Intro and Profile

MPI 2020 Industry 4.0 Study
Deadline Feb. 24, 2020

The MPI 2020 Industry 4.0 Study examines the extent to which manufacturers are readying their companies for the evolution of the Industry 4.0 into Industry 5.0 — embedding intelligence and/or smart devices into their operations and connecting them to the enterprise and supply chain, as well as offering new products that incorporate embedded intelligence.

 The MPI Industry 4.0 Study is conducted by The MPI Group and sponsored by SAP. Please answer all questions to the best of your ability, and remember that many questions will accept multiple answers "(check all that apply)."

Note: You must have a good understanding of your company's operations practices, production performances, and product plans. If your answers to the study indicate otherwise, your submission will be rejected.

Profile Characteristics

1. For which of the following functions do you have detailed knowledge of Industry 4.0 activities? (select all that apply):

Manufacturing/Production

Maintenance/Asset Management

R&D/Product Development

None of the above

2. Please indicate the type of manufacturing company for which you are responding:

Public manufacturing company   Not a manufacturing company

Private manufacturing company

3. Which of the following best describes your title?

Chairman

CEO or President

COO

CFO

CTO

Other C-level title or comparable

VP or Director or comparable

Partner or Principal or comparable

Manager or above

Other

4. In which country or region are you located?

United States

Canada

Mexico

Latin/Central America

Brazil

Other South America

France

Germany

Spain

UK

Other Europe

China

Japan

Other Asia

Middle East

Africa

Other

5. What is the approximate annual revenue (in U.S. dollars) of your company?

Less than $10 million

$10 million to $50 million

$51 million to $100 million

$101 million to $250 million

$251 million to $500 million

$501 million to $1billion

More than $1 billion

6. In which of the following manufacturing categories does your company do business? (*check all that apply*)

Food Manufacturing

Beverage and Tobacco Product Manufacturing

Textile Mills

Textile Product Mills

Apparel Manufacturing

Leather and Allied Product Manufacturing

Wood Product Manufacturing

Paper Manufacturing

Printing and Related Support Activities

Petroleum and Coal Products Manufacturing

Chemical Manufacturing

Plastics and Rubber Products Manufacturing

Nonmetallic Mineral Product Manufacturing

Primary Metal Manufacturing

Fabricated Metal Product Manufacturing

Machinery Manufacturing

Computer and Electronic Product Manufacturing

Electrical Equipment, Appliance, and Component Manufacturing

Transportation Equipment Manufacturing

Furniture and Related Product Manufacturing

Miscellaneous Manufacturing

7. How many years has your company been in operation?

Less than 2 years

2-5 years

6-10 years

11-20 years

More than 20 years

8. In which of the following markets does your company sell products? (*check all that apply*)

Agricultural

Mining and Oil and Gas Extraction

Utilities

Construction

Manufacturing

Wholesale

Retail

Transportation and warehousing

Information (software, online, publishing, movies, etc.)

Finance and insurance

Real estate and leasing

Professional, scientific, and technical services (not healthcare)

Healthcare services

Arts, Entertainment, and Recreation (e.g., concerts, sports)

Hospitality and lodging

Food services

Defense industries

Government (not defense)

Consumer services (e.g., auto repair, cleaning)

Other

9. How much progress has your company made toward achieving world-class manufacturing status?

No progress

Some progress

Significant progress

Fully achieved

Industry 4.0 Strategy

Strategic Industry 4.0

10. How important is Industry 4.0 to your business?

Extremely important

Very important

Somewhat important

Not important

11. How extensive is your company's understanding of Industry 4.0 and how to apply it to your business?

Significant companywide understanding of Industry 4.0

Some companywide understanding of Industry 4.0

Limited companywide understanding of Industry 4.0

No companywide understanding of Industry 4.0

12. What impact do you believe the Industry 4.0 will have on your industry over the next five years?

Significant impact

Some impact

Limited impact

No impact

13. What impact do you believe the Industry 4.0 will have on <u>your business</u> over the next five years?

Significant impact

Some impact

Limited impact

No impact

14. Do you see Industry 4.0 as a competitive differentiator?

Already is

Will be in the future

Not likely to change competitive environment

15. Who is leading an Industry 4.0 initiative in your company? (select all that apply)

Head of Manufacturing

Head of Service and Maintenance

Head of Engineering

Head of Logistics

Head of R&D/Product Development

COO

CIO

Chief Digital Officer

Other (please specify):

No Industry 4.0 initiatives

16. What best describes your company's strategic readiness to apply Industry 4.0 technologies to processes and embed Industry 4.0 technologies into products? (_check one in each row_)

	Strategy in place — implemented	Strategy in place — not yet implemented	Plan to develop strategy	No plans to develop strategy
Applying Industry 4.0				

| technologies to processes | ○ | ○ | ○ | ○ |
| Embedding Industry 4.0 technologies in products | ○ | ○ | ○ | ○ |

17. What best describes your company's Industry 4.0 capabilities compared to others in your industry?

Industry 4.0 leader

Industry 4.0 competitive

Industry 4.0 catchup

No Industry 4.0

18. Which of the following do you believe are elements of Industry 4.0? (select all that apply)

Smart assets

Factory automation

Integrated processes

Artificial intelligence (AI)

Predictive decision-making (maintenance/throughput etc.)

Mobile devices

Internet of Things (IoT) platforms

Location detection technologies

Advanced human-machine interfaces

Authentication and fraud detection

3D printing/additive manufacturing

Smart sensors

Big data analytics and advanced algorithms

Multilevel customer interaction and customer profiling

Augmented reality/ wearables

Fog, edge, and cloud computing

Other (please specify):

None of the above

19. What type of value is Industry 4.0 most likely to provide to the following areas of your company? (select all

	Financial value	Operations value	Brand value	Other value	No value provided
Supply Chain	☐	☐	☐	☐	☐
Research and Development	☐	☐	☐	☐	☐
Manufacturing	☐	☐	☐	☐	☐
Logistics	☐	☐	☐	☐	☐
Operations	☐	☐	☐	☐	☐
Human Resources	☐	☐	☐	☐	☐
Sales and Marketing	☐	☐	☐	☐	☐
Service	☐	☐	☐	☐	☐

20. Are your company's Industry 4.0 initiatives achieving the strategic objectives set forth prior to implementation?

Achieving all strategic objectives

Achieving most strategic objectives

Achieving some strategic objectives

Achieving no strategic objectives

No strategic objectives were set prior to implementation

No Industry 4.0

21. Have your Industry 4.0 initiatives been on schedule?

Significantly later than scheduled

Somewhat later than scheduled

On schedule

Somewhat earlier than scheduled

Significantly earlier than scheduled

No Industry 4.0

22. Have your Industry 4.0 initiatives been on budget?

Significantly over budget

Somewhat over budget

On budget

Somewhat under budget

Significantly under budget

No Industry 4.0

23. How do your company's information technology staff and operations technology staff currently collaborate? (*check all that apply*)

Upgrading legacy operations systems

Upgrading legacy enterprise systems

Resolving technical operations issues

Resolving technical enterprise issues

Linking operations data and with business analytics

Network security

Other

No collaboration

Industry 4.0 Intelligent Plants and Processes

Industry 4.0 Intelligent Plants and Processes

24. For quality purposes, please select Choice 4 below:

Choice 1

Choice 2

Choice 3

Choice 4

Choice 5

Choice 6

25. Please indicate the primary nature of production operations:

Discrete manufacturing

Process/batch manufacturing

Both discrete and process/batch

26. What percentage of your company's production equipment and processes incorporates smart devices/embedded intelligence?

27. How will your company's application of smart devices and/or embedded intelligence in production equipment and processes change in the next two years?

Increase significantly

Increase somewhat

No change

Decrease somewhat

Decrease significantly

28. To what extent have smart devices and/or embedded intelligence been applied to the following processes? (check one in each row)

	No application	Some application	Significant application	Not applicable
Fabrication/stamping	○	○	○	○
Assembly	○	○	○	○
Plating or painting	○	○	○	○
Heat-treating	○	○	○	○
Welding	○	○	○	○
Additive manufacturing	○	○	○	○

Packaging	○	○	○	○
Maintenance	○	○	○	○
Warehousing	○	○	○	○
Document management	○	○	○	○
Shipping/logistics/transportation	○	○	○	○

29. What percentage of your company's non-production equipment and processes (e.g., office, shipping, transportation) incorporates smart devices/embedded intelligence?

[   ]

30. How will your company's application of smart devices and/or embedded intelligence to non-production equipment and processes change in the next two years?

increase significantly

Increase somewhat

No change

Decrease somewhat

Decrease significantly

31. Describe the ability of your company's network infrastructure to accommodate the following types of Industry 4.0 communications?

	Currently capable	Some upgrades required	Significant upgrades required	Network overhaul required
Machine to machine (e.g., sensors in one machine trigger actions of another machine)	○	○	○	○
Machines to enterprise IT systems (i.e., machine sensors send data to your company's business systems)	○	○	○	○

Machines to supplier IT systems (i.e., machine sensors send data to your suppliers' business systems)	○	○	○	○
Machines to customer IT systems (i.e., machine sensors send data to your customers' business systems)	○	○	○	○

32. How have the application of smart devices and/or embedded intelligence into operations affected the following performances? (check one in each row)

	Worsened	No change	Some improvement	Significant improvement	No Industry 4.0
Manufacturing costs	○	○	○	○	○
Product quality	○	○	○	○	○
On-time delivery	○	○	○	○	○
Safety	○	○	○	○	○
Energy costs	○	○	○	○	○
Machine reliability/uptime	○	○	○	○	○
Equipment changeover times	○	○	○	○	○
Inventory turns	○	○	○	○	○
Regulatory compliance	○	○	○	○	○
Compliance to customer specifications	○	○	○	○	○
Customer satisfaction	○	○	○	○	○

33. How has the application of Industry 4.0 to plants and processes impacted your company's productivity over the past year?

Increased productivity more than 10%

Increased productivity 6-10%

Increased productivity 1-5%

No change to productivity

Decreased productivity

No Industry 4.0 currently or planned

34. What impact to productivity will application of Industry 4.0 to plants and processes have at your company over the next five years?

Increase productivity more than 10%

Increase productivity 6-10%

Increase productivity 1-5%

No change to productivity

Decrease productivity

No Industry 4.0 currently or planned

35. How has the application of Industry 4.0 to plants and processes impacted your company's profitability over the past year?

Increased profitability more than 10%

Increased profitability 6-10%

Increased profitability 1-5%

No change to profitability

Decreased profitability

No Industry 4.0 currently or planned

36. What impact to profitability will application of Industry 4.0 to plants and processes have at your company over the next five years?

Increase profitability more than 10%

Increase profitability 6-10%

Increase profitability 1-5%

No change to profitability

Decrease profitability

No Industry 4.0 currently or planned

37. How have the application of smart devices and/or embedded intelligence into operations affected the following business activities and objectives? (check one in each row)

	Worsened	No change	Some improvement	Significant improvement	No Industry 4.0
Security of IT systems and data	O	O	O	O	O
Ability to leverage business analytics	O	O	O	O	O
Corporate decision-making/strategy	O	O	O	O	O
Production decision-making	O	O	O	O	O
R&D/Product development	O	O	O	O	O
Operations coordination with customers	O	O	O	O	O
Operations coordination with suppliers	O	O	O	O	O
Operations agility and responsiveness	O	O	O	O	O
New-product ramp-ups	O	O	O	O	O
Remote-monitoring capabilities	O	O	O	O	O
Visualization capabilities	O	O	O	O	O

38. What aspects of Industry 4.0 capabilities present the biggest challenges for your company? (*check all that apply*)

Where/how to get started with Industry 4.0

Identifying opportunities/benefits of Industry 4.0

Incorporating smart devices/embedded intelligence

Network capabilities to handle Industry 4.0

Network capacity to handle Industry 4.0

Security of corporate devices, network, and data

Adapting existing technologies

Suppliers capable of delivering high-quality smart devices

Security of non-corporate devices (e.g., smartphones in plants)

Willingness to trust new sources of data/intelligence

Necessary skills/talent to leverage data/intelligence

Leadership support for Industry 4.0

Changing business processes and workflows to accommodate Industry 4.0

Cultural adaptation/acceptance of Industry 4.0

Budget/resources to develop or expand Industry 4.0

Redefining roles and responsibilities (e.g., IT staff)

Other:

We have not applied Industry 4.0 to our company

None of the above

39. How confident are you in your organization's current cyber risk management program (including risk assessment, monitoring, incident response planning/testing, business recovery, etc.) to address the Industry 4.0 environment?

Very confident

Confident

Not confident

Unsure

40. What steps, if any, have you taken in the last 12 months to improve your organization's security in the Industry 4.0 environment? (check all that apply)

Increased investment in security technologies

Conducted a cyber risk assessment

Conducted penetration testing

Implemented new OT security controls

Integrated IT and OT security

Adopted the Industrial Internet Security Framework

Drafted or revised a third-party risk management policy

Other

No steps taken to improve Industry 4.0 security

41. What best describes current access to Industry 4.0-enabled data within your company and by supply chain partners? (check one in each row)

	All who need it have access	Most who need it have access	Some who need it have access	No one who needs it has access	No Industry 4.0 data to access
Company executives	○	○	○	○	○
Customers	○	○	○	○	○
Suppliers	○	○	○	○	○

42. How much has your company invested in implementing an Industry 4.0 strategy into your plants and processes in the past year (as a percentage of sales)?

0%

1-2%

3-5%

6-10%

11-15%

More than 15%

43. How will investments in Industry 4.0 plants and processes change in the next two years?

Increase more than 20%

Increase 11-20%

Increase 1-10%

No change

Decrease

44. Which function or area of your company leads your Industry 4.0 strategy for plant and process applications?

C-level team

Dedicated Industry 4.0 department/function

IT leadership

Operations leadership

Cross-functional leadership

External consultants

Equipment suppliers

Other

Don't know

No Industry 4.0 strategy

45. What are the following performance measures for your company's facilities?

Cost of goods sold (the cost of direct labor, materials, and manufacturing overhead as a percentage of sales)

[   ]

Machine availability (the percentage of time that equipment is available for use when it is scheduled to be in operation)

[   ]

First-pass yield (the percentage of products completed to specifications and meeting quality targets)

[   ]

Scrap and rework products (the value of products — as a percentage of sales — that are either scrapped or require rework)

[   ]

On-time delivery (the percentage of product orders that are delivered to customers on time)

[   ]

What are your company's sales per employee (total sales / total employees)?
(PLEASE answer in U.S. dollars — dollar sign, decimals, commas, etc. not required)

[   ]

Industry 4.0 Intelligent Products

Industry 4.0 Intelligent Products

46. Describe your company's efforts to embed smart devices and/or intelligence into products?

Significant focus of our product innovation plans

Some plans to embed smart devices in products

Limited plans to embed smart devices

No plans to embed smart devices in products

47. What percentage of product dollar sales are from products with embedded smart devices/intelligence?

[   ]

48. What is your profit margin percentage on Industry 4.0-enabled products?

[   ]

49. What is your profit margin percentage on products that <u>are not</u> Industry 4.0-enabled products?

[   ]

50. To what extent has your company created the following Industry 4.0 products? (*check one in each row*)

	No products	Some products	Many products	Not applicable
Our company's finished products with embedded smart devices and/or intelligence	O	O	O	O
Parts/components for other manufacturers' products with embedded smart devices and/or intelligence	O	O	O	O
Smart devices for other manufacturers' products	O	O	O	O
Materials for other manufacturers' products with embedded smart devices and/or intelligence	O	O	O	O
Industry 4.0 software for other manufacturers' products	O	O	O	O
Fluids/substances for other manufacturers' products with embedded smart devices and/or intelligence	O	O	O	O

51. How has embedding smart devices and/or intelligence into your products affected the following? (check all that apply)

	Worsened	No change	Some improvement	Significant improvement	No products with embedded smart devices and/or intelligence
Profit margins per product	O	O	O	O	O
Revenue from new products	O	O	O	O	O
Market share	O	O	O	O	O

Customer support	○	○	○	○	○
Branding/market awareness	○	○	○	○	○
Access to new markets/sectors	○	○	○	○	○
Access to data from products or services in the field	○	○	○	○	○
Differentiating products in the market	○	○	○	○	○

52. How has the application of Industry 4.0 to products impacted your company's revenues over the past year?

Increased revenues more than 10%

Increased revenues 6-10%

Increased revenues 1-5%

No change to revenues

Decreased revenues

No Industry 4.0 currently or planned

53. What impact to revenues will application of Industry 4.0 to products have at your company over the next five years?

Increase revenues more than 10%

Increase revenues 6-10%

Increase revenues 1-5%

No change to revenues

Decrease revenues

No Industry 4.0 currently or planned

54. How has the application of Industry 4.0 to products impacted your company's profitability over the past year?

Increased profitability more than 10%

Increased profitability 6-10%

Increased profitability 1-5%

No change to profitability

Decreased profitability

No Industry 4.0 currently or planned

55. What impact to profitability will application of Industry 4.0 to products have at your company over the next five years?

Increase revenues more than 10%

Increase revenues 6-10%

Increase revenues 1-5%

No change to revenues

Decrease revenues

No Industry 4.0 currently or planned

56. What aspects of Industry 4.0-enabled products present the biggest challenges for your company? (*check all that apply*)

Where/how to get started with Industry 4.0 products

Identifying opportunities/benefits of Industry 4.0 products

Technologies needed to embed smart devices into products

Suppliers capable of delivering high-quality smart devices

Liabilities/risks of embedded devices

Clear understanding on customer needs/value

Keeping up with the pace of smart-device technology changes

R&D and innovation skills/talent in this area

Budget/resources to develop Industry 4.0-enabled products

Leadership support for Industry 4.0-enabled products

Systems and applications (e.g., modeling) to support R&D efforts

Other:

None of the above

57. How much has your company invested in embedding Industry 4.0 technologies into products in the past

year (as a percentage of sales)?

0%

1-2%

3-5%

6-10%

11-15%

More than 15%

58. How will investments in Industry 4.0 products change in the next two years?

Increase more than 20%

Increase 11-20%

Increase 1-10%

No change

Decrease