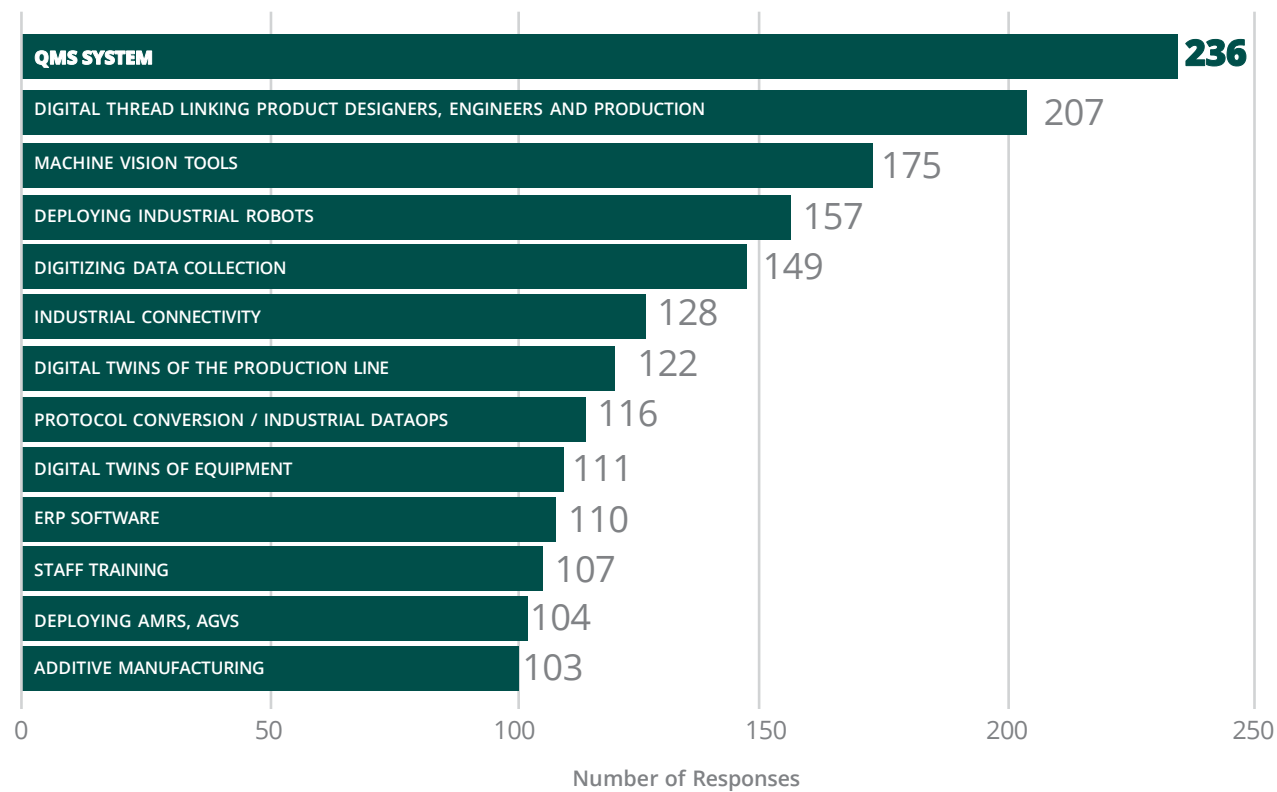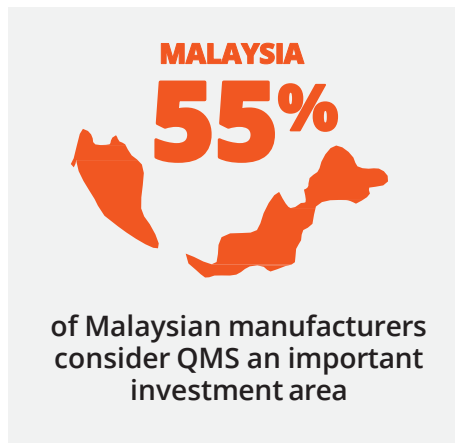
(Source: ABI Research)
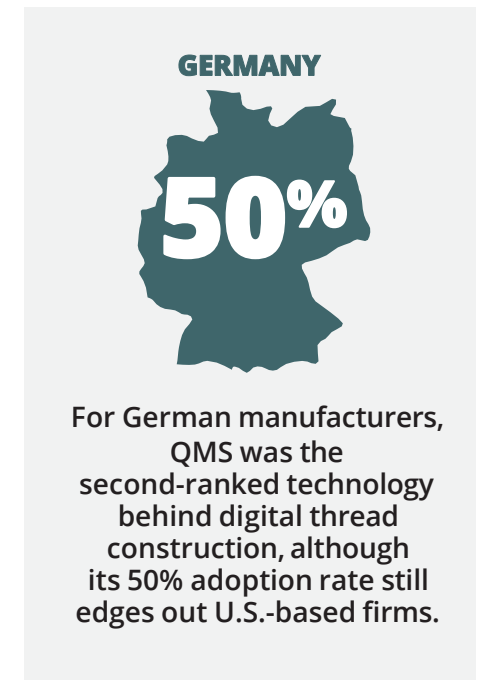
PRODUCTIVITY AND QUALITY IMROVEMENT

KEY TAKEAWAY

Improving quality levels was the top operational/business challenge, and QMS software seems to be the solution.

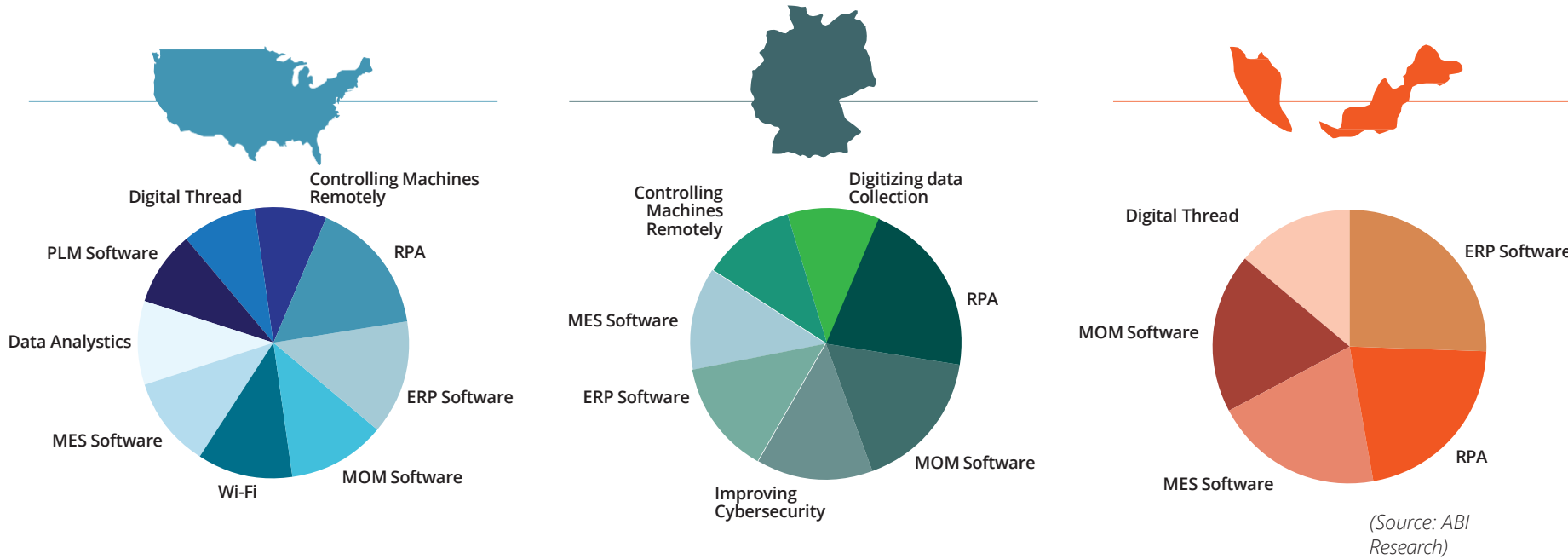### THE MOST IMPORTANT INVESTMENT AREAS IN THE NEXT YEAR TO IMPROVE QUALITY LEVELS

MALAYSIA
55%

of Malaysian manufacturers consider QMS an important investment area

UNITED STATES
48%

of U.S. manufacturers consider QMS an important investment area

Investment Area	Number of Responses
QMS SYSTEM	236
DIGITAL THREAD LINKING PRODUCT DESIGNERS, ENGINEERS AND PRODUCTION	207
MACHINE VISION TOOLS	175
DEPLOYING INDUSTRIAL ROBOTS	157
DIGITIZING DATA COLLECTION	149
INDUSTRIAL CONNECTIVITY	128
DIGITAL TWINS OF THE PRODUCTION LINE	122
PROTOCOL CONVERSION / INDUSTRIAL DATAOPS	116
DIGITAL TWINS OF EQUIPMENT	111
ERP SOFTWARE	110
STAFF TRAINING	107
DEPLOYING AMRS, AGVS	104
ADDITIVE MANUFACTURING	103

Number of Responses

(Source: ABI Research)

GERMANY
50%

For German manufacturers, QMS was the second-ranked technology behind digital thread construction, although its 50% adoption rate still edges out U.S.-based firms.

PRODUCTIVITY AND QUALITY IMROVEMENT

KEY TAKEAWAY

Technology investments that boost productivity by country.

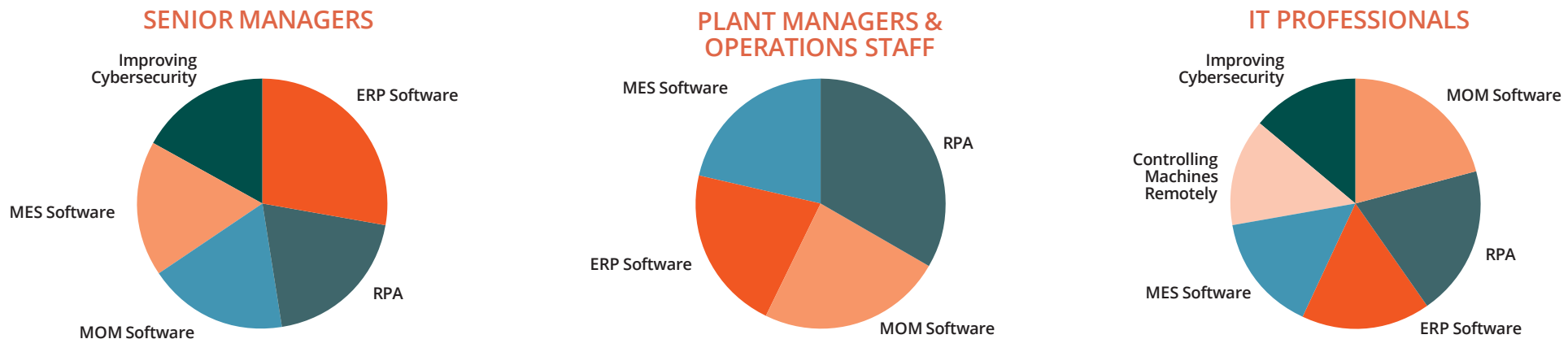United States pie chart labels: Controlling Machines Remotely, Digital Thread, PLM Software, Data Analytics, MES Software, Wi-Fi, MOM Software, ERP Software, RPA

Germany pie chart labels: Digitizing data Collection, Controlling Machines Remotely, MES Software, ERP Software, Improving Cybersecurity, MOM Software, RPA

Malaysia pie chart labels: Digital Thread, MOM Software, MES Software, ERP Software, RPA

Close to 4 in 10 Malaysian manufacturers said ERP software is an important focus for improving productivity, compared to 32% of U.S.-based manufacturers and only 27% of German manufacturers. Manufacturing Execution Systems (MESs) and Manufacturing Operations Management (MOM) software are both in the top five investment priorities to improve productivity for manufacturers.

(Source: ABI Research)

KEY TAKEAWAY

Different roles seek out different technology solutions to boost productivity.

SENIOR MANAGERS

Labels: Improving Cybersecurity, ERP Software, MES Software, RPA, MOM Software

PLANT MANAGERS & OPERATIONS STAFF

Labels: MES Software, RPA, ERP Software, MOM Software

IT PROFESSIONALS

Labels: Improving Cybersecurity, MOM Software, Controlling Machines Remotely, RPA, MES Software, ERP Software
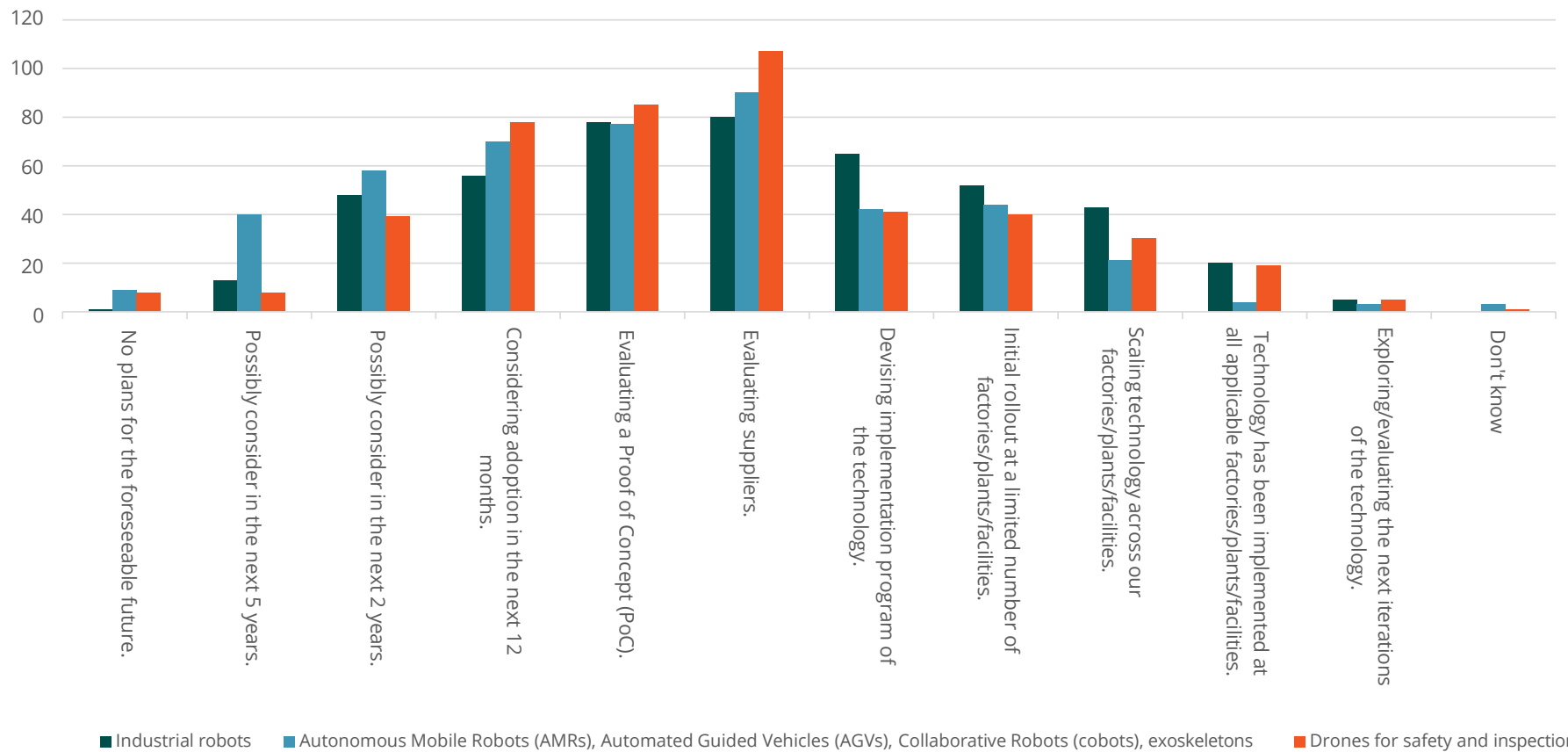
(Source: ABI Research)

ROBOTICS

KEY TAKEAWAY
Drones are gaining traction in the manufacturing space.

### AUGMENTING EXISTING PROCESSES WITH ROBOTICS

Legend:
- ■ Industrial robots
- ■ Autonomous Mobile Robots (AMRs), Automated Guided Vehicles (AGVs), Collaborative Robots (cobots), exoskeletons
- ■ Drones for safety and inspection

(Source: ABI Research)

17%
OF MANUFACTURERS

are considering commercial drone deployments in the next 12 months, indicating significant interest in the robotics technology. Manufacturers are also evaluating Proofs of Concept (PoCs) (18%), evaluating suppliers (23%), or devising implementation programs (9%).

ABIresearch

KEY TAKEAWAY

U.S.-based manufacturers have greater drone maturity for safety and inspection use cases than German manufacturers.

UNITED STATES

10%

GERMANY

5%

MALAYSIA

5%
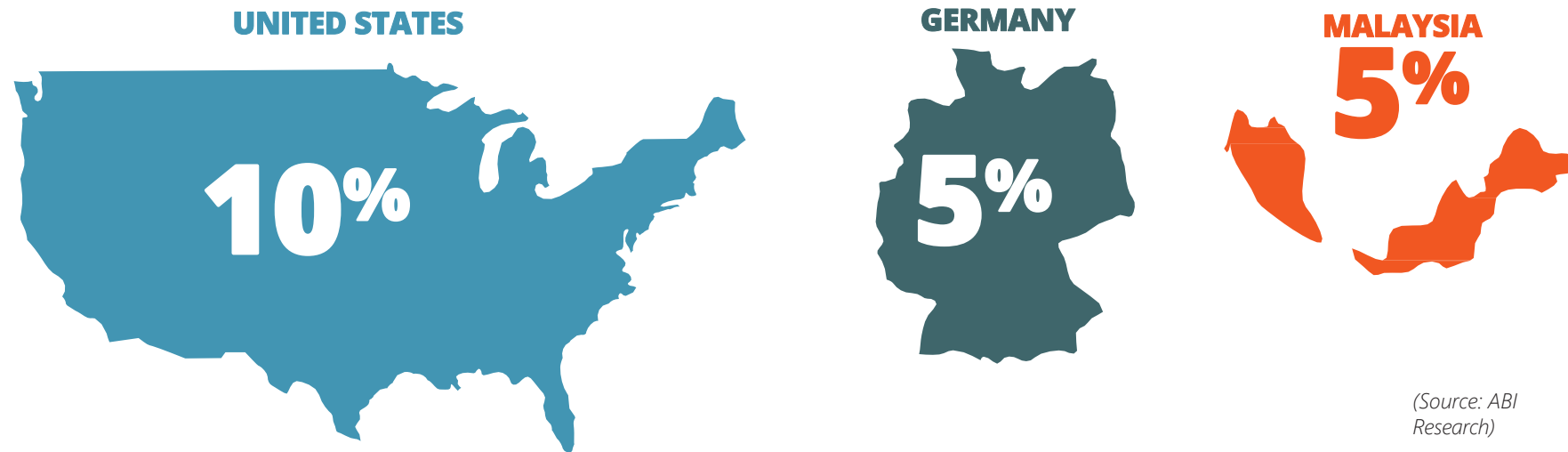
(Source: ABI Research)

1 in 10

U.S.-BASED MANUFACTURERS

are scaling safety/inspection drones across their factories, plants, or facilities. That is double the 5% of German and Malaysian manufacturers who are doing so.

KEY TAKEAWAY

Decarbonization and ESG reporting is generally more important to German manufacturers,
but U.S. and Malaysian manufacturers are more likely to see sustainability as an important challenge.

PERCENTAGE WHO SAY ENVIRONMENTAL, SOCIAL,
& GOVERNANCE (ESG) REPORTING IS A KEY CHALLENGE

1 in 5

GERMAN
MANUFACTURERS

cite decarbonization
as a challenge to their
business/operations

UNITED STATES
16%

GERMANY
23%

MALAYSIA
11%

(Source: ABI Research)

23% U.S.-BASED MANUFACTURERS

22% MALAYSIAN MANUFACTURERS

18% GERMAN MANUFACTURERS

agree supporting sustainability goals is a priority
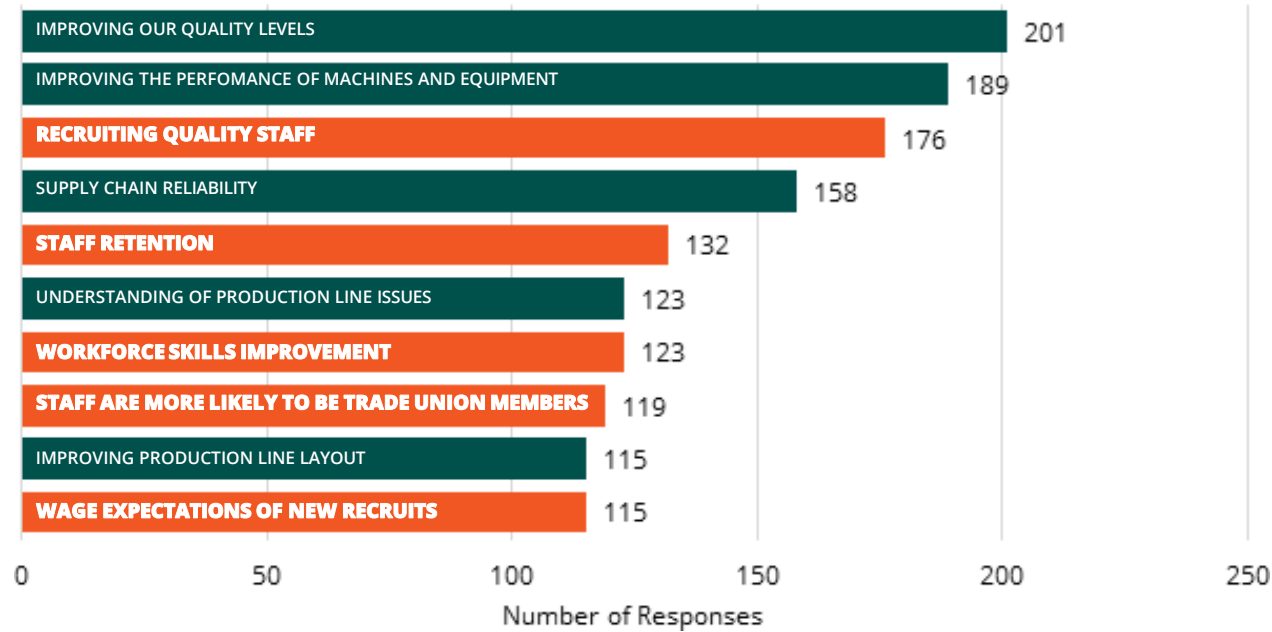
ABIresearch
THE TECH INTELLIGENCE EXPERTS

WORKFORCE CHALLENGES

KEY TAKEAWAY
Some of the biggest challenges facing manufacturers involve people, not technology.

50%

OF THE
TOP 10 CHALLENGES
ARE PEOPLE RELATED

Challenge	Number of Responses
IMPROVING OUR QUALITY LEVELS	201
IMPROVING THE PERFOMANCE OF MACHINES AND EQUIPMENT	189
RECRUITING QUALITY STAFF	176
SUPPLY CHAIN RELIABILITY	158
STAFF RETENTION	132
UNDERSTANDING OF PRODUCTION LINE ISSUES	123
WORKFORCE SKILLS IMPROVEMENT	123
STAFF ARE MORE LIKELY TO BE TRADE UNION MEMBERS	119
IMPROVING PRODUCTION LINE LAYOUT	115
WAGE EXPECTATIONS OF NEW RECRUITS	115

Number of Responses

(Source: ABI Research)

62%

OF RESPONDENTS

rated insufficient time an 8, 9, or 10 in terms of urgency, as a hindrance to planning technological innovations

69%

OF RESPONDENTS

say a lack of expertise prevents digitalization

SHAPE THE SURVEY.
SHARPEN YOUR STRATEGY.

ABI Research is now inviting a small set of participants to join our survey efforts as we launch a semiannual survey targeting respondents in industrial and manufacturing companies. This semiannual survey will offer invaluable insights into industry trends, market sentiment, and emerging opportunities, enabling informed decision-making and strategic planning for sustained growth and competitive advantage.

LEARN MORE

ABiresearch®
THE TECH INTELLIGENCE EXPERTS℠

We Empower Technology Innovation and Strategic Implementation.

ABI Research is uniquely positioned at the intersection of end-market companies and technology solution providers, serving as the bridge that seamlessly connects these two segments by driving successful technology implementations and delivering strategies that are proven to attract and retain customers.