



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai

Accredited by NAAC, UGC with 'A++' Grade (Cycle III) &

Accredited by NBA (B.E., CSE, EEE, ECE, Mech & B.Tech.IT)

COIMBATORE, 641 035, TAMIL NADU



DEPARTMENT OF AEROSPACE ENGINEERING

19MEE304 Total Quality Management

Topic: Evolution of Quality – Definitions of Quality

Definitions of Quality

- **ISO 9000:** "The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs."
- **Philip Crosby:** "Quality is conformance to requirements."
- **Joseph Juran:** "Quality is fitness for use."
- **W. Edwards Deming:** "Quality is about meeting customer needs and reducing variation."
- **Armand Feigenbaum:** "Quality is a total composite product and service characteristic."
- **Taguchi's Quality Loss Function:** Quality should minimize societal loss, not just meet specifications.

Evolution of Quality Management

1. **Craftsmanship Era (Pre-Industrial Revolution)**
 - Products were handmade by skilled artisans.
 - Quality depended on individual expertise and custom-built products.
2. **Inspection Era (Early 1900s)**
 - Introduction of mass production led to quality checks after production.
 - Example: Manual inspection of products in manufacturing lines.
 - **Limitations:** High rejection rates, waste of resources.
3. **Statistical Quality Control (SQC) Era (1920s-1950s)**
 - Introduction of **Walter Shewhart's Control Charts** for process monitoring.
 - **Acceptance Sampling** methods introduced by Dodge and Romig.
 - Used extensively in **World War II** for military manufacturing.
4. **Quality Assurance Era (1950s-1970s)**
 - Shift from defect detection to defect prevention.
 - Introduction of **Total Quality Control (TQC)** by Feigenbaum.

- **ISO 9000 standards** emerged to standardize quality.
 - Juran's **Quality Trilogy**: Quality Planning, Quality Control, Quality Improvement.
 - **Failure Mode and Effects Analysis (FMEA)** introduced for risk assessment.
5. **Total Quality Management (TQM) Era (1980s-1990s)**
- Organization-wide quality management approach.
 - Customer focus, process improvement, and employee involvement emphasized.
 - **Deming's 14 Points** introduced.
 - **Quality Circles** and **Continuous Improvement (Kaizen)** gained prominence.
 - **Benchmarking** used for competitive quality improvements.
6. **Six Sigma & Lean Quality Era (1990s-Present)**
- **Six Sigma**: Data-driven approach to minimize defects (Motorola, GE popularized it).
 - **Lean Manufacturing**: Focus on eliminating waste while maintaining quality (Toyota Production System).
 - **Design for Six Sigma (DFSS)**: Integrating quality into product design.
 - Use of **AI and automation** for real-time quality monitoring.
 - **Total Productive Maintenance (TPM)**: Improving machine reliability for consistent quality.

Key Concepts in Quality Evolution

- **Control Charts**: Used for process monitoring and identifying variations.
- **Total Quality Control (TQC)**: Company-wide quality involvement.
- **Zero Defects Philosophy**: Introduced by Crosby, emphasizing defect-free production.
- **Robust Design (Taguchi Method)**: Focus on minimizing variations in production.
- **Lean Six Sigma**: Combination of Six Sigma's defect reduction and Lean's waste elimination.
- **Statistical Process Control (SPC)**: Data-driven methodology for maintaining process quality.
- **Quality Function Deployment (QFD)**: Translating customer needs into product specifications.

Importance of Understanding Quality Evolution

- Helps organizations adopt the best quality management strategies.
- Encourages a shift from reactive to proactive quality control.
- Drives continuous improvement and customer satisfaction.
- Reduces costs associated with defects and inefficiencies.
- Enhances competitive advantage in the global market.
- Enables integration of new quality technologies and innovations.

Case Study: Evolution of Quality at Toyota

- **Inspection to Lean Manufacturing Transition.**
- **Kaizen (Continuous Improvement):** Employee-driven improvements in quality.
- **Just-in-Time (JIT):** Reducing inventory waste while maintaining high-quality standards.
- **Six Sigma Integration:** Further refinement of defect reduction methodologies.
- **Total Productive Maintenance (TPM):** Ensuring machinery reliability for consistent output.
- **Outcome:** Toyota became a benchmark in manufacturing quality worldwide.

Recent Trends in Quality Management

- **Industry 4.0 & Smart Manufacturing:** AI, IoT, and real-time quality control.
- **Blockchain for Quality Assurance:** Enhanced traceability and transparency in supply chains.
- **Predictive Quality Analytics:** AI-driven defect prediction models.
- **Sustainable Quality Practices:** Eco-friendly manufacturing and green supply chains.
- **Risk-Based Thinking in Quality Management:** ISO 9001:2015 emphasizes risk assessment in quality planning.

Conclusion

The evolution of quality management has shifted from simple defect detection to proactive defect prevention and continuous improvement. Organizations that embrace advanced quality strategies can enhance efficiency, reduce waste, and ensure customer satisfaction in a competitive marketplace. The integration of AI, automation, and sustainability will shape the future of quality management, driving continuous innovation and excellence.