

IV. Quality Management Tools

IV.A Problem-Solving Tools

IV.A.1 The seven classic quality tools

5 - Evaluate

Select, interpret, and evaluate output from these tools: Pareto charts, cause and effect diagrams, flowcharts, control charts, check sheets, scatter diagrams, and histograms.

IV.A.2 Basic management and planning tools

5 - Evaluate

Select, interpret, and evaluate output from these tools: affinity diagrams, tree diagrams, process decision program charts (PDPCs), matrix diagrams, prioritization matrices, interrelationship digraphs, activity network diagrams, and Gantt charts.

IV.A.3 Process improvement tools

5 - Evaluate

Select, interpret and apply tools such as root cause analysis, PDCA, six sigma DMAIC (define, measure, analyze, improve, control), and failure mode and effects analysis (FMEA).

IV.A.4 Innovation and creativity tools

3 - Apply

Use various techniques and exercises for creative decision-making and problem-solving, including brainstorming, mind mapping, lateral thinking, critical thinking, 5 whys and design for six sigma (DFSS).

IV.A.5 Cost of quality (COQ)

5 - Evaluate

Define and distinguish between prevention, appraisal, internal, and external failure cost categories and evaluate the impact that changes in one category will have on the others.

IV.B Process Management

IV.B.1 Process goals

5 - Evaluate

Describe how process goals are established, monitored, and measured and evaluate their impact on product or service quality.

IV.B.2 Process analysis

5 - Evaluate

Use various tools to analyze a process and evaluate its effectiveness on the basis of procedures, work instructions, and other documents. Evaluate the process to identify and relieve bottlenecks, increase capacity, improve throughput, reduce cycle time, and eliminate waste.

Quality Management Body of Knowledge

IV.B.3 Lean tools

3 - Apply

Identify and use lean tools such as cycle-time reduction, 5S, just-in-time (JIT), kanban, value stream mapping, single-minute exchange of die (SMED), poke-yoke, kaizen, and overall equipment effectiveness (OEE).

IV.B.4 Theory of constraints (TOC)

2 - Understand

Define key concepts of TOC; local vs. system optimization, physical vs. policy constraints, and throughput. Classify constraints in terms of finite resources and increased expectations.

IV.C Measurement: Assessment and Metrics

IV.C.1 Basic statistical use

3 - Apply

Use techniques such as the goal-question-metric (GQM) model and others to identify when, what, and how to measure projects and processes. Describe how metrics and data gathering methods affect resources and vice-versa.

IV.C.2 Sampling

2 - Understand

Define and describe basic sampling techniques such as random and stratified. Identify when and why sampling is an appropriate technique to use.

IV.C.3 Statistical analysis

5 - Evaluate

Calculate basic statistics: measures of central tendency (mean, median, mode), and measures of dispersion (range, standard deviation, and variance). Identify basic distribution types (normal, bimodal, skewed) and evaluate run charts, statistical process control (SPC) reports, and other control charts to make data-based decisions.

IV.C.4 Measurement systems analysis

2 - Understand

Define basic measurement terms: accuracy, precision, bias, and linearity. Understand the difference between repeatability and reproducibility in gauge R&R studies.

IV.C.5 Trend and pattern analysis

5 - Evaluate

Interpret data graphs and charts to identify cyclical, seasonal, and environmental trends. Evaluate control chart patterns to determine process shifts.

IV.C.6 Process variation

4 - Analyze

Analyze data to distinguish between common and special cause variation.

Quality Management Body of Knowledge

IV.C.7 Process capability

2 - Understand

Recognize process capability (Cp and Cpk,) and performance indices (Pp and Ppk).

IV.C.8 Reliability terminology

2 - Understand

Recognize reliability measures such as mean time between failures (MTBF) and mean time to repair (MTTR).

IV.C.9 Qualitative assessment

4 - Analyze

Identify subjective measures such as verbatim comments from customers, observation records, and focus group output. Describe how they differ from objective measures, and determine when measurements should be captured in categories rather than numeric value.