Roadmap Workshop on Sustainable Manufacturing

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Timeline – Planning and Running a Roadmap Workshop

- Form a steering committee
- Identify the people who should attend (Academic / Industrial / Government)
- Develop a Phase Zero Roadmap (3 to 6 months ahead)
- Hold the workshop using appropriate facilitators / scribes
- Generate draft report (<2 weeks)
- Refine the report (6 months)

Smart Process Manufacturing (SPM) Steering Committee

- Jim Davis UCLA (PI)
- Tom Edgar UT-Austin (co-PI)
- Yiannis Dimitratos DuPont
- Jerry Gipson Dow
- Ignacio Grossmann CMU
- Peggy Hewitt ASM/Honeywell
- Ric Jackson FIATECH
- Kevin Peavey Dow
- Jim Porter DuPont (retired)
- Rex Reklaitis Purdue
- Bruce Strupp CH2M Hill

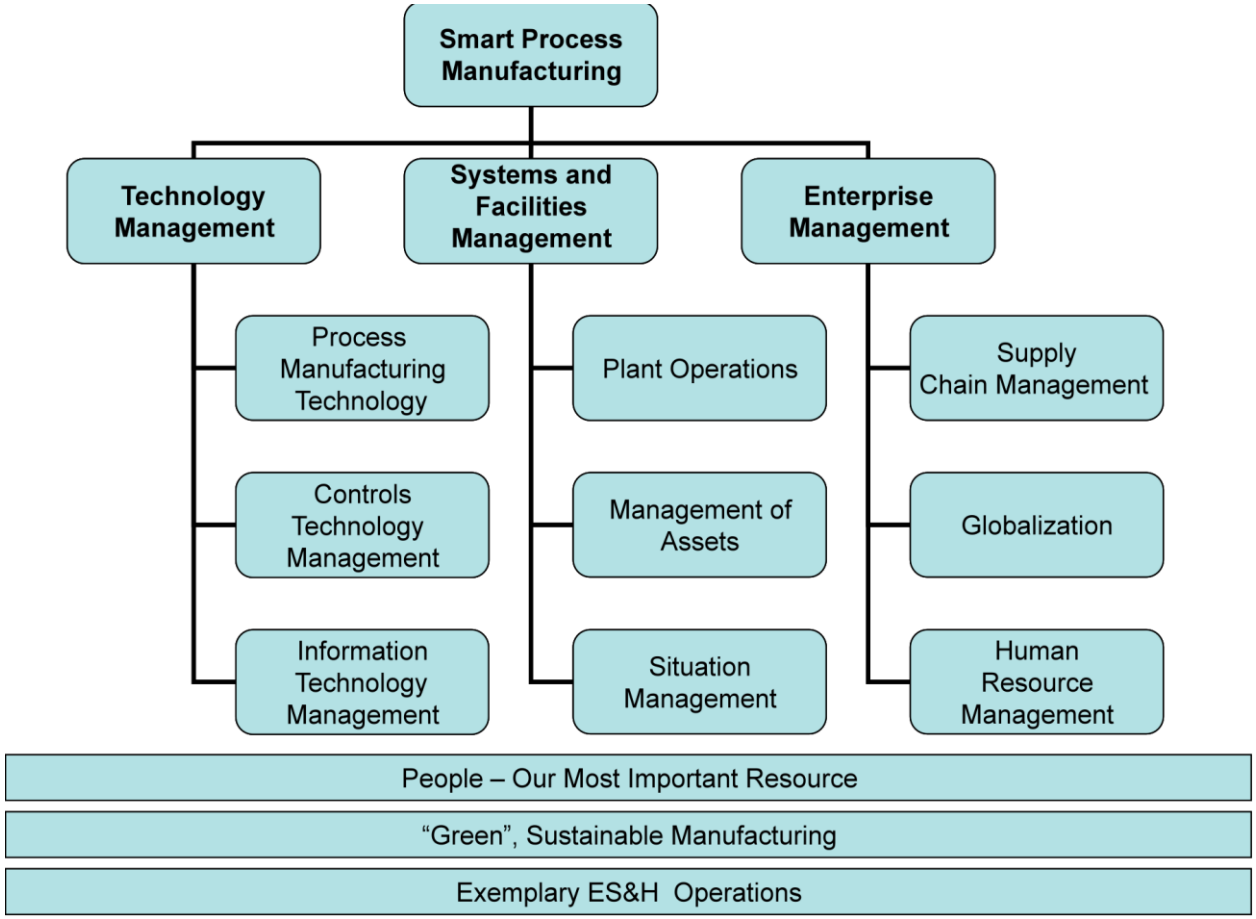
SPM Engineering Virtual Organization

- ABB AG
- Aspen Tech
- British Petroleum
- CH2M Hill
- Dow Chemical Co.
- DuPont
- Eastman Chemical Company
- Emerson Process Management
- Exxon Mobil Research & Engineering
- Honeywell
- IBM
- IMTI
- PDC Corporation
- Proctor & Gamble
- Shell
- Auburn University
- Carnegie Mellon University
- NSF
- Ohio State University
- Purdue University
- Rensselaer Polytechnic Institute
- State University of New York at Buffalo
- Texas A&M University
- Tufts University
- UCLA
- University of Florida
- University of Oklahoma
- University of Texas
- Vanderbilt University
- Wayne State University

The Business Case for the SPM Roadmap

- It is prohibitively expensive for any one company to develop the SPM infrastructure AND the competitive technologies
- Infrastructure tools, approaches and standards are non-competitive
- Environmental, sustainability, energy and supply chain are cross-company issues
- A raised collective industry technology operating bar maximizes SPM benefits
- Cross-industry standard practices, tools and technologies enable companies to more successfully collaborate and compete in the global economy
- The SPM industry benefits from an improved collective public image

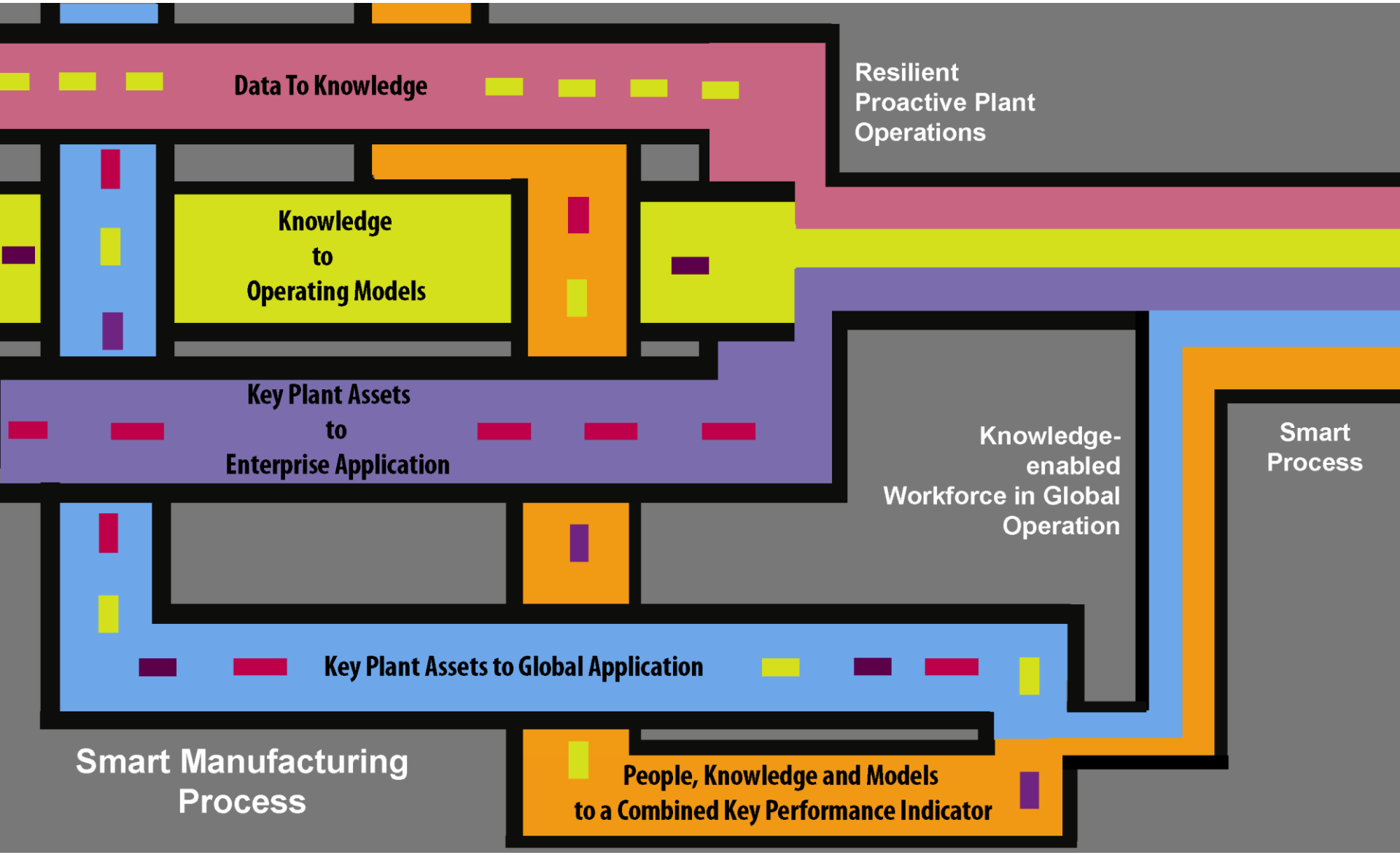
Phase 0 Roadmap

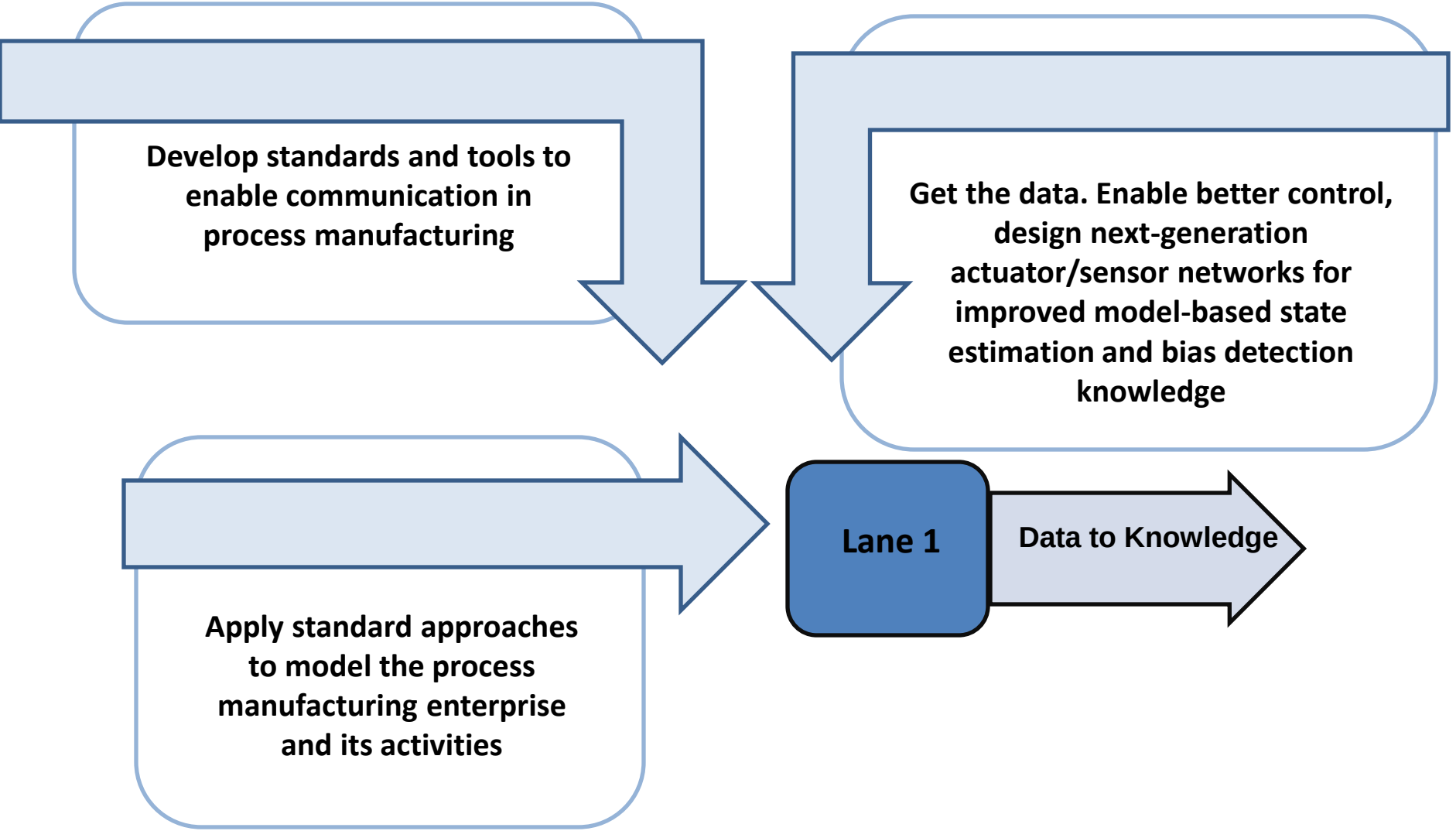


Workshop Approach

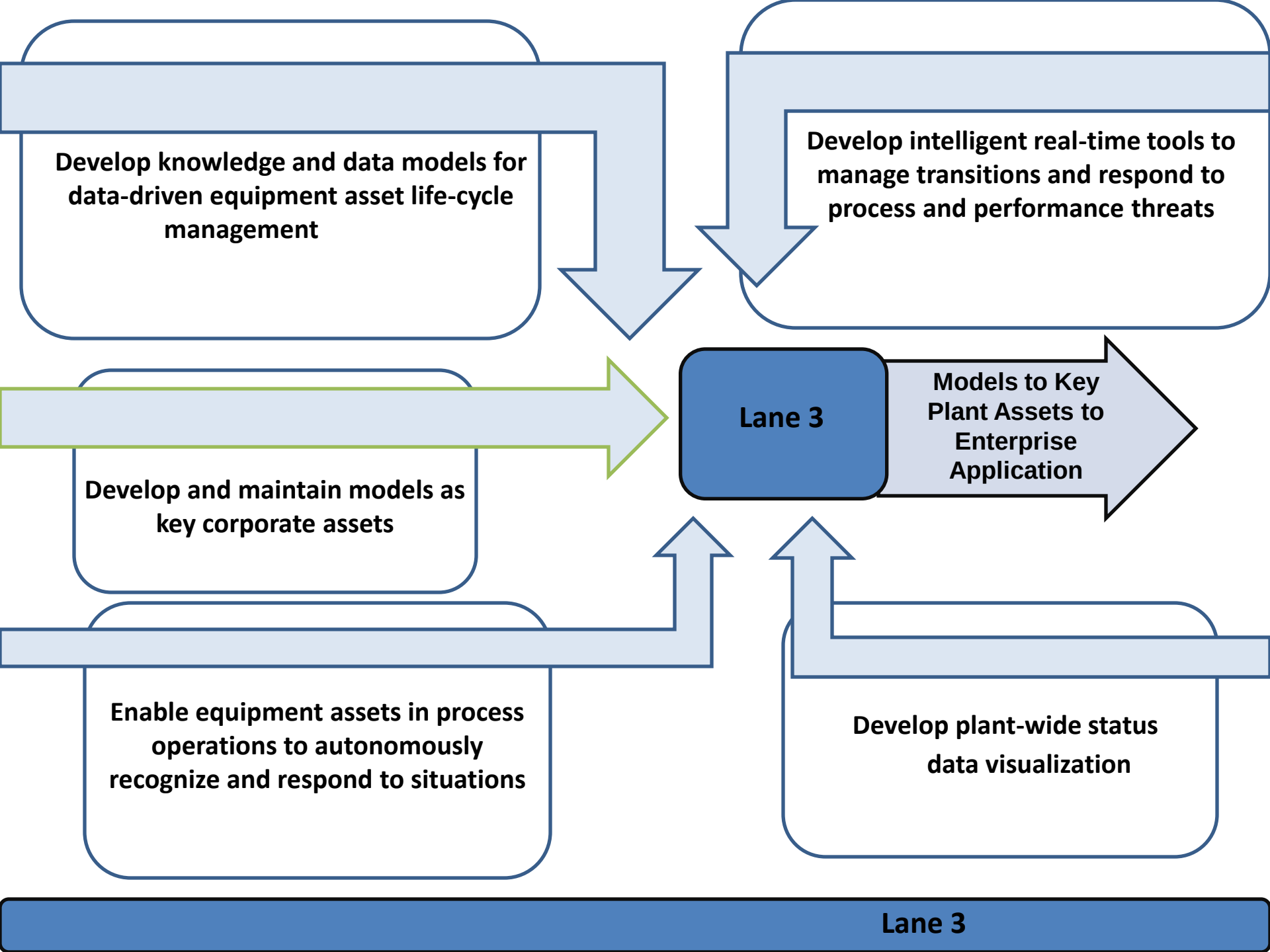
- Current State Assessment – where do we stand now?
- Define the Vision
- Identify Key Issues and Obstacles
- Propose and Rank Solutions
- Develop a “Roadmap”

An Industry-Academic Consensus-Based Technology Roadmap


Data To Knowledge
Resilient
Proactive Plant
Operations
Knowledge
to
Operating Models
Key Plant Assets
to
Enterprise Application
Knowledge-
enabled
Workforce in Global
Operation
Smart
Process
Key Plant Assets to Global Application
Smart Manufacturing
Process
People, Knowledge and Models
to a Combined Key Performance Indicator


Develop standards and tools to enable communication in process manufacturing
Get the data. Enable better control, design next-generation actuator/sensor networks for improved model-based state estimation and bias detection knowledge
Apply standard approaches to model the process manufacturing enterprise and its activities
Lane 1
Data to Knowledge

Lane 1


Develop knowledge and data models for data-driven equipment asset life-cycle management
Develop intelligent real-time tools to manage transitions and respond to process and performance threats
Develop and maintain models as key corporate assets
Lane 3
Models to Key Plant Assets to Enterprise Application
Enable equipment assets in process operations to autonomously recognize and respond to situations
Develop plant-wide status data visualization
Lane 3

Supply Chain Management

Issue:

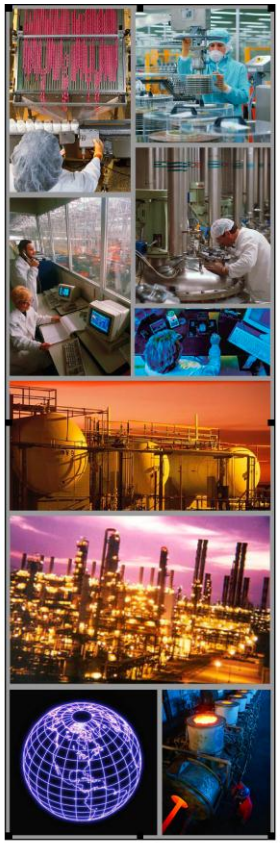
There is a gap between IT infrastructure and math models due to lack of standardization and different terminology in SC. There is a need to know how to reconcile different names, how to automate the mapping different language, how to merge different data base/structure automatically (many are manually done currently)

Solutions:

1. Develop large-scale information retrieval techniques for rationalizing unstructured data and performing feature extraction in SC databases
2. Use self-learning and adaptive techniques to evolve standards (meta models and/or semantic models) and to map process components to meta/semantic models

Lane 3: Solution Plan for Operating Models to Key Plant Assets	
Develop knowledge and data models for data-driven equipment asset life-cycle management and decision-making	
	Unified, intelligent manufacturing operations management database
	Critical resource performance indicators
	Knowledge-based asset management
	Critical operations procedures
	Intelligent manufacturing resources
Enable equipment assets in process operations to autonomously recognize and respond to situations	
	Self-aware assets
	Asset performance analysis tools
	100% uptime
	Rapid transition management
Develop plant-wide status data visualization	
	Capture, archival, and make equipment status information available
	Plant-wide process status
	Full sensory plant status simulation
	Vr-based plant scenarios
Develop intelligent real-time tools to manage transitions and respond to process and performance threats	
	Models for performance tracking
	Models for performance tracking
	Risk and uncertainty assessment
	Intelligent monitoring & control systems
	Controller design for fault tolerance
	Off-normal situation response
	Expert process advisors
	Distributed intelligent operating units
Develop and maintain models as key corporate assets	
	Requirement-driven, automated model generation
	Business case analysis for models
	Enterprise management of models
	Systematic model development
	Integrating architecture

Technology Roadmap Report



1. Motivating Smart Process Manufacturing
2. The Business Case and the Business Transformation
3. The Technical Transformation
4. The Smart Process Manufacturing Roadmap
5. The Path Forward

Proposed date for Sustainable Manufacturing RoadmapWorkshop:

August 15-16, 2012

Cincinnati, Ohio

(After ICOSSE ’12 Conference)