GE Digital
Industrial Evolution Index

Executive Summary

October 2017

Table of Contents

Key Research Questions

This research seeks to answer the following questions:

How large is the gap between the possibilities and the possible of the Industrial Internet?	How far are companies from closing that gap?	What transformation/ changes are required to help close the gap?	How familiar are ITDMs/OTDMs with GE Digital as a provider of IIoT solutions compared to competitors?	What are the relevant nuances by industry?

To answer these questions GE Digital commissioned a study including a survey of 250 IT and Operations Decision Makers (ITDMs and OTDMs) in the U.S. across five key industries (manufacturing, utilities, power/energy, transportation and aviation/aerospace). Additional in-depths interviews with C-suite executives (CEOs, CIOs, CDOs and COOs) across each of the industries were conducted to supplement the survey.

The GE Digital Industrial Evolution Index

Introducing the GE Digital
Industrial Evolution Index

The Industrial Internet of Things (IIoT) has great potential. Stakeholders are open to the opportunity, but need further resources to understand what it is, what it can enable and what's the best path to success.

The Industrial Evolution Index explores IT and Operations Decision Makers' perceptions of the Industrial Internet of Things (IIoT) and determines a 'score' in five key areas:

- Outlook

- Outcomes

- Barriers

- Company Readiness

- Workforce Readiness

On a scale of 0-100, these scores demonstrate progress toward achieving the Digital Industrial Transformation overall and across industries.

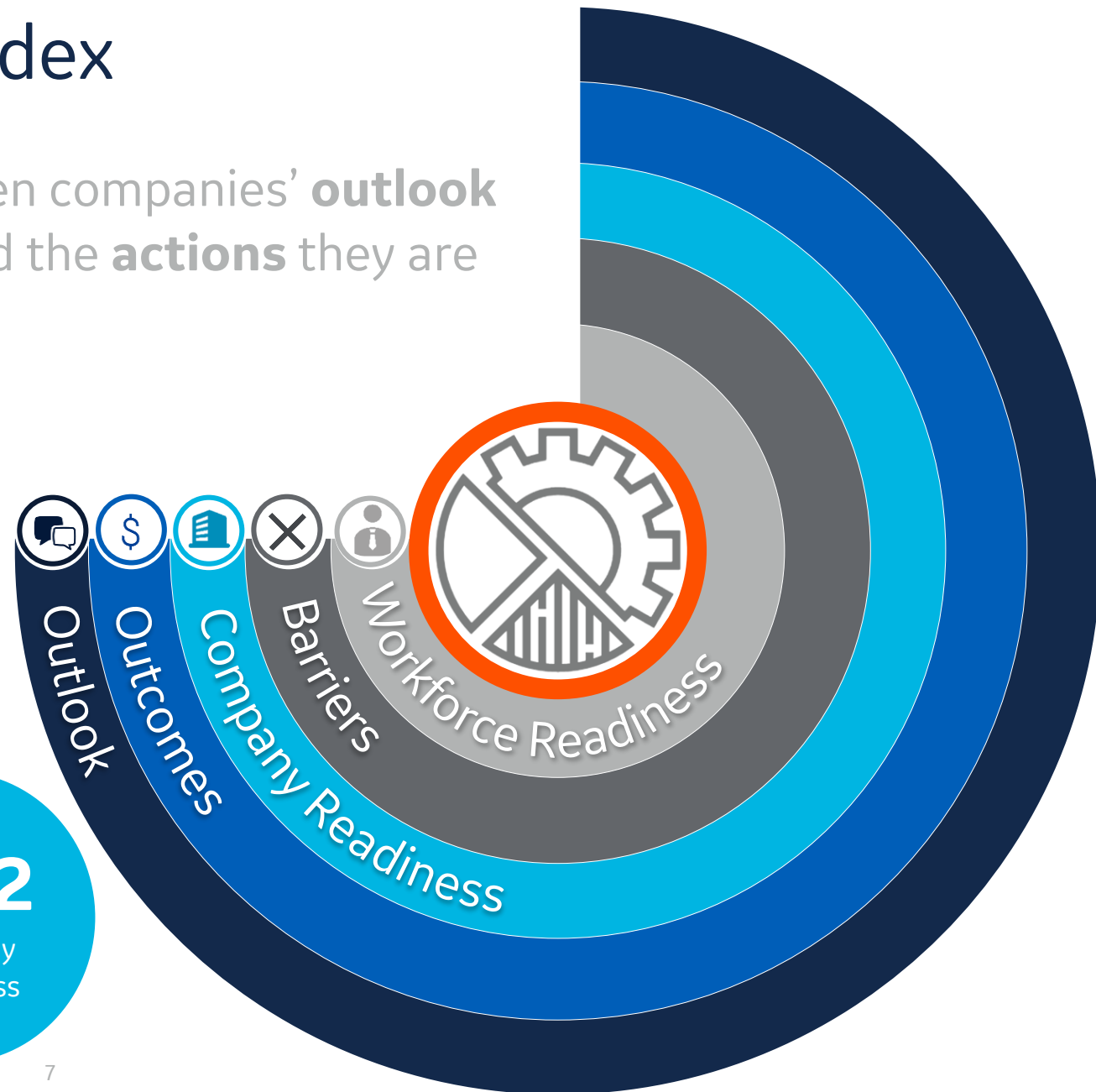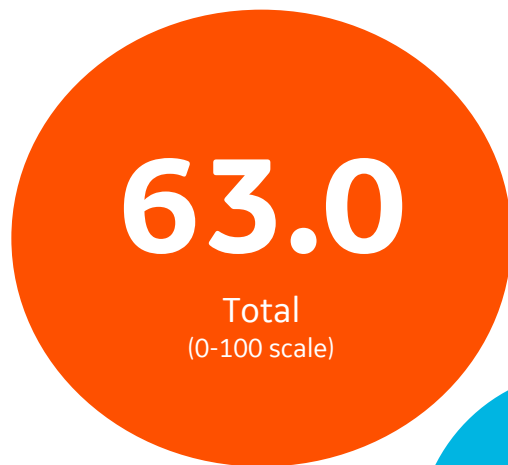The 2017 inaugural Index score at the total level is 63.0.

Closing the gap: Companies **can see** the benefits of IIoT but **are slow to transform**.

The inaugural GE Digital Industrial Evolution Index shows a **large gap** between the **'Outlook'** for the IIoT and **'Company Readiness.'**

The Industrial Evolution Index

Overall, there is a misalignment between companies' **outlook** on Digital Industrial Transformation and the **actions** they are taking to get there.

63.0
Total
(0-100 scale)

78.3
Outlook

63.4
Workforce Readiness

55.2
Company Readiness

Outlook
Outcomes
Company Readiness
Barriers
Workforce Readiness

The Industrial Evolution Index Results

Index results show that while perceptions of IIoT, its potential benefits and the importance of Digital Industrial Transformation are positive, **companies and their workforces are not as ready as they need to be**.

	Overall Index	Outlook	Outcomes	Workforce Readiness	Company Readiness	Barriers
Manufacturing	66.1	81.3	71.5	69.6	57.0	51.0
Aviation/ Aerospace	63.1	76.9	69.9	62.3	57.2	49.2
Power/Energy	63.0	80.1	71.6	61.6	53.2	48.5
Transportation	62.3	78.9	68.8	62.9	54.3	46.6
Utilities	60.7	74.5	63.7	60.8	54.1	50.6
Total	**63.0**	**78.3**	**69.1**	**63.4**	**55.2**	**49.2**

The Evolution of Digital Industrial Transformation

The growing Digital Industrial gap: Few companies have plans in place to take full advantage of 'potentially transformational' IIoT.

Although most ITDMs/OTDMs generally say **IIoT could be 'transformational'** for their company/industry, many say their company is **'gradually embracing'** Digital Industrial Transformation. At what point does gradual become an excuse to remain stagnant?

Evolution of Digital Industrial Transformation

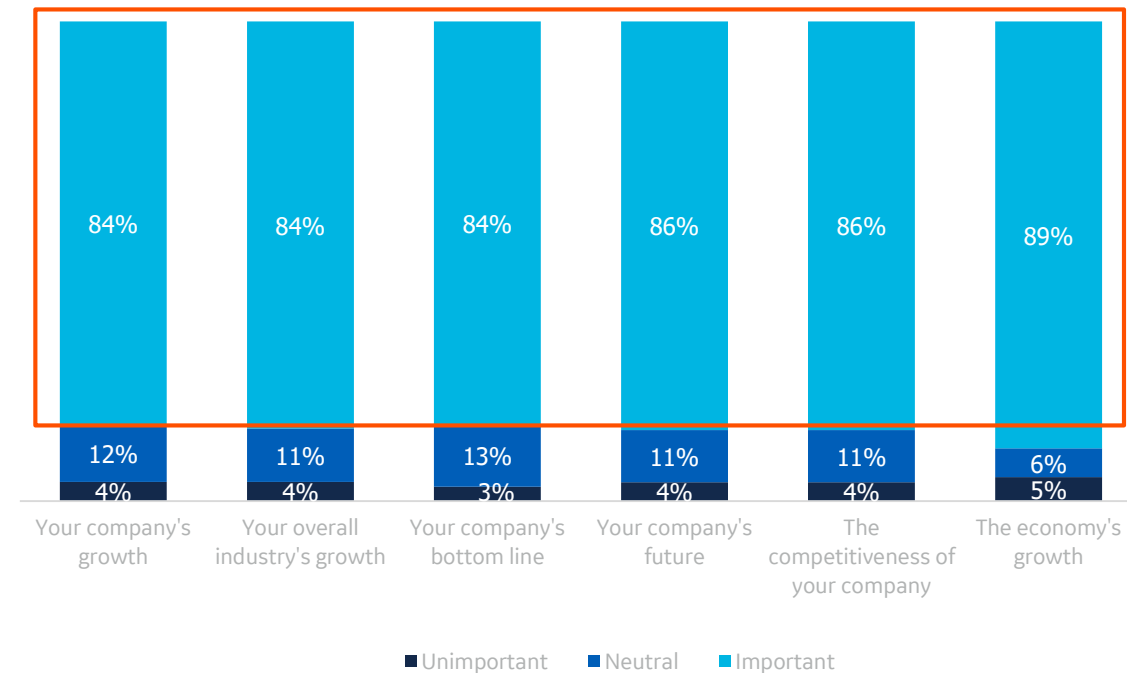The benefits of IIoT and Digital Industrial Transformation are widely recognized among ITDMs/OTDMs.

Top words for IIoT

1. **INDUSTRY-BASED**
2. **INTERNET/WEB**
3. **CONNECTED**
4. **MANUFACTURING**
5. **BUSINESS**

80%

of ITDMs/OTDMs believe the IIoT will, or could be, transformational to their company/industry

Perceived importance of Digital Industrial Transformation

	Your company's growth	Your overall industry's growth	Your company's bottom line	Your company's future	The competitiveness of your company	The economy's growth
Important	84%	84%	84%	86%	86%	89%
Neutral	12%	11%	13%	11%	11%	6%
Unimportant	4%	4%	3%	4%	4%	5%

■ Unimportant ■ Neutral ■ Important

Q3. What are the first words or phrases that come to mind when you hear 'The Industrial Internet of Things (IIoT).'?
Q4. Which of the following best matches your overall opinion of IIoT? (n=223; *Those who are somewhat unfamiliar, somewhat familiar or very familiar with IIoT*)
Q5. How important do you believe Digital Industrial Transformation is for each of the following? (n=250)

Evolution of Digital Industrial Transformation

Providing higher quality services placed in the top three overall and across all industries

*Top ways Digital Industrial Transformation could make things easier for companies:

TOTAL

Provide higher quality services	**76%**
Automate processes	74%
Increase operating efficiency	74%
Increase productivity	74%

Aviation/Aerospace

Provide higher quality services	**80%**
Increase productivity	**80%**
Drive growth	78%

Manufacturing

Automate processes	**84%**
Improve profitability	80%
Provide higher quality services	78%
Drive growth	78%
Increase productivity	78%
Increase operating efficiency	78%

Power/Energy

Increase operating efficiency	**82%**
Provide higher quality services	80%
Eliminate operating downtime	80%
Automate processes	80%
Increase productivity	80%

Transportation

Innovate	**78%**
Provide higher quality services	74%
Automate processes	74%

Utilities

Improve existing business processes	**68%**
Provide higher quality services	66%
Improve workforce performance	66%
Increase operating efficiency	66%

Q11. What type of impact, if any, do you believe Digital Industrial Transformation would have on your company's ability to do each of the following? Would it make it:
(Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)
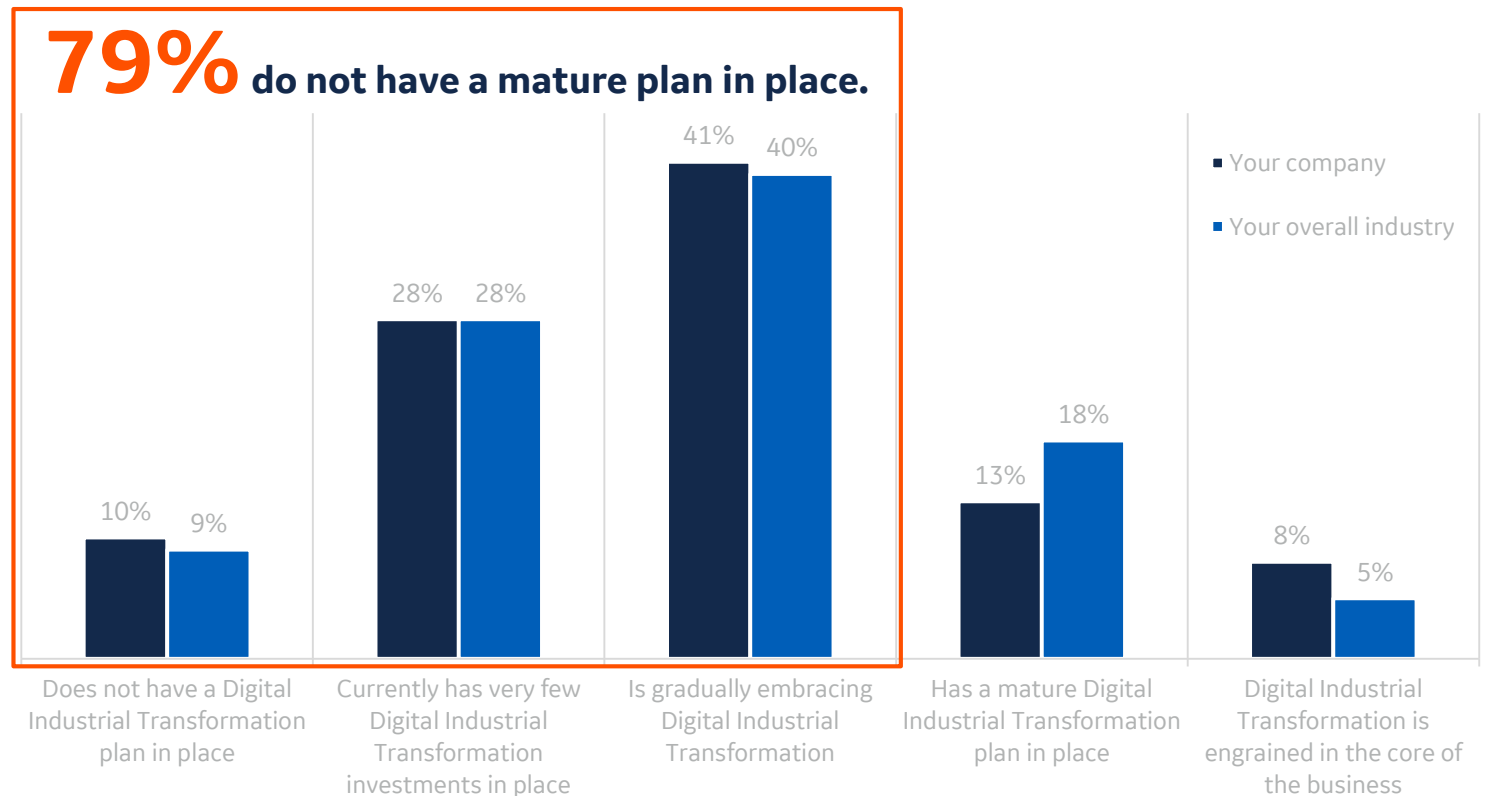
*Top 3 listed unless there is a tie

Evolution of Digital Industrial Transformation

"I think we're still on the precipice of technological transformation and I think there will be additional tools within 5-10 years that will be astounding and compelling."

- CFO, Manufacturing

8

The average number of years IT and Operations Decision Makers think it will take for their overall industry to realize the potential of Digital Industrial Transformation and the IIoT.

79% do not have a mature plan in place.

Legend:
- Your company
- Your overall industry

Chart data:
Category	Your company	Your overall industry
Does not have a Digital Industrial Transformation plan in place	10%	9%
Currently has very few Digital Industrial Transformation investments in place	28%	28%
Is gradually embracing Digital Industrial Transformation	41%	40%
Has a mature Digital Industrial Transformation plan in place	13%	18%
Digital Industrial Transformation is engrained in the core of the business	8%	5%

Evolution of Digital Industrial Transformation
Quotes from Qualitative Interviews

"I think that's ever-evolving. I don't know if we'll ever be at 100%. It's an ever-evolving and ever-changing technology. Whatever is new today in technology might be outdated in the next 2-3 years."

- CIO, Utilities

"It will be a **gradual transformation**, so I envision the five year number being where we've **added a few more [IIoT applications], and by 10 years we are fully integrated** and we have measures on every different aspect from engineering to sales, to creative to maintenance, to every part of our business. I envision every part of our business will be outfitted with an IIoT device that will make us a better company."

- CFO, Manufacturing

"We're [in the] **early days of industrial transformation**…If it's a 100 yard run, maybe we're at the 10 yard line. We're using different pockets of this technology in different places, but we have not adopted a whole broad strategy."
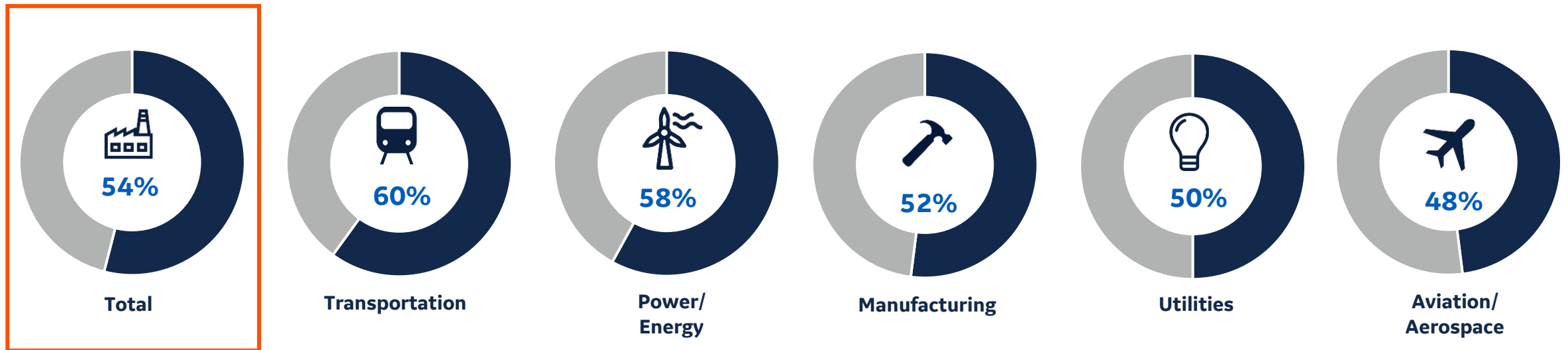
- CIO, Power/Energy

Calling for change: Industries agree that to leverage the potential of the Industrial Internet, **organizational change is critical now**, so why is transformation still so far off?

There is misalignment among what ITDMs/OTDMs say. If **transformation is a gradual process** that could take up to eight years (or longer) to achieve, then why do so many ITDMs/OTDMs believe there is **an urgent need for change in the present**?

Evolution of Digital Industrial Transformation

A majority of ITDMs/OTDMs across industries believe there is a need for change within their company's organizational structure.

54%
Total

60%
Transportation

58%
Power/Energy

52%
Manufacturing

50%
Utilities

48%
Aviation/Aerospace

Evolution of Digital Industrial Transformation

Accessible data can play a role in making organizational change a reality.

66%
Data analysts will need to be integrated into all departments/units

61%
IT functions will need to become part of the central operating function of our company

46%
A Chief Data Officer (CDO) role will need to be created to manage the transformation

228%
Silos created by data gatekeepers will need to be removed

Evolution of Digital Industrial Transformation

Connectivity placed in the top three overall and across all industries

*Top technologies required for a company to digitally transform industrial operations:

TOTAL

Connectivity	**63%**
Enterprise IIoT applications/Industrial applications	**58%**
Cloud computing	56%

Aviation/Aerospace

Connectivity	**64%**
Enterprise IIoT applications/Industrial applications	**62%**
Automation	54%

Manufacturing

Connectivity	**70%**
Cloud computing	66%
Automation	62%

Power/Energy

Enterprise IIoT applications/Industrial applications	**64%**
Connectivity	58%
Automation	56%
Big data analytics	56%

Transportation

Connectivity	**66%**
Cloud computing	56%
Automation	54%

Utilities

Connectivity	**58%**
Enterprise IIoT applications/Industrial applications	**58%**
Cloud computing	54%
Big data analytics	54%

Q6. Which of the following technologies are required for a company to digitally transform industrial operations? Select all that apply.
(Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

*Top 3 listed unless there is a tie

Evolution of Digital Industrial Transformation

While **connectivity is seen as required** for companies to transformation their industrial operations, ITDMs/OTDMs feel **other factors are more important to invest in**:

22%
An IIoT-ready industrial platform

14%
Big data analytics

14%
Enterprise IIoT applications/Industrial applications

Q7. Which of the following technologies is MOST important to invest in for a company to successfully digitally transform? (n=250)

Money matters: ITDMs/OTDMs say they can't see the **finish line** because they are too focused on their **bottom line**.

Despite a clear desire to move forward within companies and wider industries, companies may be unable to transform **due to resources constraints**.

Evolution of Digital Industrial Transformation

"We want to become more efficient but we don't have a lot of money to invest into becoming more efficient." - CIO, Power/Energy

*% of ITDMs/OTDMs who named each as a major barrier to transformation:

TOTAL

Investment costs	**42%**
System security concerns	32%
Data privacy concerns	32%

Aviation/Aerospace

Investment costs	44%
Lack of qualified workforce/necessary skillsets	38%
Operating costs	34%

Manufacturing

Legacy systems/technology	34%
Operating costs	34%
Investment costs	34%

Power/Energy

Legacy systems/technology	42%
Investment costs	40%
System security concerns	40%
Lack of qualified workforce/necessary skillsets	40%

Transportation

Investment costs	54%
Lack of clarity on return on investment (ROI)	44%
Data privacy concerns	38%

Utilities

System security concerns	40%
Investment costs	36%
Lack of clarity on return on investment (ROI)	36%

Q19. To what degree do you consider each of the following to be a barrier to Digital Industrial Transformation? (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

*Top 3 listed unless there is a tie

Evolution of Digital Industrial Transformation
Quotes from Qualitative Interviews

"It's always evolving but you have to look at your technologies and see what's important to you, and **also the bottom line to see what your competitive environment is.** That should be the goal and strategy you have to set forth in your organization."

- CIO, Utilities

"If we talk about IIoT, **asset performance management is probably the way we're going to get the most short-term value** from an IIoT solution. Making sure that we have maintenance reliability and integrity across our assets, that is the short-term big prize for IIoT."

- CIO, Power/Energy

It [IIoT] would impact us across a number of different attributes — lower maintenance costs, higher efficiency, lower safety costs — would all be in there. So we do think **we will see increased revenue and increased efficiency**. It is lowering operating costs because it's reducing unplanned downtime and increasing productivity."

- CIO, Power/Energy

The Industrial Workforce of the Future

Training for the future: The onus is on **individual companies** and **overall industries** to ready the workforce for change.

ITDMs/OTDMs look inward and to their peers to ready the workforce for transformation. However, daily tasks block progress, potentially providing an opportunity for service providers to step in to help facilitate change.
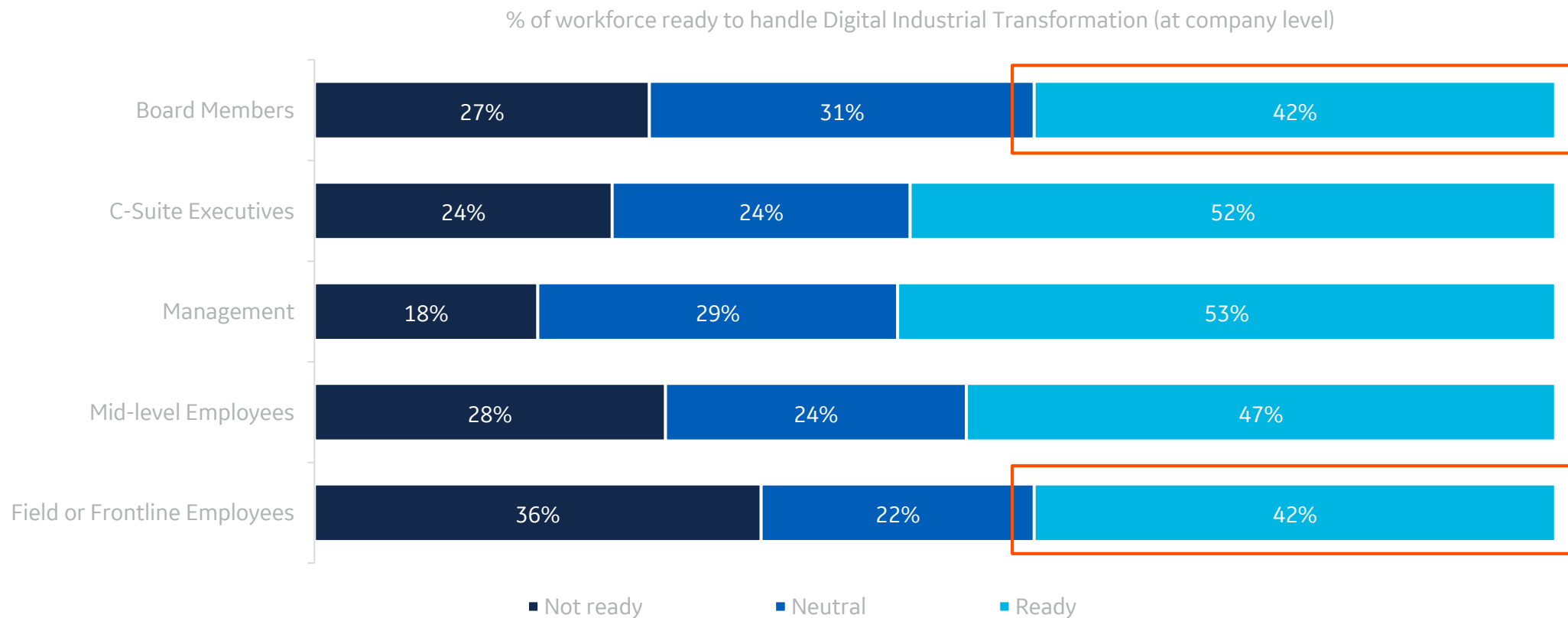
Industrial Workforce of the Future

Over half of ITDMs/OTDMs believe that **individual companies and overall industries are responsible for ensuring the workforce is ready** for the demands of the Industrial Internet.
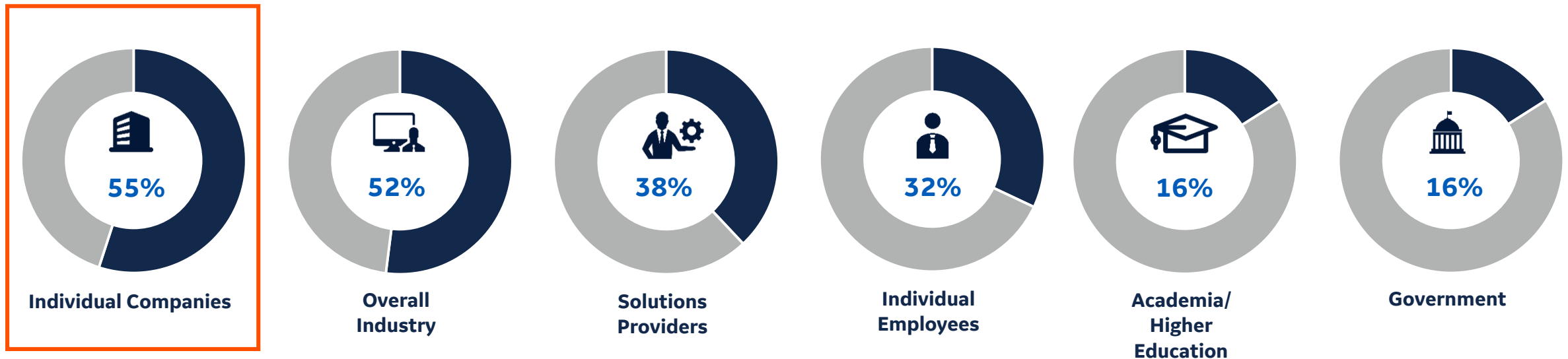
55%

Individual Companies

52%

Overall Industry

38%

Solutions Providers

32%

Individual Employees

16%

Academia/ Higher Education

16%

Government

Q26. Who do you think is responsible for ensuring that the workforce is ready for the demands of the Industrial Internet (IIoT) in your overall industry? (n=250)

Industrial Workforce of the Future

However, ITDMs/OTDMs think that **those at the top and on the frontlines within their own companies are the least ready** to transform.

% of workforce ready to handle Digital Industrial Transformation (at company level)

	Not ready	Neutral	Ready
Board Members	27%	31%	42%
C-Suite Executives	24%	24%	52%
Management	18%	29%	53%
Mid-level Employees	28%	24%	47%
Field or Frontline Employees	36%	22%	42%

■ Not ready   ■ Neutral   ■ Ready

Q22. For each of the following, on a scale of 0-5, where 0 means not ready at all and 5 means very ready, how ready is the workforce (n=250)

Industrial Workforce of the Future

Top skills ITDMs/OTDMs believe that the current workforce has to refine to transform are:
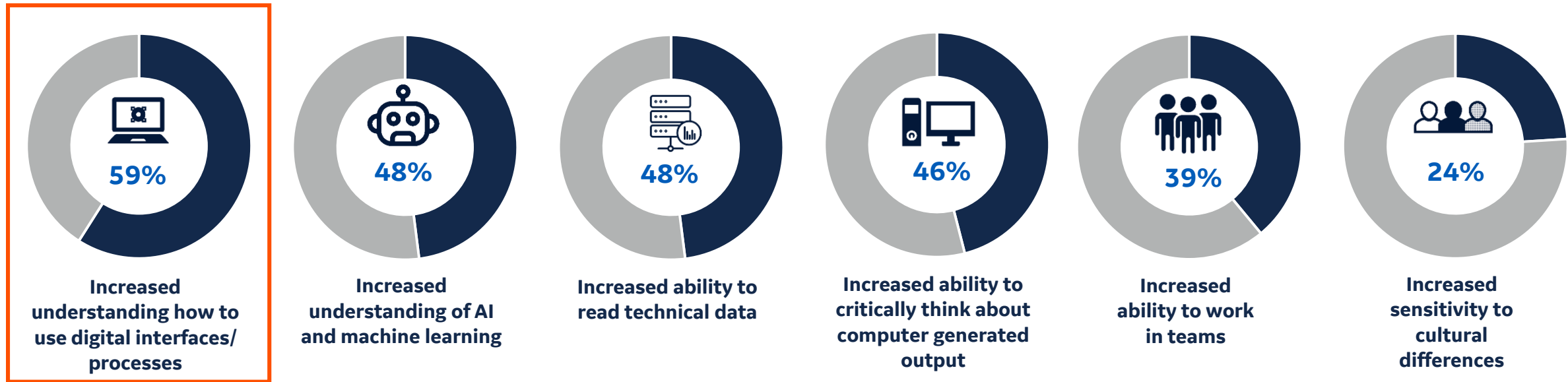
59%

Increased understanding how to use digital interfaces/ processes

48%

Increased understanding of AI and machine learning

48%

Increased ability to read technical data

46%

Increased ability to critically think about computer generated output

39%

Increased ability to work in teams

24%

Increased sensitivity to cultural differences

Q25. As Digital Industrial Transformation changes work processes for the current workforce, which of the following skills will be needed to successfully transition (n=250)

Industrial Workforce of the Future

ITDMs/OTDMs also view expertise in certain areas as critical to stay competitive in the age of Digital Industrial Transformation:
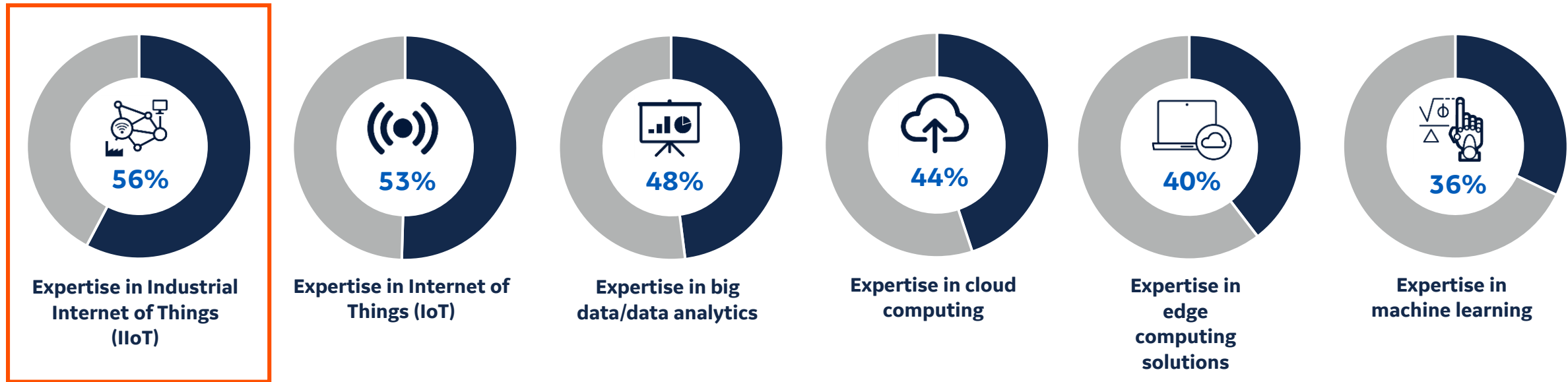
56%

Expertise in Industrial Internet of Things (IIoT)

53%

Expertise in Internet of Things (IoT)

48%

Expertise in big data/data analytics

44%

Expertise in cloud computing

40%

Expertise in edge computing solutions

36%

Expertise in machine learning

Q24. In which of the following skill area(s) does the current workforce need more training to stay competitive in the age of Digital Industrial Transformation? Select all that apply. (n=250)

Industrial Workforce of the Future
Quotes from Qualitative Interviews

"Everyone's job is going to change a little bit, I think that's just the natural evolution of the role. **I think you're going to see jobs are going to change**. Drillers will have to use data differently, make decisions less based on gut instinct and history, and more based on what the data is telling them. So **you're going to have some retooling and some retraining**, particularly at the operator level… More the people in the field **will have to rely more on data and less on their wisdom**."

- CIO, Power/Energy

"**It's on the company themselves to make sure they're ready**. Either be ready or be left behind. I don't think it's the government's place, I don't think it's the industry's place. I think the company is and will be thinking about those things as we mature, and we will have no choice but to embrace these challenges."

- CIO, Power/Energy

Appendix:
Additional Detail

Methodology

Methodology

- In partnership with Ketchum Global Research & Analytics, GE Digital polled 250 ITDMs/OTDMs across the United States and five industries to get their perceptions on Digital Industrial Transformation and the Industrial Internet of Things (IIoT).

  - 50 completes across each of five key industries: Manufacturing, Utilities, Power/Energy, Transportation and Aviation/Aerospace.

- ITDMs/OTDMs are defined as C-suite level IT or Operations professionals (CTO, COO or CIO) OR those who play a significant role in selection and implementation of IT solutions for their company. They are at least partially responsible for purchasing decisions for their company's enterprise IT Solutions.

- The survey was launched on September 20, 2017 and remained in field through October 3, 2017.

- The overall margin of error for this research is 6.2%. When making industry comparisons the margin of error is 13.86%.

- The survey was supplemented with interviews with   one executive from each of the five industries.

Index Methodology

- The GE Digital Industrial Evolution Index shows how close various key industries are to closing the gap between the possibilities and the possible of the Industrial Internet. It does this by measuring the perceptions of ITDMs and OTDMs within these industries across:

    - Attitudes, outcomes, readiness, barriers and behaviors

- This research has also been extended to produce, overall and for each industry, an Index score that compares industries across:

    - Outlooks, outcomes, workforce and company readiness, and barriers

- This Index will be the basis for tracking progress toward achieving Digital Industrial Transformation by highlighting the disconnect between 'outlook' and 'readiness'.

- The overall index and sub-indices are scored from 0-100, with 0 indication a lack of readiness to transform and 100 indicating complete transformation.

- Each component of the index was factor analyzed to ensure that each component of the index is measuring a unique aspect of the Digital Industrial Transformation.

Demographics

Who we surveyed: Demographics

62% of the ITDMs/OTDMs were male

75% have a Bachelor's degree or higher

Most majored in IT or business

Major	%
Information technology (IT)/computer science	42%
Business	24%
Engineering	15%
Life science	3%
Other	2%
Physical science	2%
Mathematics/statistics	2%
Legal/law	2%
Education/teaching	2%
Communications/marketing	2%
Art/design	1%

- Millennials (18-34 y/o) — 31%
- Generation X (35-54 y/o) — 56%
- Baby Boomers (55+ y/o) — 13%
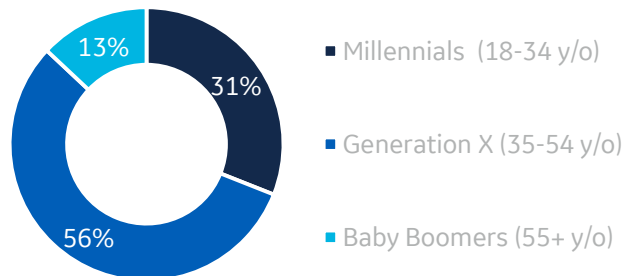
QS1. Please enter your age. (n=250); QS2. Please indicate your gender. (n=250); QD2. What is the highest level of education you have completed? (n=250); QD3. In which area did you receive your Associate's or Bachelor's degree? (Total: n=236; Aviation/Aerospace: n=46; Manufacturing: n=49; Transportation: n=44; Utilities: n=49; Power/energy: n=48))

Who we surveyed: Workplace landscape

Company size

- 23%
- 22%
- 16%
- 8%
- 11%
- 19%

- 5,000+ employees
- 1,000 - 4,999 employees
- 500 - 999 employees
- 250 - 499 employees
- 100 - 249 employees
- Less than 100 employees

Company revenue

- 10%
- 20%
- 13%
- 20%
- 37%
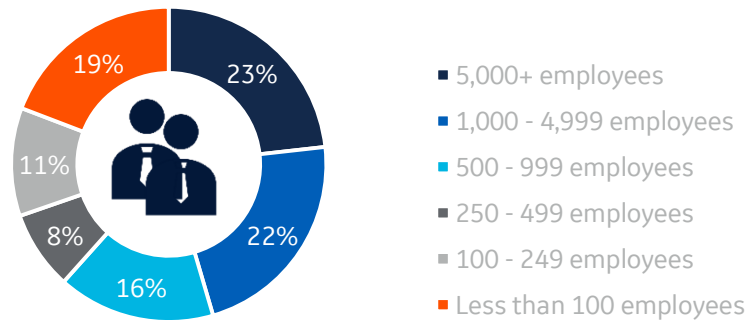
- $5 billion+ in revenue
- $1 - $4.9 billion in revenue
- $500 - $999 million in revenue
- $150 - $499 million in revenue
- Less than $150 million in revenue
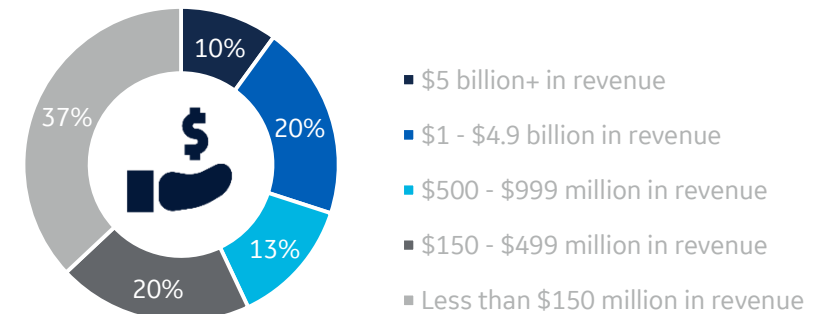
Length of time with current employer
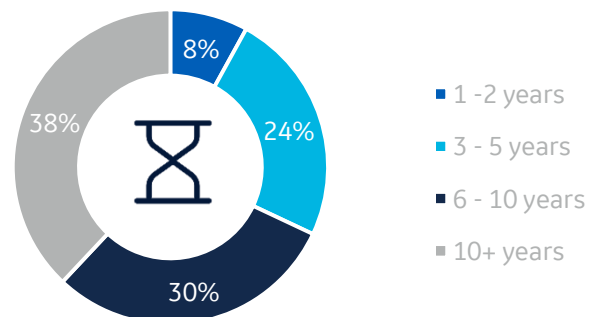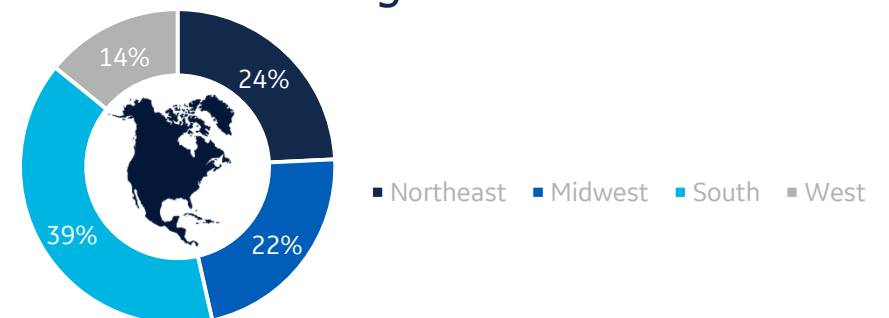
- 8%
- 24%
- 30%
- 38%

- 1 -2 years
- 3 - 5 years
- 6 - 10 years
- 10+ years

Region

- 24%
- 22%
- 39%
- 14%

- Northeast
- Midwest
- South
- West

37

Attitudes

Attitudes
Familiarity with **Industrial Internet of Things by Industry**

Familiarity with Industrial Internet of Things by Industry

Industry	Very familiar	Somewhat familiar	Somewhat unfamiliar	Not familiar at all
Total	39%	35%	15%	11%
Manufacturing	46%	28%	16%	10%
Power/Energy	42%	36%	10%	12%
Transportation	40%	32%	14%	14%
Utilities	36%	42%	20%	2%
Aviation/Aerospace	30%	38%	16%	16%

■ Very familiar ■ Somewhat familiar ■ Somewhat unfamiliar ■ Not familiar at all
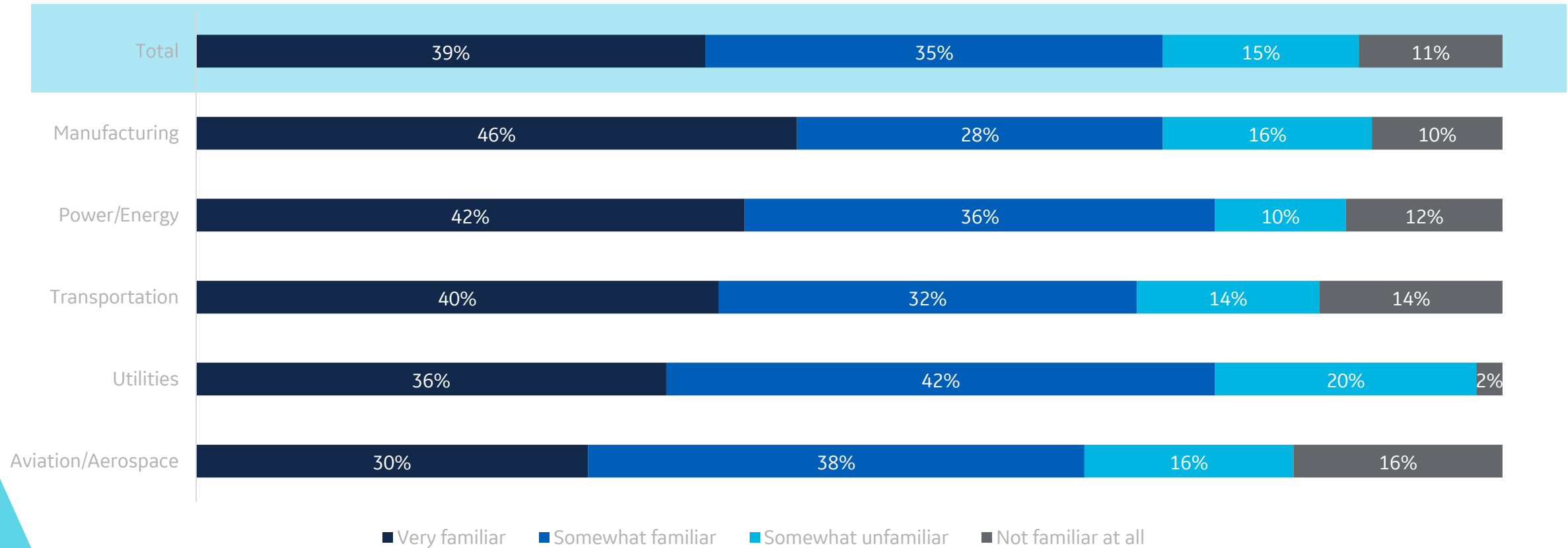
Q1. How familiar would you say you are with each of the following? (Total n=250; Utilities n=50; Transportation n=50; Power/Energy n=50; Manufacturing n=50; Aviation/Aerospace n=50)

Opinions of IIOT

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Reduced base: Those who are somewhat unfamiliar, somewhat familiar or very familiar with IIoT	n=223	n=42	n=45	n=44	n=43	n=49
IIOT will be transformational to my company and industry	48%	50%	53%	43%	51%	41%
IIOT could be transformational to my company and industry, but the science/technology is not there yet	32%	38%	31%	39%	28%	27%
IIOT will improve but not transform my company and industry	16%	7%	13%	14%	14%	**29%**
IIOT will not have any significant effect on my company or industry	4%	5%	2%	5%	7%	4%

Blue indicates a significant difference from the average
Please note: Due to rounding, totals may not add up to 100%

Q4. Which of the following best matches your overall opinion of IIoT?

Attitudes
Importance of Digital Industrial Transformation for each of the following:

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	n=250	n=50	n=50	n=50	n=50	n=50
The economy's growth	89%	88%	90%	92%	**96%**	80%
Your company's future	86%	86%	92%	86%	90%	74%
The competitiveness of your company	86%	88%	92%	88%	90%	70%
Your company's growth	84%	78%	**94%**	84%	86%	80%
Your overall industry's growth	84%	84%	88%	78%	**94%**	78%
Your company's bottom line	84%	80%	**94%**	80%	**92%**	76%

Blue indicates a significant difference from the average

Q5. How important do you believe Digital Industrial Transformation is for each of the following?

Technologies Required for a Company to Digitally Transform:

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	*n=250*	*n=50*	*n=50*	*n=50*	*n=50*	*n=50*
Connectivity	63%	64%	70%	58%	66%	58%
Enterprise IIoT applications/Industrial applications	58%	62%	56%	64%	50%	58%
Cloud computing	56%	52%	66%	52%	56%	54%
Automation	53%	54%	62%	56%	54%	38%
Big data analytics	52%	48%	56%	56%	48%	54%
An IIoT-ready industrial platform	49%	52%	48%	54%	40%	52%
AI and machine learning	38%	44%	30%	48%	30%	38%
Vertical-specific IIoT applications	38%	40%	40%	34%	32%	42%
Edge computing/analytics	36%	38%	34%	28%	34%	48%

Q6. Which of the following technologies are required for a company to digitally transform industrial operations? Select all that apply.

Attitudes
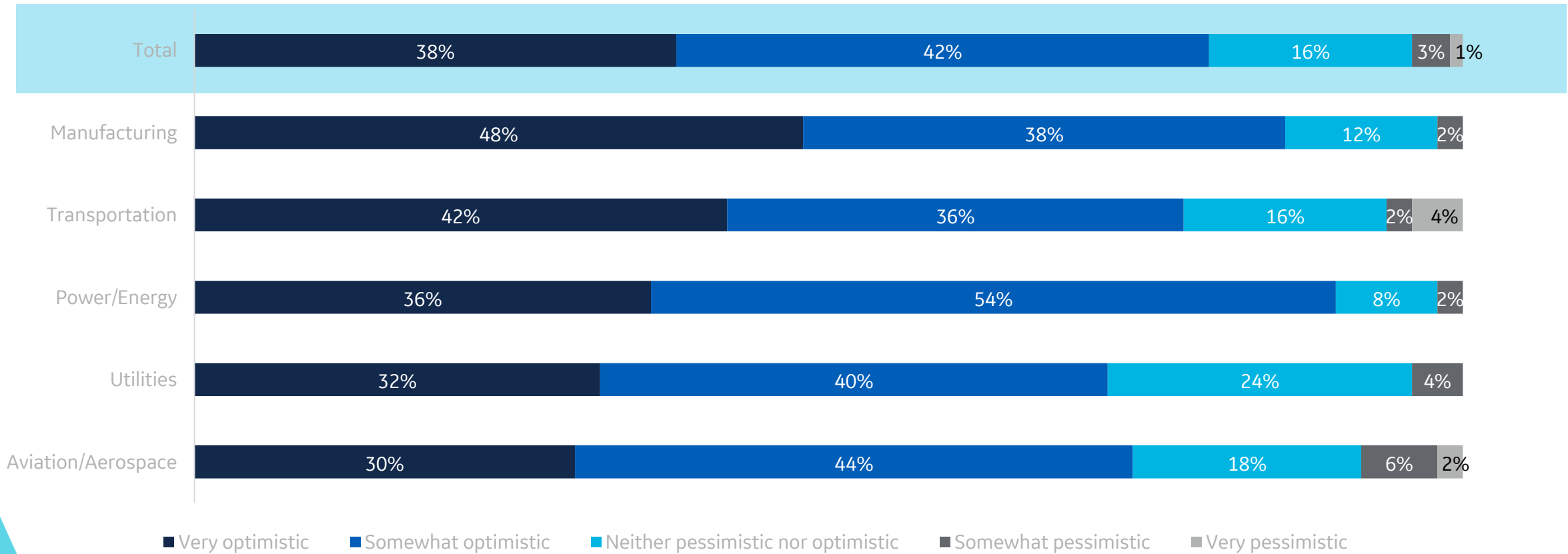## Technologies Important for a Company to Digitally Transform:

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	n=250	n=50	n=50	n=50	n=50	n=50
An IIoT-ready industrial platform	22%	30%	18%	22%	16%	26%
Big data analytics	14%	10%	12%	14%	16%	16%
Enterprise IIoT applications/Industrial applications	14%	12%	10%	12%	14%	20%
AI and machine learning	12%	8%	12%	18%	10%	10%
Automation	11%	10%	18%	4%	16%	6%
Cloud computing	10%	12%	14%	4%	14%	6%
Connectivity	9%	10%	10%	10%	8%	6%
Edge computing/analytics	4%	4%	4%	8%	2%	4%
Vertical-specific IIoT applications	2%	2%	0%	4%	2%	2%

Q7. Which of the following technologies is MOST important to invest in for a company to successfully digitally transform?

Digital Industrial Transformation: Feelings on **Benefits for Company**
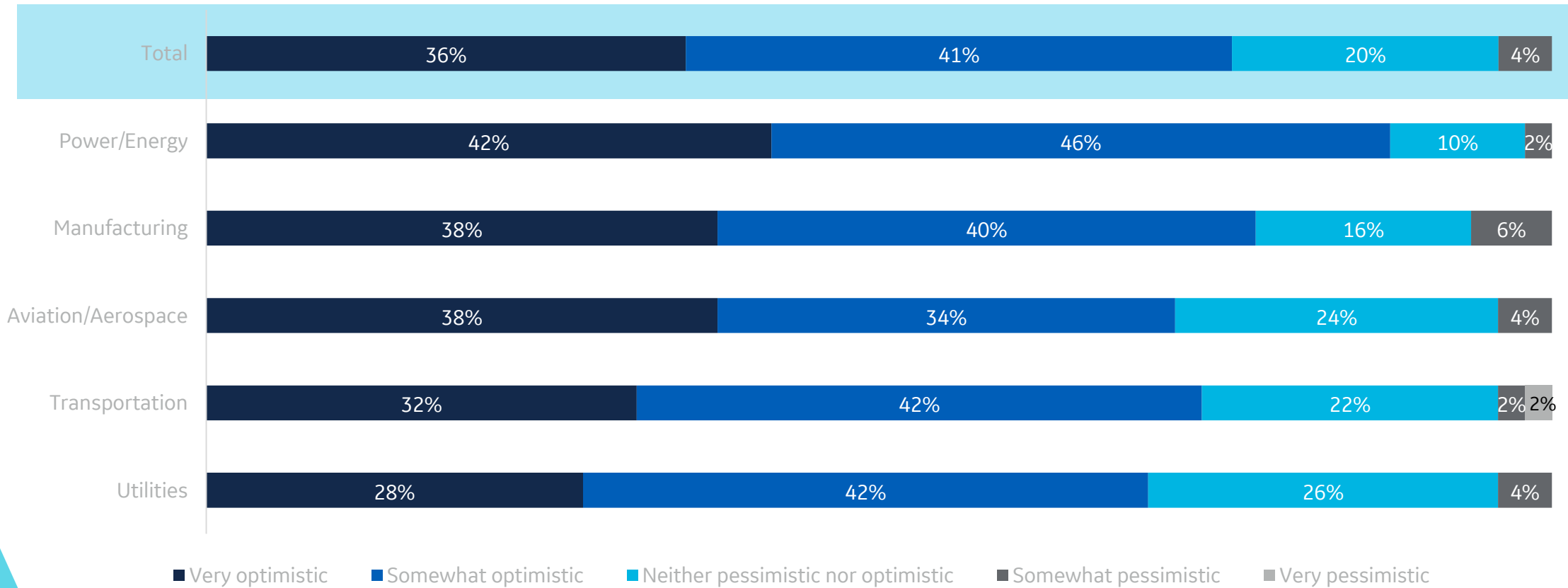
Feelings on Benefits for Company

	Very optimistic	Somewhat optimistic	Neither pessimistic nor optimistic	Somewhat pessimistic	Very pessimistic
Total	38%	42%	16%	3%	1%
Manufacturing	48%	38%	12%	2%	
Transportation	42%	36%	16%	2%	4%
Power/Energy	36%	54%	8%	2%	
Utilities	32%	40%	24%	4%	
Aviation/Aerospace	30%	44%	18%	6%	2%

■ Very optimistic ■ Somewhat optimistic ■ Neither pessimistic nor optimistic ■ Somewhat pessimistic ■ Very pessimistic

Q8a. How optimistic are you that the Digital Industrial Transformation will benefit your company? (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

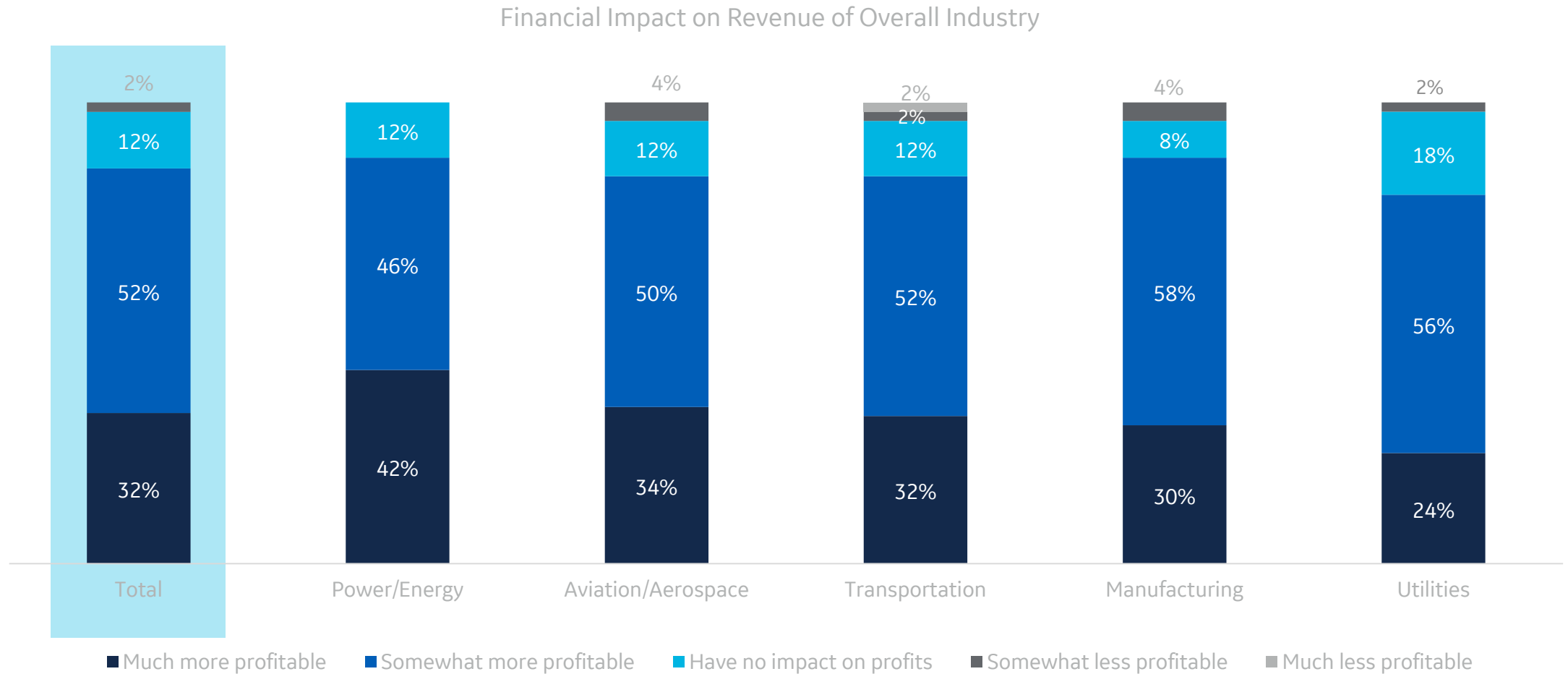# Digital Industrial Transformation: Feelings on **Benefits for Overall Industry**

Feelings on Benefits for Overall Industry

Industry	Very optimistic	Somewhat optimistic	Neither pessimistic nor optimistic	Somewhat pessimistic	Very pessimistic
Total	36%	41%	20%	4%	
Power/Energy	42%	46%	10%	2%	
Manufacturing	38%	40%	16%	6%	
Aviation/Aerospace	38%	34%	24%	4%	
Transportation	32%	42%	22%	2%	2%
Utilities	28%	42%	26%	4%	

■ Very optimistic ■ Somewhat optimistic ■ Neither pessimistic nor optimistic ■ Somewhat pessimistic ■ Very pessimistic

Q8b. How optimistic are you that the Digital Industrial Transformation will benefit the overall industry? (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

45

Please note: Due to rounding, totals may not add up to 100%

Outcomes

Financial Impact of Digital Industrial Transformation on **Revenue of Company**

Financial Impact on Revenue of Company

	Total	Transportation	Power/Energy	Manufacturing	Utilities	Aviation/Aerospace
Somewhat less profitable	2%	4%	2%	4%	2%	
Have no impact on profits	13%	12%	10%	4%	18%	20%
Somewhat more profitable	56%	52%	56%	64%	54%	56%
Much more profitable	28%	32%	32%	28%	26%	24%

■ Much more profitable ■ Somewhat more profitable ■ Have no impact on profits ■ Somewhat less profitable ■ Much less profitable

Q9. What financial impact, if any, do you believe Digital Industrial Transformation would have on revenues for each of the following? Would it make it… (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

47

Financial Impact of Digital Industrial Transformation on **Revenue of Overall Industry**

Financial Impact on Revenue of Overall Industry

	Much more profitable	Somewhat more profitable	Have no impact on profits	Somewhat less profitable	Much less profitable
Total	32%	52%	12%		2%
Power/Energy	42%	46%	12%		
Aviation/Aerospace	34%	50%	12%	4%	
Transportation	32%	52%	12%	2%	2%
Manufacturing	30%	58%	8%	4%	
Utilities	24%	56%	18%		2%

Q9. What financial impact, if any, do you believe Digital Industrial Transformation would have on revenues for each of the following? Would it make it... (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

Financial Impact of Digital Industrial Transformation on **Operating Costs of Company**

Financial Impact on Operating Costs of Company
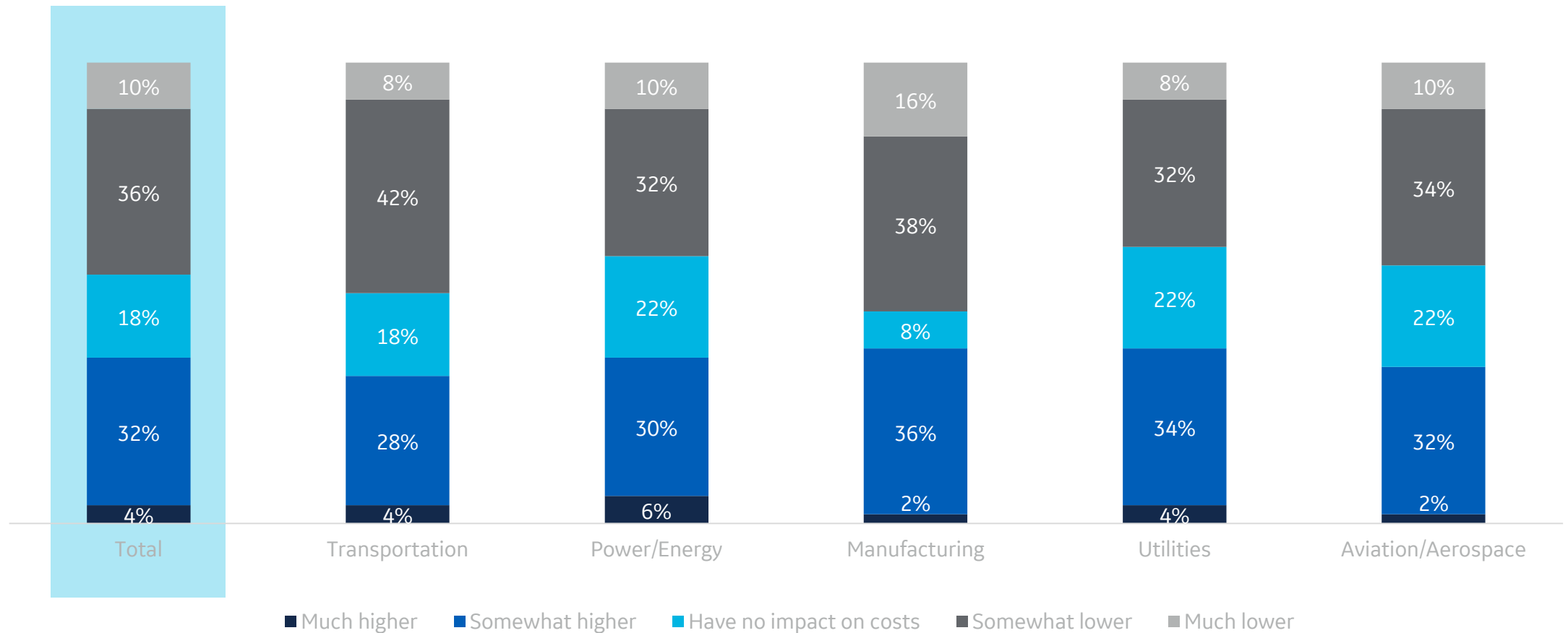
	Total	Transportation	Power/Energy	Manufacturing	Utilities	Aviation/Aerospace
Much lower	10%	8%	10%	16%	8%	10%
Somewhat lower	36%	42%	32%	38%	32%	34%
Have no impact on costs	18%	18%	22%	8%	22%	22%
Somewhat higher	32%	28%	30%	36%	34%	32%
Much higher	4%	4%	6%	2%	4%	2%

■ Much higher ■ Somewhat higher ■ Have no impact on costs ■ Somewhat lower ■ Much lower

Q10. What financial impact, if any, do you believe Digital Industrial Transformation would have on operating cost for each of the following? Would it make each: (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

Outcomes

Financial Impact of Digital Industrial Transformation on **Operating Costs of Overall Industry**

Financial Impact on Operating Costs of Overall Industry

	Total	Power/Energy	Aviation/Aerospace	Transportation	Manufacturing	Utilities
Much lower	11%	12%	10%	8%	20%	6%
Somewhat lower	32%	28%	36%	34%	30%	32%
Have no impact on costs	18%	22%	10%	22%	8%	30%
Somewhat higher	32%	28%	40%	26%	42%	24%
Much higher	6%	10%	4%	10%	—	8%

■ Much higher   ■ Somewhat higher   ■ Have no impact on costs   ■ Somewhat lower   ■ Much lower

Q10. What financial impact, if any, do you believe Digital Industrial Transformation would have on operating cost for each of the following? Would it make each: (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

50

Digital Industrial Transformation Would Make it Easier for Companies to…

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	*n=250*	*n=50*	*n=50*	*n=50*	*n=50*	*n=50*
Provide higher quality services	76%	80%	78%	80%	74%	66%
Increase operating efficiency	74%	72%	78%	82%	72%	66%
Increase productivity	74%	80%	78%	80%	70%	60%
Automate processes	74%	74%	**84%**	80%	74%	56%
Improve existing business processes	71%	72%	74%	72%	68%	68%
Innovate	70%	68%	76%	72%	78%	54%
Improve workforce performance	69%	66%	68%	74%	70%	66%
Drive growth	69%	78%	78%	74%	70%	46%
Improve profitability	67%	60%	**80%**	76%	64%	56%
Eliminate operating downtime	66%	60%	74%	**80%**	66%	52%
Create new lines of business/revenue streams	64%	70%	66%	64%	72%	48%
Create new business models	64%	68%	72%	62%	68%	48%
Provide higher quality products	64%	56%	74%	**76%**	56%	56%
Reduce operating costs	63%	64%	64%	64%	72%	50%
Improve operational/personnel safety	62%	54%	72%	**76%**	56%	54%

Q11. What type of impact, if any, do you believe Digital Industrial Transformation would have on your company's ability to do each of the following? Would it make it:

Blue indicates a significant difference from the average

Readiness

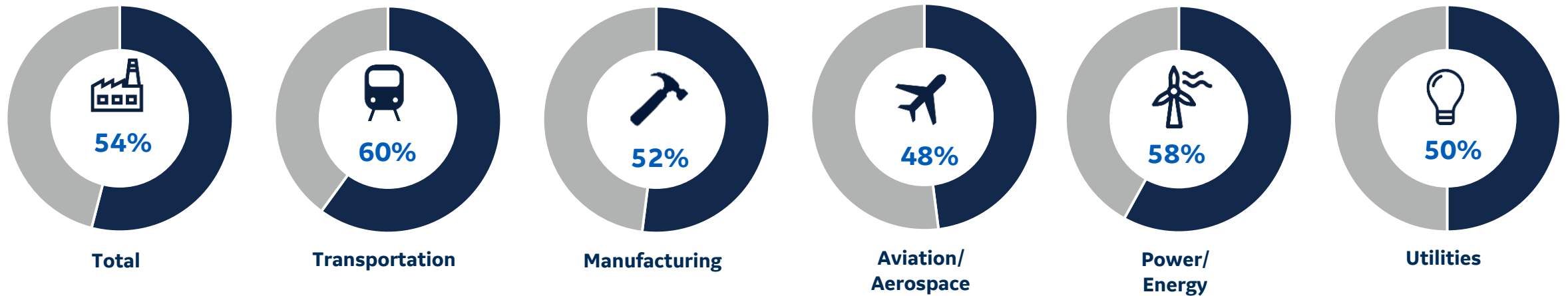# **Company's** State of Digital Industrial Transformation

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	*n=250*	*n=50*	*n=50*	*n=50*	*n=50*	*n=50*
Is gradually embracing digital industrial transformation	41%	34%	48%	48%	30%	44%
Currently has very few digital industrial transformation investments in place	28%	38%	20%	30%	34%	16%
Has a mature digital industrial transformation plan in place	13%	14%	10%	10%	22%	10%
Does not have a digital industrial transformation plan in place	10%	10%	8%	8%	10%	16%
Digital industrial transformation is engrained in the core of the business	8%	4%	14%	4%	4%	14%

Q14a. Please indicate where your company is in terms of Digital Industrial Transformation?

Industry's State of Digital Industrial Transformation

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	*n=250*	*n=50*	*n=50*	*n=50*	*n=50*	*n=50*
Is gradually embracing digital industrial transformation	40%	40%	38%	44%	30%	46%
Currently has very few digital industrial transformation investments in place	28%	28%	26%	32%	38%	16%
Has a mature digital industrial transformation plan in place	18%	18%	20%	12%	22%	18%
Does not have a digital industrial transformation plan in place	9%	8%	6%	10%	8%	14%
Digital industrial transformation is engrained in the core of the business	5%	6%	10%	2%	2%	6%

Q14b. Please indicate where your overall industry is in terms of Digital Industrial Transformation?

Company's Organizational Structure Needs to Change to Achieve Digital Industrial Transformation

54%
Total

60%
Transportation

52%
Manufacturing

48%
Aviation/ Aerospace

58%
Power/ Energy

50%
Utilities

Q17. Does your company's organizational structure need to change in order to achieve Digital Industrial Transformation? (Total n=250; Manufacturing n=50; Aviation/Aerospace n=50; Transportation n=50; Utilities n=50; Power/Energy n=50)

Ways in Which the Organization Will Need to Change

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Reduced base: Those whose organizational structure needs to change in order to achieve Digital Industrial Transformation	*n=134*	*n=24*	*n=26*	*n=29*	*n=30*	*n=25*
Data analysts will need to be integrated into all departments/units	66%	67%	77%	76%	53%	56%
IT functions will need to become part of the central operating function of our company	61%	58%	50%	66%	63%	68%
A Chief Data Officer (CDO) role will need to be created to manage the transformation	46%	42%	50%	55%	40%	40%
Silos created by data gatekeepers will need to be removed	28%	42%	23%	17%	37%	20%
Other	1%	4%	n/a	n/a	3%	n/a

Q18. In what ways will the organization need to change? Please select all that apply.

Barriers

Barriers
Perceived as **Major** Barriers

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	*n=250*	*n=50*	*n=50*	*n=50*	*n=50*	*n=50*
Investment costs	42%	44%	34%	40%	**54%**	36%
System security concerns	32%	24%	28%	40%	28%	40%
Data privacy concerns	32%	24%	26%	36%	38%	34%
Operating costs	31%	34%	34%	26%	34%	26%
Legacy systems/technology	31%	30%	34%	42%	22%	28%
Lack of clarity on return on investment (ROI)	30%	28%	18%	26%	**44%**	36%
Lack of qualified workforce/necessary skillsets	30%	38%	28%	40%	28%	16%
Competing priorities	29%	30%	30%	30%	32%	22%
Lack of executive buy-in	26%	28%	26%	32%	22%	22%
Government/government agency regulations	26%	22%	24%	32%	24%	26%
Workforce impact	21%	16%	26%	22%	26%	16%
Political climate	16%	12%	8%	**30%**	16%	16%
Potential damage to brand image/reputation	15%	8%	10%	16%	20%	22%

Q19a. To what degree do you consider each of the following to be a barrier to Digital Industrial Transformation?

Blue indicates a significant difference from the average
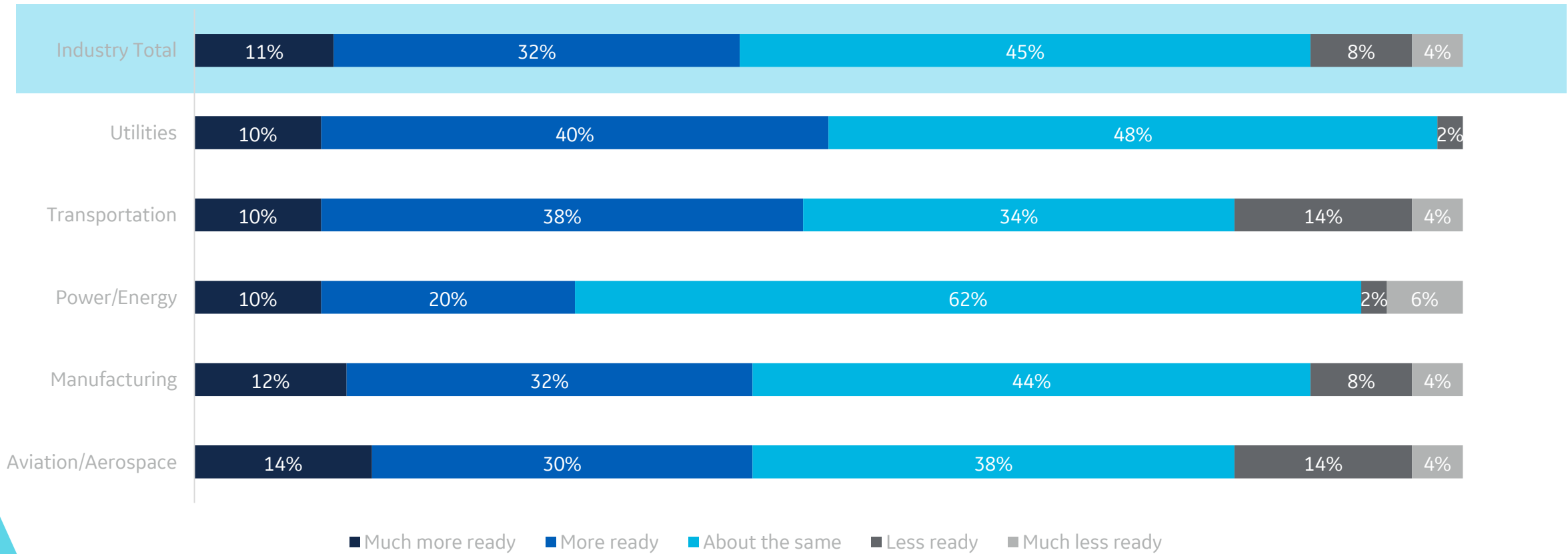
58

Barriers
Not Perceived as Barriers **at all**

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	*n=250*	*n=50*	*n=50*	*n=50*	*n=50*	*n=50*
Potential damage to brand image/reputation	46%	48%	40%	50%	40%	50%
Political climate	42%	44%	50%	34%	44%	38%
Workforce impact	28%	22%	26%	38%	20%	34%
Lack of executive buy-in	28%	24%	36%	28%	20%	32%
Government/government agency regulations	28%	28%	30%	34%	24%	22%
Lack of qualified workforce/necessary skillsets	24%	16%	22%	28%	20%	32%
Data privacy concerns	24%	26%	26%	26%	22%	20%
Legacy systems/technology	23%	18%	20%	28%	26%	24%
Lack of clarity on return on investment (ROI)	23%	24%	32%	26%	18%	16%
Competing priorities	22%	20%	20%	28%	20%	24%
System security concerns	20%	16%	22%	22%	14%	26%
Operating costs	18%	14%	14%	20%	22%	22%
Investment costs	14%	18%	14%	12%	10%	16%

Q19c. To what degree do you consider each of the following to be a barrier to Digital Industrial Transformation?

Readiness to Handle Digital Industrial Transformation

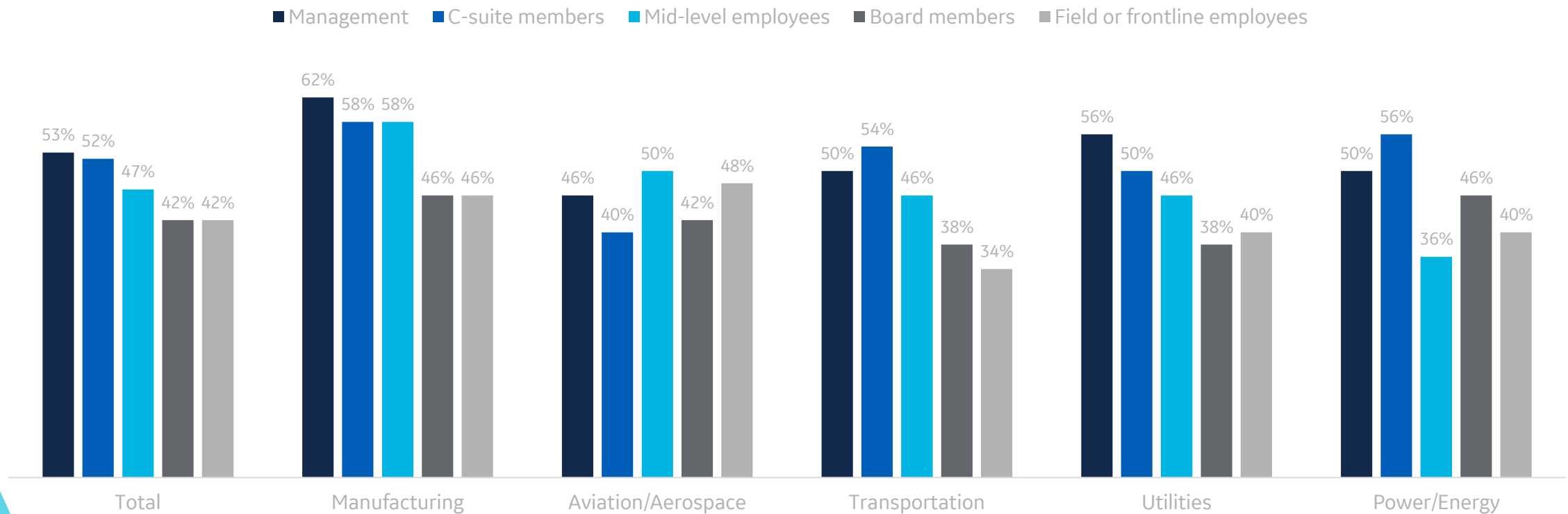## Readiness to Handle Digital Industrial Transformation by Industry

Industry	Much more ready	More ready	About the same	Less ready	Much less ready
Industry Total	11%	32%	45%	8%	4%
Utilities	10%	40%	48%		2%
Transportation	10%	38%	34%	14%	4%
Power/Energy	10%	20%	62%	2%	6%
Manufacturing	12%	32%	44%	8%	4%
Aviation/Aerospace	14%	30%	38%	14%	4%

■ Much more ready ■ More ready ■ About the same ■ Less ready ■ Much less ready

Q21. Is your company more or less ready than your competitors to handle Digital Industrial Transformation? (Total n=250; Utilities n=50; Transportation n=50; Power/Energy n=50; Manufacturing n=50; Aviation/Aerospace n=50)

Readiness of Workforce to Handle Digital Industrial Transformation in **Your Company**

Readiness of Workforce to Handle Digital Industrial Transformation in **Company** by Industry
(T2B: 4-5 on a 5-point scale)

■ Management   ■ C-suite members   ■ Mid-level employees   ■ Board members   ■ Field or frontline employees

Q22a. For each of the following, on a scale of 0-5, where 0 means not ready at all and 5 means very ready, how ready is the workforce to handle Digital Industrial Transformation? (Total n=250; Utilities n=50; Transportation n=50; Power/Energy n=50; Manufacturing n=50; Aviation/Aerospace n=50)

Barriers

Readiness of Workforce to Handle Digital Industrial Transformation in **The Overall Industry**

Readiness of Workforce to Handle Digital Industrial Transformation in **Overall Industry**
(T2B: 4-5 on a 5-point scale)

■ Management ■ C-suite members ■ Mid-level employees ■ Board members ■ Field or frontline employees

	Total	Manufacturing	Aviation/Aerospace	Transportation	Utilities	Power/Energy
Management	46%	60%	42%	38%	42%	46%
C-suite members	45%	54%	34%	46%	44%	46%
Mid-level employees	44%	54%	46%	42%	42%	36%
Board members	44%	50%	36%	46%	40%	46%
Field or frontline employees	42%	48%	46%	32%	42%	42%
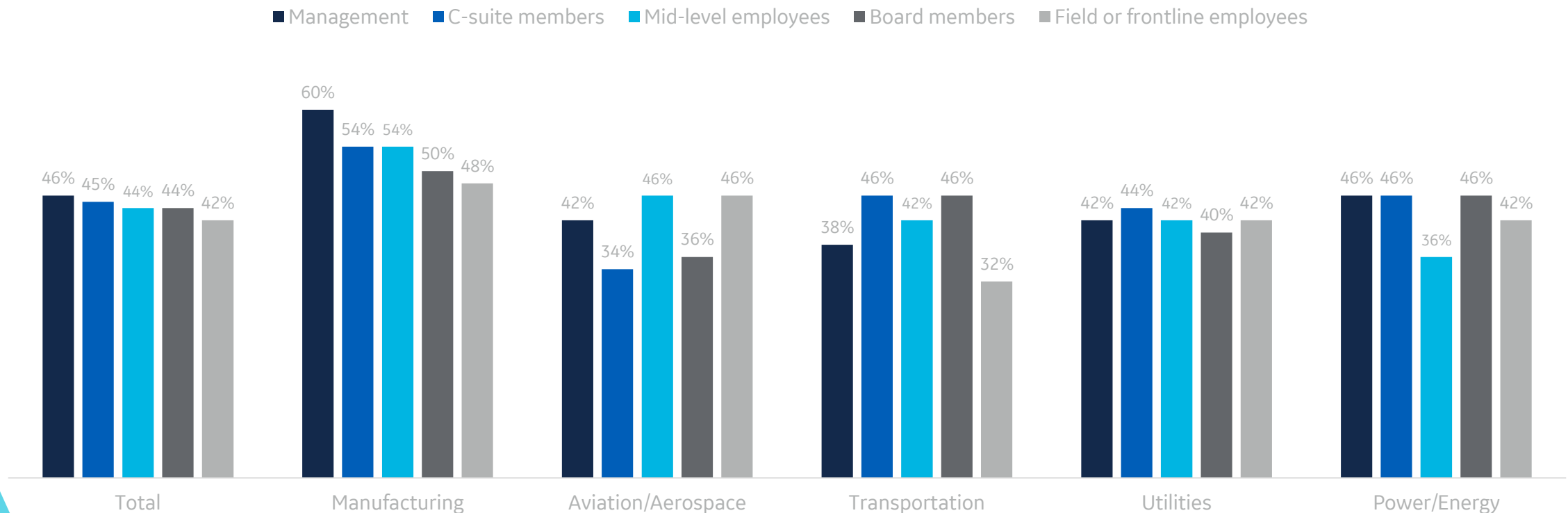
Q22b. For each of the following, on a scale of 0-5, where 0 means not ready at all and 5 means very ready, how ready is the workforce to handle Digital Industrial Transformation? (Total n=250; Utilities n=50; Transportation n=50; Power/Energy n=50; Manufacturing n=50; Aviation/Aerospace n=50)

62

Behaviors

Skills Needed to Stay Competitive in Age of Digital Industrial Transformation

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	n=250	n=50	n=50	n=50	n=50	n=50
Expertise in Industrial Internet of Things (IIoT)	56%	60%	56%	54%	62%	50%
Expertise in Internet of Things (IoT)	53%	54%	58%	46%	48%	58%
Expertise in big data/data analytics	48%	52%	58%	38%	46%	44%
Expertise in cloud computing	44%	52%	50%	46%	34%	40%
Expertise in edge computing solutions	40%	42%	44%	36%	40%	36%
Expertise in machine learning	36%	42%	32%	40%	36%	28%

Q24. In which of the following skill area(s) does the current workforce need more training to stay competitive in the age of Digital Industrial Transformation? Select all that apply.

Skills Needed to Successfully Transition to Digital Industrial Transformation

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	n=250	n=50	n=50	n=50	n=50	n=50
Increased understanding how to use digital interfaces/processes	59%	58%	64%	60%	64%	48%
Increased understanding of AI & machine learning	48%	52%	46%	54%	44%	42%
Increased ability to read technical data	48%	46%	50%	38%	**62%**	42%
Increased ability to critically think about computer generated output	46%	52%	50%	44%	40%	44%
Increased ability to work in teams	39%	46%	32%	40%	42%	36%
Increased sensitivity to cultural differences	24%	22%	18%	20%	26%	32%
None of these	4%	0%	4%	4%	2%	8%

Blue indicates a significant difference from the average

Q25. As Digital Industrial Transformation changes work processes for the current workforce, which of the following skills will be needed to successfully transition? Select all that apply.

Responsible to Get Workforce Ready for Demands of Industrial Internet of Things in Overall Industry

	Total	Aviation/ Aerospace	Manufacturing	Power/Energy	Transportation	Utilities
Base size	n=250	n=50	n=50	n=50	n=50	n=50
Individual companies	55%	54%	54%	54%	56%	56%
Overall industry	52%	60%	46%	56%	42%	58%
Solutions providers	38%	42%	34%	40%	40%	36%
Individual employees	32%	30%	36%	38%	26%	32%
Academia/Higher Education	16%	18%	12%	18%	16%	18%
Government	16%	18%	8%	18%	14%	22%
None of these	3%	0%	4%	4%	4%	4%

Q26. Who do you think is responsible for ensuring that the workforce is ready for the demands of the Industrial Internet of Things (IIoT) in your overall industry? Select all that apply.

GE Digital
Industrial Evolution Index

Executive Summary

October 2017