

# Lean Six Sigma History

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# Learning Objectives

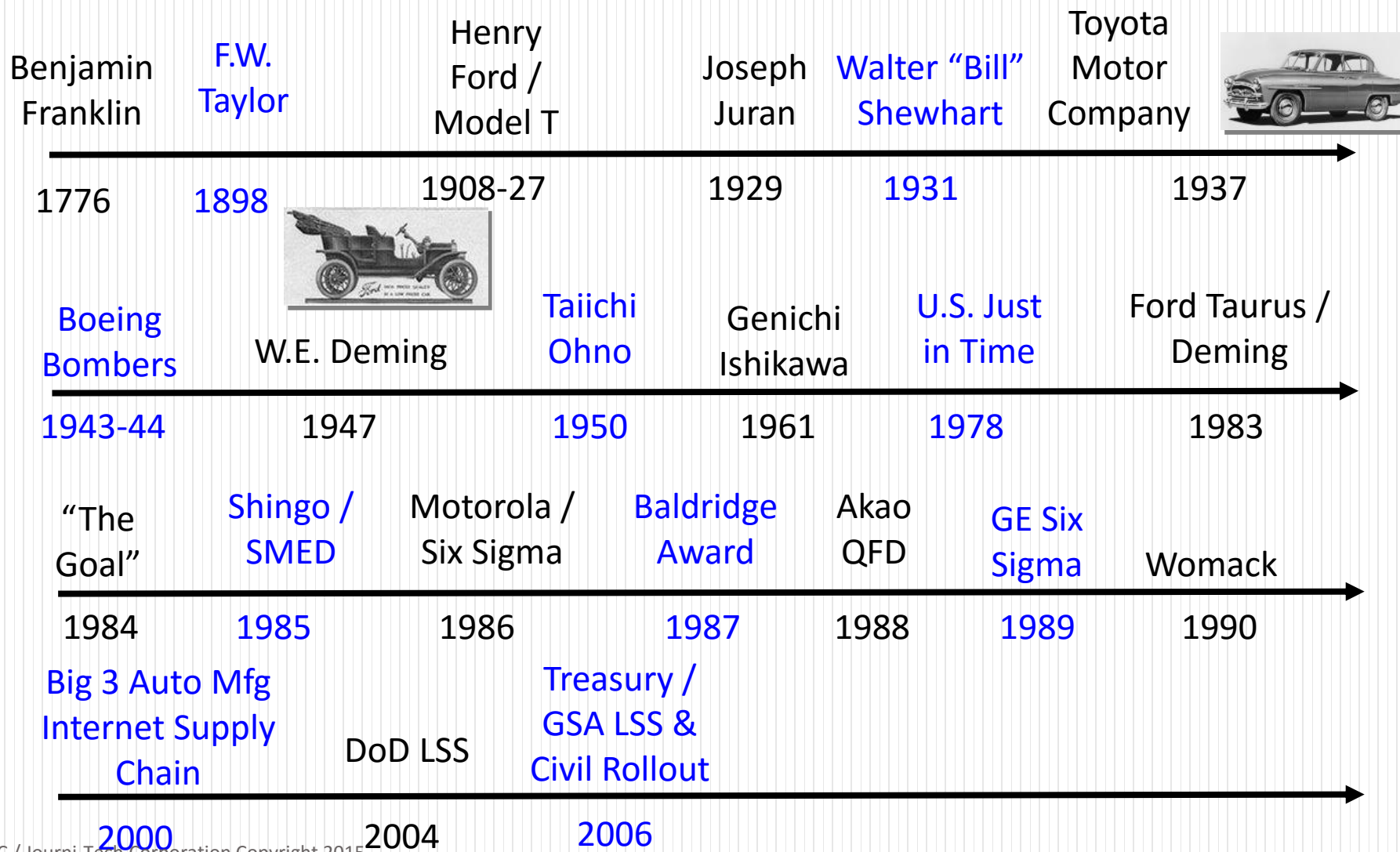


Upon successful completion of this module, the student should be able to:

- Understand History of Lean Six Sigma



# Macro-view: Key LSS Timeline Elements





# Lean Six Sigma Development

- Benjamin Franklin initiated a new way thinking in the American colonies:
  - Lists of Pros vs. Cons
  - Efficiency and waste reduction
  - Experimentation
    - Electricity
    - Optics
    - Stove
    - Lightning Rod
    - Glass Harmonica
    - Urinary Catheter
  - Designed the U.S. Postal Service and was designated the 1st Postmaster General
    - Franklin's conceptual system – collecting, sorting, distributing – continues in use through current day with very little change!

17 Jan 1706



17 Apr 1790

**Franklin's scientific contributions occurred concurrently with signing The Declaration of Independence; publishing a newspaper and almanac; contributing to the Constitutional Convention; serving as an Ambassador; and negotiating with Britain to end the Revolutionary War**



# LSS Uses The Scientific Method

- The Scientific Method uses
  - Observation
  - Hypothesis formation
    - Independent variable (X) manipulation impacts outcome variable (Y) because (Y) results or depends upon (X)
  - Controlled experiments on hypothesis
    - Test various combinations of independent variables (Xs) and measured outcome (Y)
    - Formula:  $Y = f(X) = (X1 + X2 + \dots + Xn)$
  - Assess effectiveness of intervention and apply success to larger environment
  - Publish results (findings)



# The Rise and Contributions of Physical Scientists to Business Problems



(1856-1915)

- Frederick Taylor conducts iron ore time-and-motion shoveling studies, 1898



(1904-2008)

- Joseph Juran, PhD – father of Quality Management



(1891-1967)

- Walter “Bill” Shewhart, PhD – father of  $3\sigma$  (99%) Statistical Process Control (SPC) accuracy



(1893-1993)

- Edwards Deming, PhD – father of Total Quality Management (TQM); 14 Points; often hosted Juran and Shewhart at the current university where he was working



# The Theory of Constraints

- Nuclear physicist, Eli Goldratt, PhD, introduces the Theory of Constraints in “The Goal” (1984) – fictional story
  - Novel about very real business problems and family crisis
  - Physics principles are used to exploit resources:
    - Bottleneck resources
    - Non-bottleneck resources
    - Balance “flow” by “tuning” to bottleneck capacity
  - 3 Fundamental questions to ask in attaining the Goal
    - What to Change?
    - What to Change to?
    - How to Cause the Change?
  - “The Goal” finally goes to print in Japan (2008) and outsells “Harry Potter”
    - Amazes Goldratt because he thought Japan business processes were much more mature than principles he lays out



(1947-2011)



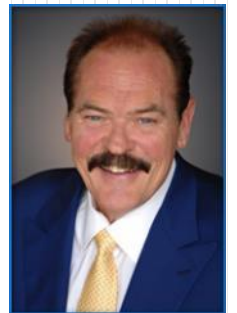
# American Productivity Crisis: Impending Disaster or Tremendous Opportunity



- Motorola (~1984)
  - Unable to put sufficient quality into tactical radios, was on verge of losing a significant Pentagon contract, and going out-of-business
  - Bill Smith researched the library for published findings, collected and put numerous management techniques under one umbrella, and implemented by:
    - Harnesses the power of small computers
      - Spread sheets (VisiCalc / Lotus 1-2-3)
      - Database (dBase II)
    - Improved radio production to be near flawless
      - Over \$16 BILLION in savings!
- Notes:
  - Bill Smith is a 1952 US Naval Academy Graduate
  - Motorola won the 1st ever issued Malcolm Baldrige Award
  - PhD intern, Mikel Harry did the math for Smith



1929-1993



1951-





# Bill Smith Develops Six Sigma to Solve Problems for which the Answer is 'Unknown'



- Called this data driven statistical technique “Six Sigma”
  - 3.4 defects per every 1 million opportunities (vs. 66,800 at  $3\sigma$ )
  - 99.99967% accuracy (vs. 99.73% accuracy of Shewhart)
  - Full-time, trained Practitioners called “Black Belts”
    - Smith practiced karate as a hobby and was a “Black Belt”
    - Black Belts produce \$1 million savings per year or greater
  - Part-time, trained practitioners called “Green Belts”
    - Produce ~\$50,000 savings per year
  - Others trained in Six Sigma concepts
    - Managers called “Yellow Belts” (Motorola)
    - Employee in-processing training produces “White Belts” (Motorola)



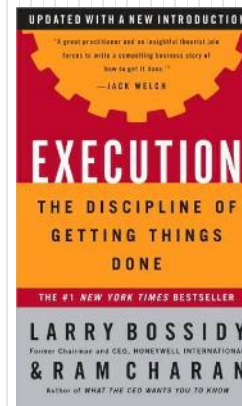
# Motorola Capitalizes on Its Radio Success

- Six Sigma produces data-driven decision-making for profitable, quality results in all lines of business
- Applies the Scientific Method to business / service problem-solving
- Six Sigma Consists of 5 Phases: DMAIC (dah-may-ick) to ascertain if intended results are being attained each step along the way
  - Define
  - Measure
  - Analyze
  - Improve
  - Control
- Six Sigma / DMAIC quickly assimilated into Motorola University curricula



# Expansion of Six Sigma Concept

- Allied Signal
  - Motorola shares Six Sigma concept with Allied Signal, a supplier for Motorola products, to attain better quality inputs
  - Allied Signal began internal implementation with good results
  - CEO Lawrence Bossidy shares Six Sigma success and concept with Jack Welch over lunch
    - Larry was GE Chief Operating Officer (COO) under Welch and they remained friends



1935-



# General Electric (GE) Embraces Six Sigma and Makes it a Household Word



- Jack Welch had never “bought into” any management fads
- Quantitative, data-driven decision-making approach of Six Sigma made sense to Welch
- Welch pushed Six Sigma into all aspects of GE
  - Way of Life – New philosophical paradigm
  - Mandate for GE to be Number 1 or 2 in every Global Market
  - Suppliers and subcontractors adopted Six Sigma approach for GE business
    - Welch set performance criteria for entire GE channel
  - Wall Street took notice of stellar GE improvements and performance
  - Competitors adopted Six Sigma practices so as not to be eclipsed by GE’s products and services



“Neutron Jack” Welch  
1935-



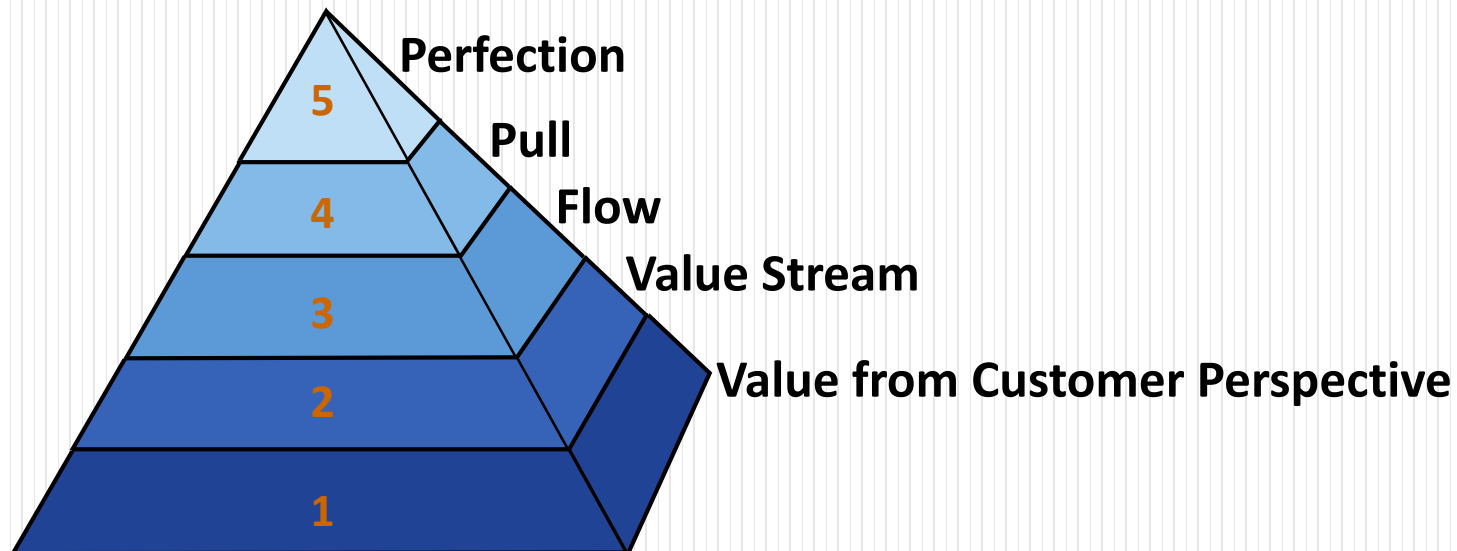
# Enhanced Lean Component Comes from Japan

- Lean, interchangeable parts originated with Eli Whitney (1777) for Revolutionary War muskets
- Toyota Production Services (TPS)
  - Pioneers Lean principles to Just-in-Time inventory & manufacturing
  - Taiichi Ohno develops “Pull” concept from grocery market shelves
    - Leads to “Just-in-Time” framework
  - Establishes the Lean Pyramid of 5 Tiers



Ohno trained by Deming

1912-1990





# The “Non-Shotgun Marriage” of Lean and Six Sigma



- Allied Signal, Part 2
  - Michael Joyce heads Allied Signal’s aerospace quality performance that uses Six Sigma with great success, but not getting the ultimate results he needs
  - Allied Signal hires Max Allway from Toyota (8 years experience)
  - Cross-Pollination occurs in Towson, Maryland
    - Max and Mike blend Lean with Six Sigma
    - Discover that Leaning eliminates “waste” prior to “reducing variation” and produces a much better product / service in less time
  - Highly profitable Allied Signal facility sold to Raytheon at a premium price
    - Raytheon eventually razes building when they could not produce at Allied Signal profitability levels
    - Learns about LSS after facility razed and abandoned...



Michael Joyce  
1955-



Max Allway  
1944-

# Why we really need to have and use LSS...



How the Customer Explained It



How the Project Leader Understood It



How the Analyst Designed It



How the Programmer Wrote It

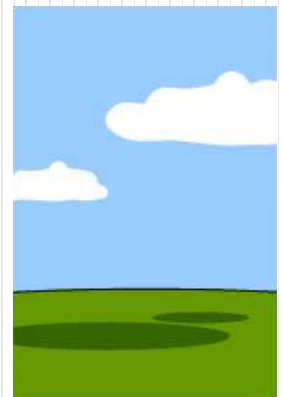


How the Business Consultant Described It



How the Business Consultant Described It

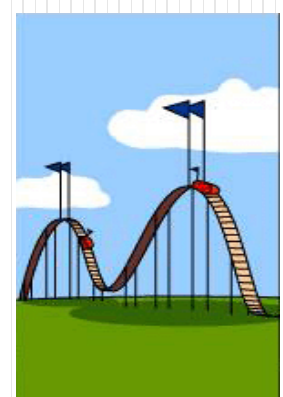
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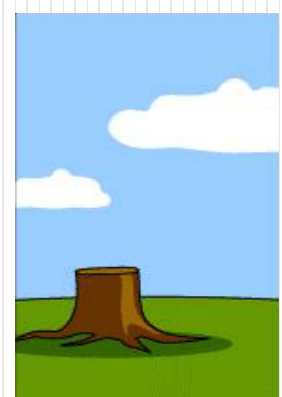
How the Project was Documented



What the Operators Installed



How the Customer was Billed



How it was Supported

OR



How it was Supported



What the Customer Really Needed



# Summary

- History of Lean Six Sigma

