What is Lean?
A Culture of Continuous Improvement
The Henry Ford Production System

“Quality is doing it right when no one is looking.” -Henry Ford

Arizona Society of Pathologists Fall Meeting, Detroit, MI
Richard J Zarbo, MD
Henry Ford Health System
“The only things that evolve by themselves in an organization are disorder, friction and malperformance”

Peter F. Drucker
Toyota in the House of Ford
LEAN = Deming (perfected by)
Quality focus- customer requirements
Quality control
Measurement (Shewhart-Deming cycle PDCA)
Knowledge of variation, process stability
Value of worker, PDCA at worker level
New focus and role of the leader/manager
Continuous improvement
Long term plan
DEMING’S 14 POINTS
CREATE CULTURE
Deming’s Way

14 Points for Management

1. Create constancy of purpose for improvement-customer focus
2. Adopt the new philosophy
3. Cease dependence on mass production
4. End the practice of awarding business on price alone
5. Constantly & forever improve systems of production & services
6. Institute modern methods of training on the job
7. Institute modern methods of supervision & leadership
8. Drive out fear
9. Break down barriers between departments
10. Eliminate numerical goals for workforce
11. Eliminate work standards & numerical quotas
12. Remove barriers to pride of workmanship
13. Institute a vigorous program of education & training for everyone
14. Create a structure in top management that will push every day on the above 13 points

W E Deming Out of the Crisis, 1982
The Challenge

“We cannot solve our problems with the same thinking we used when we created them.”

- Albert Einstein
CULTURE OF CONTINUOUS IMPROVEMENT
“The process improvement tools and techniques, while important, are not the key for successfully transitioning from conventional manufacturing to LEAN manufacturing.

The key is the culture – that supports and stimulates continuous growth and improvement.”

(J. Womack)
One Quality Vision, Mission, Values

HENRY FORD PRODUCTION SYSTEM

- **Best in Class**
  - Every Life Deserves World-Class Surgical Services

- **Culture of continuous improvement**
  - Relentlessly Pursuing Perfection

- **Culture of worker empowerment for change**
  - Never Make, Accept, or Pass a Defect

- **Deming management principles**
  - Our People Are Our Experts & Most Valuable Asset

- **Lean work rules & principles**
  - Variation and Poor Communication Are Our Enemies
Empowered Workers

Transformed Culture

Continuous bottom up

Management Style

Sporadic Kaizen Events

Management Style

Direct Top-down

Concepts & Tools

Partial Adoption

Passing Fad

“Let’s Outlast This Thing”
Common, Continuous Problem Solving Culture

“Most people spend more time and energy going around problems than in trying to solve them.”

-Henry Ford
Philosophy That Promotes People

HENRY FORD PRODUCTION SYSTEM

VALUE
Quality, Cost, Time

The Henry Ford Way

Respect for People

Continuous Improvement

MANAGEMENT SYSTEM

HUMAN DEVELOPMENT

TECHNICAL TOOLS

QUALITY PHILOSOPHY

Each patient & customer first

Motivated & trusted people solving problems in empowered teams

Continuous improvement from the level of the work

Assume nothing Go and see!

Never pass a defect

STABILITY

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“We know from the changes that have already been brought about that far greater changes are to come, and that therefore we are not performing a single operation as well as it ought to be performed.”

– Henry Ford

“Relentlessly pursuing perfection!”

Chapter 9
Bringing Ford’s Ideas Alive at Henry Ford Health System Labs through PDCA Leadership
CHANGING CULTURE
"Start as soon as possible to construct with deliberate speed an organization to guide continual improvement of quality."
Integrated System to Achieve Culture of Continuous Improvement

- Standard Work
- 5S
- Visual workplace
- Continuous flow
- Pull production
- Kanban
- Just in Time
- Load leveling
- Batch size
- Mistake proof

Tools of Improvement
Integrated System to Achieve Culture of Continuous Improvement

- Standard Work
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- Visual workplace
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- Batch size
- Mistake proof
Philosophy of People 1st
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- Mistake proof

Tools of Improvement

- Customer 1st
- Continually develop your most valuable resource, your PEOPLE
- Continuous improvement
- From the level of the work
- Blameless management

Cultural Philosophy
Foundations of Lean Production

Toyota’s “Lean” Production System

**VALUE**
High Quality, Low Cost, Shorten Time

**Just-in-Time**
- Pull System
  - Produce What is Needed, When Needed, in Quantity Needed
  - One Piece Flow
  - Continuous Flow
  - Eliminate Man, Machine, Material, Method Problems Impacting Flow

**Build in Quality** (Jidoka)
- Stop & Notify Abnormalities
  - Immediate Quality Feedback
  - Defects Visible at Source
  - Call for Help. Quick Action to Fix
  - Countermeasures to Not Pass Defect
  - More Effective Use Human Resources

**Production Leveling** (Heijunka)

**Standard Work**

**Continuous Improvement** (Kaizen PDCA Cycles)

**STABILITY**

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“Don’t find fault, find a remedy; anybody can complain.”

-Henry Ford

“On the internet, nobody knows you’re a dog.”
Educate to Work Differently
What is my role and what do you want me to do?

- Physicians, Leaders, Managers, Supervisors, Coordinators
- Quality Team Leaders
- All employees

1. Be engaged
2. Own it
3. Improve it
4. Everyday
Continually Strive to Create the IDEAL Work Condition

Delivery of products & services should pursue the Ideal

Production that is

➢ Defect Free (goal is zero, meets customer expectation)
➢ On demand (supplied when you want it, in right version)
➢ Immediate (now, no waiting)
➢ One at a time (single piece flow, batch size of 1)
➢ Continuous flow (no batches, queues)
➢ Minimal waste (materials, labor, energy, other resources)
➢ Safely for every employee
Basics of LEAN

Specify Value Desired by Customer
- Identify value stream & challenge all wasted steps
- Manage towards perfection (zero defects)

Reduce & Eliminate Waste, Continually
- Overproduction
- Time waiting
- Transportation
- Processing
- Stock on hand
- Movement
- Defective products

Process Focused
Incremental Improvements
Specific Ideals, Rules, Operational Principles
4 Rules of Work Design

- **Rule 1 - STANDARD ACTIVITIES**
  - Specifications document all work processes to include content, sequence, timing, location & expected outcome (how do you do your work)

- **Rule 2 - STANDARD CONNECTIONS**
  - Connections with clear YES/NO signals directly link every customer & supplier (requests & responses)

- **Rule 3 - STANDARD PATHWAYS**
  - Every product & service travels a predefined, single, simple & direct flow path (no looping or forking)

- **Rule 4 - IMPROVEMENT & WORKER EMPOWERMENT**
  - Workers at level where work is done, guided by a teacher, improve their own work, using data
Management Systems for Continuous Improvement
Integrated System to Achieve Culture of Continuous Improvement

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- Customer 1st
- Continually develop your most valuable resource, your PEOPLE
- Continuous improvement
- From the level of the work
- Blameless management

Tools of Improvement

Cultural Philosophy

Customer 1st
Continually develop your most valuable resource, your PEOPLE
Continuous improvement
From the level of the work
Blameless management

Customer 1st
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Management Systems
- Hoshin Planning/Policy deployment
- Team leader system
- Improvement management (kata)
- Coaching and development (kata)
- Deviation management
- Daily management
- Document management

Cultural Philosophy
- Customer 1ˢᵗ
- Continually develop your most valuable resource, your PEOPLE
- Continuous improvement
- From the level of the work
- Blameless management
EMPOWERING SUB-SYSTEMS
The Processes of Managing for Continuous Improvement

- Audit System
- Development System
- Document Management
- Coaching System
- Team Leader System
- Ongoing PDCA Continuous Improvement
  - Identify Defects Non Conformances
  - PDCA-A3 Resolution
  - Daily Resolution
  - Daily Countermeasure
  - Customer-Supplier Communication at level of work
  - Team Leader Facilitation
  - Standard Work, Connections, Pathways
  - policy, procedure, document control
  - Share the Gain Learnings

Deviation Management

Daily Management

管理的持续改进过程

- 审核系统
- 发展系统
- 文档管理
- 指导系统
- 团队领导系统
- 持续改进 PDCA 循环
  - 识别缺陷
  - 非一致性
  - A3 解决方案
  - 每日解决方案
  - 每日对策
  - 客户-供应商沟通
  - 标准化工作，连接，路径
  - 政策，程序，文档控制
  - 分享经验学习

偏差管理

每日管理

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The Processes of Managing for Continuous Improvement

- **Audit System**
- **Development System**
- **Document Management**
- **Coaching System**
- **Team Leader System**

**Deviation Management**
- Identify Defects Non Conformances
- Policy, procedure, document control
- Standard Work, Connections, Pathways
- Team Leader Facilitation
- Customer-Supplier Communication at level of work
- PDCA-A3 Resolution

**Ongoing PDCA Continuous Improvement**

**Daily Management**
- Daily Resolution
- Daily Countermeasure

**Improvement Management**

- System Coaching
- System Development
- System Audit
EMPOWERING STRUCTURE
Structure for Change
Worker Driven Continuous Improvement

1. Create organizational structure for authorized change
2. Identify group & team leaders by workstations
3. Align in path of workflow for horizontal management

Customer-Supplier Interaction
EXPECTATION OF MANAGERS
Deming’s Redefinition of Management

“In companies that have embraced Deming’s vision, management’s job is to ‘work on the system’ to achieve continual product and process improvement.

The Deming-style manager must-

- ensure a system’s consistency and reliability, by bringing level of **variation in its operations within predictable limits**, then by **identifying opportunities for improvement**, by **enlisting the participation of every employee**, and by giving subordinates the practical benefit of his experience and the **help they need to chart improvement strategies**.”

(A. Gabor)
Managers Weekly Checklist

"You get what you inspect not what you expect”

1. Know and understand the variation in your work via metrics
2. Engage the workforce in quality improvements, develop your people’s skills
3. Deviations/Non-conformances outliers and trends
4. Temp humidity checks - completeness of documentation, root cause and corrective actions
5. 5S activity documentation
6. Posted job aides and all visuals reviewed and updated
7. New or revised procedures reviewed with staff and staff competencies verified
8. New problems of risk (mis-ID, safety) and resolutions discussed
9. White Board review leading to interventions and process improvements
10. Ongoing and planned process improvements reviewed
11. Inventory and kanban check
12. Lead then delegate “Share the Gain”
“If you can’t measure it, you can’t improve it”
The TRIAD of Quality!

**Metric**

**WHAT do you measure?**

**People**

**WHO measures?**

**Structure**

**HOW are defects fixed?**
Managing the Visual Workplace

- Deviation Management:
  - Daily Tracking of All Non-Conformances
  - With Documented Immediate Resolutions or Root Cause Analysis with Corrective/Preventive Actions

- Whiteboards:
  - Daily Visual Capture of Select Non-Conformances by Workstations

- Daily Management Boards:
  - Tracking & Trending of Select Performance Metrics by Workstations

- PDCA-Based Continuous Improvements
“A legacy of quality”

<table>
<thead>
<tr>
<th>Q</th>
<th>T</th>
<th>I</th>
<th>P</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Time</td>
<td>Inventory (or WIP)</td>
<td>Productivity</td>
<td>Safety</td>
</tr>
</tbody>
</table>
EXPECTATION OF WORKERS
CQI = Daily Team Sport
“Getting good players is easy. The hard part is getting them to play together.”

Casey Stengel
Baseball manager and philosopher
Redefine the Expectation of “Work”

Never Accept, Make or Pass a Defect

“It’s the work, not the man that manages.”

-Henry Ford
The Engaged Worker

**Transform** approach to work

- Not just showing up for work, but arriving to do the work better

**Culture**

Empowered workers who see their daily work in the context of-

- Continually learning
- Constantly communicating
- Making effective process improvements
- Designed and tested by scientific method

Empowered Personnel, Correcting One’s Own Errors, Accountable For Solving Problems in Teams & Creating Standard Work
VISUAL WORKPLACE
-DEFECTS-
BLAMELESS CULTURE
What is a defect?

Poor quality of service or product that makes you:

- Stop your work
- Reject it
- Return it to sender
- Delay your work to fix it yourself
- Not please, could be better

Error = hurts someone

WASTE = REWORK

Measures of Variation
Structure & Process for CQI from “shop floor”
Drive Comes from Working Toward the Purpose & Clear Targets Through Creative Problem Solving

Creative Tension → Problem Solving

Current State

Gap = Challenge

Target

Ideal State

Business & People Purpose

See Mike Rother, Toyota Kata
Slide courtesy of Jeffrey Liker

Grasp The Situation

Plan

Act

Check

Act

Plan

Act

Check

Act

Plan

Act

Check

Act

Plan

Act

Check

Act

Plan

Act

Check
Continual Improvements Toward Goal

Repetitive PDCA Cycles

<table>
<thead>
<tr>
<th>Step</th>
<th>% BNP TATs Meeting Goal</th>
</tr>
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<tbody>
<tr>
<td>Baseline</td>
<td>80</td>
</tr>
<tr>
<td>Red Rack</td>
<td>84</td>
</tr>
<tr>
<td>Autovalidation</td>
<td>85</td>
</tr>
<tr>
<td>Rocker Relocation</td>
<td>93</td>
</tr>
<tr>
<td>Unique Tube</td>
<td>95</td>
</tr>
</tbody>
</table>

- BNP: B-natriuretic peptide
- TATs < 60': Turnaround Times less than 60 minutes
Expected Outcomes of Cultural Change
Expected Outcomes

- Reduction in rework
- Throughput
- Timeliness
- Unused capacity
- Productivity and efficiency
- Patient and Employee Safety
- Regulatory deficiencies
- Job satisfaction
- Customer satisfaction
- Cost and Profitability
## Eliminate Rework

### Surgical Pathology

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total SP Cases</td>
<td>1690</td>
<td>1791</td>
<td>1000</td>
</tr>
<tr>
<td>Cases with Defects</td>
<td>472</td>
<td>223</td>
<td>24</td>
</tr>
<tr>
<td>Total Defects</td>
<td>494</td>
<td>288</td>
<td>24</td>
</tr>
<tr>
<td>Defective Case Frequency</td>
<td>1 of 3</td>
<td>1 of 8</td>
<td>1 of 40</td>
</tr>
<tr>
<td>Defect reduction</td>
<td>50/day</td>
<td>30/day</td>
<td>5/day</td>
</tr>
</tbody>
</table>

**Fix Real-time**

55% 91%
Defect Comparison 2006 to 2007

Power of People

Top 4 defects Lab made

PRE-ANALYTIC
Spec.Receiving 1 24
Recuts 8 66
Accessioning 50 123
Rehab 17 85

ANALYTIC
Immuno Sp. Stain 2 9
Histo Slides 61 151
Grossing 72 99

POST-ANALYTIC
Amended Reports 8 13

"My theory of waste goes back of the thing itself into the labour of producing it"
-Henry Ford

89% 62% 31% 62%
Total Process Improvements
Pathology & Laboratory Medicine Service Line

Henry Ford Production System

Empowered Work Teams

<table>
<thead>
<tr>
<th>Year</th>
<th>Lean Year 4</th>
<th>Lean Year 5</th>
<th>Lean Year 6</th>
<th>Lean Year 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>536</td>
<td>1128</td>
<td>1392</td>
<td>1323</td>
</tr>
<tr>
<td>2010</td>
<td>1392</td>
<td>1323</td>
<td>1794</td>
<td>1230</td>
</tr>
<tr>
<td>2011</td>
<td>1794</td>
<td>2012</td>
<td>1230</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- **Yellow**: Henry Ford Hospital Laboratories
- **Blue**: All Laboratories, Hospitals and 30 clinics

Empowered Work Teams
wRVU Anatomic Pathologists

Pathology & Laboratory Medicine Service Line

Productivity

Integration
one employed group
5 hospitals

Avg.
RVU/FTE

HFH
alone

13
pathologists

12%

20
pathologists

27%

19
pathologists

13%

17
pathologists

Target
5199

Target
5199

Target
5267

Target
5267

2008

2009

2010

2011
Reduction in Pathologist Mis-Interpretations

Amended Reports per 10,000 cases

HFH range 38,000 - 49,000 surgical cases/year
CAP Inspection Deficiencies
Henry Ford Hospitals

CAP Onsite Accreditation Inspections
2009-2014 Total Deficiencies

HFH 2010: 15
HFH 2011: 14
HFH 2012: 9
HFH 2013: 2
HFH 2014: 1

WBH 2010: 32
WBH 2012: 2
WBH 2014: 1

WH 2010: 16
WH 2012: 4
WH 2014: 6

MCT 2009: 20
MCT 2011: 4
MCT 2013: 0
Employee Engagement

Gallup Q\textsuperscript{12} Survey

GrandMean (of all 12 items)
Overall satisfaction
I know what is expected of me at work
I have the materials & equipment I need to do my work right
At work I have the opportunity to do what I do best everyday
In the last 7 days, I have received recognition or praise for doing good work
My supervisor or someone at work, seems to care about me as a person
There is someone at work who encourages my development

At work, my opinions seem to count
The mission or purpose of my company makes me feel my job is important
My associates or fellow employees are committed to doing quality work
I have a best friend at work
In the last 6 months, someone at work has talked to me about my progress
This last year, I have had opportunities to learn and grow
Gallup Q12 Surveys 2008 vs 2010 vs 2012
Grand Mean Performance Trend in Employee Engagement Surveys

Employee Engagement

<table>
<thead>
<tr>
<th>Year</th>
<th>Surgical Pathology</th>
<th>Cytopathology</th>
<th>Microbiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>2.3</td>
<td>2.6</td>
<td>2.9</td>
</tr>
<tr>
<td>2010</td>
<td>2.9</td>
<td>3.2</td>
<td>3.5</td>
</tr>
<tr>
<td>2012</td>
<td>3.5</td>
<td>3.8</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Gallup Healthcare Percentile Rank
- Surgical Pathology: 94
- Cytopathology: 75
- Microbiology: 50
Anatomic Pathology Clinician Satisfaction

Percent Favorable Score

- Overall Satisfaction
- Diagnostic Accuracy
- Communicate Relevant Info
- Timely Reporting
- Tumor Boards
- Teaching Conferences
- Frozen Section Accessibility
- Responsive to Problems
- Professional Interaction
- Courteous Support Staff
- Abnormal Results Notification
- Report Clarity

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Challenge

Volume

FTE

2011  3% FTE
2012  3.5% FTE
2013  10% FTE
Main Hosp & Core Lab Unit Cost Trends

- Open & Consolidate Community hospital #1
- Reduce 11 FTEs Main Hospital
- Consolidate Micro GC/CT Community hospital #2
- Consolidate Anatomic Pathology Community hospital #2
- Close Community hospital #4 & consolidate its Outreach No incr FTEs
- Consolidate Special Chemistry Community hospital #3. No incr FTEs
- Reduce 14 FTEs Main Hospital
- Increase Outreach Volumes
- Consolidate Microbiology Community hospital #2
- Reduce 38.5 FTEs Main Hospital
- Consolidate Special Chemistry & Microbiology Community hospital #2
- Reduce Community hospital #4 & consolidate its Outreach No incr FTEs
- Consolidate Anatomic Pathology Community hospital #2
- Consolidate Micro GC/CT Community hospital #2
- Consolidate Special Chemistry Community hospital #3. No incr FTEs
- Reduce 14 FTEs Main Hospital
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- Consolidate Microbiology Community hospital #2
- Reduce 38.5 FTEs Main Hospital

Fully Loaded Main Lab Expense

Core Lab Expense
LEAN is SLOW
So you can get FAST
Manage Toward the Goal

Results as Lean Evolves to Aligned Continuous Improvement

With Philosophy

Without Philosophy

I. Apply Tools
II. Management Led Lean
III. Aligned Continuous Improvement

Starting out Maturing

Maturity in Integrating Lean and Business Strategy

From The Toyota Way to Continuous Improvement by Liker & Franz

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Lean Deployment Phase I – Applying & Teaching Tools

**Characteristics:**

- Beginning of Lean Activity
- Focus on teaching and using the tools
- Activity is “Event” based (e.g., kaizen events) or “Project” based (e.g., kaikaku)
- Activity is lean “expert” driven and directed (External)
- Focus: Fix processes to demonstrate results

**Warning:** This phase by itself is not self sustaining. Entropy Will Set in Degrading to a Lean Facade!

Modified version of figure by David Meier. From *The Toyota Way to Continuous Improvement* by Liker & Franz
Lean Deployment Phase II – Management-Led Lean

Characteristics:

• Local ownership of lean by managers of the core operations
• Evidence of lean thinking in middle management
• Periodic adjustment by middle and senior management (with staff expert support)
• Activity Driven by local leader (takes responsibility)
• Focus: Involve Middle Managers in Improvement

Warning: Management Led Lean can arrest entropy, but expect Episodic improvement

Modified version of figure by David Meier. From The Toyota Way to Continuous Improvement by Liker & Franz

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Lean Deployment Phase III – Aligned Continuous Improvement

Characteristics:
- Local ownership of lean by team members and leaders
- Clear evidence of lean thinking in work groups
- Activity is continuous (team & individual focus)
- Activity is aligned with business goals (hoshin kanri)
- Leadership chain responsible for kaizen & coach kaizen
- Focus: Achieve business goals while building Continuous improvement culture top to bottom

Warning: This is an ideal vision you will never fully achieve and requires a life-long commitment!

Modified version of figure by David Meier. From The Toyota Way to Continuous Improvement by Liker & Franz

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Quality as Teamwork

The Best Team Wins!

-Danaher Business System
Failure Points in Lean Adoption

- Poor leader commitment, engagement, support
- Poor communication of the vision
- Poor manager buy in and engagement of employees
- Lack of education and facilitation of employee involvement
- Lack of structure to enable people to work collaboratively
- Persistent silos of control or finance that preclude people from redesigning proper approaches to work
- Focus on just financial gain
- Persistence of a “blame” culture
- Fear of losing one’s job
- The usual resistance to change - make the case!
Key to Success in HFPS Lean Enterprise

- Vision, dissatisfaction with status quo, set goals
  - Top down & bottom up pursuit zero defects
  - Aligned strategies and priorities
- Philosophy & Management System with Sub-systems
  - Continuous improvement, customer & shop floor focus, people development & empowerment & accountability
- Leaders & managers own it or fail
- Structure for team-driven change, collaboration
- Education and more education
- Targets, Metrics, PDCA-based change
- Deviation Management & Daily Management
- Meetings, all levels, horizontal management control
- Reinforcers- “Share the Gain”, performance appraisal
Take Home Messages

- Leadership commitment is key. Move beyond tools
- Create management systems and structures
- Communication, effective and often is required
- Empower the worker to voice ideas and develop improvements related to daily problems
- Customer-Supplier meetings to discuss requirements
- Create a Lean organizational structure so employees have structure to succeed in the new work expectation of continuously improving the work
The real challenge is to expand beyond understanding lean as a set of tools, and more aggressively pursuing an understanding of the comprehensive approach to managing organizations so they are capable of self-diagnosis, learning, and relentless internally generated improvement and innovation.

- Steven Spear 2010
As Leader, this is your JOB #1

"Our system of management is not a system at all; it consists of planning the methods of doing the work as well as the work."

-Henry Ford