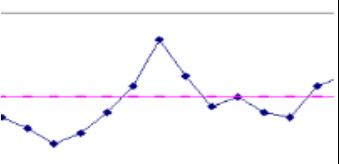
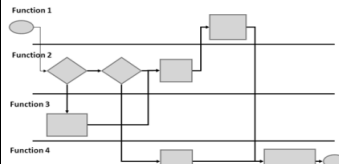


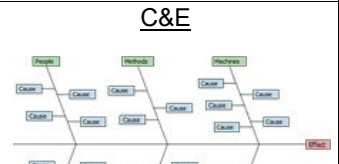

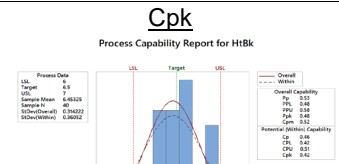
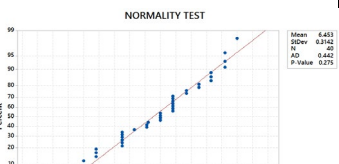
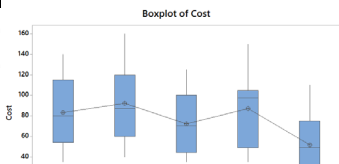


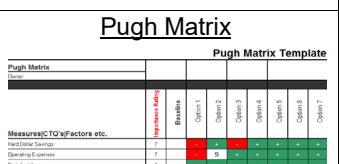
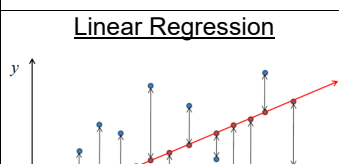
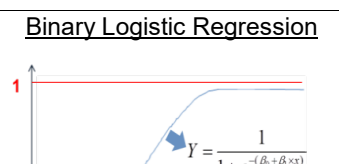
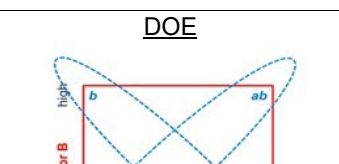

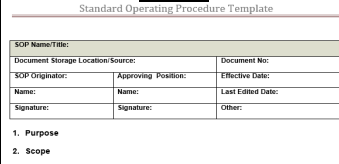
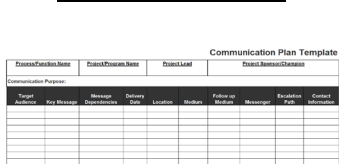
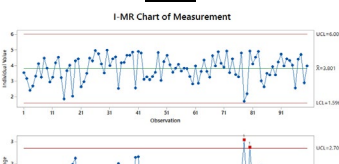


# Lean Six Sigma DMAIC Roadmap

| Purpose |  | Key Tools   |  |  |  | Key Outputs  |
|---------|--|---|--|--|--|--|
| Define  | To establish a quantified problem statement, objective and business case that will become the foundation to your Six Sigma project. Conduct stakeholder analysis, select team members and kick-off your project. | Primary Metric<br> | Process Map<br>        | Project Charter<br>             | Project Plan<br>    | <ul style="list-style-type: none"> <li>* Process Map</li> <li>* Gather VOC</li> <li>* Translate VOC to CTQ's</li> <li>* QFD/HOQ</li> <li>* COPQ</li> <li>* Primary &amp; Secondary Metrics</li> <li>* Establish Project Charter</li> <li>* Stakeholder Analysis</li> <li>* Team Selection</li> <li>* Project Plan</li> </ul>         |
|         |  | C&E<br>            | SIPOC<br>              | FMEA<br>                        | Cpk<br>             | <ul style="list-style-type: none"> <li>* Early Y=f(x) Hypothesis</li> <li>* Detailed Process Map</li> <li>* SIPOC</li> <li>* Cause &amp; Effect Diagram</li> <li>* Cause &amp; Effect Matrix</li> <li>* FMEA</li> <li>* Basic Statistics</li> <li>* Normality Test</li> <li>* Capability Analysis</li> <li>* Gage R&amp;R</li> </ul> |
| Measure | Refine your understanding of the process. Assess process capability relative to customer specifications. Validate measurement systems. Brainstorm potential x's.   | Normality Test<br> | ANOVA<br>              | 2 Sample t-test<br>             | Equal Variances<br> | <ul style="list-style-type: none"> <li>* Narrowed Y=f(x)</li> <li>* 1 &amp; 2 Sample t-tests</li> <li>* 1 &amp; 2 Proportions tests</li> <li>* Equal variance tests</li> <li>* Normality tests</li> <li>* ANOVA</li> <li>* Moods Median</li> <li>* Mann Whitney</li> <li>* Paired t-test</li> <li>* Chi-Squared test</li> </ul>      |
|         |  | Pugh Matrix<br>   | Linear Regression<br> | Binary Logistic Regression<br> | DOE<br>            | <ul style="list-style-type: none"> <li>* Refined Y=f(x)</li> <li>* Pugh Matrix</li> <li>* Correlation</li> <li>* Simple Linear Regression</li> <li>* Multiple Linear Regression</li> <li>* Binary Logistic Regression</li> <li>* Full Factorial DOE</li> <li>* Fractional Factorial DOE</li> </ul>                                   |
| Analyze | Conduct data collection and planned studies in order to eliminate non-critical x's and validate critical x's. Establish a stronger and quantified Y=f(x) equation.   |   |  |  |  |  |
|         |  |   |  |  |  |  |
| Improve | Design, test and implement your new process or product under live operating conditions. Pilot solutions if feasible before broadly deploying expensive improvements or products.                                 |   |  |  |  |  |
|         |  |   |  |  |  |  |
| Control | Plan, communicate, train and implement your product or process solutions. Ensure control mechanisms are established. Use Poke Yoke, visual controls, SOP's and SPC wherever possible.                            | Control Plan<br> | SOP's<br>            | Communication Plan<br>        | SPC<br>           | <ul style="list-style-type: none"> <li>* Control Plan</li> <li>* Training Plan</li> <li>* Refined FMEA</li> <li>* Communication Plan</li> <li>* Standard Operating Procedures</li> <li>* Five-S Audit</li> <li>* Poke Yoke</li> <li>* Visual Controls</li> <li>* Statistical Process Control</li> </ul>                              |
|         |  |   |  |  |  |  |