STATISTICAL PROCESS CONTROL IMPLEMENTATION ROADMAP

**Phase 1: Define**
- Define Product
- Identify Critical To Quality (CTQ's)
- Identify Impacted Process(es)
- Define Project Objectives
- Train Project Team Members
- Train & Obtain Top-Management Commitment
- Inform Employees

**Phase 2: Measure**
- Identify Key Process Output Variables (KPOV's)
- Define Specification Limits (USL-LSL)
- Validate Measurement System Capability (%R&R)
- Calculate Short-Term (Long-Term) Process Capability (KPOV's)
- Identify Key Process Input Variables (KPIV's)
- Implement Control Charts on Y's (KPOV's)

**Phase 3: Analyze**
- Identify Potential Leverage Variables (KPIV's)
- Analyze and Identify KPIV's responsible of most important part of Variation on KPOV's
- Identify Critical Key Process Input Variables (KPIV's)

**Phase 4: Improve**
- Establish Relationships between KPOV's & KPIV's
- Define Control Limits (UCL-LCL) on Key Process Input Variables (KPIV's)
- Validate Measurement System Capability (%R&R)
- Confirm Results
- Validate Improvement

**Phase 5: Control**
- Calculate Short-Term (Long-Term) Process Capability (KPOV's et KPIV's)
- Implement Control Charts on X's (KPIV's)

**Tools Used**
- CTQ Diagram
- QFD Matrix
- Process Map – SIPOC
- C&E Fishbone Diagram
- Pareto Chart
- MSA on Y's – %R&R Study
- Short-Term (Long-Term) Capability Study
- Control Charts
- C&E Matrix
- Failure Mode and Effects Analysis – FMEA
- Central Limit Theorem
- Multi-Vari Analysis
- Correlation and Regression
- Design of Experiments (DOE)
- Short-Term (Long-Term) Capability Study
- Control Charts
- Control Plan
- Procedures, Audits
- Poka-Yoke
- Gauge Control Plan

**Equation:**
\[ y = f(x_1, x_2, x_3, \ldots, x_n) \]

**y**
Understand the Customers Requirements (KPOV’s)

**y**

\[ y \]

\[ x_1, x_2, x_3, \ldots, x_n \]

\[ x_i \]

Control the Key Process Characteristics (KPIV’s)
**STATISTICAL PROCESS CONTROL IMPLEMENTATION ROADMAP**

**Phase 1 Define**

**Objective:**
Define the Project's purpose, scope & obtain background information about process and its Customers

**Activities**
- Define Product
- Identify Critical To Quality (CTQ's)
- Identify Impacted Process(es)
- Define Project Objectives
- Train Project Team Members
- Train & Obtain Top-Management Commitment
- Inform Employees

**Tools Used**
- CTQ Diagram
- QFD Matrix
- Process Map – SIPOC

**Outputs / Results**
- Project Charter
- Top Level Process Map
- Critical To Quality Characteristics (CTQ's)
- Milestone & Allocated Resources
- Team Members trained to SPC

**CTQ : Critical To Quality**
# STATISTICAL PROCESS CONTROL IMPLEMENTATION ROADMAP

## Phase 2: Measure

**Objective:** Measure the actual situation by gathering data & understanding how the current process operates

### Activities

- Identify Key Process Output Variables (KPOV’s)
- Define Specification Limits (USL-LSL)
- Validate Measurement System Capability (%R&R)
- Calculate Short-Term (Long-Term) Process Capability (KPOV’s)
- Identify Key Process Input Variables (KPIV’s)
- Implement Control Charts on Y’s (KPOV’s)

### Tools Used

- C&E Fishbone Diagram
- Pareto Chart
- MSA on Y’s – %R&R Study
- Short-Term (Long-Term) Capability Study
- Control Charts

### Outputs / Results

- Detailed Process Map
- Key Process Output Variables (KPOV’s)
- Measurement System Capability on Y’s
- Current DPMO & z Value of Process
- Baseline Short-Term (Long-Term) Process Capability (KPOV’s)
- Key Process Input Variables (KPIV’s)

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LSL : Lower Specification Limit – %R&R : % Reproducibility & Reproductibility
# STATISTICAL PROCESS CONTROL

## IMPLEMENTATION ROADMAP

### Phase 3  Analyze

**Objective:**
Analyze the potential root causes of Process variations & Confirm them with Statistical data

### Activities
- Identify Potential Leverage Variables (KPIV's)
- Analyze and Identify KPIV's responsible of must important part of Variation on KPOV's.
- Identify Critical Key Process Input Variables (KPIV's)

### Tools Used
- C&E Matrix
- Failure Mode and Effects Analysis – FMEA
- Central Limit Theorem
- Multi-Vari Analysis
- Correlation and Regression
- **Design of Experiments (DOE)**

### Outputs / Results
- Relationships between KPOV's & KPIV's
- KPIV's Critical to Process Performance
- Understanding of Process

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KPIV : Key Process Input Variable  –  KPOV : Key Process Output Variable
## STATISTICAL PROCESS CONTROL IMPLEMENTATION ROADMAP

### Phase 4: Improve

**Objective:**
Improve step is to Develop & Implement solutions that address root causes

### Activities
- Establish Relationships between KPOV’s & KPIV’s
- Define Control Limits (UCL-LCL) on Key Process Input Variables (KPIV’s)
- Validate Measurement System Capability (%R&R)
- Confirm Results
- Validate Improvement

### Tools Used
- Correlation and Regression
- Failure Mode and Effects Analysis – FMEA
- MSA on X’s – %R&R Study
- Corrective Actions Plan
- Creativity

### Outputs / Results
- Proved Relationships between KPIV’s & KPOV’s
- Control Limits (UCL-LCL) on Key Process Input Variables (KPIV’s)
- Measurement System Capability on X’s
- Updated Process Map
- Updated AMDEC

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**KPOV**: Key Process Output Variable  
**KPIV**: Key Process Input Variable  
**UCL**: Upper Control Limit  
**LCL**: Lower Control Limit  
**%R&R**: % Reproducibility & Reproducibility

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STATISTICAL PROCESS CONTROL
IMPLEMENTATION ROADMAP

**Phase 5 - Control**

**Objective:**
Control to maintain the Gains we have made by monitoring processes & anticipating future improvements

**Activities**
- Calculate Short-Term (Long-Term) Process Capability (KPOV's et KPIV's)
- Implement Control Charts on X's (KPIV's)

**Tools Used**
- Short-Term (Long-Term) Capability Study
- Control Charts
- Control Plan
- Procedures, Audits
- Poka-Yoke
- Gauge Control Plans

**Outputs / Results**
- DPMO & z Value of Process
- Short-Term (Long-Term) Process Capability (KPOV's) (KPIV's)
- Updated AMDEC (RPN)
- Control Charts (KPIV's)

KPOV : Key Process Output Variable – KPIV : Key Process Input Variable