



The Lean Advancement Initiative (LAI) at MIT and Principles of Enterprise Systems

Prof. Debbie Nightingale
Co-Director
Lean Advancement Initiative
Lean+ Conference – Spring 2009

Outline

- LAI Overview
- New Products, Partnerships and Events
- Boeing Involvement with LAI
- Future Direction

LAI: A Consortium Dedicated To Enterprise Performance

- Enable Enterprises to effectively, efficiently and reliably create value in a complex and rapidly changing environment
- Enable focused and accelerated transformation of complex enterprises
- Collaborative engagement of all stakeholders in Industry, Government and Academia
- Understand, develop, and institutionalize principles, processes, behaviors and tools



LAI Members Share A Goal: Enterprise Excellence

NORTHROP GRUMMAN

BOEING

LOCKHEED MARTIN

**Rockwell
Collins**



Raytheon

USA
United Space Alliance



LAI 
LEAN ADVANCEMENT INITIATIVE™



ULA
United Launch Alliance



 **Pratt & Whitney**
A United Technologies Company

BAE SYSTEMS

 **Sikorsky**
A United Technologies Company



Boeing Involvement with EdNet

- Boeing has sponsored 10 Lean Academy weeklong workshops in last 4 years
 - Lean education for entry level Boeing employees
 - Involvement of local universities
 - Exposure to local leaders and lean activities
- Boeing “alums” are active participants in developing and delivering material
 - Al Haggerty
 - Thad Sandford

LAI - Expanding Enterprise Focus

Increasing Total
Enterprise
Effectiveness

EVOLUTION OF LEAN ENTERPRISE THINKING

Operations
Functional lean
successes
Manufacturing
Supplier Networks
"Islands" of Success

Successes
through
interaction
between
functions

Lean applied
to enabling
processes
• HR
• IT, etc.

Success
through
*enterprise
integration &
application to
Product Dev*

Transition from
waste
minimization to
value creation

Success
through total
enterprise
integration of
all
stakeholders
• Industry
• Government
• Suppliers
• Employees

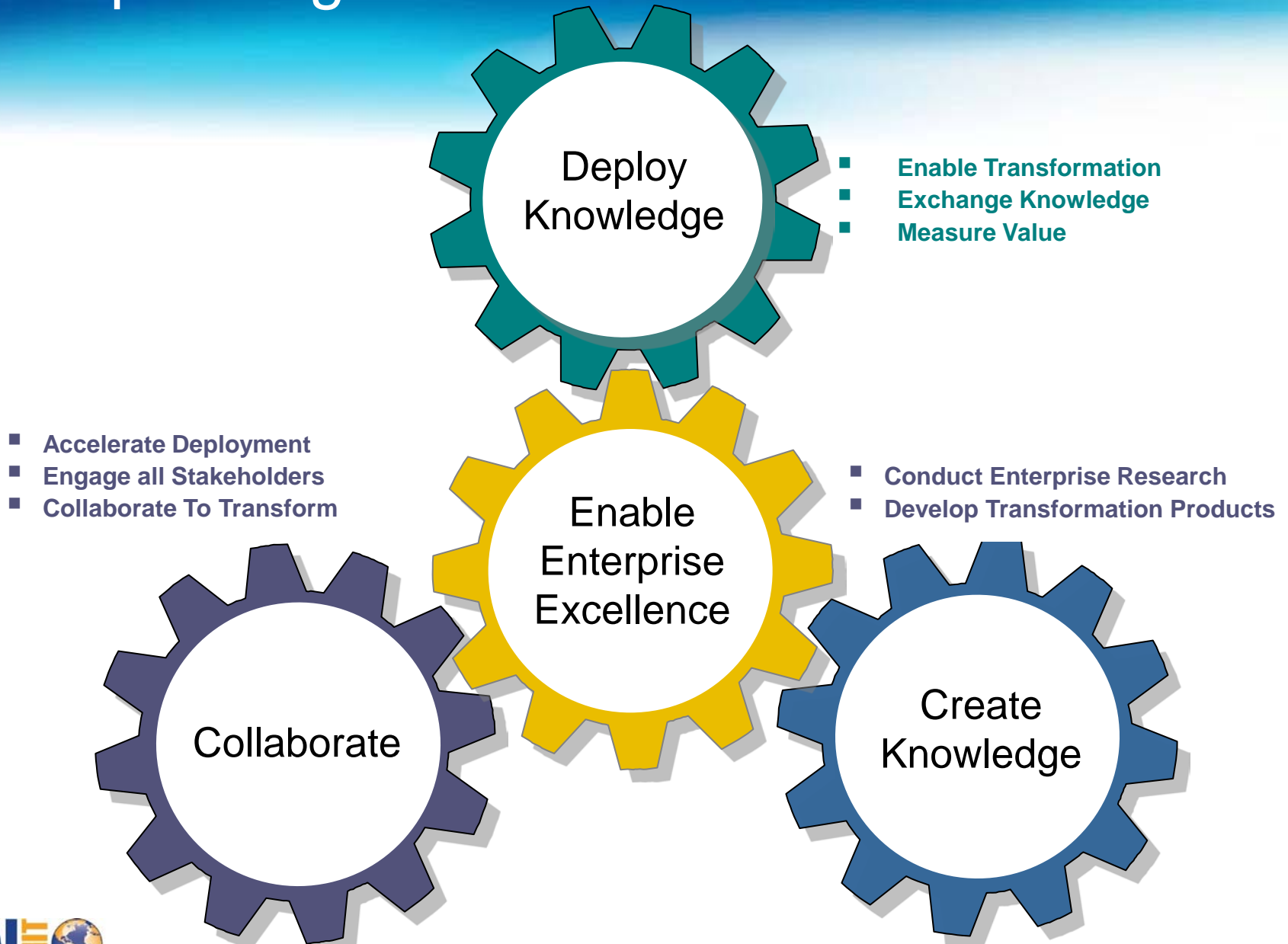
Success
through
*networked
enterprises*

Expanding the
lean boundaries
• Suppliers
• Customers
• Partners

1993

NOW

LAI Operating Model



Creating a Holistic Approach to Enterprise Transformation

Transformation Issue

How do I motivate and sustain enterprise transformation?

How do I transform my enterprise to lean?

What analytical tools can I use to support my decision making?



Enterprise Tool

7 Principles of Lean Enterprise Thinking

Enterprise Transformation Roadmap

Enterprise Architecting Framework

Enterprise Strategic Analysis and Transformation (ESAT)

7 Principles of Lean Enterprise Thinking

1.

Adopt a **holistic approach** to enterprise transformation.

2.

Identify relevant **stakeholders** and determine their **value propositions**.

3.

Focus on enterprise **effectiveness before efficiency**.

4.

Address **internal and external** enterprise interdependencies.

5.

Ensure **stability and flow** within and across the enterprise.

6.

Cultivate leadership to support and drive enterprise behaviors.

7.

Emphasize **organizational learning**.

STRATEGIC CYCLE

Determine Strategic Imperative

- Articulate Business Case for Lean
- Focus on Stakeholder Value
- Leverage Lean Gains

Pursue & Sustain Enterprise Transformation

Engage Leadership in Transformation

- Convey Urgency
- Foster Executive Lean Learning
- Obtain Executive Buy-In
- Establish Executive Lean Transformation Council

Strategic Implications of Transformation...

Nurture, Process & Imbed Lean Enterprise Thinking

- Monitor & Measure the Outcomes
- Nurture Process, & Imbed Lean Culture
- Capture & Diffuse Lessons Learned
- Synchronize Strategic Long-Term & Short-Term Cycles

Long-Term Corrective Action

PLANNING CYCLE

A Committed Leadership Team

Understand Current State

- Perform Stakeholders Analysis
- Define As-Is Value Stream
- Perform Enterprise Assessment

Capabilities & Deficiencies Identified

Envision & Design Future Enterprise

- Create Vision of Future State
- Define "To-Be" Enterprise Value Stream
- Perform Gap Analysis

Lean Enterprise Vision

Implement & Coordinate Transformation Plan

Implementation Results

- Develop Detailed Project Implementation Plans
- Synchronize Detailed Plans
- Implement Projects and Track Progress
- Commit Resources
- Provide Education & Training

Short-Term Corrective Action

EXECUTION CYCLE

Create Transformation Plan

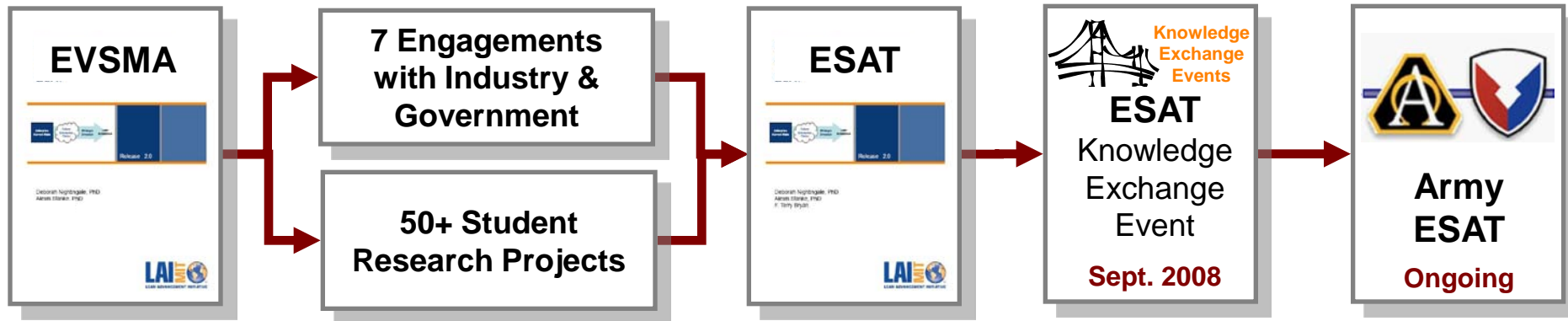
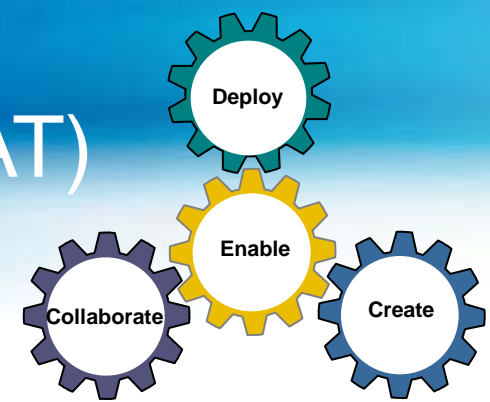
- Identify Key Enterprise Improvement Project Areas
- Determine Impact Upon Enterprise Performance
- Prioritize, Select and Sequence Project Areas
- Publish Communication Plan

Alignment Requirements Identified...

Align Enterprise Infrastructure

- Align Organization
- Align Incentives
- Empower Change Agents
- Rationalize Systems & Policies
- Align Metrics

Enterprise Strategic Analysis for Transformation (ESAT)

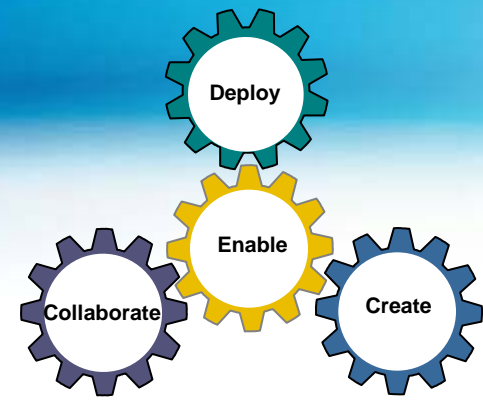


ESAT

An integrated, analytical framework for diagnosing and improving overall Enterprise performance.

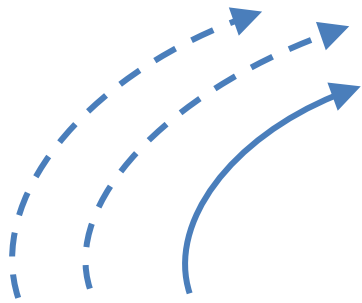
- Focuses on Enterprise-wide processes
- Provides a cohesive method for diagnosing an Enterprise to expose sources of waste and barriers to value delivery
- Considers the needs and values of all Enterprise stakeholders
- Identifies process interfaces, disconnects, and delays
- Establishes an Enterprise vision for the future
- Identifies improvement opportunities that will lead the Enterprise to its future state

LAI Enterprise Self-Assessment Tool (LESAT)

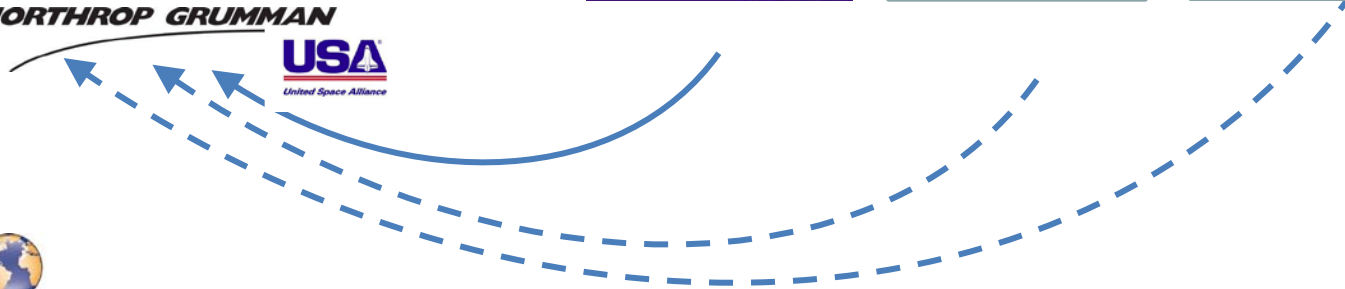
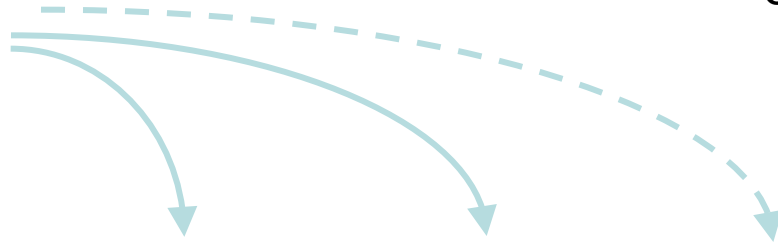


Downloaded more than
3,400 times
since 2003

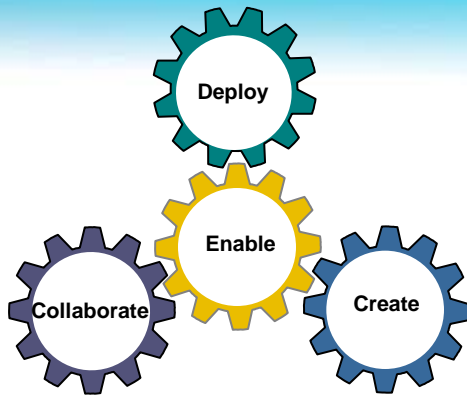
LAI Research
EV SMA
ESAT
Theses



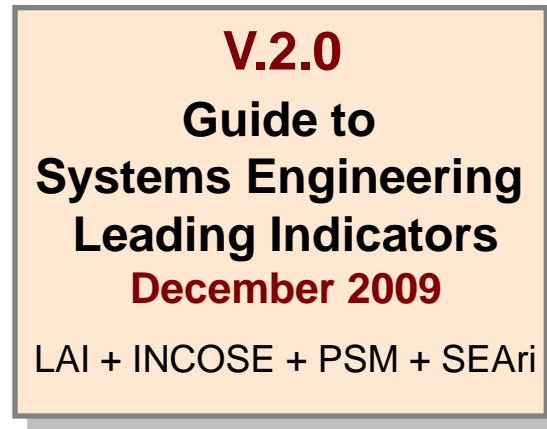
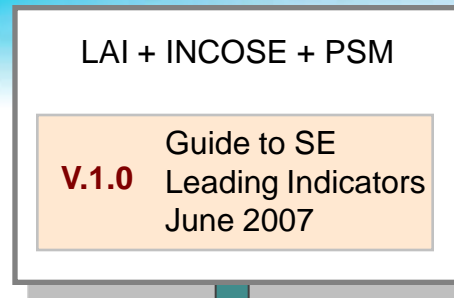
LAI Consortium
Usage Experience



Systems Engineering Leading Indicators



- Version 2.0 development team includes 20+ participants from US, UK, and Australia
- Schedule aligned with DoD effort on systems engineering effectiveness



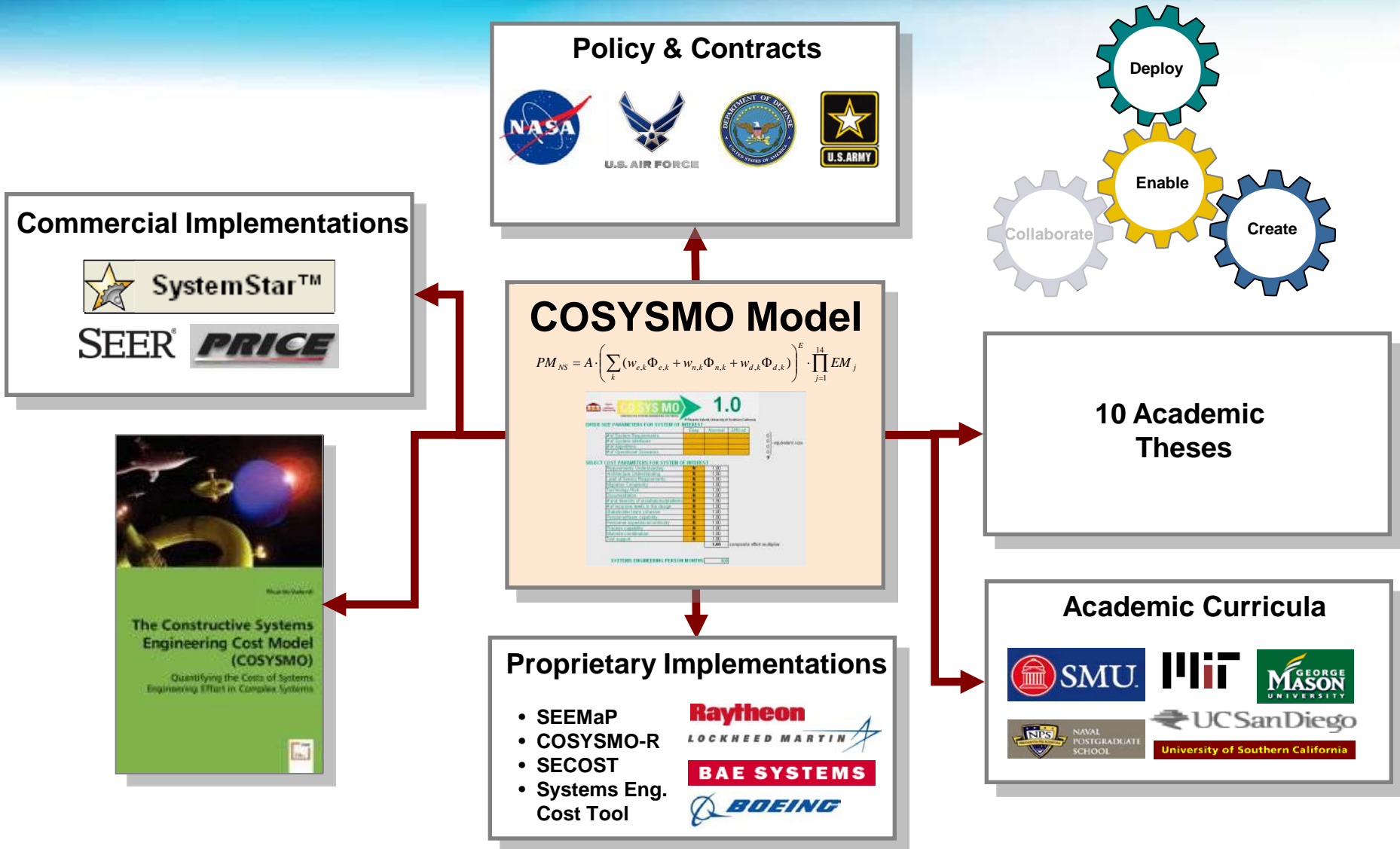
- Six new leading indicators to be added to current 13
- New information and real-world examples will be included

The logo features a stylized 'E' with a globe inside a square frame. Below it, the text reads 'Magazine March 2007'.

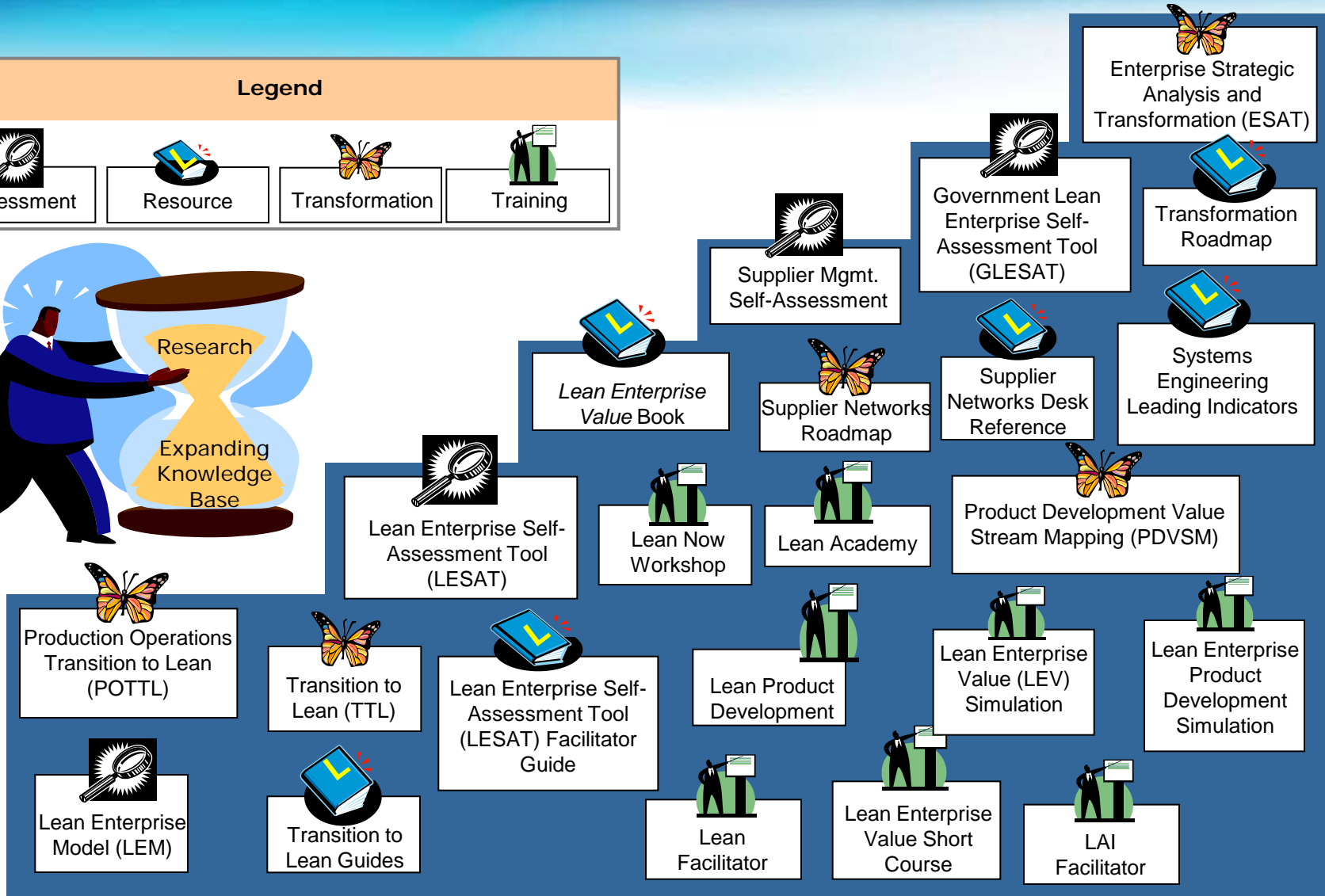
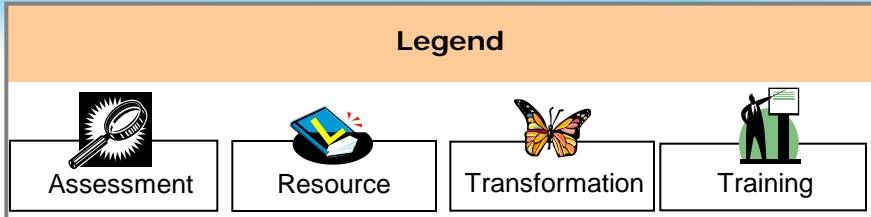
*"The leading indicators project is an excellent example of how academic, government and industry experts can work together to perform collaborative research that has **real impact** on engineering practice"*

- Incorporated in IBM Rationale Product Suite
- NAVAIR's Systems Engineering Development & Implementation Center (SEDIC) using SE leading indicators to develop advanced analysis techniques and toolkit for Navy programs

Cost Modeling



Co-Evolving Research, Products, and Tools



Knowledge Exchange Events



CHANGE MANAGEMENT

Knowledge
Exchange Event

October 2008



Event was hosted by:
Pratt & Whitney
A United Technologies Company

- Taught and applied the five Enterprise Change Capabilities
- 16 participants
- Visited P&W EHRO facility to apply and present findings
- EHRO Facility reviewed and implemented suggestions



ESAT

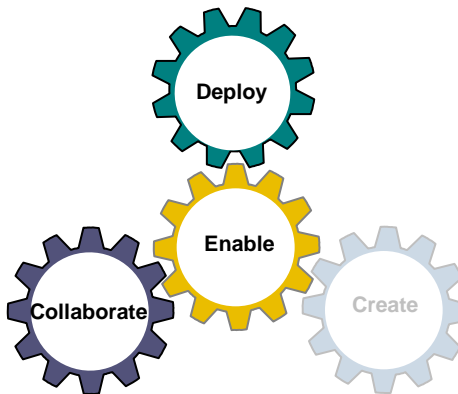
Knowledge
Exchange Event

Sept. 2008

Event was hosted by:



U.S. Army



METRICS

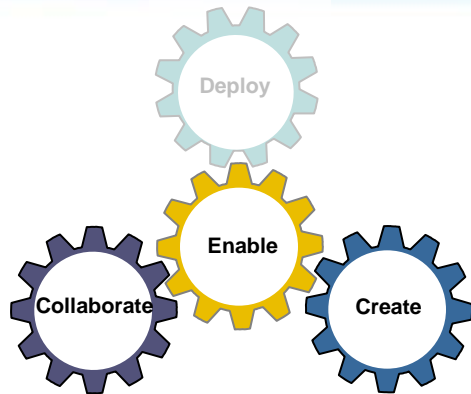
Knowledge
Exchange Event

November 2008

Event was hosted by:

Raytheon

Communities of Practice



Community of Practice

A knowledge creating community that collaboratively solves hard, real-world problems

- Active participation
- Open and honest sharing



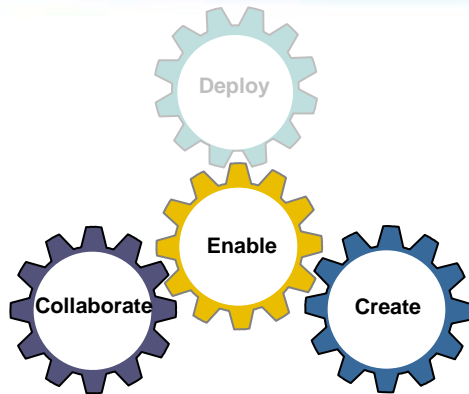
Product Development Community of Practice

- LAI's third PD benchmarking event hosted by Raytheon in June 2008 at the University of Arizona.
- MIT partnering with McKinsey and Co. to develop new global database identifying high-performance PD practices.
- Collaboration with Technical University of Braunschweig for global benchmarking of implementation of Lean practices in PD.

Metrics Community of Practice

- Group's second KEE was hosted by at Raytheon in Andover, MA, in November 2008
- LAI continues to contribute to measurement initiatives at Raytheon and Lockheed Martin
- Joint measurement workshop planned for May 2009

New Community of Practice Formed



Community of Practice

A knowledge creating community that collaboratively solves hard, real-world problems

- Active participation
- Open and honest sharing



Assessment/Diagnostic Community of Practice

- Recent interest in common methodologies and instruments for assessment or diagnostic sparked discussion session at Annual Meeting
- Meeting defined key interest areas for members
- Consensus to form a community of practice at April 2009 LAI Annual Meeting
- Future involvement in revisions to LAI LESAT tool

Expanding Lean Into Software



Boeing Phantom Works

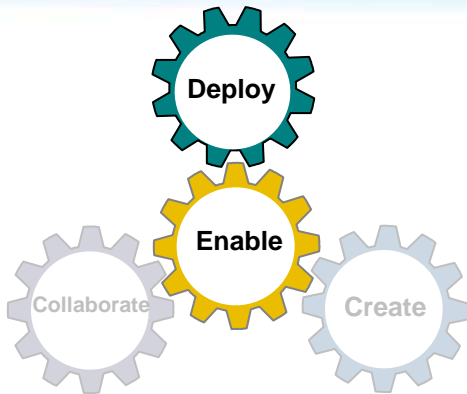
- LAI developed a roadmap for enabling rapid certification of aerospace embedded software systems

Literature Review
(Standards, Academic
Literature)

Expert Interviews
(Industry, Government,
Academia)

Roadmap for Future
Research
(Technology, Process)

Journal of Enterprise Transformation (JET)



Unique New International Journal

- Forum for articles on trends, new findings, and ongoing research on Enterprise Transformation
- Interdisciplinary research in management, industrial & systems engineering, information systems, organizational behavior, political science, and economics



- Partnership with the Institute of Industrial Engineers (IIE) and the International Council on Systems Engineering (INCOSE)



- Professor Nightingale and Dr. Ricardo Valerdi will serve as inaugural editors
- Associate editors from Europe, Asia, and the United States

- First Issue in early 2010

January 2009 Research Summit

2009 LAI Enterprise Transformation Research Summit

A Day-Long Overview of LAI's
Enterprise Research, Insights, Findings, and Applications

Videos

Thirteen presentations from this Research Summit are on video and can be viewed on our website (<http://lean.mit.edu>) and on MIT TechTV (<http://techtv.mit.edu>)

Focused on LAI modes of doing Enterprise research:

- Developing and Deploying Enterprise models into practice and engagement
- Creating powerful partnerships for research and engagement
- Strengthening Enterprise performance with competency and collaboration models
- Learning from case studies
- Addressing Enterprise processes

Provided a mechanism to:

- Rapidly disseminate learning
- Highlight key areas from members that need further work

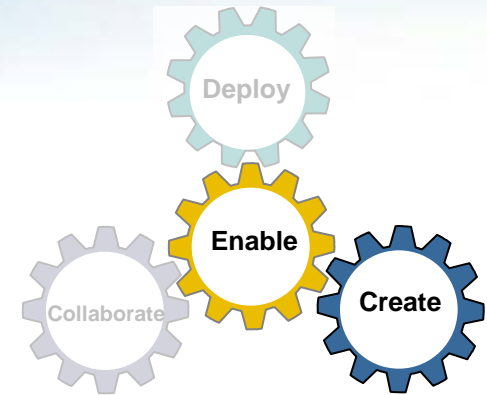
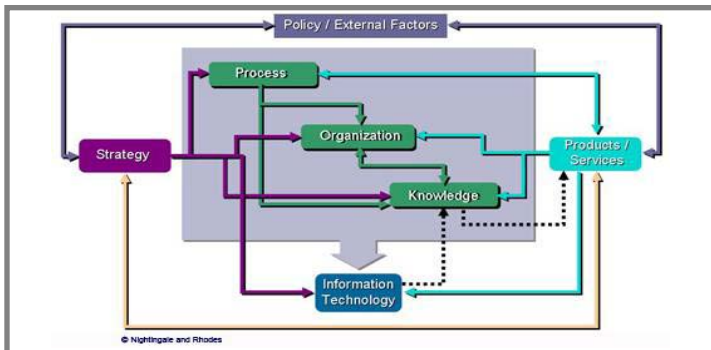
Highlights of Emerging Research



Chris Glazner

MIT Degree Candidate:
Ph.D., Engineering Systems, 2009

- Strategic-level modeling and simulation of Enterprise Architecture to address key question directly affecting bottom-line results
 - Analyzes investment tradeoffs across multiple business units
 - Provides guidance on how to most effectively incentivize a company's business units and allocate R&D discretionary budget



“Modeling and Understanding Enterprise Behavior Using a Hybrid Simulation Approach”



Presented by
Chris Glazner
at the
**LAI 2009 Enterprise
Transformation
Research Summit**

See this presentation on Video
at the LAI website (<http://lean.mit.edu>)
and at MIT Tech TV (<http://techtv.mit.edu>)

Highlights of Emerging Research

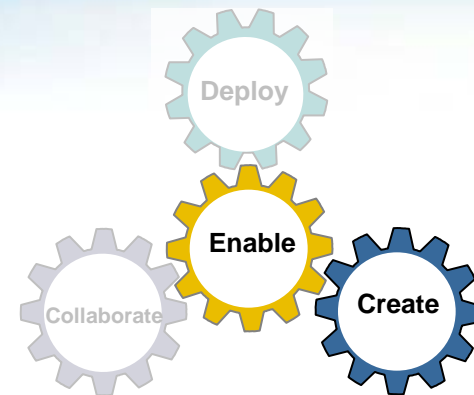


Major Robb Wirthlin
 United States Air Force
 MIT Degree Candidate:
 Ph.D., Engineering Systems, 2009

- Developed and empirically validated integrated model of the USAF requirements, planning, budgeting, and acquisition systems
- Anomalous behaviors of acquisition are in fact **emergent behaviors** of a much larger, complex system
 - Prior studies suggest many of the ‘pathologies’ outside of the control of the acquisition managers

Swim Lane	Pre-MS "A" (Concept Refinement)	Pre-MS "B" (Technology Development)	Pre-MS "C" (System Development & Demonstration)	Pre-Full Rate Production (Production & Deployment)	Operations and Sustainment
User					
Requirements					
Money	Scope of Model				
Acquisition					
Contractor					

Time →



“Identifying Leverage Points in Defense Acquisition Program Performance”



Presented by
Major Robb Wirthlin
 at the
LAI 2009 Enterprise Transformation Research Summit

See this presentation on Video
 at the LAI website (<http://lean.mit.edu>)
 and at MIT Tech TV (<http://techtv.mit.edu>)

Everything Is Here: lean.mit.edu



Watch video footage
LAI 2009 Enterprise Transformation Research Summit

Knowledge Exchange Events 

Member Login

Username

Password

Remember me

Login

 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Welcome

The Lean Advancement Initiative (LAI) offers organizational members from MIT and other leading universities, industry, and government a unique research consortium that provides a platform for learning, and best practices.

LAI offers:

- unique opportunities to engage with leading organizations and share organizational transformation experiences
- a portfolio of thought-provoking research and analysis
- innovative enterprise-level research and development

Vision

LAI's work is designed to enable enterprises to effectively, efficiently, and reliably create value in complex and rapidly changing environments.

Mission

LAI enables the focused and accelerated transformation of complex enterprises through collaborative stakeholder engagement in developing and institutionalizing principles, processes, behaviors, and tools for enterprise excellence.

RESEARCH OVERVIEW

RECENT RESEARCH

ANALYSIS OF ENTERPRISE DYNAMICS

COST ESTIMATION

ENTERPRISE CHANGE CAPABILITIES

ENTERPRISE PRODUCT DEVELOPMENT

ENTERPRISE STRATEGY

KNOWLEDGE MANAGEMENT

LEAN ENTERPRISE METRICS

MANAGING RISK

ROLE OF INFORMATION TECHNOLOGY (IT) IN THE ENTERPRISE

STRATEGIES FOR EFFECTIVE ENGINEERING

VALUE-BASED DECISION METHODS

SUPPLIER TOOLSET

SYSTEMS ENGINEERING LEADING INDICATORS GUIDE

Spotlight

March 31 - April 02, 2009

Achieving Enterprise Excellence: LAI 2009 Annual Meeting

Keynote speaker Lieutenant General N. Ross Thompson will discuss the Army's ongoing collaboration with LAI as the Army develops an enterprise-level platform for change.

Upcoming Events

Mar 31, 2009

LAI Executive Board Meeting

Mar 31, 2009

Achieving Enterprise Excellence: LAI Annual Meeting

Apr 01, 2009

Achieving Enterprise Excellence: LAI Annual Meeting

Apr 02, 2009

Achieving Enterprise Excellence: LAI Annual Meeting

Featured News

LAI Offers International Lean Enterprise Product Development Research Opportunity

Summit Videos: lean.mit.edu



HOME | ABOUT LAI | NEWS | EVENTS | RESEARCH | PRODUCTS | EDNET | COMMUNITIES | PUBLICATIONS | SITEMAP | SEARCH

HOME ▶ EVENTS ▶ LAI 2009 ENTERPRISE TRANSFORMATION RESEARCH SUMMIT ▶ ADOPTION OF MEASUREMENT TOOLS AT BAE SYSTEMS AND RAYTHEON

Knowledge Exchange Events 

Member Login

Username

Password

Remember me

Login

 MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Adoption of Measurement Tools at BAE Systems and Raytheon



LAI Researcher Dr. Ricardo Valeri | 00:13:00



What Makes measurement systems Adoptable?
(survey Qs)

- Well documented
- Trialability
- Low barrier of entry
- Transparency
- Demonstrates value
- Variety of incentives
- Tailorable
- Information freshness
- Relative advantage
- Compatibility
- On-going peer support
- Credibility
- Agility
- Flexibility
- Failure modes
- Enabled by IT
- Data validity/integrity

MIT TechTV

Videos

- [LAI Overview](#)
- [LAI Research Overview](#)
- [Adoption of Measurement Tools at BAE Systems and Raytheon](#)
- [Modeling and Understanding Enterprise Behavior Using a Hybrid Simulation Approach](#)
- [Overview of LAI Partnership Model](#)
- [Applying Enterprise Architecting within the Army Transformation](#)
- [Architecting the Healthcare System for Stakeholder Value](#)
- [Establishing Systems Competency in Enterprises: Recent Studies](#)
- [A Case Study of Lean Transformation at Rockwell Collins: Part I](#)
- [A Case Study of Lean Transformation at Rockwell Collins: Part II](#)
- [Making the Transition to Lean Product Development](#)
- [Facilitating Communities of Practice and Benchmarking](#)

 LEAN ADVANCEMENT INITIATIVE

<http://lean.mit.edu>

© 2009 Massachusetts Institute of Technology – Deborah Nightingale April 2009 - 26

LAI Synergies



Boeing Involvement with LAI

- Active involvement in LAI's Executive Board
- Participant in Case Studies and Knowledge Exchange Events
- Boeing has been active in all of LAI's Lean PD benchmarking events
 - Rockwell Collins, 2007; Raytheon Missile Systems, 2008; Boeing hosted a second 2008 meeting in El Segundo
- In 2003 Boeing adopted LAI's lean product development simulation as part of their basic training for engineers
 - Trained several thousand engineers and managers.
 - LAI workshop for train-the-trainer

Boeing Involvement with LAI

- Boeing incorporated parts of LAI's supplier networks transformation toolset into their executive education programs.
- Boeing was a member of the LAI-collaboration that produced the Leading Indicators Guide Version 1.0 and LESAT 1.0.
- Supervision of Boeing Students
 - Steve Patneau's 2008 thesis, "Transforming Commercial Aerospace Supply Chain Management Practices by Utilizing Toyota Production System Principles, Practices, and Methodologies," was distributed as a must read to Boeing Commercial leadership
 - Other SDM/LFM/Advanced Degree students in the areas of Supply Chain Management, Enterprise Transformation, Lean Engineering

Upcoming Knowledge Exchange Events



Knowledge Exchange Events

Network - Share - Learn

May 14, 2009

Using LESAT for Transformation

Host:
MIT,
Cambridge, MA



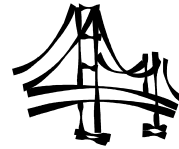
Knowledge Exchange Events

Network - Share - Learn

August 4-5, 2009

Sustaining Lean Practices Through Industry Education

Host:
Boeing,
Seal Beach, CA



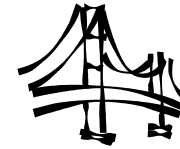
Knowledge Exchange Events

Network - Share - Learn

October 28-30, 2009

Sharing Lean Change Success Stories

Host:
TBD



Knowledge Exchange Events

Network - Share - Learn

November 4, 2009

Systems Engineering and Project Management Strategies for Cost Estimation

Location:
TBD

This Summer at MIT



PROFESSIONAL EDUCATION



Architecting the Future Enterprise

June 8-9, 2009

(25% discount for LAI members)



LAI Lean Academy Course

July 13-15, 2009

(10% discount for LAI members)



LAI Lean Engineering Seminar

July 16-17, 2009

(10% discount for LAI members)



LAI Lean Healthcare Academy

July 16-18, 2009

(10% discount for LAI members)

web.mit.edu/professional/short-programs/

The Road Ahead



**LAI will continue unique focus on large-scale
Enterprise architecting and transformation**

“Pull” from other sectors for Lean Enterprise thinking

Increase National and International impact

Enabling Enterprise Excellence

Discovery - Deployment - Renewal

Research Shapes
Deployment

Enterprise Research

We study Enterprises to identify best practices, transformation strategies and future Enterprise architectures



Transformation Knowledge Deployment

We transform research-based knowledge into education, products, knowledge exchange events, and transformation events

Deployment Shapes
Research

Stakeholder-Centric Value Creation

