MIT Machine Intelligence for Manufacturing and Operations

Machine Intelligence for Manufacturing & Operations

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MIMO.MIT.EDU


Finding the shortest
path from data to impact
Machine Intelligence for
Manufacturing & Operations

MIT Machine Intelligence for Manufacturing and Operations

Research and educational program to increase industrial competitiveness by accelerating the deployment and understanding of machine intelligence.

MITLGO
LEADERS FOR GLOBAL OPERATIONS

Machine Intelligence for Manufacturing & Operations

Machine Intelligence for Manufacturing & Operations

McKinsey & Company

Toward smart-production

The emergence of machine intelligence in operations

Our goals for today

Introduce you to and review the scope and impact of the effort

Highlight what leaders do well, what we can learn from them

Introduce the individualized MIMO implementation playbook

Lay out next steps on journey to using machine intelligence

Executive summary

Top performers in **Machine Intelligence (MI**) in operations have reported average KPI **improvements of 9.5% vs. the 3.5%** reported by **less mature organizations**

Leveraging the combined networks of MIT and McKinsey, we set out to understand how 100 companies in North America were (or weren't) applying MI in their operations

- The **impact on 21 key performance indicators** was evaluated based on **9 categories of enablers**, **17 desired business outcomes**, and the impact of **17 different use cases**

We used **three groups of attributes** to understand drivers of success

1. **Results**: what impact the company achieved, and across how many use cases/topics
2. **Enablers**: practices and procedures used to identify, develop and deploy use cases
3. **Deployment**: how long a company has worked on MI topics, maturity of implementations and sophistication

From survey and the interviews, 5 categories of enablers stood out

- **Governance**, **Deployment**, **Partnering**, **People** and **Data execution**

There's a **substantial gap** in performance against these **enablers**, between **leaders** and **the rest**

- **Leaders** have only **accelerated their investments** vs. the rest

What do we mean by Machine Intelligence

From insight to autonomy

Machine Intelligence
Computer model that learns from historical or real-time data and adjusts its actions autonomously to achieve a human-set goal

Predictive Analytics
Past and present data are used to forecast the likelihood Of future outcomes

Digital reports/dashboards
Data is reported directly from the system with simple visualizations

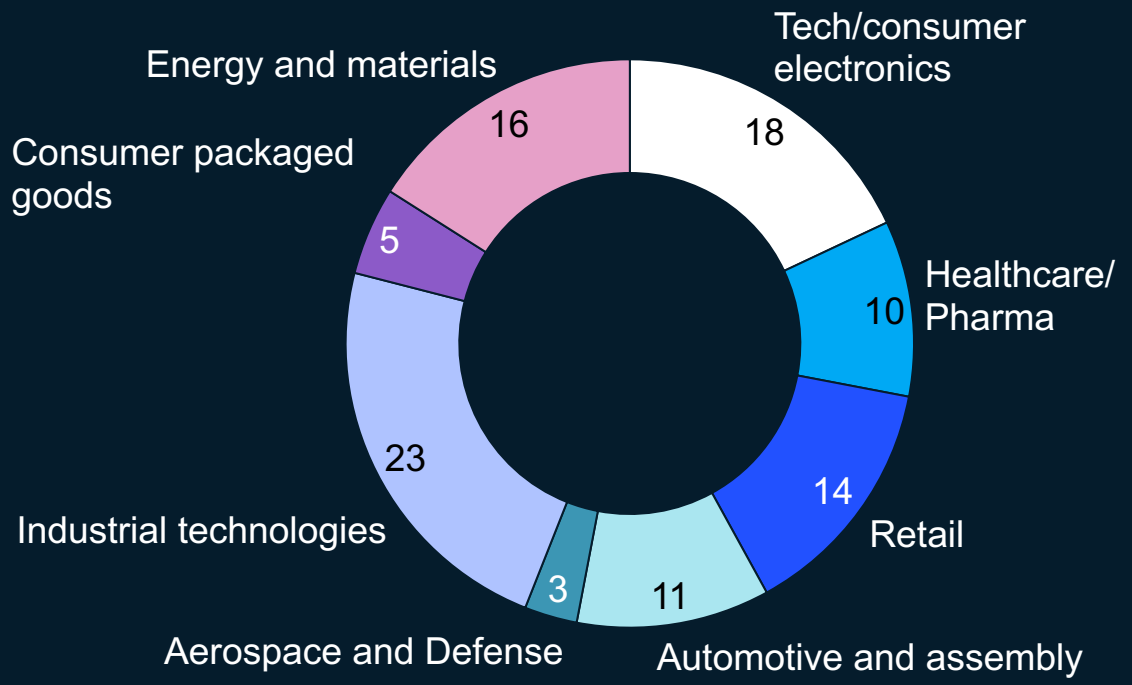
Prescriptive Analytics
Data is analyzed to predict future outcomes and advise/determine next steps

Descriptive Analytics
Data is collected and analyzed to summarize and capture general trends

191 individuals completed surveys, across ~100 companies

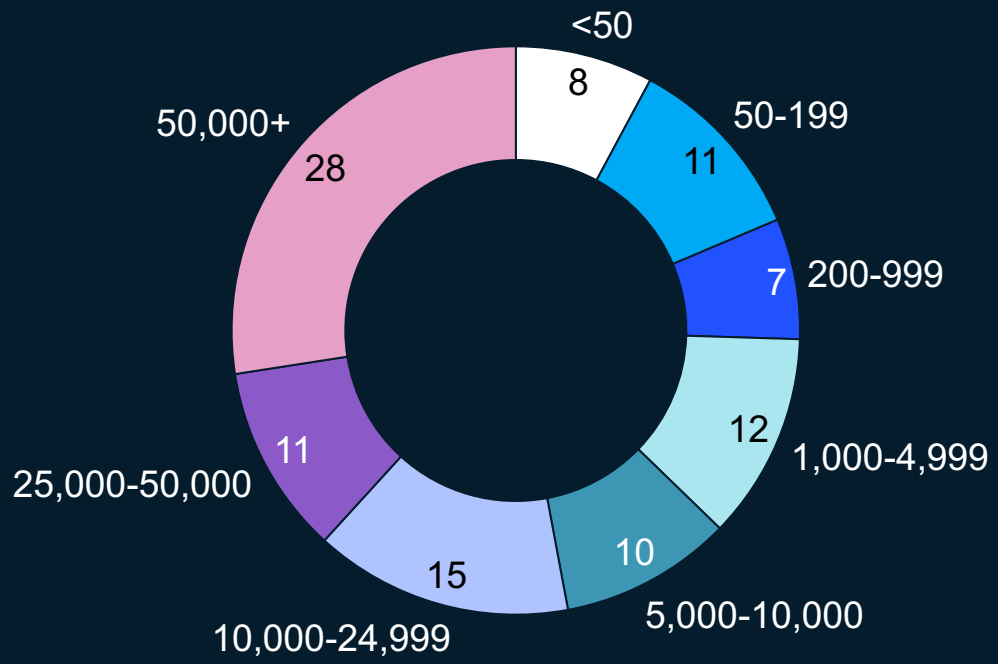
Survey completed by industry

% of response, N=191



Survey completed by size

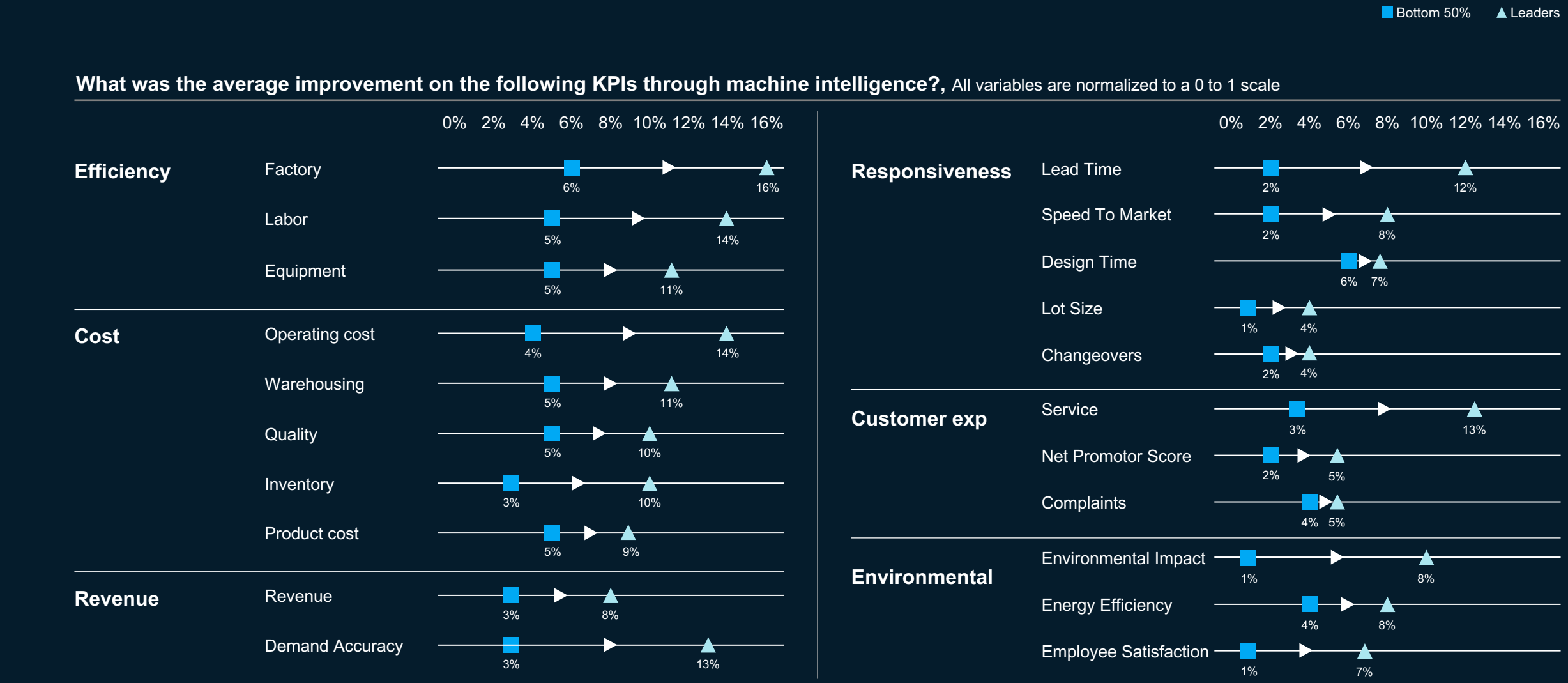
% of responses, N=191



Source: Machine intelligence for Manufacturing and operations

What's at stake – leaders are driving 2x the impact through Machine Intelligence

Everywhere leaders have chosen to play they are better than the rest

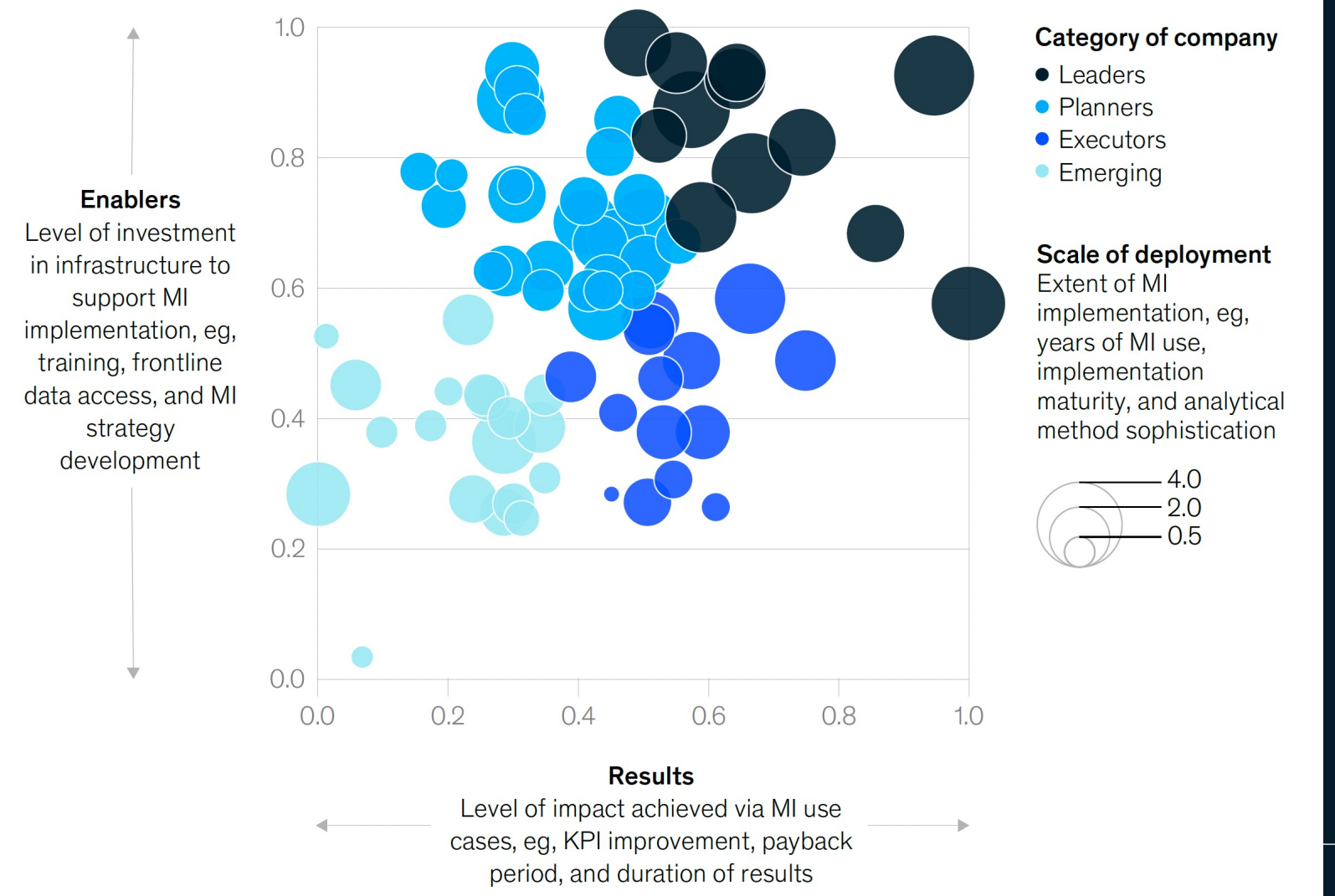


Source: MIT MIMO and McKinsey Machine Intelligence Survey

What are the leaders doing different?

Introduction to the MI Impact matrix

Machine-intelligence (MI) impact matrix, variables are normalized to a 0 to 1 scale



This MI Impact matrix allows us to quantitively measure, compare and group companies based upon their actions and results.

Created using Machine Intelligence

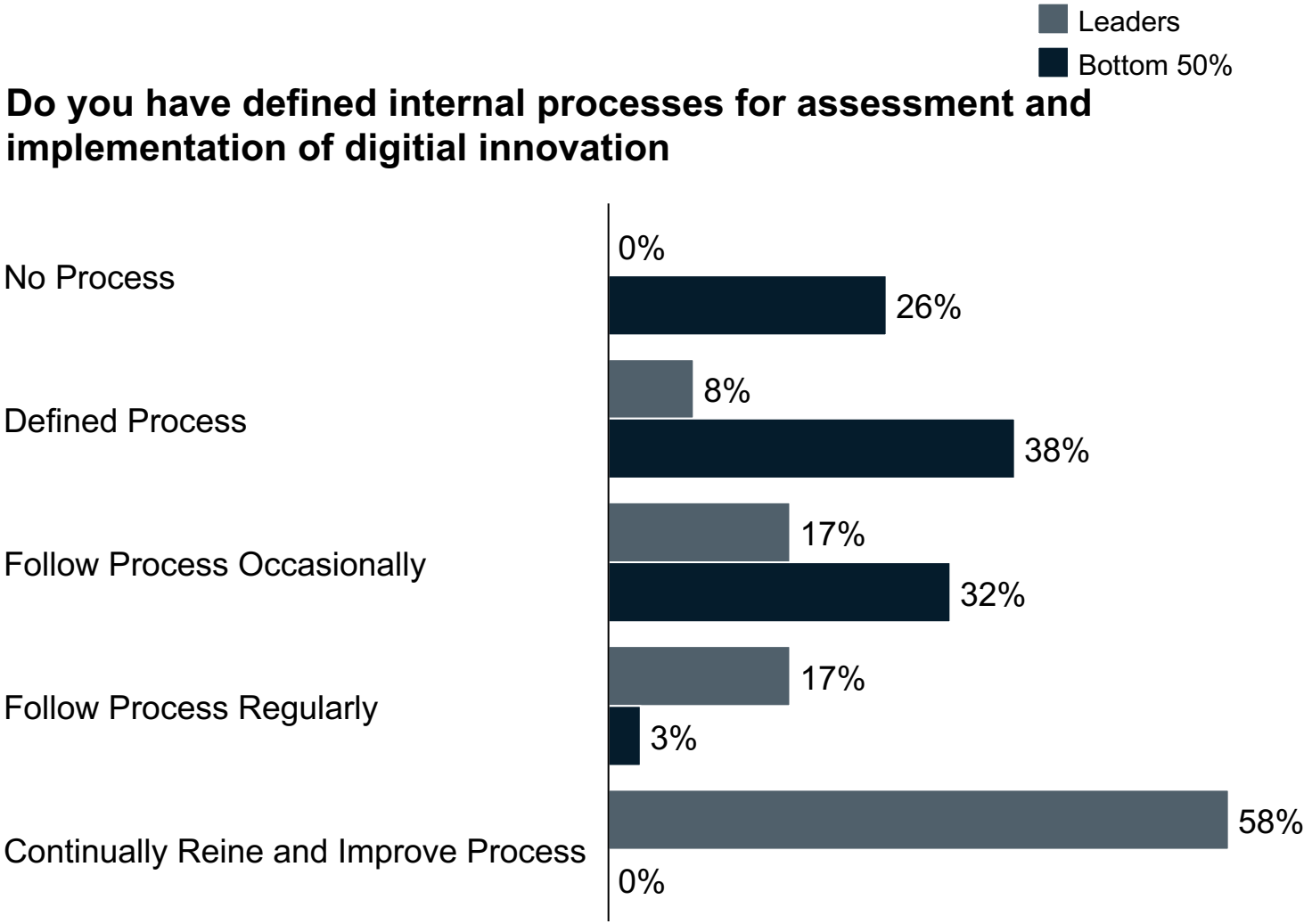
Taking a deeper look – what are the leaders doing different?

Top Quartile, 75%+ | Above Average, 50%+ | Bottom Half, <50%

(#) Key differentiators

	Leaders	Planners	Executers	Emerging	Definitions
Strategy					Strategy maturity, Center of Excellence, Business outcomes, Digitization change
Opportunity focus					Current and Planned Use Cases (only on the most impactful Use Cases)
1 Governance					Mechanisms for tracking issues, reviewing processes
2 Deployment					Implementation maturity, MI Functions, Method sophistication
3 Partnering					External players and implementation partners
4 People					Frontline data access, Employee training, Job titles
5 Data Execution					Acquire/Share data, Equipment data %, % on Cloud, Remote access
Budget					Investment in MI projects and programs
Results					Payback and KPI

1: What leaders do well: Governance - processes & capabilities to rapidly scale

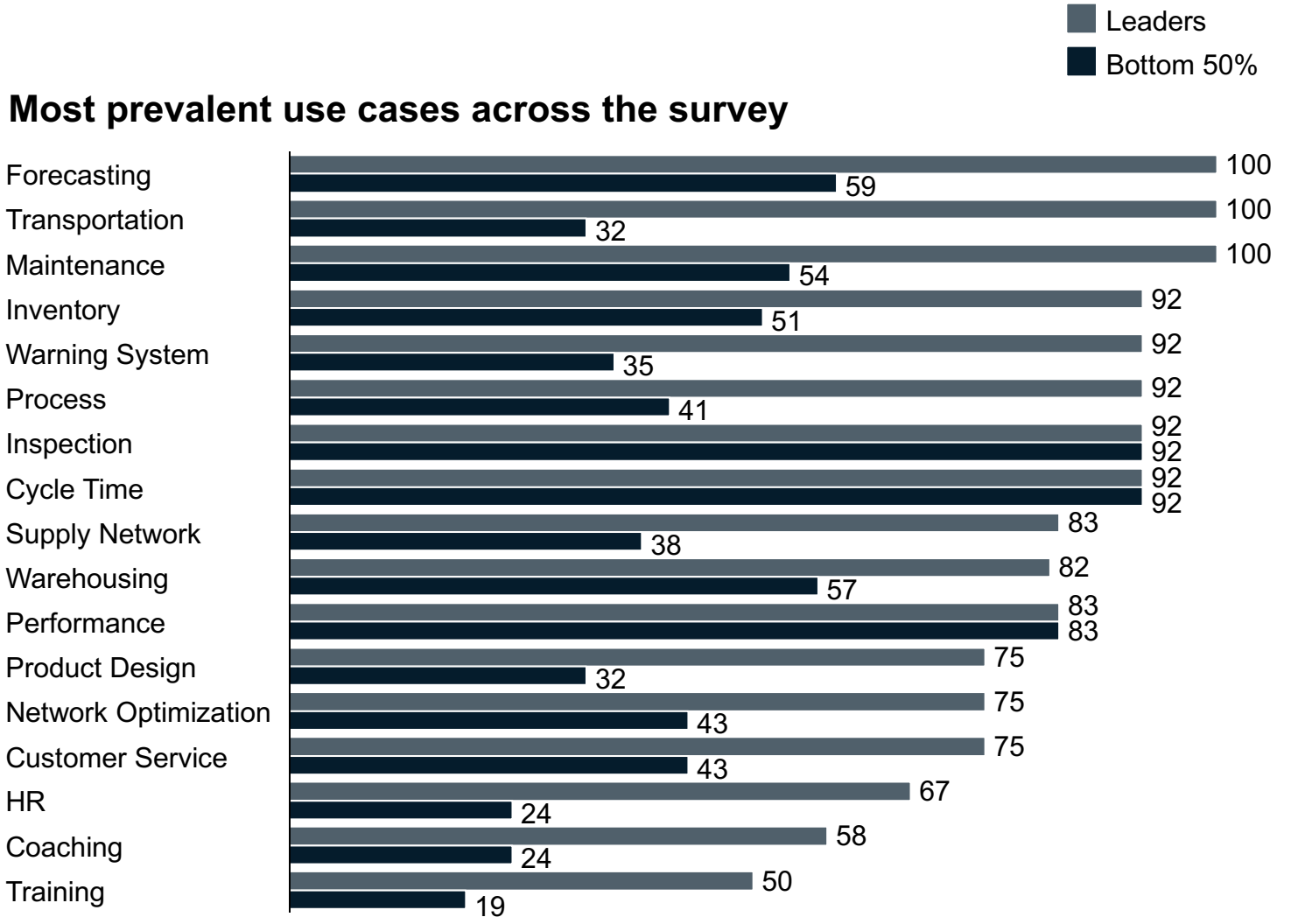


Leaders are committed to continuous improvement in data driven innovation, whereas the rest don't follow/don't have assessment processes

The "lean" mindset of continuous improvement differentiates the leaders across our study

Leaders are also more likely to follow the process regularly and to update it continually as the organization learns more

2: What leaders do well: Governance - processes & capabilities to rapidly scale



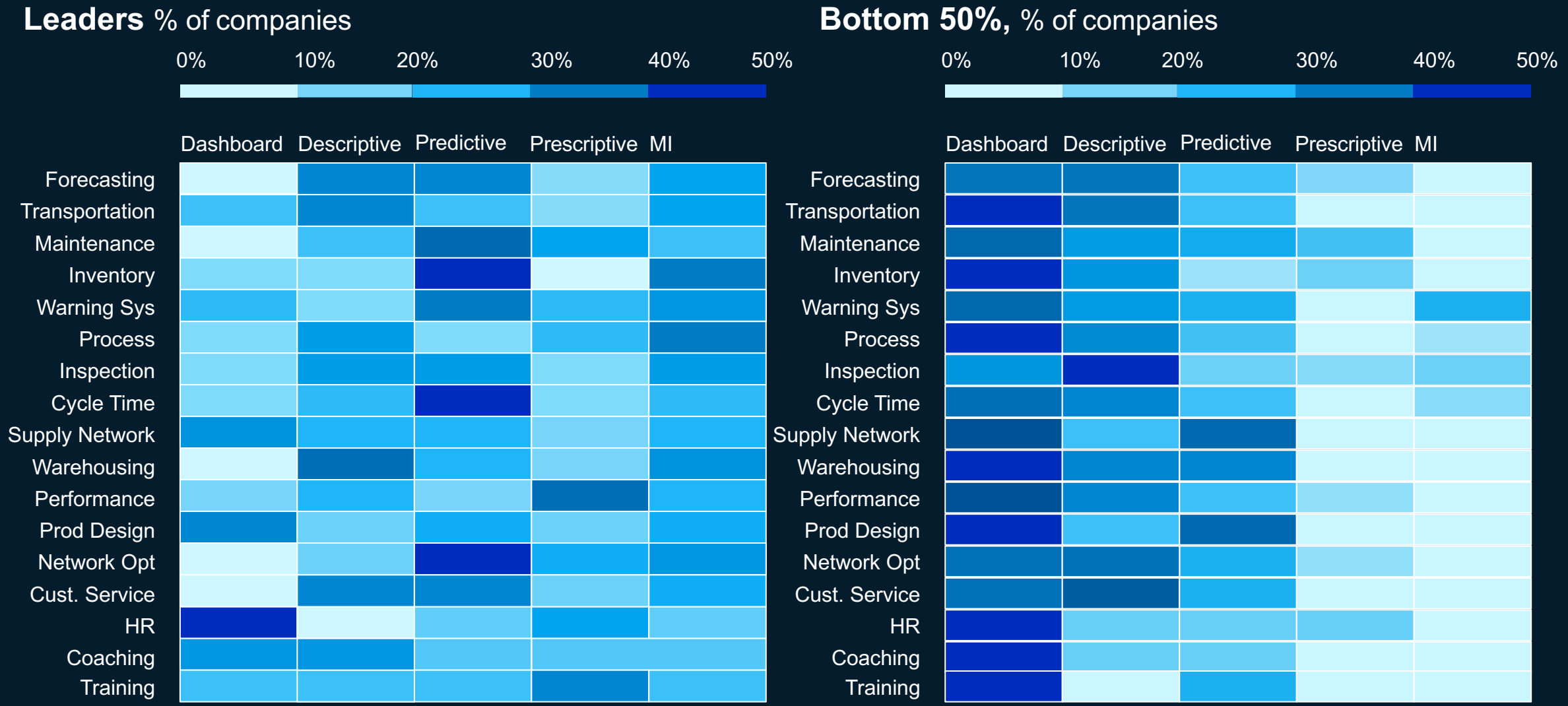
There is clear consensus among leaders on where to focus

Forecasting, transportation and maintenance all provide fertile grounds for driving high impact MI applications

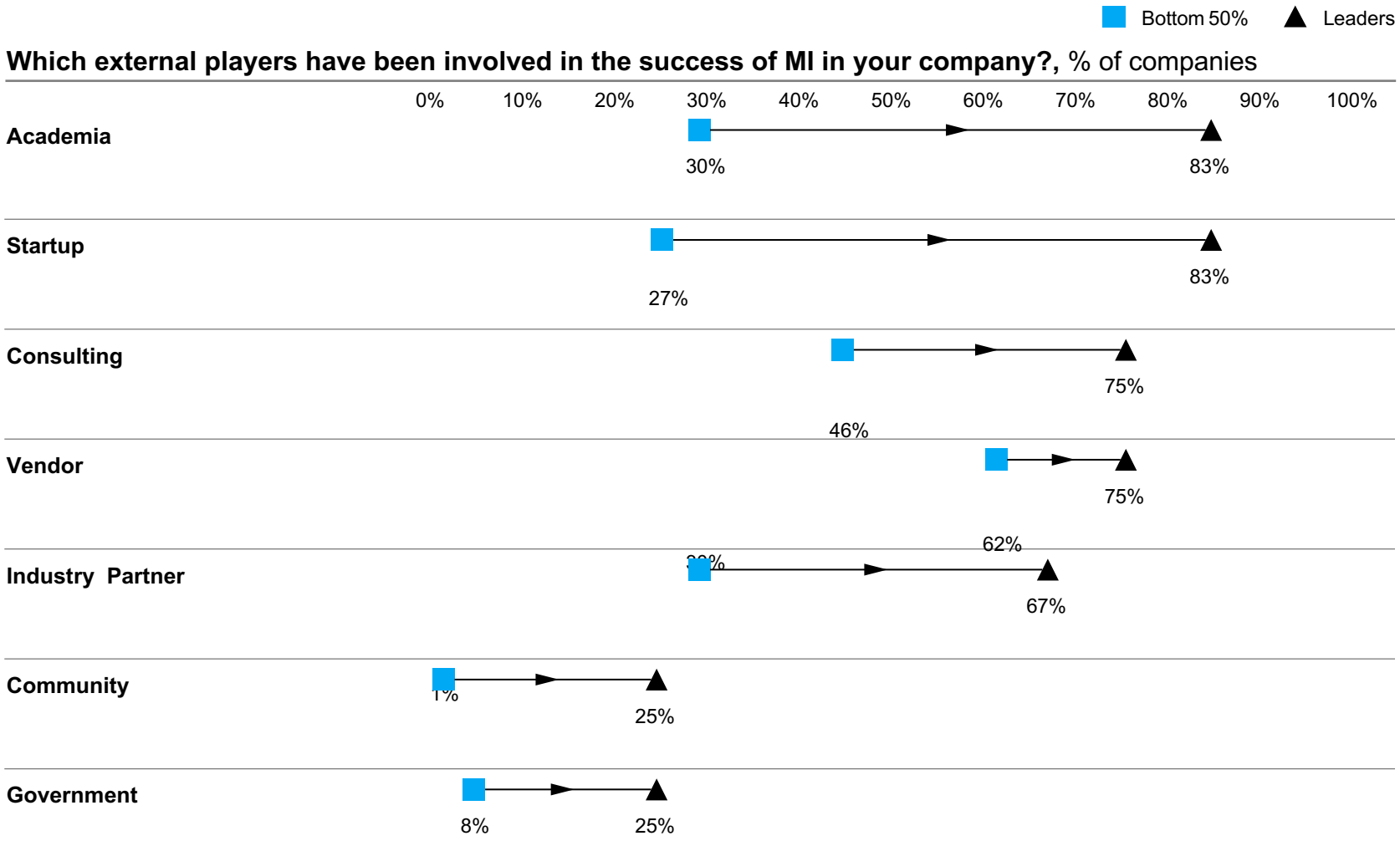
The rest of the participants in our group had a much broader dispersion of their use case prioritizations

2: What leaders do well: Deployment - *Common* vision and advanced methodologies(2/2)

The best use more advanced approaches and yield better results



3: What leaders do well: Partnering - A broad ecosystem of partners



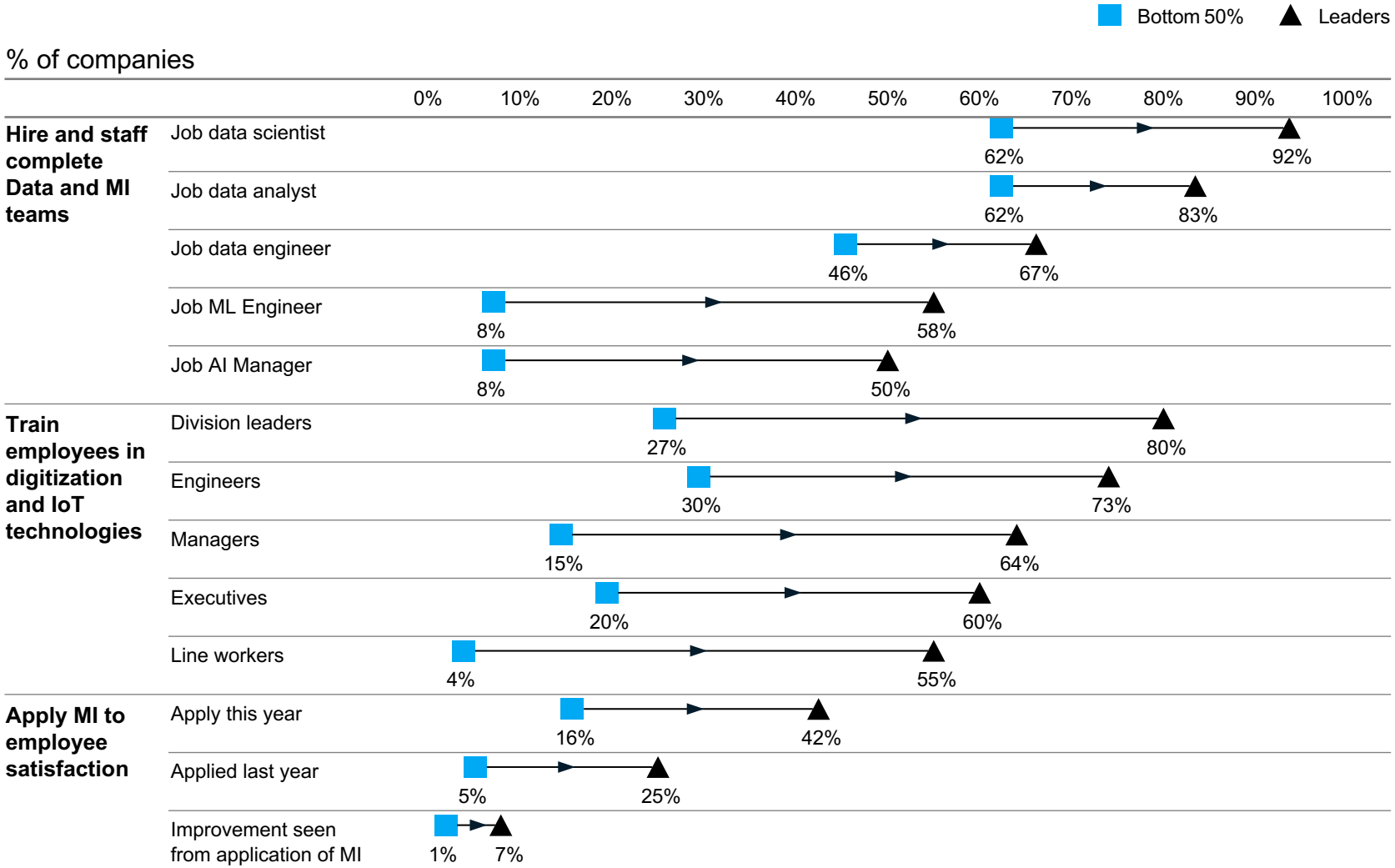
Partnerships are critical no matter the starting point

Leaders have started tackling projects that require more domain expertise, and/or areas which don't have well defined solutions

- They've turned to startups and academia to help them solve these problems

But, across the board, leaders partner with all types of institutions, but mostly focus on private sector and academia

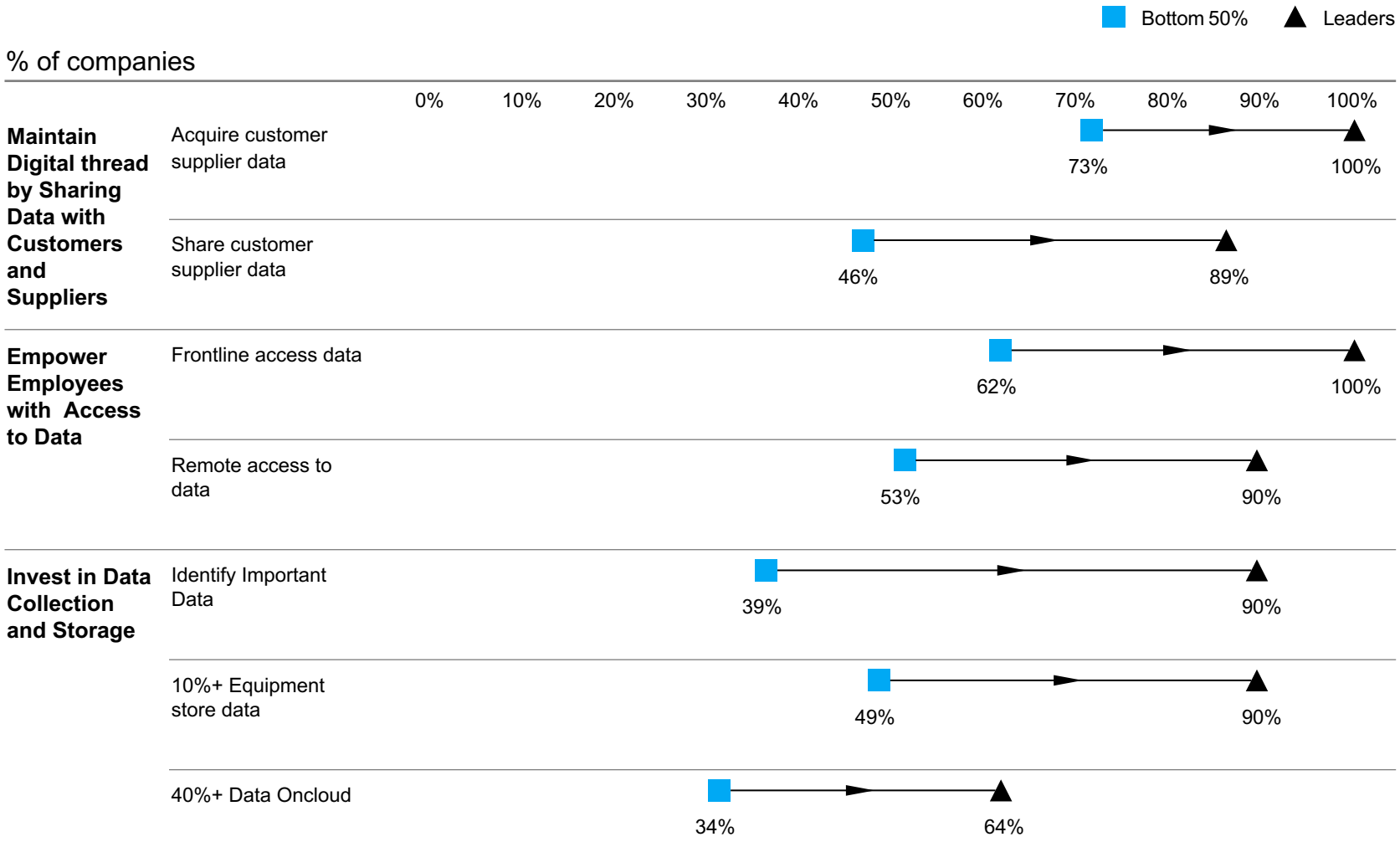
4: What leaders do well: People - Employee empowerment



Leaders hire a full team including ML engineers who maintain the ML application in production and Product managers who ensure that the right problem are addressed, and a complete solution is delivered

More than 50% of leaders train front line workers in MI

5: What leaders do well: Data execution - Data they can use

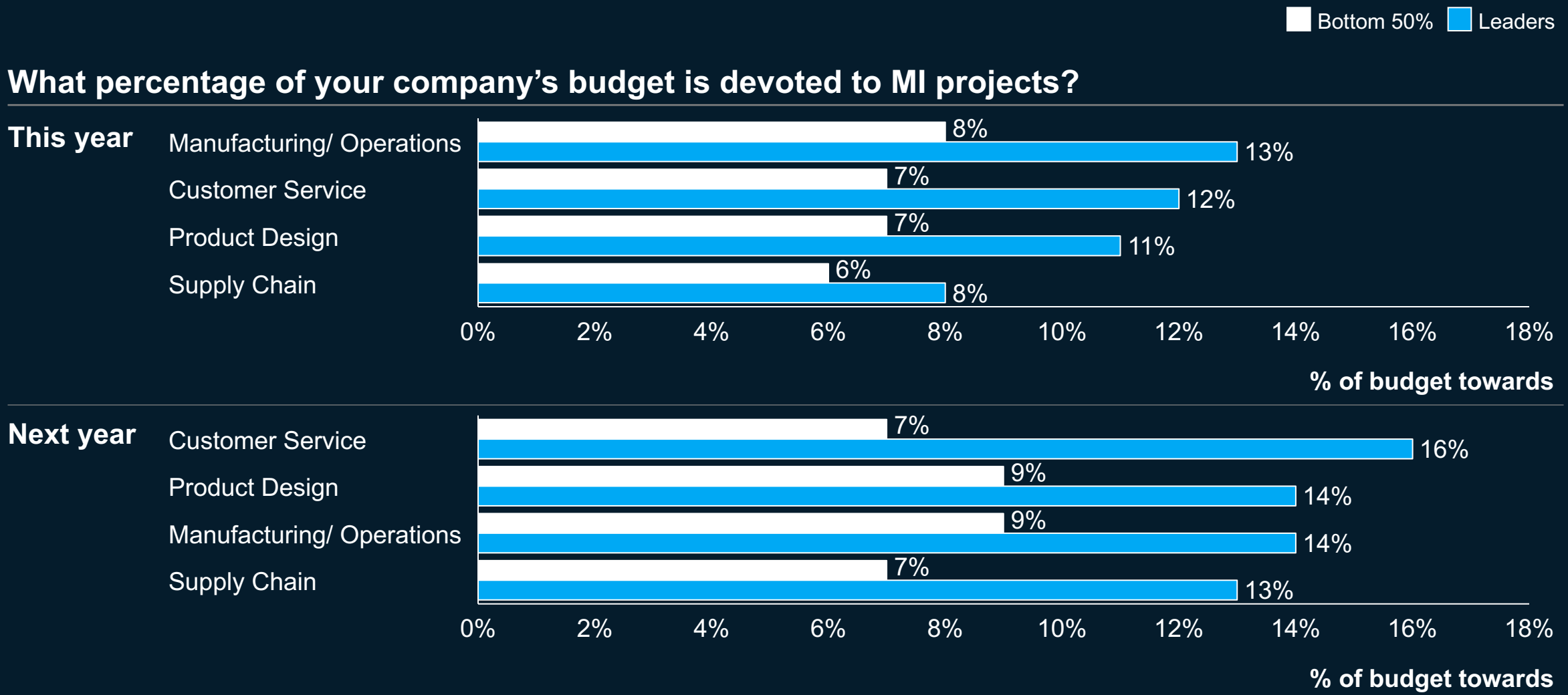


100% of leaders group give frontline staff access to data, compared to 62% of rest

All leaders collect data from suppliers and customers, in addition 89% of them reciprocating in sharing data back with these groups

Leaders invest in data collection up front, they identify what's important and make sure it's properly categorized, organized and stored

Now is not the time for business as usual, leaders continue to invest at rates 2x that of the rest and accelerating



What are the implications for those on the MI journey?

Identify the organization's North Star and conduct a visioning exercise that describes an ideal version of its operations in three or four years' time - this will require looking past legacy infrastructure and skill constraints

Conduct an honest assessment of the organization's starting point across dimensions - companies often over-index on a few dimensions during early successes but find the momentum difficult to maintain without an operating-model change

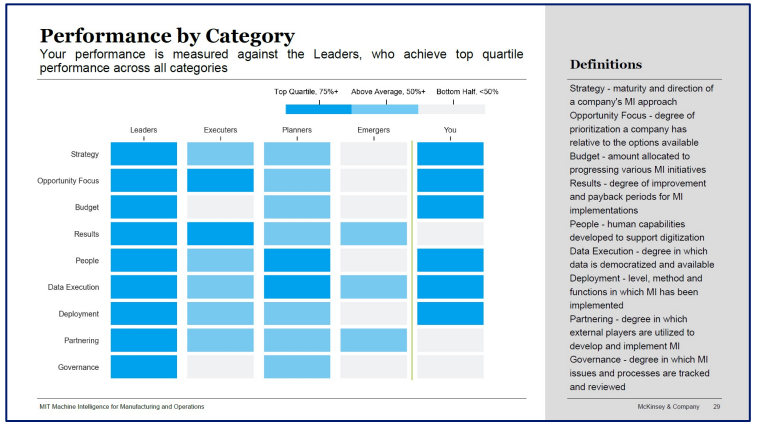
Scope out a rough transition plan, accounting for barriers to change, critical infrastructure (such as data migration to the cloud), and assigning realistic medium-term targets - most leaders in our survey started by using data to make decisions using tools simpler than MI

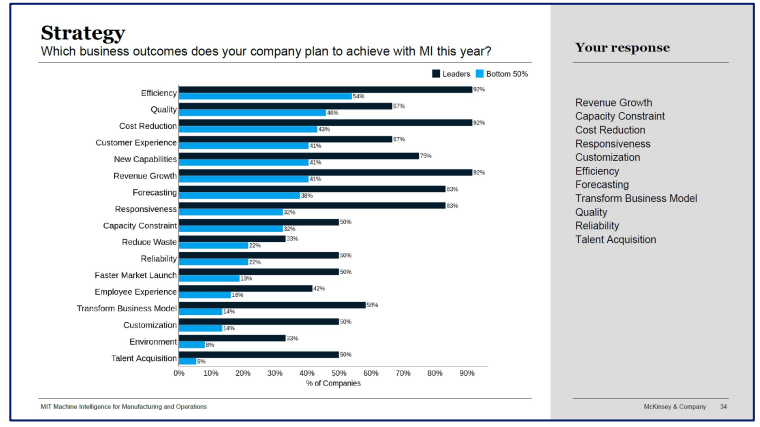
Find a handful of use cases to gain early momentum while at the same time scoping out (and potentially self-funding) the necessary changes in infrastructure, talent, and related supports

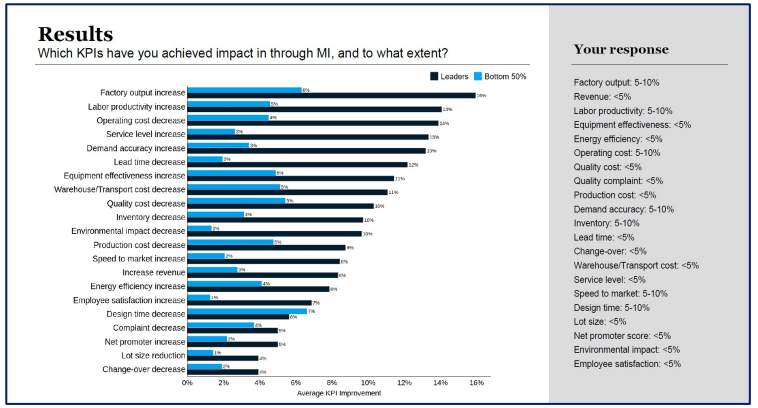
MIMO Implementation Playbook

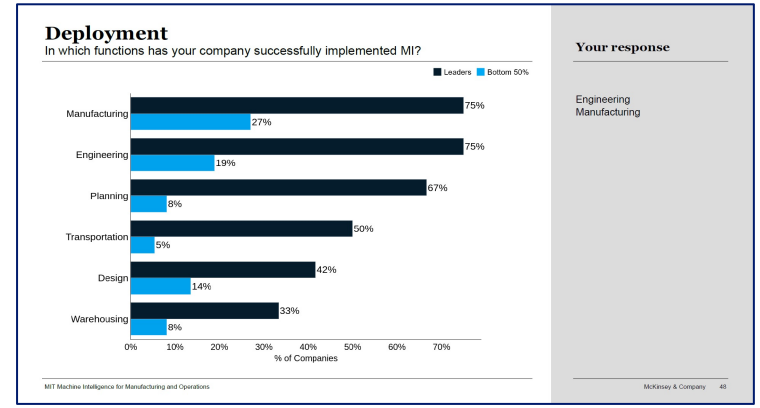
Full participants receive custom 30 page playbook highlighting how they responded vs. others across every dimension of the survey

Contains implementation roadmap and best practices.







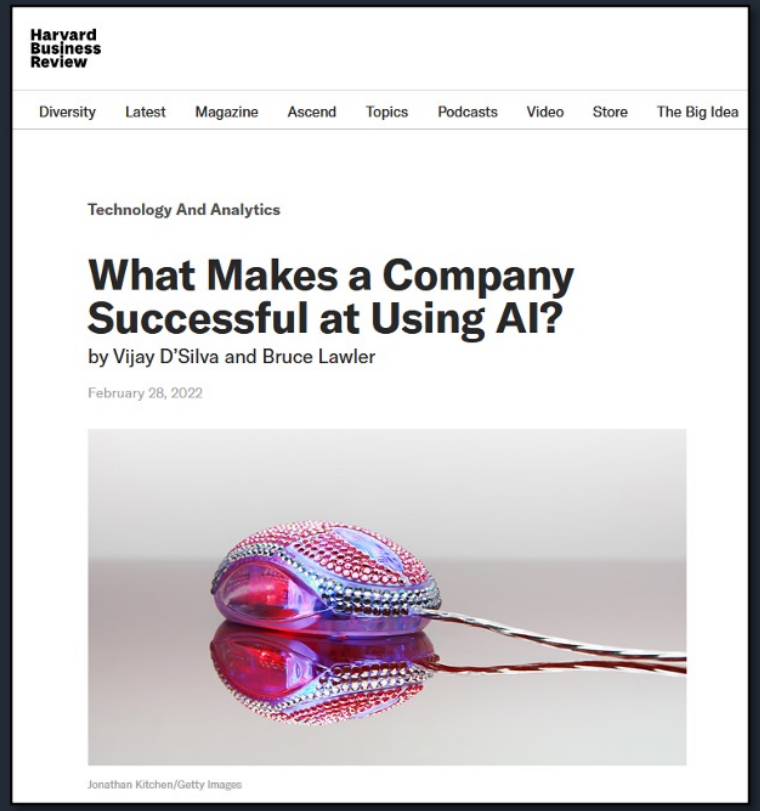


What's next

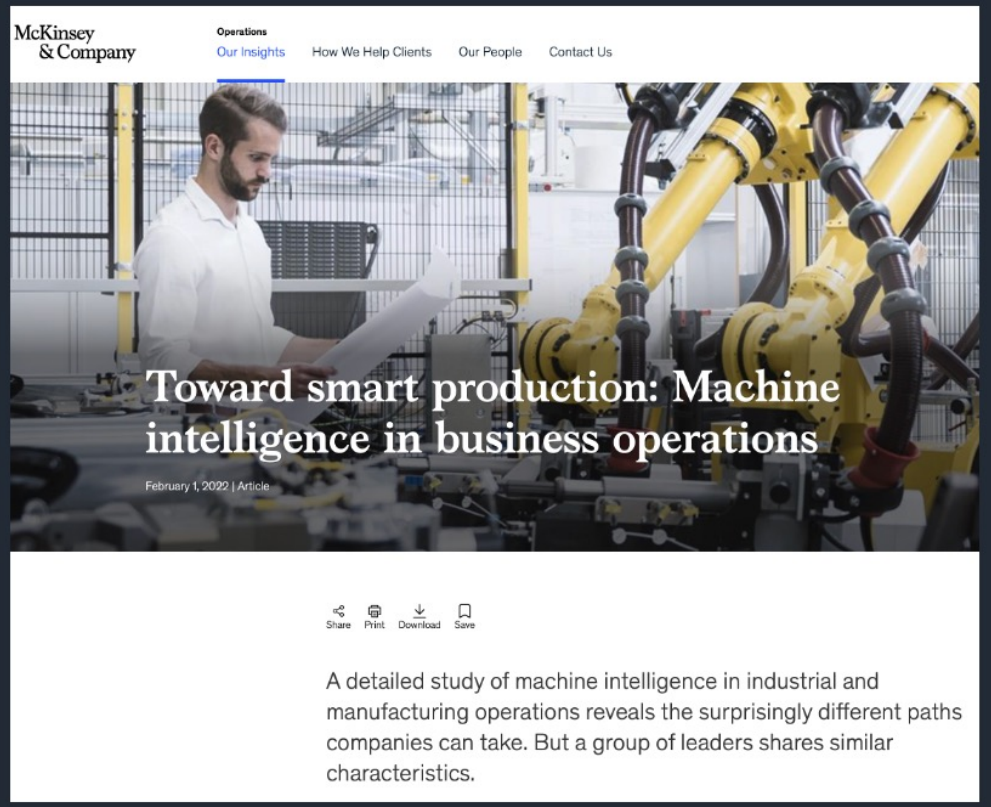
- Study Growth Goals
  - Continue to track growth and changes with year over year study
  - Grow the study beyond our 100 founding participants
  - Implement division and conglomerate MI fingerprints and individual playbooks

- What can you do?
  - Read our research
  - Attend our Symposium May 4th, 2022
  - Sign up to participate in this year's study
  - Receive your company's custom Machine Intelligence Implementation Playbook with full participation

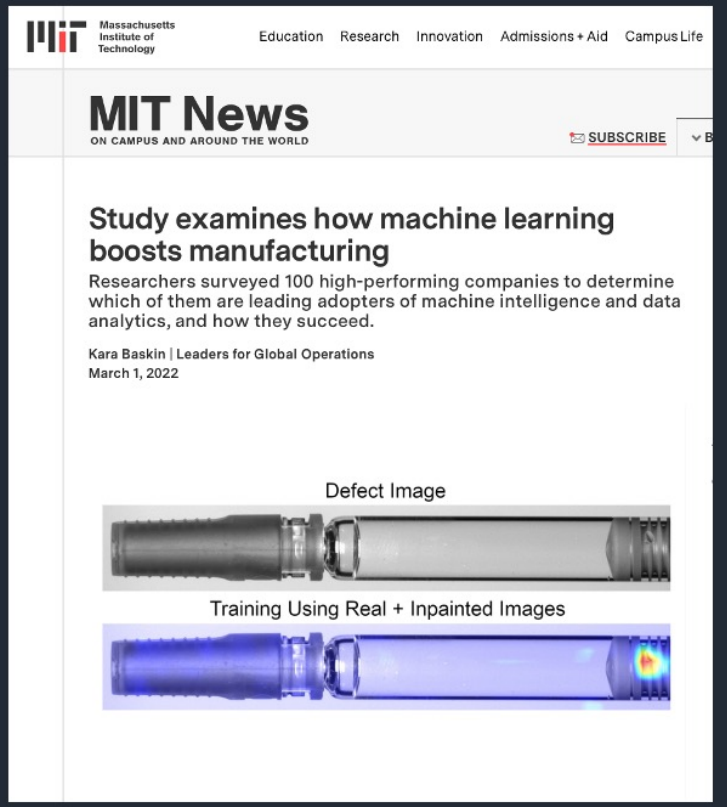
Read more about our research:



Harvard Business Review



McKinsey & Co.



MIT News

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Operationalize your Organization's AI Strategy

2022 MIMO SYMPOSIUM

May 4, 2022
1 Main St, Cambridge, MA

Learn from academic and industry leaders who are using frontier technologies to improve manufacturing and operations.

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- Maximizing the value of your data
- Creating and deploying a data strategy
- Transforming into a data-driven culture
- Managing AI/ML development

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Opportunities to connect with students, experts from inside MIT community and industry