Highlights of Enterprise Transformation Research

Debbie Nightingale

April 24, 2008
The Challenges of Complex Enterprises Requires a Systems Approach

• New strategic systems perspective
• Viewing enterprises as **holistic** and **highly networked** systems
• Integrating leadership processes, lifecycle processes and enabling infrastructure systems
• Balancing needs of multiple stakeholders working across boundaries

MOVING FROM THE PAST (hierarchical) enterprise

TOWARDS THE FUTURE (networked) enterprise
Understanding Mission Assurance

Initiation
LAI SMC EVSMA Event

Phase 1
(March 08)
Enterprise View of Government Projects

Phase 2
(April 08)
Integration of Govt. Industry Processes

Outcome
Enterprise View of Mission Assurance ‘Big Picture’
“Rockwell Collins places first in this year’s Top-Performing Companies (TPC) ranking of aerospace and defense (A&D) companies with annual revenues of $1-5 billion.”

Source: Aviation Week and Space Technology, 2007

“From 1998 through 2005, we made dramatic market share gains, going from ... the mentality of an OEM to a very service oriented company.”

Kent Stattler
EVP of Services, Rockwell Collins
Overhaul & Maintenance, Sept. 1, 2007

Source: George Roth, MIT 2005
Creating a Holistic Approach to Enterprise Transformation

Implementation 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 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.


http://lean.mit.edu
Enterprise Transformation Roadmap

**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

**Understand Current State**
- Perform Stakeholders Analysis
- Define As-Is Value Stream
- Perform Enterprise Assessment

**Create Vision of Future State**
- Define “To-Be” Enterprise Value Stream
- Perform Gap Analysis

**PLANNING CYCLE**

**Envision & Design Future Enterprise**
- Create Vision of Future State
- Define “To-Be” Enterprise Value Stream
- Perform Gap Analysis

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

**Implement & Coordinate Transformation Plan**
- Convey Urgency
- Foster Executive Lean Learning
- Obtain Executive Buy-In
- Establish Executive Lean Transformation Council

**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

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

**Alignment Requirements Identified…**

**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

**Capabilities & Deficiencies Identified**

**Long-Term Corrective Action**

**Short-Term Corrective Action**

**A Committed Leadership Team**

**Source:** Nightingale, Srinivasan and Mize

http://lean.mit.edu

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Enterprise Architecting – Enables Greater Efficiency and Effectiveness

- Effective integration – managing complex interdependencies
- System optimization, not local optimization
- Knowledge-based enterprise capabilities
- Achieving desired future state characteristics
  - Agility
  - Flexibility
  - Reconfigurability
EA Example: Reduce Time to Market Imperative

Policy / External Factors

Process

- Streamlined Integrated Product/Process Development Process; Design standardization and reuse
- Modular and platform product architectures to promote reuse, standardization, technology insertions, etc.
- Global product development and manufacturing; ITAR restrictions

Organization

- IPD teams with representatives from engineering design, manufacturing and suppliers; collaborative team members with holistic perspective
- IPD members must understand critical dimensions of product life cycle

Knowledge

Information Technology

Products / Services

- Engineering Data Management System to support new process
- Responsive support structure, enabled by standardized components and reliable products

Reduce time to market for new product introduction

- Strategy
- Responsive support structure, enabled by standardized components and reliable products
Enterprise Architecture Framework

Policy / External Factors

Process

Organization

Knowledge

Information Technology

Strategy

Products / Services
LAI Research Groups Address 4 Grand Questions

1. How can I understand the way my organization currently operates within its larger context?

2. How can I define and evaluate the future possibilities for a more efficient and effective enterprise?

3. What are the most effective strategies and tactics to achieve these future possibilities for my enterprise?

4. How can I best manage the enterprise change process?

FOCUS of RESEARCH
- ESE Approaches
- SE Effectiveness Indicators
- Studies of ESE Practices (with MITRE)

FOCUS of RESEARCH
- Lean Product Development
- Lean Systems Engineering
- Lean Software

FOCUS of RESEARCH
- Enterprise Value Analysis
- Enterprise Architecting
- IT as Enterprise Enabler
- Enterprise Cost and Metrics
- Enterprise Modeling

FOCUS of RESEARCH
- Change Management
- Enterprise Change Philosophy
- Studies of Successful Change
- Distributed Leadership

EA-ET
Enterprise Architecting - Enterprise Transformation

LEPD
Lean Enterprise Product Development

ESE
Enterprise Systems Engineering

ECM
Enterprise Change Management

http://lean.mit.edu

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# The Four Research Groups

<table>
<thead>
<tr>
<th>Faculty Lead</th>
<th>ECM Enterprise Change Management</th>
<th>ET/EA Enterprise Transformation/Enterprise Architecting</th>
<th>ESE Enterprise Systems Engineering</th>
<th>LEPD Lean Enterprise Product Development</th>
</tr>
</thead>
</table>

## Research Areas

- **Change Management**
- **Enterprise Change Philosophy**
- **Studies of Successful Change**
- **Distributed Leadership**
- **Enterprise Value Analysis**
- **Enterprise Architecting**
- **IT as Enterprise Enabler**
- **Enterprise Cost and Metrics**
- **Enterprise Modeling**
- **Enterprise SE Approaches**
- **SE Effectiveness Indicators**
- **Studies of ESE Practices (with MITRE)**
- **Lean Product Development**
- **Lean Systems Engineering**
- **Lean Software**

## Communities

- **Change Management**
- **CIO**
- **System Engineering**
- **Product Development**

## Team Members

- **George Roth**
- **Kirk Bozdogan**
- **Donna Rhodes**
- **JK Srinivasan**
- **Ricardo Valerdi**
- **Donna Rhodes**
- **Ricardo Valerdi**
- **Eric Rebentisch**
- **JK Srinivasan**
- **Hugh McManus**

## Products & Tools

- **Enterprise Change Fieldbook**
- **Transformation Roadmap / ESAT / LESAT**
- **SE Leading Indicators Guide**
- **PDVSM / LEPD/PDTTL**

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[http://lean.mit.edu](http://lean.mit.edu) © 2008 Massachusetts Institute of Technology  D.Nightingale 04/24/08
Enterprise change research has been developed at LAI based on the following observations:

- Transformation that derives from within “lean” and enterprises approaches differs from traditional notions of managing planned organizational change

**Expected Contributions of Enterprise Change Research**

1. A comprehensive set of precepts for managing organizational to enterprise change
2. Roadmap for leadership that will help them to initiate, accelerate, and sustain lean enterprise transformation
3. Use of case study observations of change efforts to provide insights into what make for effective lean enterprise cultures and structures
4. Providing references and illustrations for tools and methods that support enterprise transformation
What happened?

A series of case studies of successful lean enterprise change initiatives has been undertaken.

Raytheon

Warner Robins ALC

Rockwell Collins

Ariens

All case studies available at http://lean.mit.edu
Impact on Practice

These studies are:
1) Documented LAI case studies available on the LAI web site
2) Used to illustrate theory and methods for lean enterprise change:

The system of change
~ leads to a ~
lean enterprise system

- Rethinking boundaries
- Installing innovation sets
- Pulling & pushing change
- Seeking growth
- Distributing leadership
Systemic change: Europe, Japan and US, 1992-1997

<table>
<thead>
<tr>
<th>The 3 Dimensions</th>
<th>Europe</th>
<th>Japan</th>
<th>US</th>
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<tr>
<td>Structure (S)</td>
<td>30.3%</td>
<td>6.2%</td>
<td>16.5%</td>
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<tr>
<td>Processes (P)</td>
<td>74.9%</td>
<td>53.7%</td>
<td>82.3%</td>
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<tr>
<td>Boundaries (B)</td>
<td>44.9%</td>
<td>30.7%</td>
<td>57.0%</td>
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</table>

The 4 Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Europe</th>
<th>Japan</th>
<th>US</th>
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</thead>
<tbody>
<tr>
<td>System 1 (S+P+B)</td>
<td>13.0%</td>
<td>1.2%</td>
<td>8.9%</td>
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<tr>
<td>System 2 (S+P)</td>
<td>25.1%</td>
<td>4.7%</td>
<td>12.7%</td>
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<tr>
<td>System 3 (P+B)</td>
<td>34.2%</td>
<td>18.7%</td>
<td>46.8%</td>
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<tr>
<td>System 4 (S+B)</td>
<td>16.4%</td>
<td>1.6%</td>
<td>11.4%</td>
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</table>

Very few companies adopting whole system of change

* Based on work by Andrew Pettigrew, University of Bath
Impact on Practice

Systemic change and performance: Summary of regression results

<table>
<thead>
<tr>
<th>The 4 Systems</th>
<th>Pooled Sample of Western Firms</th>
<th>UK</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 1 (S+P+B)</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>System 2 (S+P)</td>
<td>-</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>System 3 (P+B)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>System 4 (S+B)</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

- The adoption of a full set of changes (System 1) increases the probability of improving corporate performance
- The adoption of partial systems (System 2 and System 3) is likely to reduce performance

Competitive Advantage Grows Out of a System of Activities as a Whole

* Based on work by Andrew Pettigrew, University of Bath
Impact on Practice

An example of Enterprise Change Capabilities is the complementary and cumulative set of changes as shown in Rockwell Collins’ Lean Electronics™.
Future direction

UTC ACE Case study – Program, Office, Manufacturing, Engineering and cross-organizational studies

Enterprise Change Theory – KEE, Book, Field Book and journal articles
Enterprise Systems Engineering
Research on SE Leading Indicators

Dr. Donna H. Rhodes
Massachusetts Institute of Technology
April 24, 2008
Motivation, Issues and Questions

• How do I know if a program is performing good systems engineering? -- Dr. Marvin Sambur, 2004

• How can metrics that help me plan new programs also help me manage my current one?

• How can industry, government, and academia collaborate to help make traditional metrics more useful?

• Where can I find good practices on using and interpreting metrics – and by that I mean what real practitioners have discovered?
History of the Research Effort

AF/DOD SE Revitalization Policies

AF/LAI Workshop on Systems Engineering
June 2004

SE LI Working Group
With SSCI and PSM

BETA
Guide to SE Leading Indicators
(December 2005)

Pilot Programs
(several companies)

Masters Thesis
(1 case study)

Validation Survey
(>100 responses/one corporation)

SE LI Working Group
With SSCI and PSM

V. 1.0
Guide to SE Leading Indicators
June 2007

Applications
IBM® Rational Method Composer – RUP Measurement Plug-in

Knowledge Exchange Event

Tutorial on SE Leading Indicators
(many companies)
(1) January 2007
(2) November 2007

Practical Software & Systems Measurement Workshops
(1) July 2005
(2) July 2007

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Access to Results

Version 1.0 Guide
- Download http://lean.mit.edu

Masters Thesis
- Download http://lean.mit.edu

Journal Paper
- Coming soon on Wiley Systems Engineering journal website

IBM Rational Unified Process PSM Plugin
- http://www.psmsc.com/PSMRMC.asp

Collaboration
- INCOSE Measurement Working Group http://www.incose.org

IBM: The new release of the RUP for PSM Plug-in (Version 3.0) incorporates measures vital to organizations involved with systems engineering.

http://lean.mit.edu
What is an example of how leading indicators have contributed to effective systems engineering on a program?

**Requirements Volatility.** The graph illustrates the rate of change of requirements over time. It also provides a profile of the types of change (new, deleted, or revised) which allows root-cause analysis of the change drivers. By monitoring the requirements volatility trend, the program team is able to predict the readiness for the System Requirements Review (SRR) milestone. In this example, the program team initially selected a calendar date to conduct the SRR, but in subsequent planning made the decision to have the SRR be event driven, resulting in a new date for the review wherein there could be a successful review outcome.
Future Direction
SE Leading Indicators Research

• MIT research to extend leading indicators to Human Systems Integration

• Follow-on studies of long term impact of leading indicator triggered program actions

• INCOSE Measurement Working Group – validation and updates

• Knowledge Exchange Event planned for late 2008
Enterprise Systems Engineering
Research Portfolio

• Continue ongoing research in collaborative systems thinking

• Evolve systems engineering leading indicators in collaboration with industry/government partners

• Extend work in collaborative distributed systems engineering toward development of collaboration assessment instrument

ESE
Enterprise Systems Engineering

FOCUS of RESEARCH
• ESE Approaches
• SE Effectiveness Indicators
• Collaborative Systems Thinking
• Studies of ESE Practices
Extending Lean Analysis Techniques to Complex Product Development

Dr. Eric Rebentisch
Massachusetts Institute of Technology
April 24, 2008
erebenti@mit.edu  617-258-7773
Lean 101 (Waste Reduction and Flow): How to Make it Work in PD?

• Work flow in PD still a challenge
  • inefficient Information transfers across boundaries (~50% pure waste)
  • Information rot: 6% of value is lost per month sitting in WIP
  • Developing PD flow is valuable, but hard

• Complex PD systems challenge traditional VSM methods
  • Process iterations, parallel flows
  • Multi-tasked resources
  • Difficult-to-define process and system capacities
  • Inherent risks and uncertainties

• VSMs get even more unruly at enterprise levels
  • Multiple value streams, stakeholders, flows

• Key questions:
  • How must familiar lean tools and methods be adapted for understanding/improving PD systems?
  • How effective are they?
  • What are their limitations?

References:
M. Rother and J. Shook, Learning to See, Lean Enterprise Institute, 1998
H. McManus, Product Development Value Stream Mapping, LAI, 2005

Additional sources: Graebsch, 2005; Kato, 2006
Traditional Project Management Tools Can Add Analytical Power to VSM at Project Level

- Highly parallel, interdependent, and iterated processes
  - Use value stream map format, or Gantt (or PERT) chart?
  - Info for analysis exists in typical project mgt tools
- Research case: Engineering change process modeled using VSM, MS Project, and MATLAB
- Critical: understanding that multi-tasking makes people availability key to process time reduction
  - Focus on hand-offs and availability, rather than capacity
  - Doubling personnel availability reduces mean process time from 259 to 121 days—more possible
- Better process and work scheduling, not more people needed

Sources: MacKenzie, 2006; Davis, 2008

http://lean.mit.edu
Adding SIPOC Helps Reduce Difficulty of Assessing Complex Enterprise VSMs

- The enterprise challenge: multiple value streams, multiple processes, multiple outcomes, multiple stakeholders
  - Can’t dissect relationships for analytical convenience
- Must capture complexity of relationships and interfaces
  - Combine SIPOC with VSM to accommodate multiple value streams in enterprise processes
- Approach characterizes essential enterprise attributes while remaining manageable in facilitating a large group
  - Identifies macro enterprise behaviors, disconnects at boundaries, long cycle time processes, and unsynchronized processes
  - Mapping work easily distributed among subteams

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Getting to Root Causes of Waste in Complex PD Systems

- Develop a comprehensive set of PD wastes and root causes descriptions
- Develop a systematic method for prioritizing which wastes to target for elimination
  - Accounting for enterprise system coupling and feedback loops
- Determine root causes to be corrected
- Make it usable—simple interface for data entry and reduced data burden
- Foundations for possible future lean enterprise PDSAT developed!

# Turning Research into Training, Tools, and Change

## Training
- **LEPD KEE** (June 24-25, 2008, St Louis)
  - Lean PD principles and PD role in the Lean enterprise
  - PDVSM and related improvement techniques applications producing ~4x cycle time, throughput improvements, ~60% fewer engineering hours, significantly better financials
- **MIT PI—LAI Lean Academy® Seminar:** Engineering (Pl.211s, July 17-18, 2008)
- **MIT ESD.60 Lean/Six Sigma Processes (LFM, Summer 2008)**
- **LAI EdNet Lean PD course curriculum (Fall 2008)**
- Related: **MIT PI—Value-driven Tradespace Exploration for System Design** (Pl.27s, June 9-12, 2008)

## Tools
- **Lean PDSAT**—On-going research, in development
- **PDTTL**—On-going research, in development

## Events
- **Lean Now!, EVSMA interventions test tools, generate new insights, stimulate change**
- **Lean PD Benchmarking events**—practitioner knowledge sharing and research cases

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**Table 1: Needs**

<table>
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<tr>
<th>PM</th>
<th>Programs (Programs)</th>
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**Table 2: PDVSM and related improvement techniques applications producing ~4x cycle time, throughput improvements, ~60% fewer engineering hours,**

**Table 3:**

- **MIT PI—LAI Lean Academy® Seminar:** Engineering (Pl.211s, July 17-18, 2008)
- **MIT ESD.60 Lean/Six Sigma Processes (LFM, Summer 2008)**
- **LAI EdNet Lean PD course curriculum (Fall 2008)**

**Meta Principles**

- Create Profitable Value Streams
- Maximize Learning-to-Cost

**LPDS Enterprise Principles**

- **Overarching Practices**
  - Toward Technical Competence
  - Chief Engineer System
  - Pull, Flow, Standardization, SBCE
  - Learning and Continuous Improvement

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**Value Focus**

- Motivation: Problem-solving (e.g., cure programs, cut costs)
- Change Orientation: Reduce primarily on expert change agents (many external)

**Process Focus**

- Motivation: Changing system behaviors (e.g., address fundamental changes in mandates, stakeholders)
- Change Orientation: Emphasis on development teams, expert change agents, top-down, bottom-up system change

**Execution and Growth**

- Motivation: Extend system capabilities for growth (e.g., high throughput, new markets)
- Change Orientation: Emphasis on expanding capacity, capabilities across enterprise and extended enterprise networks (e.g., partners, suppliers)

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[http://lean.mit.edu](http://lean.mit.edu)
LAI Lean PD Research Portfolio

PD Waste and Value Stream Analysis
- Marcus Pessoa—Diagnosing PD enterprise-level wastes to prioritize improvement actions
- Christian Breigel—Linking PD wastes, root causes to lean countermeasures
- LFM and SDM research projects on related topics

Lean PD Enterprise Process Design
- Sid Rupani—Creating adaptive, efficient PD enterprise process architectures
- João Castro—Coordination/Alignment for flow in PD systems
- Pedzi Makumbe—Sourcing work in globally-distributed PD
- Dan Gillespie—Overcoming enterprise inertia to create innovative new product requirements

Coordinating/Integrating across Multiple Programs
- Dave Long—Defining product family architectures for UAV systems
- Ryan Boas—Managing commonality during product family lifecycle
- Robb Wirthlin—Managing product development portfolios using risk

Furthering our Understanding of the Multiple Elements of the Lean Enterprise/Product System, its Operation, and Improvement
Metrics for Enterprise Transformation

Dr. Ricardo Valerdi
Massachusetts Institute of Technology
April 24, 2008
Motivating Issues & Questions

Links to Grand Questions
A. How can I understand how my organization currently operates within a larger enterprise?
B. How can I understand the possibilities for a more efficient and effective organization and enterprise? In short, what does it mean to be lean, transformed, enterprise-wise?

Key questions
1. How do you measure the (outward-looking) impact of a transforming enterprise?
2. What are the relevant and measurable (inward-looking) attributes of an enterprise undergoing transformation?
3. How do the 8 views of the enterprise motivate metrics?
4. How can synergies and conflicts between metrics be effectively managed in a transforming enterprise?
History of the Research Effort

• Events
  • LAI/UK LAI metrics workshop in 2000 (40 attendees)
  • Knowledge Exchange Event in March 2008 (34 attendees)
  • Upcoming Knowledge Exchange Event in June/July 2008

• Research (LAI theses)
  • Metrics thermostat
  • Enterprise metrics system
  • Lean Enterprise Self Assessment
  • Performance measurement system
  • Instability in transforming organizations

• Tools & Frameworks
  • Lean Enterprise Self Assessment Tool (LESAT) & Gov. LESAT
  • EVSMA (X-Matrix)
  • System of metrics, ROIC
March 6, 2008 (LMCO Headquarters, Bethesda, MD)

- Formation of a “Metrics community of practice” that can share knowledge across industry and government
- Benchmarking of best practices across industry and government
- Case studies that can serve as useful lessons learned for organizations undergoing lean enterprise transformation
- Identification of the most pressing issues facing organizations that wish to define and measure transformation-related metrics

Invited speakers from:
Raytheon and Rockwell Collins

Next Metrics KEE: June/July in Andover, MA
1. Transformation takes 4.75 years on average
2. 26% indicated that transformation is never ending
Ratio of successful to unsuccessful enterprise transformations (n=20)

<table>
<thead>
<tr>
<th>Unsuccessful</th>
<th>Successful</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 9 8 7 6 5 4 3 2 1</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
</tr>
</tbody>
</table>
Future Directions

- Understand how often metrics evolve in organizations
- Incorporate the role of context in measuring transformation
- Capture significant “plateaus” that serve as markers of incremental transformation
- Obtain more detailed insight from complementary data sources
  - Case studies
  - Interviews
IT-Enabled Enterprise Transformation

Jayakanth Srinivasan
Massachusetts Institute of Technology
April 24, 2008
Industry

• Aerospace and Defense (A&D) IT budgets for 2007

Source: AMR Research, Aerospace and Defense Budget and Outlook for 2007, December 2006

• 40 – 60% of ERP projects fail

Government

• DOD systems overly complex and error-prone

Source: GAO 06-658

• Fiscal 2007 – DOD request - $16 billion
Source: GAO 07-451

How do we design, implement and sustain IT systems to enable lean enterprise transformation?

More importantly

How do we do it in a lean manner?
IT-Enabled Enterprise Transformation
Knowledge Area Evolution

2006
- Identification
  - IT identified a key enabler in enterprise transformation
  - Research committee strongly resonated with the topic
  - Executive board members facilitated the preliminary contact with organization CIOs

1st A&D CIO Round Table
- 7 LAI members
  - NGC, LM Space, BAE Systems, DCMA, Pratt & Whitney, Bell Helicopter, Boeing
  - Feedback - needs more structure to facilitate better discussions

2007
- 2nd A&D CIO Round Table
  - 9 LAI members, 1 non member
  - LM Space, LM Aero, Rockwell Collins, USAF, BAE Systems, Bell Helicopter, Pratt & Whitney, Sikorsky
  - Discussions structured around the holistic enterprise transformation framework

2008
- Two Major Research Areas
  - Role of IT in Large Scale Public Sector Transformation
  - Engineering Systems Integration
Results

- **Aligning IT Strategy to Enterprise Strategy**
  
  “We are currently undergoing a paradigm/culture shift, where we are going to a space in which we haven’t played before ... We are now expected to add value – internal to the organization as well as on the customer side” – Industry CIO

  “Our strategy has not changed a lick in the last three years” – Government CIO

- **Driving Successful Execution**
  
  Once we delivered the first module, then all of a sudden it went from “this is never going to happen” to “Oh! Oh! this is going to happen and we many need to get involved”

  We are “fighting” with the customer on a daily basis to say this is what the systems does, work with it.. Our customers are like fighter pilots – they want it done their way – we are still listening to comments like “the screen doesn’t look the way it used to” and “I don’t do it that way”
“A strategic business approach that applies a consistent set of business solutions in the support of the collaborative creation, management, dissemination, and use of product definition information across the extended enterprise from concept to end of life – integrating people, process, business systems and information (emphasis added)”

– CIMdata definition of Product Lifecycle Management
Framework for Enterprise Agility in Software Development

<table>
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<tr>
<th>Focus</th>
<th>Idea Phase</th>
<th>Production Phase</th>
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<tbody>
<tr>
<td>Problem</td>
<td>Wicked</td>
<td>Complex/Complicated</td>
</tr>
<tr>
<td>Process</td>
<td>Defined/Fluid</td>
<td>Rigid</td>
</tr>
<tr>
<td>Team Size</td>
<td>Small</td>
<td>Large</td>
</tr>
<tr>
<td>Search Strategy</td>
<td>Exploration</td>
<td>Exploitation</td>
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<tr>
<td>Knowledge Management</td>
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<td>Explicit</td>
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<tr>
<td>Nature of Innovation</td>
<td>Architectural and</td>
<td>Incremental</td>
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<tr>
<td></td>
<td>Incremental</td>
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<td>Capabilities</td>
<td>Dynamic</td>
<td>Routines</td>
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<tr>
<td>Expectation</td>
<td>Curiosity/ WOW! Factor</td>
<td>System Works Every Time</td>
</tr>
<tr>
<td>Responsibility, Authority, Accountability</td>
<td>Team</td>
<td>Organization</td>
</tr>
</tbody>
</table>

Source: Jayakanth Srinivasan, Balancing Agility and Discipline in Software Organizations, 2008
Going Forward

“Everyone has a system, so WHAT?”

- **Align IT Strategy to the Enterprise Strategy**
  - Extend ESAT process to include IT architecture mapping and analysis

- **Managing the Change Process**
  - Case studies at LAI member sites to understand the challenges associated with implementing a new IT System

- **Value of IT**
  - Extend heuristics into metrics that can be used to guide enterprise transformation

- **Lean Software Development**
  - Framework for Enterprise Agility in Software Development
The Evolution of Business Ecosystems: Enterprise Architecture Drives Performance

Ted Piepenbrock

Enterprise Architectures

Competitive Dynamics

Firm Performance

Industrial Evolution

Maximization of Shareholder Value

Maximization of Stakeholder Surplus

Carrying Capacity (e.g. Global GDP)

Stable Markets (Economies of Scope)

Growing Markets (Economies of Scale)

Modular Enterprises

Integral Enterprises

Enterprise Stakeholders

Firm

Product markets

Capital markets

Labor markets

Supplier markets

Maximization of Shareholder Value

Maximization of Stakeholder Surplus

Long-term Speed & Stability

Short-term Speed & Flexibility

Firm Output


1900 1950 1975 2000

1925 1975

15 10 5

Growing Markets (Economies of Scale)

Stable Markets (Economies of Scope)

Carrying Capacity (e.g. Global GDP)

Market Capitalization

Modular 3

Modular 2

Modular 1

Integral Enterprises

Top-line Revenue focus

Bottom-line Cost focus

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Enterprise Architecting

• LTC Doug Matty – *Analytical and Empirical Methods for Enterprise Management*

• Ted Piepenbrock - *The Evolution of Business Ecosystems*

• Jorge Oliveira – *Designing Hospital Enterprise Architectures to Attain High Performance*

• Chris Roberts - *Dynamic Engineering System Design Strategies*

Enterprise Modeling

• Chris Glazner - *Understanding and Modeling Enterprise Behavior using a Hybrid Modeling Approach*

• John Dickman - *Dynamics of Enterprise System Architecture: Design and Evolution of Flexibility*

• Marc Haddad - *Knowledge Integration in the Development of Complex Aerospace Systems*

IT as an Enterprise Enabler

• Danny Gagne - *Architecting IT Enabled Enterprise Integration*

Enterprise Metrics

• Craig Blackburn - *Metrics for Enterprise Transformation*
LAI Research Groups Address 4 Grand Questions

1. How can I understand the way my organization currently operates within its larger context?
2. How can I define and evaluate the future possibilities for a more efficient and effective enterprise?
3. What are the most effective strategies and tactics to achieve these future possibilities for my enterprise?
4. How can I best manage the enterprise change process?

FOCUS of RESEARCH
- ESE Approaches
- SE Effectiveness Indicators
- Studies of ESE Practices (with MITRE)

FOCUS of RESEARCH
- Lean Product Development
- Lean Systems Engineering
- Lean Software

FOCUS of RESEARCH
- Enterprise Value Analysis
- Enterprise Architecting
- IT as Enterprise Enabler
- Enterprise Cost and Metrics
- Enterprise Modeling

FOCUS of RESEARCH
- Change Management
- Enterprise Change Philosophy
- Studies of Successful Change
- Distributed Leadership

LEPD
Lean Enterprise Product Development

ESE
Enterprise Systems Engineering

ECM
Enterprise Change Management

http://lean.mit.edu

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Vision Going Forward

Research Shapes Deployment

Enterprise Research
We study Enterprises to identify best practices, transformation strategies and future Enterprise design.

Transformation Knowledge Deployment
We transform research-based knowledge into education, products, knowledge exchange events and transformation events.

Deployment Shapes Research

- Insight into research
- Participate in projects, collaborate with researchers and support projects
- Find value in being part of LAI