



Lean Six Sigma DMAIC Improvement Story

DMAIC Project Objective:
TITLE

Last Updated: 04/01/2019

Team:

M. W. (Team Leader)

T. D.

T. L.

R. F.

M.G.

D. J. (Sponsor)

042019

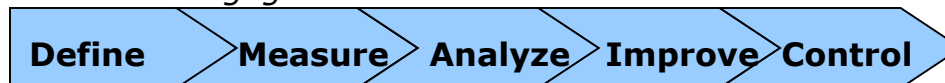
Roadmap

Lean Six Sigma Problem Solving Process

The team utilized the 5-Step DMAIC problem solving process.

Process Step		Description of Key Team Activities
Number	Name	
1	DEFINE	<ul style="list-style-type: none"> • Select Priority Issue / Process • Confirm Stakeholder Requirements • Display Theme Indicator and Performance “Gap” • Develop a SMART Theme Statement • Determine the Cost of Poor Quality • Establish a Method to Monitor Team Progress • Develop a DMAIC Project Schedule
2	MEASURE	<ul style="list-style-type: none"> • Construct a Process Flow Chart • Perform 8 Wastes Analysis • Develop a Data Collection Plan • Stratify the Problem (i.e. “Gap”) and Select the Significant Problem • Develop a Target and a SMART Problem Statement
3	ANALYZE	<ul style="list-style-type: none"> • Identify Potential Root Causes(s) • Verify Root Cause(s) • Assess Impact of Root Causes on the Problem in the Measure Step
4	IMPROVE	<ul style="list-style-type: none"> • Identify and Select Countermeasures • Identify Barriers and Aids • Develop Action Plans • Confirm Pilot Plan Effectiveness and Document Lessons Learned • Determine the Expected Return on Investment
5	CONTROL	<ul style="list-style-type: none"> • Confirm / Document Improvement Results • Determine the Actual Return on Investment • Standardize Improvements within Operations • Replicate Changes • Document Lessons Learned • Identify Future Plans for Continued Process Improvement

Note: Keep sponsor informed and engaged.



Monitor Team Progress

The team and management used a Checklist to monitor team progress.

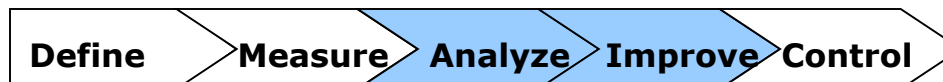
ets Six Sigma DMAIC Checklist			
Step	DMAIC Steps – Objectives and Checkpoints	✓	Key Tools / Techniques
Step 1: Define	Quantify the need for improvement in terms of performance and financial impact.		
	1. The stakeholders and needs were identified.	✓	<ul style="list-style-type: none"> • Selection Matrix • Line Graph • Theme Statement • Cost of Poor Quality Matrix • Action Plan • Project Charter • Project Planning Worksheet
	2. An indicator measuring performance in meeting the need was developed.	✓	
	3. A theme statement consistent with the indicator was developed, and the Cost of Poor Quality (COPQ) were determined.	✓	
	4. A schedule for completing the five DMAIC steps was developed.	✓	
5. The sponsor signed off on the project's purpose, scope, and significance.			
Step 2: Measure	Identify the significant problem and set a target for improvement.		
	6. Measurement and data collection systems were developed.		<ul style="list-style-type: none"> • Process Flow Chart • 8 Wastes • Checksheet, Spreadsheet, Survey • Histogram • Pareto Chart • Target Setting Worksheet • Problem Statement
	7. The theme was stratified from various viewpoints and a significant problem was chosen.		
	8. A target for improvement was established based on the stakeholders' needs.		
	9. The impact of the target on the theme indicator and the COPQ were determined.		
	10. A problem statement that addressed the gap between the actual and target values was developed.		
11. The sponsor signed off on the project's focus and target.			



Monitor Team Progress

ets Six Sigma DMAIC Checklist

Step	DMAIC Steps – Objectives and Checkpoints	✓	Key Tools / Techniques
Step 3: Analyze	Identify and verify the root causes of the problem.		
	12. Cause and effect analysis was taken to the root level.		<ul style="list-style-type: none"> • Cause and Effect Diagram (Fishbone) • 5 Whys • Qualitative Analysis • Single Case Bore Analysis • Chi Square Test • Root Cause Verification Matrix
	13. Potential causes most likely to have the greatest impact on the problem were selected.		
	14. A relationship between the root causes and the problem was verified with data.		
	15. The impact of each root cause on the gap and the COPQ were determined.		
	16. The sponsor signed off on the verified root causes and impact on the gap.		
Step 4: Improve	Select and plan effective and feasible countermeasures and determine the expected Return on Investment.		
	17. Countermeasures were selected to address verified root causes.		<ul style="list-style-type: none"> • Countermeasures Matrix • Work Breakdown Structure • Barriers and Aids Analysis • Cost Benefit Analysis • Action Plan • Pilot/Simulated Pilot • Lessons Learned • Return on Investment
	18. The method for selecting the appropriate practical methods was clear and considered effectiveness and feasibility.		
	19. Barriers and Aids were determined for countermeasures worth implementing.		
	20. The action plan reflected accountability, schedule, and cost.		
	21. A test pilot plan was implemented and evaluated to determine the capability to achieve the target established in the Problem Statement.		
	22. Lessons learned from the pilot were incorporated into the full-scale action plan, and the project's expected Return on Investment (ROI) was calculated.		
23. The sponsor signed off on the action plan and expected results.			



Monitor Team Progress

ets Six Sigma DMAIC Checklist

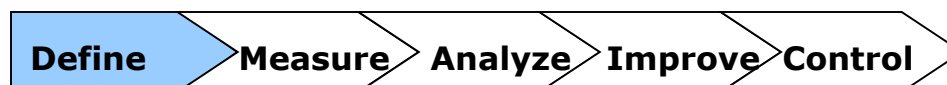
Step	DMAIC Steps – Objectives and Checkpoints	✓	Key Tools / Techniques
Step 5: Control	Confirm the results including the actual Return on Investment, standardize the changes, and develop future plans.		
Results Phase	Evaluate the results by confirming that the countermeasures implemented impacted the root causes, the problem, and the Theme Indicator, and determine the actual Return on Investment.		<ul style="list-style-type: none"> • Before and After Results Graphs • Process Control System • Radar chart • Action Plan (for Future Plans / Next Steps) • Management Presentation
	24. The effects of countermeasures on the root causes were demonstrated.		
	25. The effects of countermeasures on the problem were demonstrated.		
	26. The improvement target was achieved and causes of significant variation were addressed.		
27. The effects of countermeasures on the theme indicator representing the stakeholders' needs were demonstrated, and the project's actual ROI was calculated.			
Standardization Phase	Ensure process revisions are incorporated into standard work, including replication in all applicable areas.		
	28. A method was established to document, permanently change, and communicate the revised process or standard.		
	29. Responsibility was assigned and periodic checks scheduled to ensure compliance with the revised process or standard.		
	30. Specific areas for replication were identified.		
Future Plans Phase	Document lessons learned and develop plans for the next process improvement cycle.		
	31. Any remaining problems of the theme were addressed.		
	32. Lessons learned, P-D-C-A of the ets DMAIC Method, and team growth were assessed and documented.		
	33. The sponsor signed off on the results and next steps.		



Essential Tools

The team ...

- Identified Stakeholders and their Needs. 1.
- Confirmed alignment to organization's KPIs. (Scorecard and/or Strategic Plan).
- Created a Theme Indicator (Line Graph) for performance. 2.
- Developed a SMART Theme Statement consistent with the Theme Indicator (Line Graph). 3.
- Determined the Cost of Poor Quality of the "gap".
- Developed a Project Charter and DMAIC Schedule. 4.
- Achieved Sponsor Sign-off. 5.



Define Step Roadmap



Background

- KPI Linkage
- Strategic Plan Linkage
- Selection Matrix
- Bar Chart

- Situation Appraisal
- Consultant Process Tree
- Lean vs. Six Sigma
- 7 Tracks
- Value-added Matrix
- Benefit vs. Effort Analysis



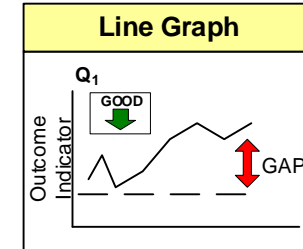
Stakeholders	Needs

- Stakeholder and Needs Analysis



Data Collection Tool

- Checksheets
- Spreadsheets
- Surveys



- Project Indicator Selection
- 3 Types of Spreadsheets (Spreadsheet design is included in this section and is part of checkpoints 2, 6 and 14)



Theme Statement

A **Theme Statement** tells specifically what your DMAIC project is attempting to do. In practice, theme statements serve as the "title" of a DMAIC project, and should be clear and concise.

- Represents Line Graph
- SMART Criteria Applied



Cost of Poor Quality Matrix

- COPQ Analysis of the "gap"



Project Planning Worksheet

- Project Planning Worksheet & DMAIC Schedule
- Project Charter



Sponsor Sign-off

	✓	
	✓	
	✓	

- Sponsor Review



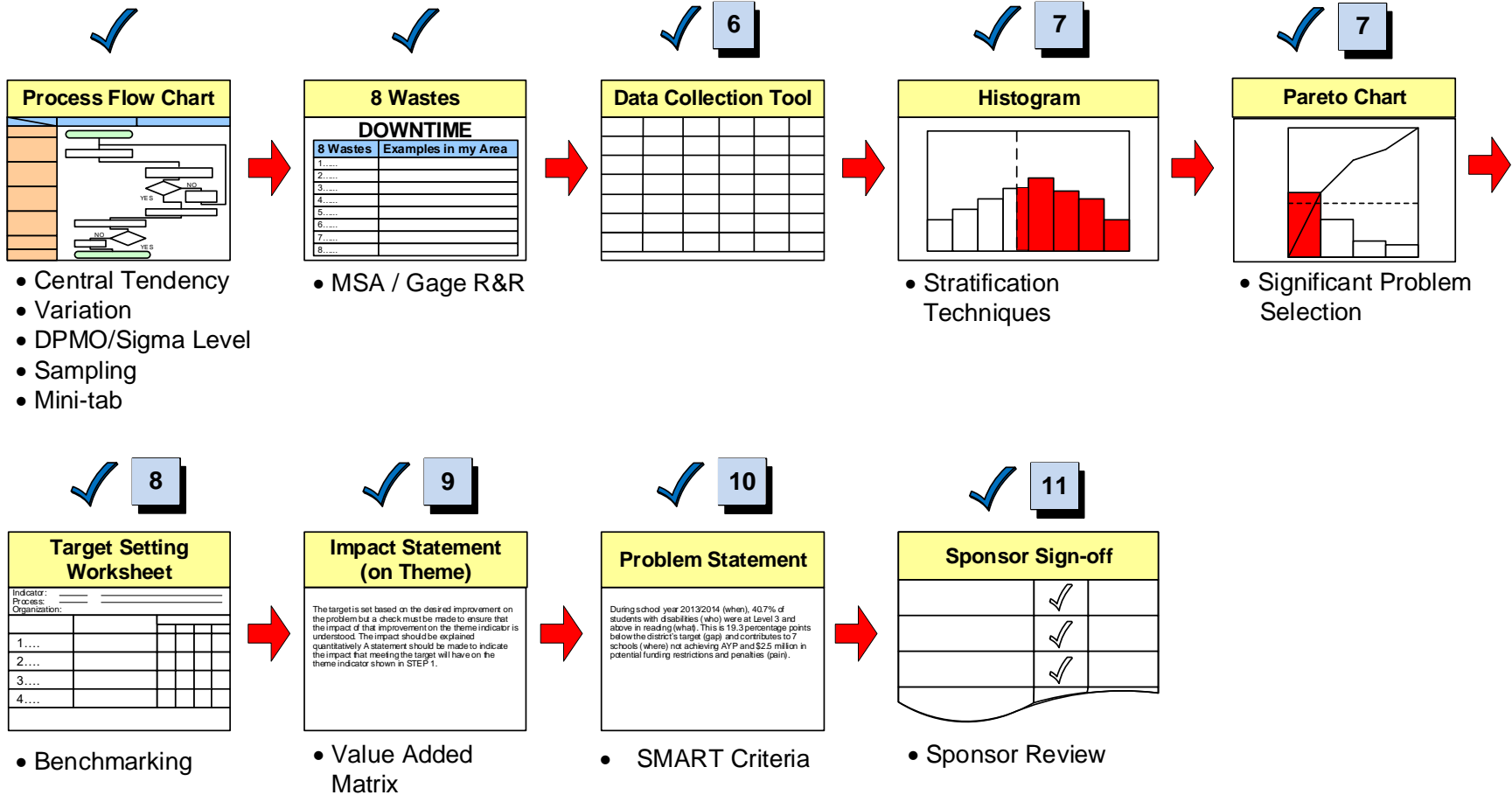
Essential Tools

The team ...

- Constructed a Process Flow Chart and applied the 8 Wastes. 6.
- Developed a Checksheet / Spreadsheet or Survey to collect data.
- Created a Histogram (if measurable data). 7.
- Developed a Pareto Chart to prioritize problems.
- Selected the significant problem.
- Set a target for the problem (big bar on the Pareto Chart). 8.
- Determined how much achieving the target on the problem (big bar) will impact the Theme Indicator. 9.
- Developed a SMART Problem Statement. 10.
- Achieved Sponsor Sign-off. 11.



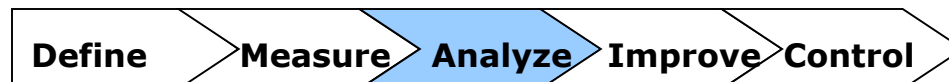
Measure Step Roadmap



Essential Tools

The team ...

- Developed a Cause & Effect Diagram (Fishbone) to identify potential causes and applied 5 Whys. 12.
- Selected most likely potential causes. 13.
- Performed Qualitative Analysis for potential “Quick Wins”. 14.
- Conducted Root Cause Verification using Statistical Tools. 15.
- Assessed the impact of verified root causes on the Problem (big bar on Pareto Chart) target in the MEASURE step. 16.
- Achieved Sponsor Sign-off. 16.

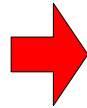


Analyze Step Roadmap



Potential Causes

- Cause & Effect Diagram (Fishbone)
- Brainstorm
- Affinity Process
- 5 Whys



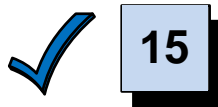
Probable Causes

- Qualitative Analysis
- Multi-voting
- Scatter Diagram
- Single Case Bore Analysis



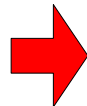
Root Causes

- Contingency Table
- Chi Square Test
- Verification through Observation
- Root Cause Verification Matrix



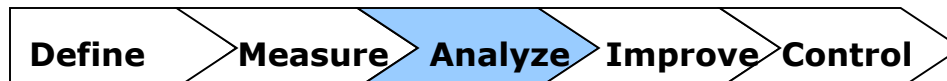
Impact on Problem

- Impact of Root Causes Relative to Problem Target in Measure Step Determined



Sponsor Sign-off

	✓	
	✓	
	✓	
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# Essential Tools

The team ...

- Developed a Countermeasures Matrix and Selected Countermeasures to Address Root Causes. 17.
- Evaluated Practical Methods for effectiveness and feasibility. 18.
- Applied Work Breakdown Structure and Performed Barriers and Aids Analysis. 19.
- Conducted Cost Benefit Analysis. 20.
- Reviewed and updated COQP from DEFINE step.
- Developed Action Plan.
- Conducted a Pilot Project (An actual pilot or simulation). 21.
- Documented lessons learned from the Pilot. 22.
- Documented lessons learned from the Project.
- Calculated Expected Return on Investment (ROI).
- Achieved Sponsor Sign-off. 23.



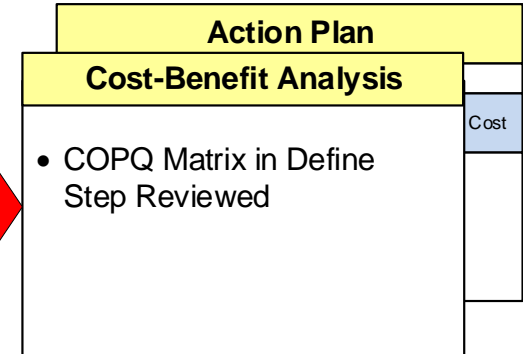
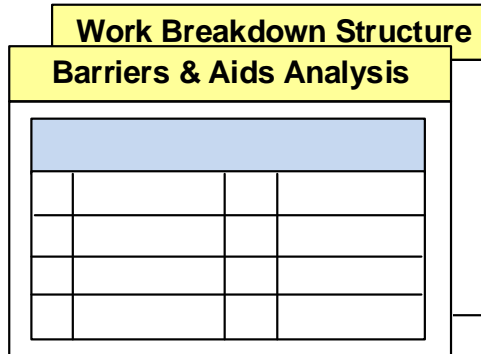
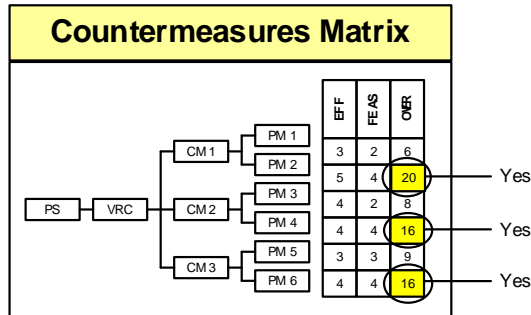
# Improve Step Roadmap

✓ 17

✓ 18

✓ 19

✓ 20

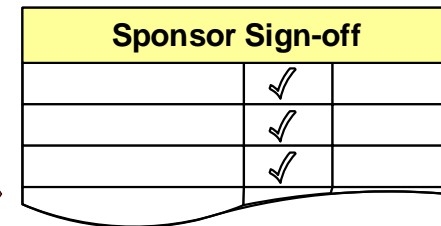
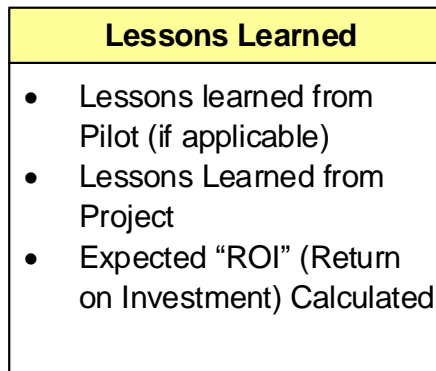
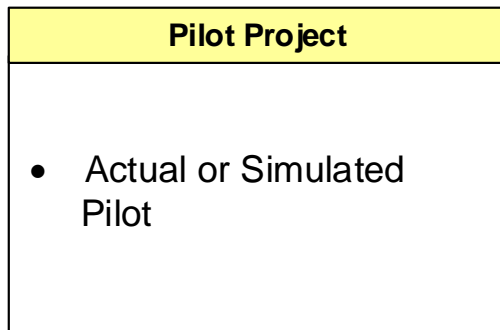


- Applied Work Breakdown Structure
- Performed Barriers & Aids

✓ 21

✓ 22

✓ 23



# Essential Tools

The team ...

- Developed Before and After Graphs (using graphs shown in the Analyze, Measure, and Define steps in reverse order). 24.  & 25.
- Determined Actual Project Return on Investment (ROI). 26.  & 27.
- Updated the Process Flow Chart and revised procedures. 28.
- Provided training in new procedures. 29.
- Updated and implemented the Process Control System. 30.
- Monitored compliance with new methods. 31.
- Identified Replication Opportunities. 32.
- Developed an Action Plan for Future Plans / Next Steps. 33.
- Documented overall project lessons learned / team growth.
- Achieved Sponsor Sign-off.
- Team made its Management Presentation, received Recognition.



# Control Step Roadmap

✓ 24 25 26 27

**Results**

- Before and After Graphs
- Reverse Order:
  - Root Causes (Analyze)
  - Pareto (Measure)
  - Histogram (Measure)
  - Line Graph (Define)
- Actual Project ROI Calculated

✓ 28 29 30

**Standardization**

- Procedures Revised
- Training Conducted
- Process Control System Revised and Monitored for Compliance
- Replication Planned

✓ 31 32

**Future Plans**

- Other Opportunities (Pareto in "Results") Identified
- Overall Lessons Learned from Project Documented
- Team Growth Determined

✓ 33

**Sponsor Sign-off**

	✓	
	✓	
	✓	

✓

**Team Presentation**

- Celebration
- Recognition



# Appendix

Use the Appendix for:

- Back up data and analysis documentation.
- Meeting minutes.
- Source documents and reports.
- Organization's Key Performance Indicators (KPIs), Scorecard, and/or Strategic Plan.

## **Notes:**

- *The “Essential Tools” will be used in most DMAIC project stories. Some projects may require additional tools.*
- *Remember: Fact-based conclusions; consistency in terminology; continuity of data; and logical story flow.*