Building the Future of Work in the Age of AI

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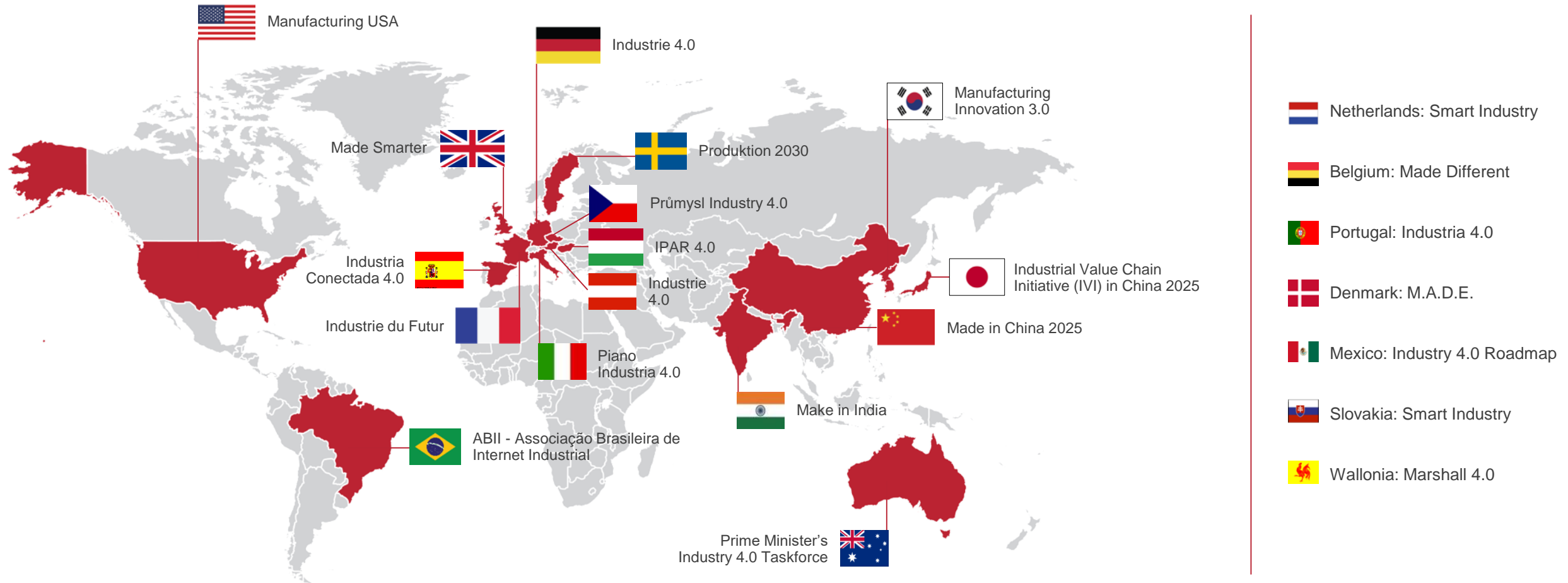
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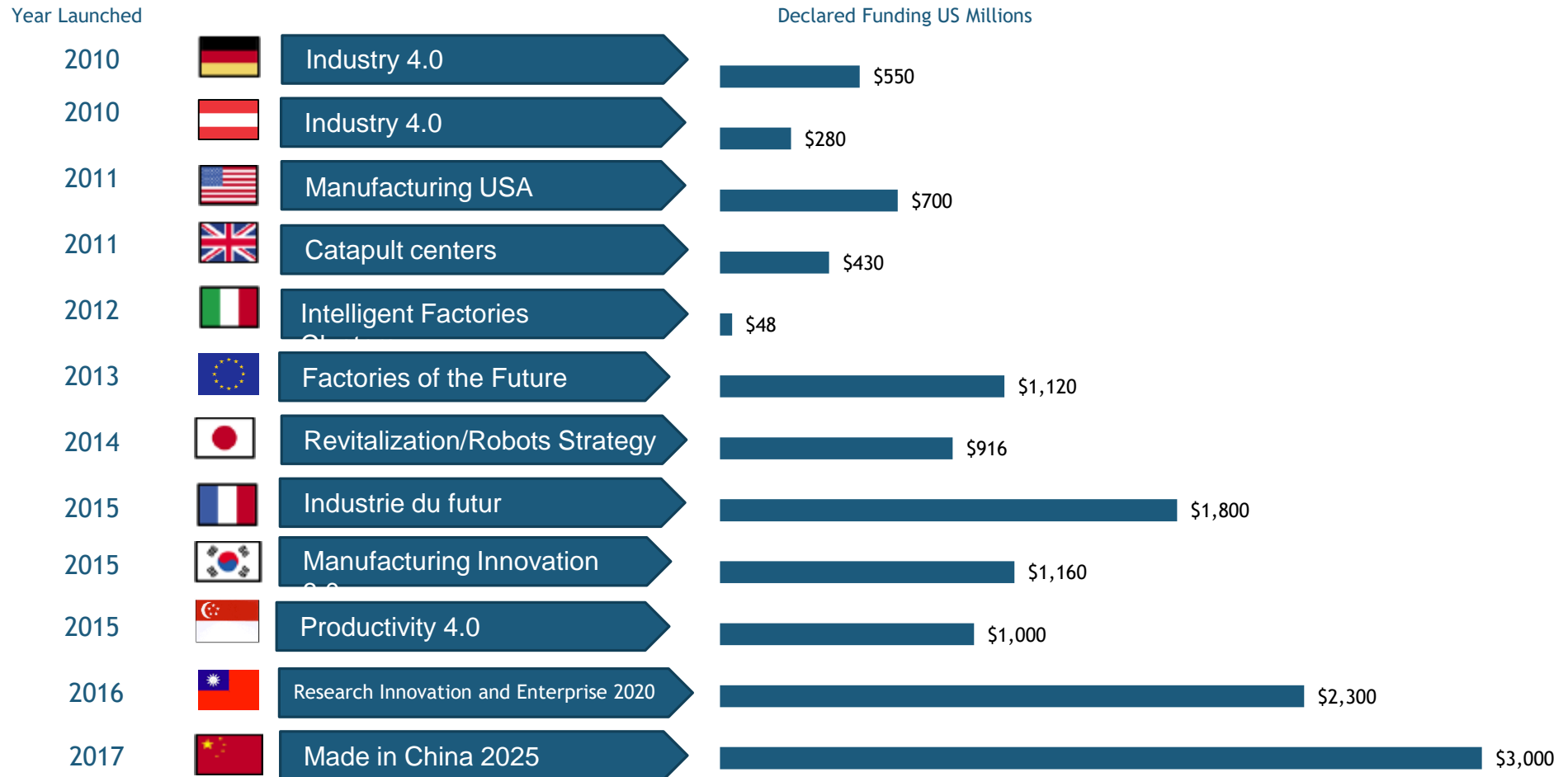**1** Digitalization Transforming Manufacturing

2 How AI Will Transform the Manufacturing Workforce

3 Developing and Acquiring AI Talent

4 Policy Recommendations

Manufacturing Digitalization Becoming a Priority Worldwide

Manufacturing USA

Industrie 4.0

Made Smarter

Manufacturing Innovation 3.0

Produktion 2030

Prùmysl Industry 4.0

IPAR 4.0

Industria Conectada 4.0

Industrie 4.0

Industrie du Futur

Industrial Value Chain Initiative (IVI) in China 2025

Piano Industria 4.0

Made in China 2025

Make in India

ABII - Associação Brasileira de Internet Industrial

Prime Minister's Industry 4.0 Taskforce

Netherlands: Smart Industry

Belgium: Made Different

Portugal: Industria 4.0

Denmark: M.A.D.E.

Mexico: Industry 4.0 Roadmap

Slovakia: Smart Industry

Wallonia: Marshall 4.0

Courtesy: Dave Vasko, Rockwell Automation

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Countries Aggressively Implementing Policies to Achieve Digital Manufacturing Leadership

Year Launched		Policy	Declared Funding US Millions
2010	🇩🇪	Industry 4.0	$550
2010	🇦🇹	Industry 4.0	$280
2011	🇺🇸	Manufacturing USA	$700
2011	🇬🇧	Catapult centers	$430
2012	🇮🇹	Intelligent Factories Cluster	$48
2013	🇪🇺	Factories of the Future	$1,120
2014	🇯🇵	Revitalization/Robots Strategy	$916
2015	🇫🇷	Industrie du futur	$1,800
2015	🇰🇷	Manufacturing Innovation 3.0	$1,160
2015	🇸🇬	Productivity 4.0	$1,000
2016	🇹🇼	Research Innovation and Enterprise 2020	$2,300
2017	🇨🇳	Made in China 2025	$3,000

Source: Roland Berger; ITIF Analysis

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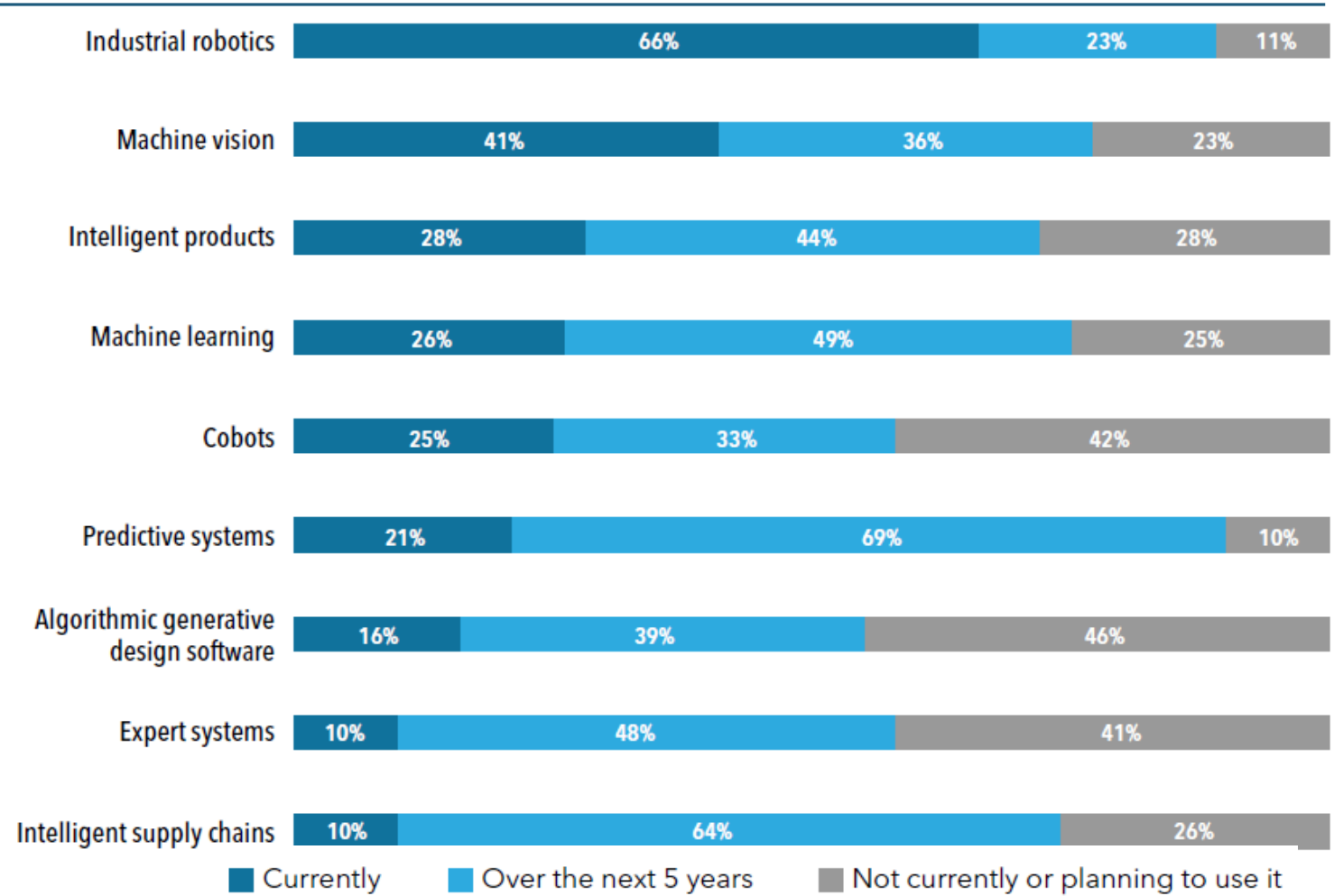
ITIF/MAPI "The Manufacturing Evolution" Report

- Surveyed AI adoption/workforce implications for 70 MAPI members.

The Manufacturing Evolution

How AI Will Transform Manufacturing & the Workforce of the Future

AUTHORS: ROBERT D. ATKINSON AND STEPHEN J. EZELL, INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION

AUGUST 6, 2019 | PRODUCED BY THE MAPI FOUNDATION

mapifoundation.org

AI Deployment Levels Vary By Application

Most common apps in 5 years:

- Industrial robotics

- Machine vision/learning

- Predictive systems

- Intelligent products

- Intelligent supply chains

Application	Currently	Over the next 5 years	Not currently or planning to use it
Industrial robotics	66%	23%	11%
Machine vision	41%	36%	23%
Intelligent products	28%	44%	28%
Machine learning	26%	49%	25%
Cobots	25%	33%	42%
Predictive systems	21%	69%	10%
Algorithmic generative design software	16%	39%	46%
Expert systems	10%	48%	41%
Intelligent supply chains	10%	64%	26%

■ Currently   ■ Over the next 5 years   ■ Not currently or planning to use it

Leading Barriers to AI Adoption Among Manufacturers

Barrier	Percentage
Lack of data resources needed to enable AI solutions	58%
Uncertainty about how to implement AI solutions to solve specific challenges	52%
Lack of sufficient workforce digital skills to develop and/or implement AI solutions	47%
Lack of interoperability between equipment that precludes data integration needed to support AI applications	47%
Skepticism about achieving sufficient ROI from investments in AI solutions	40%
Unaware of how to define what AI skills we need	34%
Lack of sufficient financial resources to support requisite investments	31%
Lack of senior leadership buy-in for AI solutions	21%
Concerns pertaining to cybersecurity risks	21%

Source: ITIF/MAPI, "The Manufacturing Evolution: How AI Will Transform Manufacturing & The Workforce of the Future"

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Why Has Digital Manufacturing Progress Been So Slow?

Supply
- Suite of technologies not yet fully mature.
- Fragmented providers/lack of interoperable standards.

Demand
- Underinvestment in capital equipment.
- Lagging employee skills and competencies.
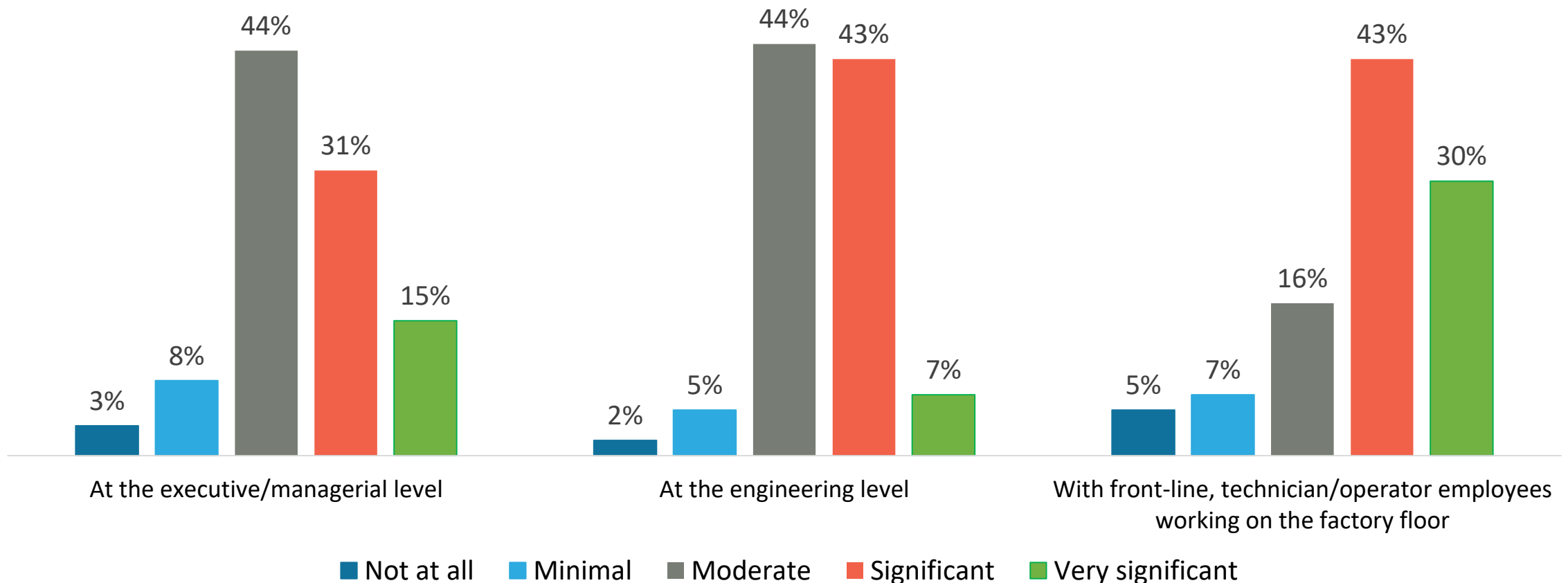- SMEs unclear how to proceed/understand value proposition.

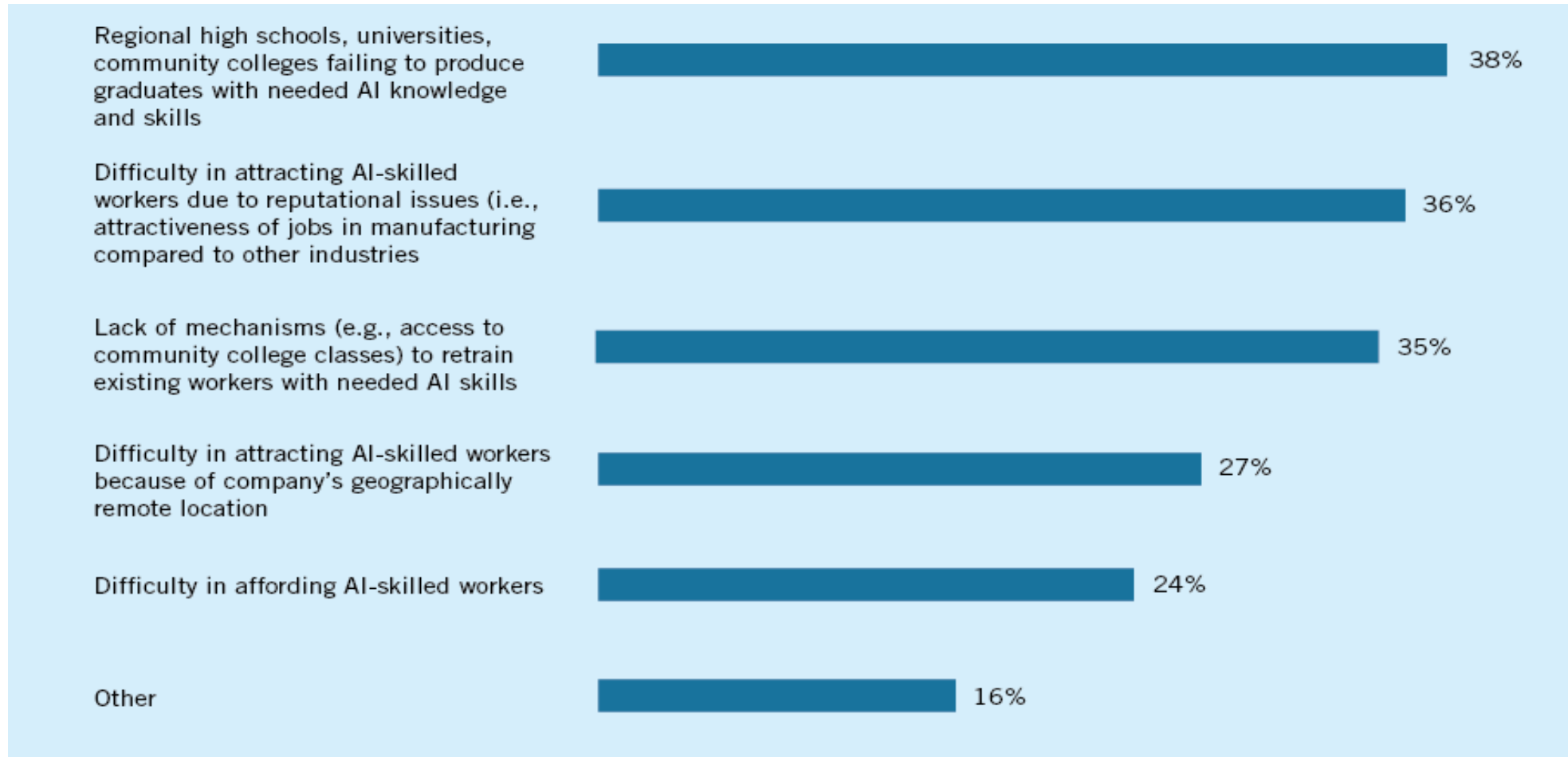# Today's Presentation

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AI Skill Gaps Appear Across All Levels of Mfg. Workforce

Bar chart showing AI skill gap levels across three workforce categories:

At the executive/managerial level
- Not at all: 3%
- Minimal: 8%
- Moderate: 44%
- Significant: 31%
- Very significant: 15%

At the engineering level
- Not at all: 2%
- Minimal: 5%
- Moderate: 44%
- Significant: 43%
- Very significant: 7%

With front-line, technician/operator employees working on the factory floor
- Not at all: 5%
- Minimal: 7%
- Moderate: 16%
- Significant: 43%
- Very significant: 30%

Legend: Not at all | Minimal | Moderate | Significant | Very significant

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Barriers In Finding Employees with Requisite AI Skills

Barrier	Percentage
Regional high schools, universities, community colleges failing to produce graduates with needed AI knowledge and skills	38%
Difficulty in attracting AI-skilled workers due to reputational issues (i.e., attractiveness of jobs in manufacturing compared to other industries	36%
Lack of mechanisms (e.g., access to community college classes) to retrain existing workers with needed AI skills	35%
Difficulty in attracting AI-skilled workers because of company's geographically remote location	27%
Difficulty in affording AI-skilled workers	24%
Other	16%

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13

AI Policy Recommendations

- Support the development industry-led, market-driven global standards for AI-enabled manufacturing products and technologies.

- Ensure the future workforce has the skills it needs by establishing incentive programs for universities to expand their offerings in computer science

- Ensure firms are incentivized to train the workforce.

Thank You!

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