

An Introduction to Lean Six-Sigma

D. Vanderbist 21/04/2019

1. Brief History

- Combination of Lean and Six Sigma
- Two frameworks:
 - DMAIC
 - DMADV
- Quality management: prevent instead of detect defects!
- Focus:
 - Waste reduction!
 - Process variation reduction!

(source: unknown)



2. Core Principles

- Prioritize customer needs:
 - What is adding customer value?
 - Eliminate waste, these things that add no value
- Fluidity in Processes:
 - Achieving goals require fluid processes
 - Focus on bottlenecks
- More value & Less waste:
 - Make waste tangible
 - Waste:
 - Overproduction
 - Time wastage
 - Logistical challenges i.e. transport
 - Defective products
- Eliminate Variation:
 - Standardizing processes
 - Checklists and Templates
- Collaborate:
 - Include people from every part of the process in the decision taking
- Understand what we do:
 - Documenting the processes
 - Process mining: analyzing a process so you understand the composing tasks
 - Performance analysis
 - Checking process conformance
 - Automated business process discovery (ABPD)
 - Process Conformance
 - Check/evaluate documented process with executed process
 - Find Missing or Additional steps in the process
 - Performance Analysis
 - Checking the time duration and comparing executors
 - Tools
 - Kofax Insight: financial and robotic process automation
 - QPR Process Analyzer (MS Dynamics Plugin): KPI, root cause analysis
 - Process Sheets
 - Ceolins (IOT)

3. Strategic Concepts

- Quality assurance team executes your strategy
- Define strategic objective for projects
- Define customer service levels
- **Link customer service to company objectives and strategy**

- Variation can introduce issues like defects
 - Waste = effort to make adjustments to resolve the issue
 - Dissatisfaction = customers want stable quality

- Scientific approach:
 - **Make things measurable**
 - **Set objectives and goals**
 - **Test:** compare objectives, goals with results

- People:
 - Learning aspect
 - Resistance to change

4. DMAIC

- DMAIC:
 - **D**efine
 - **M**easure
 - **A**nalyze
 - **I**mprove
 - **C**ontrol
- Suitability:
 - Imminent problem
 - Improvement
 - Quantifiability

4. DMAIC: Define

- Define:
 - Define customer & requirements
 - Problems statement: goals & benefits
 - Team & process owner
 - Project resources
 - Organizational support
- Tools:
 - SIPOC diagram
 - Project charter
 - Process flowchart
 - WBS
 - Customer requirements and definitions
- SIPOC Diagram:
 - Suppliers
 - Input
 - Process
 - Outputs
 - Customers

Process or Function Name: AUTOMOTIVE DIVISION CUSTOMER SERVICE		Date: 2/4/16
Scope: ALL U.S. CUSTOMER SERVICE FOR AUTOMOTIVE DIVISION. CANADA AND MEXICO OUT OF SCOPE.		Notes: EDI ORDER MAINTENANCE WILL BE ADDED ON 5/1/17

SIPOC Diagram

Suppliers	Inputs	Processes	Outputs	Customers
Who supplies the process inputs?	What inputs are required?	What are the major steps in the process?	What are the process outputs?	Who receives the outputs?
CONSUMERS	PHONE ORDERS	(1) ENTER PHONE AND FAX ORDERS	ORDERS ENTERED	CONSUMERS
RETAIL CUSTOMERS	FAX ORDERS	(2) RESPOND TO TECHNICAL SUPPORT CALLS	CLOSED CUSTOMER INQUIRIES	RETAIL CUSTOMERS
SAP CRM SYSTEM	CUSTOMER CALLS AND EMAILS	(3) RESPOND TO ORDER STATUS INQUIRIES	RAPID-ALERTS DISTRIBUTED	MATURE-PRODUCT ENGINEERING
FIELD SALES TEAM	CUSTOMER PORTAL INQUIRIES	(4) MAINTAIN RAPID-ALERT SYSTEM FOR PRODUCT ISSUES	MONTHLY CS METRIC REPORT	EXECUTIVE MANAGEMENT
TECHNICAL PRODUCT DATABASE	DATA FOR MONTHLY METRICS	(5) PUBLISH MONTHLY CS METRICS		MANUFACTURING QUALITY
SAP ERP SYSTEM	PRODUCT APPLICATION DETAILS			FIELD SALES TEAM
	ORDER STATUS			



4. DMAIC: Measure

- Measure:
 - Identify metrics and units
 - Data collection
 - $Y=f(x)$ relationship
 - Baseline and progress
- Tools:
 - Process sigma calculation

4. DMAIC: Analyze

- **Analyze:**
 - Determining the x's in $f(x)$ relationships
 - Establish root causes
 - **Determining adding values and non-adding values in the process**
 - Performance objectives
- Tools:
 - Pareto chart
 - Histogram
 - Scatter plot
 - Run chart
 - Fishbone
 - 5 why's
 - Statistics: regression

4. DMAIC: Improve

- Improve:
 - Carry out random experiments
 - Find solutions
 - Define tolerances
- Tools:
 - Pugh matrix
 - Experiment design
 - Brainstorming
 - Failure Modes and Effects Analysis (FMEA)
 - Hours of quality (QFD)

4. DMAIC: Improve

Pugh Matrix											2005-08-22											
Evaluation criterias	Reference Design		Concept 1		Concept 2		Concept 3		Concept 4		Priority - 5 is high		Rating		Weighted		Rating		Weighted			
	Product Cost	5	1	5	3	15	2	10	2	10	1	5	5	1	5	3	15	2	10	2	10	1
Tooling Cost	2	5	10	4	8	2	4	3	6	1	2	3	4	12	2	6	1	3	1	3	1	3
Development time	3	4	12	2	6	1	3	1	3	1	3	5	1	5	1	5	3	15	3	15	3	15
Ease of customer use	5	1	5	1	5	3	15	3	15	3	15	2	0	0	1	2	3	6	2	4	3	6
Viewability	2	0	0	1	2	3	6	2	4	3	6	4	1	4	1	4	4	16	4	16	1	4
Customer physical attributes	4	3	15	4	20	2	10	3	15	1	5	3	3	15	4	20	2	10	3	15	1	5
Interface acceptance	5	3	15	4	20	2	10	3	15	1	5	3	4	12	4	12	1	3	1	3	4	12
Mounting space	3	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1
Auxiliary system inputs	1	2	6	3	9	4	12	1	3	2	6	3	2	6	3	9	4	12	1	3	2	6
Ergonomics	5	3	15	3	15	3	15	3	15	1	5	3	3	15	3	15	3	15	3	15	1	5
Clinic rating	3	2	6	2	6	1	3	1	3	1	3	3	2	6	2	6	1	3	1	3	1	3
Ease of diagnostics	1	2	2	2	2	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1
Number of new parts																						
Total Score			94		106		99		96		69											
Selected/Rejected/Maintained alternative																						

Responsible for Pugh
Leader:
Engineering:
Engineering:
Advanced Engineering:
Aftermarket:
Product Planning:
Product Planning:
Marketing:
Eng. PM

Potential Failure Mode and Effects Analysis													FMEA Number:			Prepared by:			(Rev.):				
(Design FMEA)													FMEA Date (Orig):			FMEA Date (Rev.):							
Item / Function	Requirements	Potential Failure Mode	Potential Effects of Failure	S E V	C L A S S	Potential Causes / Mechanisms of Failure	Current Design Controls Prevention	O C C	Current Design Controls Detection	D E T	R P N	Recommended Actions	Responsibility & Target Completion Date	Action Results									
														Actions Taken	S E V	O C C	D E T	R P N					



4. DMAIC: Control

- **Control:**
 - Establish standards and procedures
 - Statistical process control approaches
 - Verify cost savings, benefits and growths
 - Communicate to the business
 - Document and close project
- Tools:
 - Control plan
 - Cost savings calculation
 - Attribute and variable control charts
 - Process sigma calculation

5. DMADV

- **DMADV:**
 - **Define**
 - **Measurement**
 - **Analysis**
 - **Design**
 - **Verify**
- **Developing new processes, products and services**
- **DMAIC vs DMADV**
 - **Same:**
 - Statistical approach,
 - Reduce waste
 - **Differences:**
 - DMAIC = customer oriented,
 - DMADV = business model oriented
- **Define:**
 - Reason behind process, services or product
- **Measurement:**
 - What are the factors that will influence the quality of the process, service or products
- **Analysis:**
 - Determine the ideal combination of requirements
- **Design:**
 - The right approach for the alternatives you have chosen
- **Verify:**
 - Is the prototype in line with real-time metrics

6. Lean vs Leans Six Sigma

- Lean: Waste reduction - Toyota
 - **Muda** = anything that introduces waste or constraints
 - **Mura** = inefficiency and inconsistencies in workflows
 - **Muri** = tasks that add unnecessary stress
- Value
 - Value stream
 - Flow
 - Pull (just-in-time to avoid stock)
 - Perfection
- Wastes:
 - **Process defects**: undocumented changes, lack of design, lack of control
 - **Overproduction**: forecasting issues, lack of proper understanding of customer needs
 - **Idle time**: waiting between operations, bottlenecks
 - **Nonutilized talent**: lack of proper training, friction in team assignments
 - **Transportation waste**: misaligned process flows, unnecessary steps in transport process
 - **Excess inventory**: lengthy set-up times
 - **Unnecessary machine and employee actions**: sharing machines & tools, overloaded workstations, inefficient work lay-out
 - **Nonvalue adding processing**: lack of understanding, communication

6. Lean vs Leans Six Sigma

- **DOWNTIME:**
 - **D**efects
 - **O**verproduction
 - **W**aiting
 - **N**onutilized talent
 - **T**ransportation
 - **I**nventory excess
 - **M**otion waste
 - **E**xcess Processing
- **Lean vs Six Sigma:**
 - **S**tatistical vs **P**hilosophical approach
 - **P**roblem solution vs **c**ontinuity (daily basis)
 - **T**op-down vs **b**ottom-up
- **Lean Six Sigma:**
 - **H**ybrid methodology

7. Understanding Customer Needs

- **Customer:**
 - Dynamic, driven by internal and external environment
- CRM: **Relationship Management**
 - Sales effectiveness: Define, Develop, Sustain
 - Sales process
 - Managing opportunities
 - Sales efficiency
 - Sales performance
 - Sales skills
- **Developing new markets:**
 - Identify target market
 - Customer profiles
 - Market demographics
 - In-depth market analysis
- **Improving pricing process:**
 - Can target customer afford goods and services?
 - Value addition focus
 - Shun / Avoid price wars
- **Improve advertising communication:**
 - Sales promotion
 - Personal selling: one-to-one channels
 - Public relations
 - Internet marketing
 - Direct marketing
 - Advertising
- **Assessing Customer Satisfaction:**
 - Maslow
 - The Kano
 - Needs:
 - Basic Need: get customer attention
 - Performance needs: compete against others
 - Excitements needs: grow and develop market
- **Dissatisfiers & Satisfiers**
 - Customer expectations
- **Delighters & Indifferent needs & Reverse Needs**
 - +, 0 or - effect on customers' needs

8. How to identify improvement projects

- **Unnecessary improvement projects are waste:**
 - Cancel
 - High-cost of running the project
 - Long lead times
 - Lack of team motivation
 - Lack of management attention
 - Ineffective project results
- **Selecting improvement projects:**
 - Consultation: ask and empower team members
 - Use performance indicators
 - User performance reports
 - Benchmarking: compare against industry standards and competition
 - Strategic decision making: look at evolution of short-term goals in effect on long-term goals
 - Project Champions and Mast Black Belts: find core areas of the business processes

9. How to Win Management Support

Management support:

- Maintain the company culture: **align with company goals**
- Leadership paradigm shift: there is **a limit to** where a leader can exert his **influence**
- Training and education: management teams are often leaders and experts in what they do
- **Overcoming management resistance:**
 - Result assurance
 - Astute project selection
 - Setting departmental goals: teams should discuss and set their own goals
 - Incorporating lean six sigma
 - Progress monitoring
 - Support people processes
 - Team dynamics

10. Common Implementation Mistakes

Mistakes:

- Impassive leadership = apathy
- Inapposite deployment policies = **avoid one-size-fits-all policies**
- Extraneous compulsion for advance training = **be careful to push teams for certifications**
- Using training as a divertissement = not taking training serious
- Inappropriate project selection = choosing the wrong project = project beyond your and the teams handling capacity
- Disparate distribution of effort = if not all team members work towards the same goal
- Inaccessible resources = resources should only be handled by champions
- Lack of purview = people might struggle if they are punching above their weight
- Stakeholder support = management might support but you also need stakeholders to back the project

11. Benefits of Methodology and Culture

Benefits:

- Time management = learn how to best make use of your time, SMART goals
- Circumvent the cost of failure = reduce waste
- Supply chain management = lowest possible rate of defects + impact on your suppliers
- Customer loyalty
- Strategic planning = SWOT analysis of mission statement
- Improving Efficiency
- Motivate your employees = motivated people drive-up performance with 25% - 50%
- Output quality
- Improved customer service = reducing time to delivery
- Workplace safety = focus on actions within standardized processes
- Manage deadlines
- Project implementation and management = more methodological approach to projects
- Profit motive
- Cost consideration = reducing operational costs
- Team spirit = getting employees involved with things that matter
- Easy learning process

12. Certification & Criticism

- **Certification:**

- White belt
- Yellow belt
- Green belt
- Black belt

- **Criticism:**

- Fat practices
- Alien concept
- Lack of time
- Cost considerations
- Inferiority complex = does not fix small or medium sized companies
- We are in the service industry = overly focus on manufacturing and production
- Complex Concept
- We are comfortable with lean?
- **We have done this before?**
- **What if we fail?**