Enterprise Principles

Professor Deborah Nightingale
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Objectives

• Enterprise perspective
• Enterprise value streams
• Three levels of enterprises
• Stakeholders
• Principles of lean enterprises
• Enterprise value stream analysis
Historical Industrial Paradigms

<table>
<thead>
<tr>
<th>1885...</th>
<th>1913...</th>
<th>1955...</th>
<th>1993...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Craft Production</strong></td>
<td><strong>Mass Production</strong></td>
<td><strong>Toyota Production System</strong></td>
<td><strong>Lean Enterprise</strong></td>
</tr>
<tr>
<td>Machine then harden</td>
<td>Parts inter-changeability</td>
<td>Worker as problem solver</td>
<td>“Lean” applied to all functions in enterprise value stream</td>
</tr>
<tr>
<td>Fit on assembly</td>
<td>Moving production line</td>
<td>Worker as process owner enabled by:</td>
<td>Optimization of value delivered to all stakeholders and enterprises in value chain</td>
</tr>
<tr>
<td>Customization</td>
<td>Production engineering</td>
<td>-- Training</td>
<td>Low cost</td>
</tr>
<tr>
<td>Highly skilled workforce</td>
<td>“Workers don’t like to think”</td>
<td>-- Upstream quality</td>
<td>Improving productivity</td>
</tr>
<tr>
<td>Low production rates</td>
<td>Unskilled labor</td>
<td>-- Minimal inventory</td>
<td>High quality product</td>
</tr>
<tr>
<td>High cost</td>
<td>High production rates</td>
<td>-- Just-in-time</td>
<td>Greater value for stakeholders</td>
</tr>
</tbody>
</table>

“Lean” is elimination of waste and efficient creation of enterprise value

Legend:
- **High cost**
- **Low cost**
- **High production rates**
- **Persistent quality problems**
- **Inflexible models**
- **Responsive to change**
- **Infl ls**
- **Persistant quality problems**
- **Just-in-time**
- **Eliminate waste**
- **Responsive to change**

Legend:
- **Highly skilled workforce**
- **Low production rates**
- **Unskilled labor**
- **High production rates**
- **Low cost**
The Early Lean Message

Sometimes “less” adds up to “more.”

- less waste
- less design time
- less costs
- fewer organizational layers
- fewer suppliers
- more employee empowerment
- more flexibility and capability
- more productivity
- more quality
- more customer satisfaction
- more long-term competitive success

… stressed minimizing waste.

The emphasis was on Lean Production.
The 21st Century

The emphasis is on Value Added Activities

The Evolving Lean Message

Moving beyond lean “production” to an extended lean enterprise.
"One or more persons or organizations that have related activities, unified operation or common control, and a common business purpose"

-Blacks Law Dictionary, 1999
Lean Enterprise Defined

“A lean enterprise is an integrated entity which efficiently creates value for its multiple stakeholders by employing lean principles and practices.”

-Lean Aerospace Initiative, MIT, 2001
Integrated Enterprise

- Customer
- Product Support
- Finance, H/R, Legal, etc...
- Supplier Network
- Manufacturing Operations
- Product Development
Identify Three Levels of Enterprises

- Program
  - F-22

- Multi-Program
  - Boeing, USAF, Lockheed Martin

- National or International
  - Primes, Suppliers, Government
JSF Example of a Program Enterprise

Centralized Control

Decentralized Execution

Supply Chain Management

UK Ownership

Rapid Decision Making

Flexible Repositioning

BAE SYSTEMS

NG ACS

Rolls Royce

P & W

GE

Major Critical Suppliers

JSFPO

LMIS

Vehicle Mission Systems

Training

Support

Airframe

World Class Team

Status at a Glance

Metrics

Boeing Example of a Multi-Program Enterprise

Source: The Boeing Co. 2001 Annual Report
Expanding Enterprise Focus

Increasing Total Enterprise Effectiveness

EVolUtiOn oF LeAN eNTerPiRiSE tHInKiNg

Success through interaction between functions
Success through enterprise integration
Transition from waste minimization to value creation
Success through total enterprise integration of all stakeholders
- Industry
- Government
- Suppliers
- Employees

Expanding the lean boundaries
- Suppliers
- Customers
- Partners

Functional lean successes
- Manufacturing
- Product Dev.
- Supplier Network

“Islands” of Success
- Lean applied to enabling processes
  - HR
  - IT, etc.
“Value measures the worth of a product or service to a customer. It is a function of the product’s usefulness to the customer, its relative importance to the customer’s need, its availability relative to when it is needed, and how much the customer has to pay for it.”

-Rebentisch, MIT, 2000
Manufacturing Excellence

• “...deliver what the customer wants, including design changes, when wanted, where wanted, at reasonable cost, with no quality glitches and no environmental degradation” (Dr. Robert Hall -- Association for Manufacturing Excellence)

• 21st century ideal - meet any need or change instantly
Increased Emphasis on the Customer

- Customer as consumer will play increasingly proactive role
- “Prosumer” -- a customer who participates in own service or order fulfillment
- Prosumers will change character of industry
- Surviving enterprises will be different in form and practice
Stakeholder Defined

Any group or individual who can affect or is affected by the achievements of the organization’s objective*

* Source: Freeman, Strategic Management: A Stakeholder Perspective, Pittman, 1984
Lean Enterprise System

A Lean Enterprise Requires the Integration of
- Processes
- People / Organization
- Information
- Technology

Holistic View

Enterprise as a System
Lean Thinking Embraces the Entire Enterprise Value Stream, Focuses on Processes, Cuts Across all Functions & Covers all Phases of the Product Lifecycle

- Enterprise perspective: Lean requires an enterprise perspective, encompassing the entire enterprise value stream (extended enterprise), for successful implementation.

- Process focus: Lean views the enterprise as a network of processes; optimizing each process does not optimize the entire set of enterprise processes.

- Functional integration: Lean cuts across & integrates all enterprise functions (product development, manufacturing, finance, human resources, customer support).

- Lifecycle orientation: Lean spans from product development to production to operations & support to deliver best lifecycle value.
“A product introduced at the right time and for the right price which delivers best value in mission effectiveness, performance, affordability, and sustainability, and comparatively retains these advantages over the useful life of the product.”

- Murman et al, MIT, 2000
Processes Must Be Integrated to Deliver Value

Finance
- Budgets & Costs
- Forecasts

Marketing
- Product Concept/Design
- Detail Designs

Procurement
- Schedule & Material Reqs
- Delivery Material Reqs
- Reqs

Process Planning
- Schedule

Prod. Control
- Schedule Reqs

Mfg. Assy.
- Test Insp.

Distrib.
- Support

Customer

Suppliers
- Process Capabilities

Costs & Process Capabilities
- Reliability/Maintainability
- Product Requirements
Traditional vs. Core Process

TRADITIONAL

ORDER GENERATION TO FULFILLMENT

INTEGRATED PRODUCT - PROCESS DEFINITION

PRODUCT DISTRIBUTION

CUSTOMER DEFINITION SUPPLY REALIZATION DISTRIB. CUSTOMER SERVICE

Core Process Approach
Enterprise Process Architecture

Life Cycle Processes
- Business Acquisition and Program Management
- Requirements Definition
- Product/Process Development
- Supply Chain Management
- Production
- Distribution and Support

Enabling Infrastructure Processes
- Finance
- Information Technology
- Human Resources
- Quality Assurance
- Facilities and Services
- Environment, Health, and Safety

Enterprise Leadership Processes
- Strategic Planning
- Business Models
- Managing Business Growth
- Strategic Partnering
- Organizational Structure and Integration
- Transformation Management
What is the Vision of the Future Lean Industrial Base?

A Future Manufacturing Base That Responds Quickly and Efficiently to Gov’t and Commercial Sector Needs

Characteristics and Competencies of This Future Industrial Base

• Workforce
• Products
• Organizations
• Customer
Vision of the Future Lean Industrial Base: Workforce

- Flexible organizations where workers are treated as the most valuable company resource
- Multi-skilled, continuously trained, highly committed workforce
- Easy access to industry knowledge, data, and lessons learned
- Advanced, integrated information systems
  - Seamless access to information without regard to geographic distance or corporate boundaries
  - Revolution in manner in which individuals work individually and together
Vision of the Future Lean Industrial Base: Products

- Dramatically reduced costs, cycle times, and improved quality in all aspects of product life cycle
- Technical risk, producibility, and affordability will be considered early in R&D process
- Quantum advances in key materials technologies including composites, metal alloys, and ceramics
- Modular systems and low-cost upgrades to take advantage of technology advances
- Extensive use of Commercial standardized components in military applications
Vision of the Future Lean Industrial Base: Organizations

- Agile engineering and manufacturing systems
- Seamlessly integrated flexible supply chains
- Expansive use of partnerships to achieve product, technology, and service breakthroughs
- Civil and military industrial bases will be more fully integrated
- Globally competitive companies and leadership
- Virtual Enterprises on a global basis
Vision of the Future Lean Industrial Base: Customer

• Quick response to global queries for products with affordable, high-quality solutions

• Products enter production with predictable and affordable costs, schedules, and funding

• Global customers delighted by quality, price, and environmental friendliness
Lean Enterprise Principles

• Create lean value by doing the job right and by doing the right job.

• Deliver value only after identifying stakeholder value and constructing robust value propositions.

• Fully realize lean value only by adopting an enterprise perspective.

• Address the interdependencies across enterprise levels to increase lean value.

• People, not just processes, effectuate lean value.
Lean Enterprise Model (LEM)

Lean Aerospace Initiative
What is the LEM?

• A systematic framework for organizing and disseminating LAI research results

• Comprised of lean enterprise principles, practices and metrics

• Populated by data derived from surveys, case studies and other research activities

A Major Product of the Lean Aerospace Initiative!
The LEM is a “Lean” Enterprise Tool

• Assists in the self-assessment of leanness of consortium organizations and processes
  • By examination of existing practices
  • By comparison of quantitative performance
  • By assessment of rate of improvement

• Serves as a guide for identifying leverage points for organizational change

• Provides insights as to where lean efforts should be directed

Supports Consortium Members in their Journey toward Lean
### LEM Overarching Practices

#### Address People and Process

**People Practices**
- Promote lean leadership at all levels
- Relationships based on mutual trust and commitment
- Make decisions at lowest appropriate level
- Optimize capability and utilization of people
- Continuous focus on the customer
- Nurture a learning environment

**Process Practices**
- Assure seamless information flow
- Implement integrated product and process development (IPPD)
- Ensure process capability and maturation
- Maintain challenges of existing processes
- Identify and optimize enterprise flow
- Maintain stability in changing environment
LEM Enterprise Principles

- Waste minimization
- Responsiveness to change
- Right thing at right place, and in right quantity
- Effective relationships within the value stream
- Continuous improvement
- Quality from the beginning

*Source: LAI*
OAP Interaction Matrix

*Source: LAI*
Where Should Enterprises Begin?

<table>
<thead>
<tr>
<th></th>
<th>Actual Cost Percentage</th>
<th>Life Cycle Cost Influence Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product/Process Design</td>
<td>5 %</td>
<td>70 %</td>
</tr>
<tr>
<td>Material</td>
<td>50 %</td>
<td>20 %</td>
</tr>
<tr>
<td>Labor</td>
<td>15 %</td>
<td>5 %</td>
</tr>
<tr>
<td>Overhead</td>
<td>30 %</td>
<td>5 %</td>
</tr>
</tbody>
</table>

From Ford Motor Company information, reflecting leverage for improvements in life cycle costs.

Source: Boothroyd and Dewhurst
Enterprise Value Stream Mapping Analysis
Motivation

• Expand successful technique of value stream analysis and mapping to enterprise application

• Provide a coherent method for analyzing and improving enterprise performance, integrating
  • Strategic objectives
  • Stakeholder interests
  • Process performance

• Provide supporting tools for the enterprise Transition-to-Lean (TTL) Roadmap
Transition-To-Lean Roadmap

Focus on the Value Stream
- Map Value Stream
- Internalize Vision
- Set Goals & Metrics
- Identify & Involve Key Stakeholders

Develop Lean Structure & Behavior
- Organize for Lean Implementation
- Identify & Empower Change Agents
- Align Incentives
- Adapt Structure & Systems

Enterprise Strategic Planning
- Create the Business Case for Lean
- Focus on Customer Value
- Include Lean in Strategic Planning
- Leverage the Extended Enterprise

Short Term Cycle
Focus on Continuous Improvement
- Monitor Lean Progress
- Nurture the Process
- Refine the Plan
- Capture & Adopt New Knowledge

Detailed Corrective Action Indicators

Create & Refine Transformation Plan
- Identify & Prioritize Activities
- Commit Resources
- Provide Education & Training

Detailed Lean Vision
Enterprise Level Transformation Plan

Outcomes on Enterprise Metrics
Implement Lean Initiatives
- Develop Detailed Plans
- Implement Lean Activities

Environmental Corrective Action Indicators

ESD.61J / 16.852J: Integrating the Lean Enterprise © Deborah Nightingale, 2005 Massachusetts Institute of Technology
Product VSM and EVSMA

Traditional Value Stream Mapping
- Focuses on delivering value to the customer
- Addresses product lifecycle processes
- Addresses one program or line of business

Enterprise Value Stream Mapping and Analysis
- Focuses on delivering value to all stakeholders
- Addresses lifecycle, enabling, and leadership processes
- Addresses multiple programs or business units
Enterprise Value Stream

- A portrayal of the relationships of the enterprise with its external environment and the general ordering and integration of high-level internal enterprise processes

  Typically more general than a single product value stream
  Integrates multiple processes and multiple stakeholders

  Encompasses product or service lifecycle processes as well as enabling support processes and executive/leadership functions
Goals and Expected Outcomes

- Create a vision of a lean enterprise three to five years in the future which optimizes the enterprise value stream

- Provide enterprise executives with a balanced decision aid to:
  - Identify barriers to the creation/delivery of value to each stakeholder
  - Specify a vision of their future lean enterprise
  - Determine significant gaps between current and future states
  - Prioritize opportunities for eliminating waste and increasing value delivery for the maximum benefit of the total enterprise
Benefits of EVSMA

• Focuses at total enterprise level

• Provides a cohesive method for diagnosing an enterprise in order to expose sources of waste and to identify barriers to value delivery

• Gives consideration to the needs/values of all stakeholders

• Focuses on enterprise-wide processes

• Identifies process interfaces, disconnects and delays

• Identifies improvement opportunities that will benefit the entire enterprise
Estimated Resources Required

• Small execution team including:
  • Enterprise leader as champion or sponsor
  • Team lead, one of the enterprise leaders direct reports
  • Facilitator, with background in lean and EVSMA method
  • Enterprise process owners on an ad hoc basis as needed to provide information

• Following the EVSMA methodology is expected to take approximately three months