Orientation

- **DRPM MIB:** Current inability to meet operational availability goals for ships and submarines due to delays in New Con and Maintenance

- **US Navy Need:**
  - **Submarines:** "1+2" Goal: 1 Columbia + 2 Virginia annually by 2026
  - **Surface Combatants:** 6 ships/year – Frigates and Destroyers by 2031

- **Challenges to overcome:**
  - Slow adoption of advanced manufacturing/production processes in shipbuilding
  - Supply Chain - Long lead time parts
  - Lack of an adequately trained workforce

Industry 4.0

Smart Manufacturing

Intelligent Manufacturing

Advanced Manufacturing

"What do we do first?"

Advanced Manufacturing Roadmap Program for Shipyards

- A facilitated process & jointly developed Roadmap of implementation projects

- Inform the sequence of investments to achieve the business/mission goals for the yard (Time to Delivery)

Market Study: Industry 4.0 for Maine

funded by…

STONE & ASSOCIATES

Understand the state of Industry 4.0 in Maine

- *What do Maine companies need to adopt I4.0?*
- *What are the successful program models in other regions?*
- *What are the needed skills?*

https://mainemep.org/blog/industry-4-0-smart-manufacturing-for-maine-market-study/

Assistance Needs of Companies and Implications for Potential Solutions

Key Observations

- **Awareness and education** for **company leaders** to understand what I4.0 (digital transformation)

- **Need an independent, unbiased assessment and roadmap** from a trusted resource

- **Spending constraints** for investment in the transformation to I4.0

- **Inadequate supply of skilled labor** to I4.0 transformation in thinking and implementation

- Require **implementation assistance in-house competency & outside resource**

Smart Manufacturing...

*Is the **information-driven**, **event-driven**, **efficient** and **collaborative orchestration** of **business, physical and digital processes** within plants, factories and across the **entire value chain**.*

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Smart Manufacturing…

*Is the **information-driven**, **event-driven**, **efficient** and **collaborative orchestration** of business, **physical and digital processes** within plants, factories and across the **entire value chain**.*
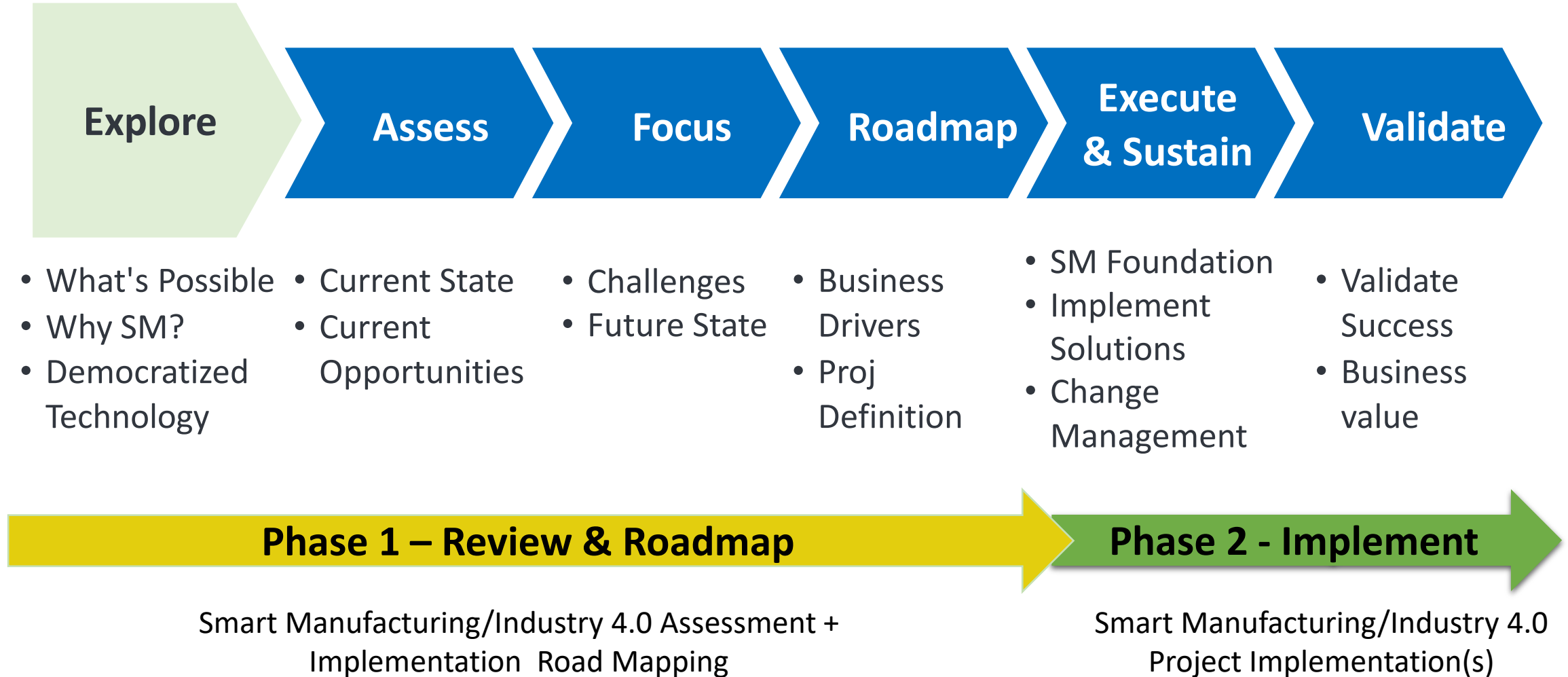
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Smart/Advanced Manufacturing...

enables data-driven decisions by getting

- *The right **information***
- *To the right **people***
- *In the right **way***
- *At the right **time***

CESMII Smart Manufacturing Acceleration Framework

Explore	Assess	Focus	Roadmap	Execute & Sustain	Validate
• What's Possible • Why SM? • Democratized Technology	• Current State • Current Opportunities	• Challenges • Future State	• Business Drivers • Proj Definition	• SM Foundation • Implement Solutions • Change Management	• Validate Success • Business value

Phase 1 – Review & Roadmap

Phase 2 - Implement

Smart Manufacturing/Industry 4.0 Assessment + Implementation Road Mapping

Smart Manufacturing/Industry 4.0 Project Implementation(s)

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Smart Manufacturing Roadmap Program

Critical Smart Manufacturing Areas
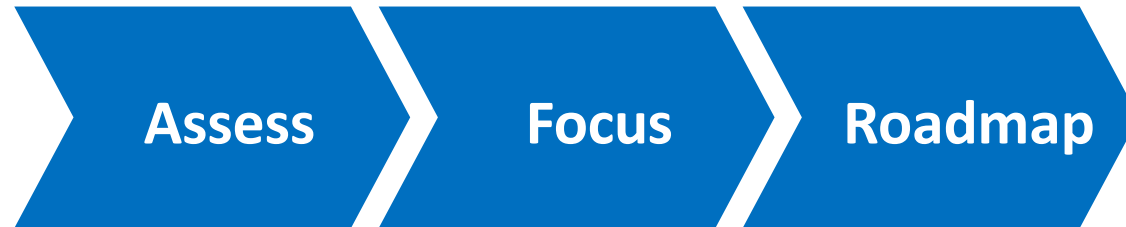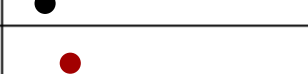
Assess → **Focus** → **Roadmap**

- Current State
- Current Opportunities

- Challenges
- Future State

- Business Drivers
- Proj Definition

Manufacturing Strategy and Leadership
Manufacturing Excellence & Culture
Data-Driven Processes
Systems Infrastructure and Integration
Workforce Optimization
SC Resilience & Agility

Contact: Jack Lesko, j.lesko@northeastern.edu

Example: Current State

Descriptive words/Definition:	Disconnected, Highly Manual, Highly Reactive, Isolated, low and unsophisticated technology adoption	Learning about Digitalization of the Business and the opportunities that can be acheived.	Vision for tactical execution. Best practices shared across teams and organizations. Primarily manual sharing of data and information across People, Processes, and Technology. Evaluative decision making after reviewing data and information.	Proactively use data and insights to plan for and drive continuous process improvement. Proactive and Predictive management of People, Processes, and Technology.	Strategic vision and in-progress execution to fully optimize and leverage People, Process, and Technology. Information is acted upon in near real-time by People, Process, and Technology
Critical Smart Manufacturing Areas	**Reactive**	**Aware**	**Collaborative**	**Proactive**	**Adaptive**
Manufacturing Strategy and Leadership					
Manufacturing Excellence & Culture					
Data-Driven Processes					
Systems Infrastructure and Integration					
Workforce Optimization					
SC Resilience & Agility					

Legend:
- 🔵 Supply Chain management, Purchasing, Sourcing
- 🟢 Engineering, R&D, Design, Technical Management
- 🔴 Information Technology or Systems IT/IS
- 🔵 C-Level/Executive Management
- ⚫ Operations, Production, Plant Management
- 🔴 Quality
- 🟠 Other
- 🟢 All Company Average

Current and Future State Transition

Critical Smart Manufacturing Areas	Disconnected, Highly Manual, Highly Reactive, Isolated, low and unsophisticated technology adoption	Learning about Digitalization of the Business and the opportunities that can be acheived.	Vision for tactical execution. Best practices shared across teams and organizations. Primarily manual sharing of data and information across People, Processes, and Technology. Evaluative decision making after reviewing data and information.	Proactively use data and insights to plan for and drive continuous process improvement. Proactive and Predictive management of People, Processes, and Technology.	Strategic vision and in-progress execution to fully optimize and leverage People, Process, and Technology. Information is acted upon in near real-time by People, Process, and Technology
	Reactive	**Aware**	**Collaborative**	**Proactive**	**Adaptive**
Manufacturing Strategy and Leadership		✕ →→→	✕		
Manufacturing Excellence & Culture			✕ →→→	✕	
Data-driven Processes		✕ →→	✕		
Connected Systems	✕ →→→→→		✕		
Optimized Workforce		✕ →→→→→		✕	
Supply Chain Resilience & Agility		✕ →→→→	✕		
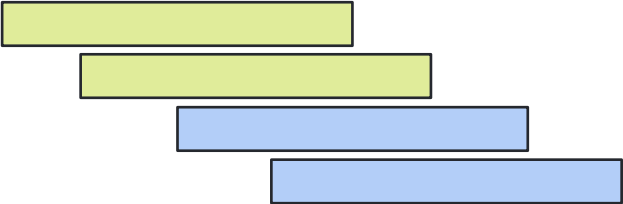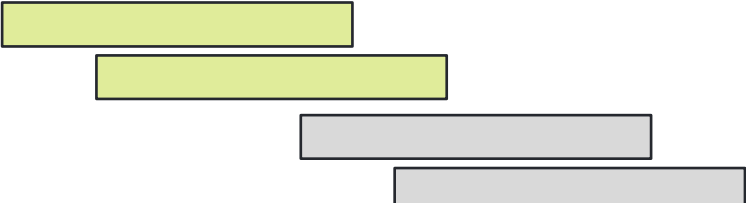
✕ Current State   ✕ Future State

Sample: Strategic Roadmap Plan

Business Objectives	Improvement Areas	Initiatives	Strategic Roadmap
			2Q22	3Q22	4Q22	1Q23	2Q23	3Q23
Profitable Growth	Manufacturing Strategy and Leadership	Standardize metrics and digital dashboards	
Competitive Edge	Data-driven Operations	Enhanced data collection and analysis	
Operational Excellence	Data-driven Operations	Standardization of Information Models	
Operational Excellence	Data-driven Operations	Self-optimizing processes for energy utilization	
Operational Excellence	Systems Infrastructure and Integration	Equipment and Systems Interoperability	
Customer Experience	Supply Chain Resilience and Agility	Expediting of Parts/Material Replacement	

Key Dependencies and Risks

- New inter-department workflow depends on integration of vendor cloud solutions
- Management needs to agree on top 5-6 KPIs for the organization

Key Metrics/KPIs

- Corporate wide access to standard KPI dashboard for the organization.
- Percent of suppliers on new Supplier Data Exchange portal
- Improved on-time delivery rates, customer quality rating and reduce warranty claims
- Improved value creation from project investment

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Adapting CESMII Smart Manufacturing Acceleration Framework for Shipyards

Execution: AdvM Roadmap Program for Shipyards
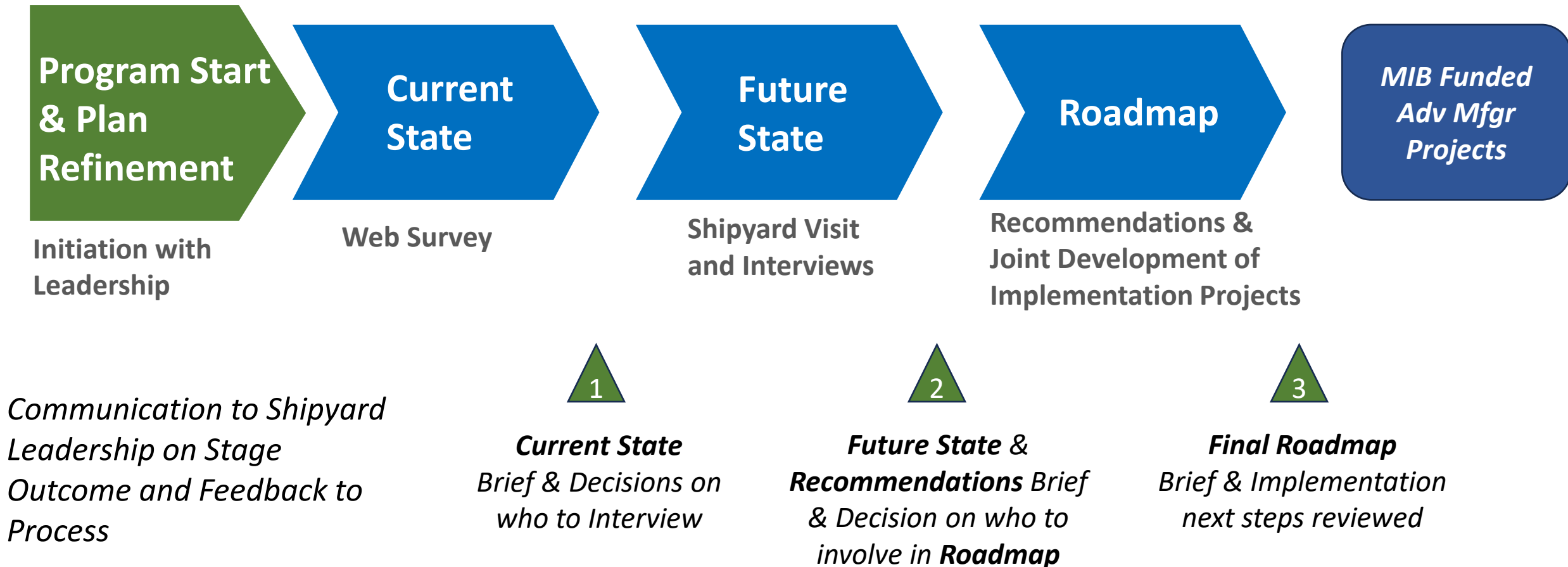
Shipyard Advanced Manufacturing Roadmap
Value Propositions for Shipyards

- AdvMR-identified projects are eligible for further MIB implementation funding

- Near-term AdvM implementations, focused schedule, and time to delivery

- Workforce enhancement for improved efficiency and productivity

- Worker-centric AdvM for accelerated adoption and job satisfaction/retention

Advanced and Data Driven Manufacturing in Shipbuilding

Thank You

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