

**DMAIC Training Methodology and Tools**

Define Phase	Measure Phase	Analyze Phase	Improve Phase	Control Phase
<ul style="list-style-type: none"> <li>• <b>Six Sigma Overview</b></li> <li>• <b>Six Sigma Methodology and Tools</b></li> <li>• <b>Step #1 – Develop the Business Case</b> <ul style="list-style-type: none"> <li>• Develop and Test the Project Charter</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #5 – Compile Project Metrics</b> <ul style="list-style-type: none"> <li>• Type of Data</li> <li>• Graphical Display of Data Bar, Pie Charts, Histograms, Box Plots, Scatter Diagrams, Pareto Chart</li> </ul> </li> <li>• Descriptive Statistics Measures of Central Location</li> <li>• Measures of Variability Data Collection and Sampling</li> <li>• Statistical Process Control Run Charts and Control Charts</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #7 – View the Current Process and Implement agreed-to-process improvement changes</b> <ul style="list-style-type: none"> <li>• Map a Process to Understand and Improve                             <ul style="list-style-type: none"> <li>• Process Flow Chart</li> <li>• Lean Thinking</li> </ul> </li> </ul> </li> <li>• <b>Step #8 – Identify Variables that affect Process Output</b> <ul style="list-style-type: none"> <li>• Identify Variables that affect the Process output                             <ul style="list-style-type: none"> <li>• Cause &amp; Effect Diagram</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #13 – Create a Data Collection Plan</b> <ul style="list-style-type: none"> <li>• Create a Data Collection Plan; Implement agreed-to process improvement changes                             <ul style="list-style-type: none"> <li>• Data Collection Plan</li> <li>• Identify Sources of Variation</li> </ul> </li> </ul> </li> <li>• <b>Step #14 – Use Graphical Techniques to Visually Represent the Sources of Variability and Differences within the Process</b> <ul style="list-style-type: none"> <li>• Multi-Vari Chart</li> <li>• Box Plot</li> <li>• Marginal Plots</li> <li>• Other Graphical Tools</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #20 – Error-Proof KPIV's</b> <ul style="list-style-type: none"> <li>• Control Plan                             <ul style="list-style-type: none"> <li>• Mistake Proof the Plan</li> <li>• Develop controls for KPIV metrics</li> <li>• Develop Monitoring plan for KPOV metrics</li> <li>• MSA for monitoring Plan</li> <li>• Establish Audit Plan</li> <li>• Visual Controls</li> <li>• Control Charts</li> <li>• Pareto Charts</li> <li>• Corrective Actions</li> <li>• TPM</li> </ul> </li> </ul> </li> </ul>
<p align="center"><b>Measure Phase</b></p>	<ul style="list-style-type: none"> <li>• <b>Step #6 – Process Capability and Performance - Baseline</b> <ul style="list-style-type: none"> <li>• Six Sigma Measurement Studies</li> <li>• Process Capability <math>C_p</math>, <math>C_{pk}</math> and Process Sigma</li> <li>• DPMO</li> <li>• Rolled Throughput Yield</li> <li>• Probability Distributions</li> </ul> </li> <li>• Lean Metrics                             <ul style="list-style-type: none"> <li>• Cycle Time</li> <li>• Takt Time</li> <li>• Value-Added vs. Non-Value-Added Time</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #9 – Assess the Strength of relationships between inputs and Outputs</b> <ul style="list-style-type: none"> <li>• Assess the strength of relationships between inputs and outputs                             <ul style="list-style-type: none"> <li>• Cause &amp; Effect Matrix</li> </ul> </li> </ul> </li> <li>• <b>Step #10 – Assess the Integrity of the Data</b> <ul style="list-style-type: none"> <li>• Measurement System Analysis</li> <li>• Variable Gage R&amp;R</li> <li>• Attribute Gage Study</li> </ul> </li> <li>• <b>Step #11 – Rank Importance of Input Variables and Create a List of Variables that are thought to be Key Process Input Variables</b> <ul style="list-style-type: none"> <li>• Potential X's and Quick Hits are identified</li> </ul> </li> <li>• <b>Step #12 – Prepare for Risk</b> <ul style="list-style-type: none"> <li>• Process FMEA</li> <li>• Design FMEA</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #18 – Determine Variable Relationships <math>y = f(x_n)</math> Optimize The Process</b> <ul style="list-style-type: none"> <li>• Regression Analysis</li> <li>• Simulation Pilot Test – Dry Run</li> <li>• Graphical Tools                             <ul style="list-style-type: none"> <li>• Process Capability Study, Pre-Post Control Charts, Line Graph, Bar Chart, Histogram, Box Plot, Pareto Chart, Run Chart</li> </ul> </li> </ul> </li> <li>• <b>Develop Practical Solutions using Knowledge Tools:</b> <ul style="list-style-type: none"> <li>• Brainstorming, Affinity Diagram, Interrelationship Digraph, Creativity Thinking, Benchmarking, Replication</li> </ul> </li> <li>• <b>Re-confirm the Financials</b> <ul style="list-style-type: none"> <li>• Cost Benefit Analysis, Pay-Off Matrix</li> <li>• Review and Approval by Finance</li> </ul> </li> <li>• <b>Update Sigma Measures Standardize the Process</b> <ul style="list-style-type: none"> <li>• Update Process Map and FMEA</li> <li>• Develop Standard Operating procedure(s)</li> <li>• Check MSA requirements</li> <li>• Update Control Plan</li> </ul> </li> <li>• <b>Opportunity to Launch a Lean Kaizen using some of the following Lean Tools</b></li> <li>• <b>Step #19 – Determine Optimum Operating Windows of KPIV's and Implement Identified Process Improvements Data Analysis</b> <ul style="list-style-type: none"> <li>• <i>Plan for Transfer to Operations</i></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>Step #21 – Project Closure</b> <ul style="list-style-type: none"> <li>• Financial Validation</li> <li>• Final Project Presentation and Report</li> <li>• Executive Summary</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• <b>Step #3 – Cost of Poor Quality</b> <ul style="list-style-type: none"> <li>• Financial Analysis</li> <li>• Identify and Financially Quantify Waste Areas (Lean)</li> <li>• Identify and Financially Quantify Cost of Variation and Defects</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>• <b>Step #15 – Assess Statistical Significance of Relationships</b> <ul style="list-style-type: none"> <li>• Hypothesis Tests and Statistical Analysis of Data</li> </ul> </li> <li>• <b>Step #16 – Gain Insight into the Source of Output Variability</b> <ul style="list-style-type: none"> <li>• Variance Components Analysis</li> </ul> </li> <li>• <b>Step #17 – Gain Insight of how KPIV's can Impact KPOV's and Implement agreed-to-process improvement changes</b> <ul style="list-style-type: none"> <li>• Correlation, Regression</li> <li>• ANOVA</li> </ul> </li> </ul>		
<ul style="list-style-type: none"> <li>• <b>Step #4 – Project Management</b> <ul style="list-style-type: none"> <li>• Change Management, Facilitating Teams, Gantt Chart, Project Scope</li> </ul> </li> </ul>				