Industry 4.0 Technology Adoption Issues for SMMs and the Role of AI to Improve Adoption Rates

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Outline/Agenda

- Introduction
- Smart Manufacturing Adoption
- AI in Electronics Manufacturing
- Conclusions
- Q & A

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Introduction

- Industry 4.0 has revealed significant opportunities for manufacturers
- AI is the term used to describe the ability of computers to simulate human thinking, make decisions
- AI is built upon networked connectivity, sensors, data, and robust computational capability

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Auburn University ICAMS Smart Manufacturing Adoption Study 2023

146 responses (95 completed responses)

36 U.S. States Represented

Aerospace **42%**

Automotive **25%**

Consumer Goods **26%**

Defense **53%**

Energy **21%**

Medical **28%**

Transportation **18%**

Other **23%**

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Smart Manufacturing Technologies

- 3D Printing
- Artificial Intelligence (AI)
- Automation
- Big Data
- Sensors/Internet of Things (IoT)
- Predictive Analytics

Adoption Stages[1]

1. Awareness
2. Researching
3. Evaluating
4. Implementing
5. Using

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Top Challenges Manufacturers Are Facing

- **1.** Workforce- Operations (64%)*
- **2.** Operational Efficiency (59%)
- **3.** Workforce- Engineering (41%)

*% of respondents that ranked the issue as a top 3 business challenge

- Growing challenges (2022 to 2023):
  workforce- engineering and **capital improvements**

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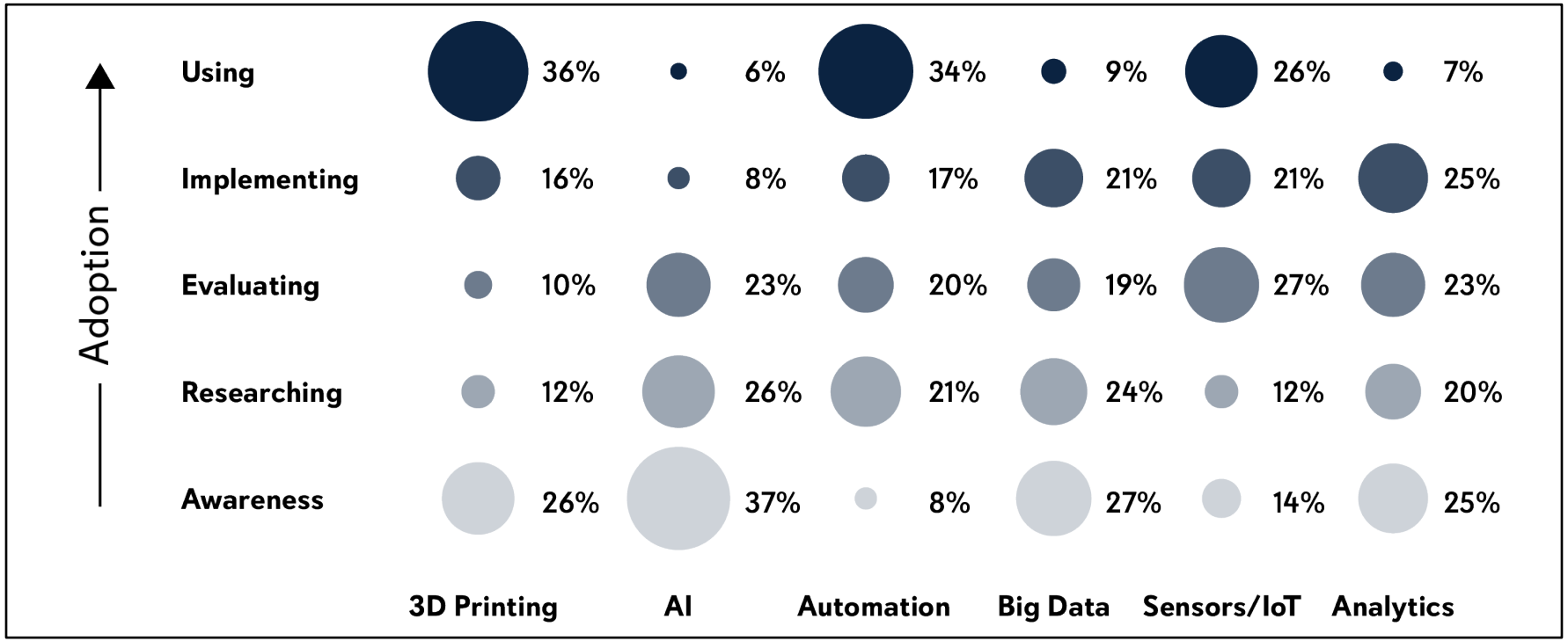
2023 U.S. Smart Manufacturing Technology Adoption



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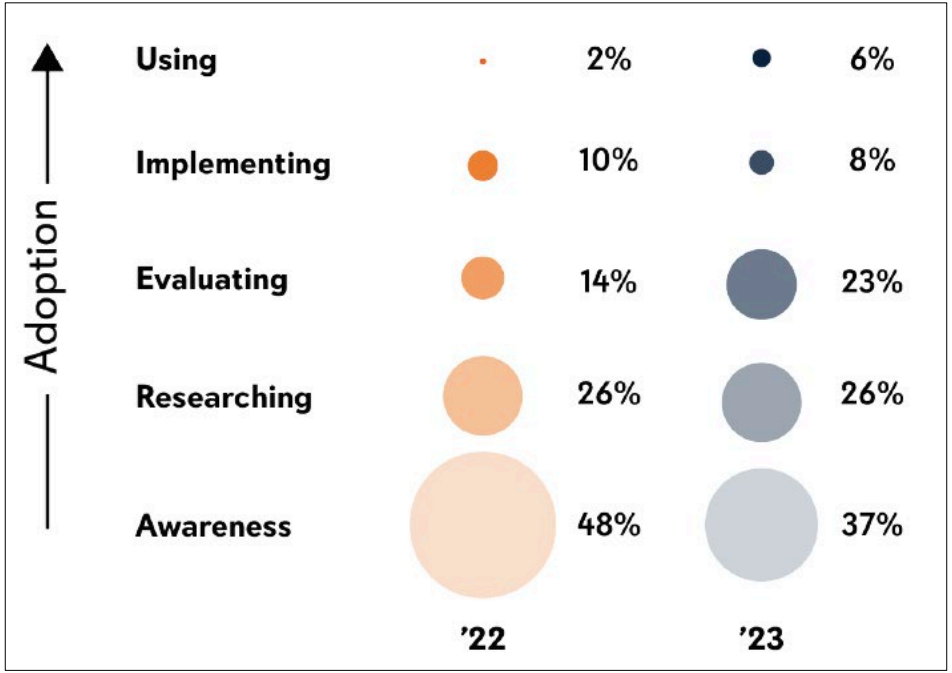
AI Adoption Year-Over-Year



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Adoption Barriers by Technology

2023	Lack of				Lack of			
	Awareness	Business Cases	Capital	High Cost	Peer Experience	Resources	Workforce	Workforce Skill Set
3D Printing	13%	19%	8%	17%	10%	4%	13%	15%
Artificial Intelligence	22%	23%	5%	12%	7%	6%	11%	14%
Automation	11%	13%	13%	19%	6%	8%	14%	15%
Big Data	19%	20%	8%	11%	8%	8%	11%	14%
Sensors/IoT	15%	16%	10%	13%	7%	7%	16%	16%
Predictive Analytics	22%	17%	8%	11%	7%	8%	11%	16%

Two Prominent Barriers Are
Lack of Awareness and Lack of Business Cases

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How do we enable digitalization and improve technology adoption?

Digitization: The computerization of manual activities. Does not result in a complete digital thread.

Typical of silo efforts to add digital to an existing process.

Digitalization: The process changes to improve connectivity and information flow while leveraging the power of digital capabilities.

Takes advantage of the capabilities of the technology to redefine a more efficient and effective workflow.

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Industry 4.0/Smart Manufacturing

- Artificial Intelligence
- Additive Manufacturing

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The Role of Artificial Intelligence in Electronics Manufacturing

- Artificial intelligence and machine learning are helping to improve the production process for electronics and other manufacturers
- Industry 4.0 optimizations (big data sets and control systems)
- Design (semiconductors, printed circuit boards, etc.)
- Electronics testing, optical inspection, and automated correction during midstream manufacturing processes

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AI Applications in Electronics Manufacturing

- AI and ML are valuable tools on the factory floor
- Industrial Internet of Things (IIoT) with sensors and machine communications
  - Real-time visibility to alert operations to potential failures
- Predictive maintenance systems using ML can provide insight into the state and status of the equipment

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Additional manufacturing activities in which AI has potential applications

- Demand forecasting, inventory optimization, scheduling and dispatching, and optimization for utilities and indirect materials
- Overall Equipment Effectiveness
  - Quality, Availability, Productivity

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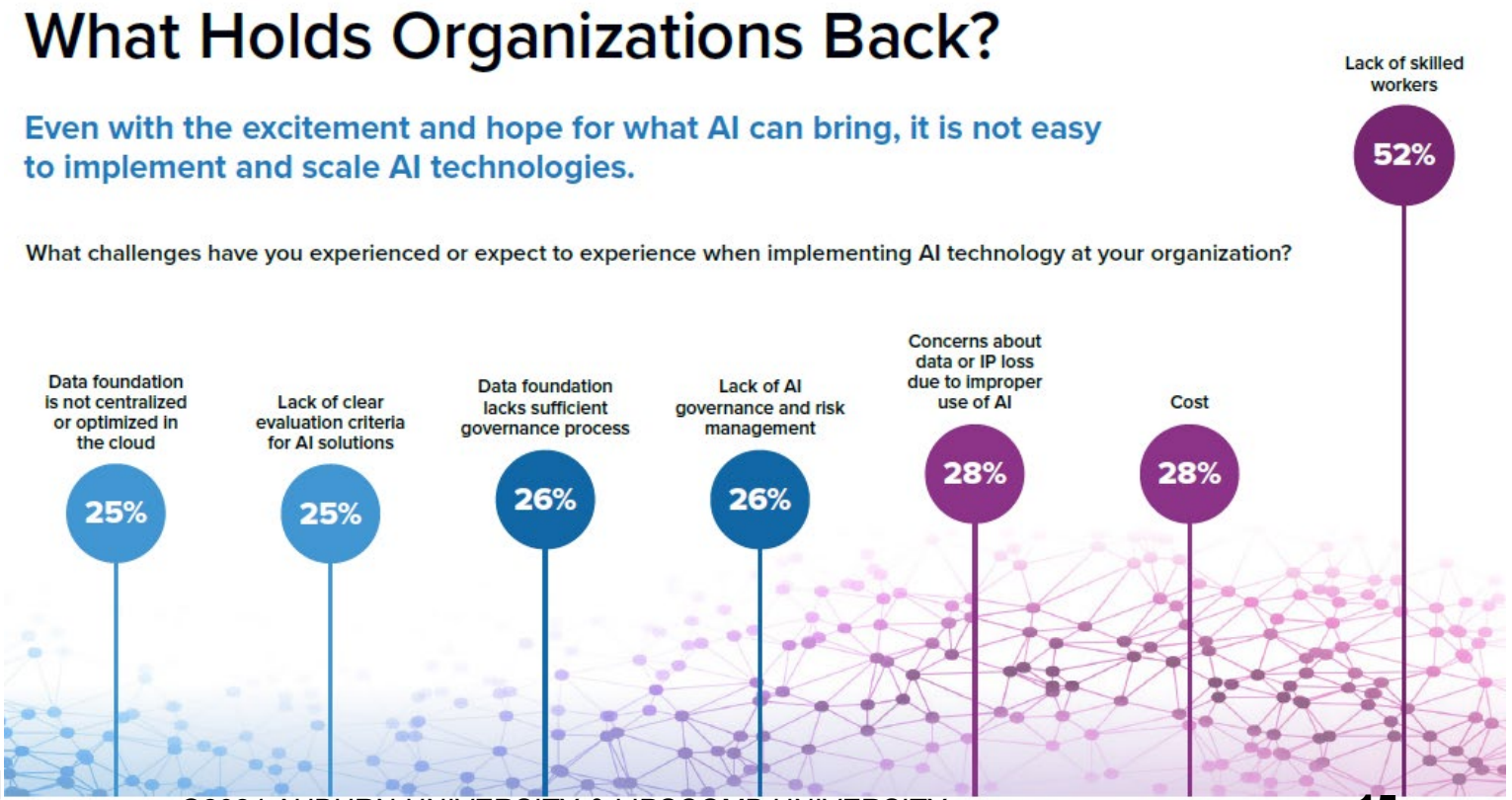
How is the implementation of AI going?

30% of companies surveyed say they are making progress in AI



[2]

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Enablers to AI in Electronics Manufacturing

- Start with a strategic road map
- Assemble talent and prepare the organization
- Understand the application and implement the technology
- Ensure good data
- Start with the intent to scale
- Learn from each step

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Conclusions

- Leaders in the field have:
  - An enterprise strategy aligned with business goals
  - Understand business value
  - Emphasize efficiency, data and skills readiness, governance, and optimize technology
  - Reduce business risk
  - Implement policies and processes for responsible and secure AI practices and principles
  - Reallocate budgets to enable spending on AI projects

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Conclusions -2

- The future of advanced manufacturing is using connectivity to enable automated optimization.
- AI/ML systems can process massive data sets that provide insights into process trends and potential quality escapes and use the information created to make decisions.
- AI and ML are at the forefront of Industry 4.0 and have the power to transform production and operations on every level for electronics manufacturing.

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Acknowledgements

Auburn University's ICAMS team would like to acknowledge the support and participation of the following in the execution of this research:

- America Makes
- IPC International, Inc. (world-wide electronics association and standards body)
- Manufacturing x Digital Institute (MxD the Digital Manufacturing Institute)
- National Defense Industrial Association (NDIA)
- Society of Manufacturing Engineers (SME)

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[1] E. M. Rogers, Diffusion of innovations, 5th ed. New York: Free Press, 2003.

[2] IDC's FutureScape: Worldwide Generative Artificial Intelligence 2024 Predictions InfoBrief, sponsored by Microsoft, November 2023

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THANK YOU!

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