Topic 7: Quality Management Systems

MIB2307 Operations Management

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Defining Quality

> "Quality is the total composite product and service characteristics through which the product or service in use will meet the expectations of the customer."

Quality control must start with identifying customer quality requirements and end only when the product is in the hands of a **satisfied customer**.

Performance

Primary operating characteristics

Reliability

Probability of failure-free operation

Conformance

Match to specifications

Durability

Product lifespan

Aesthetics

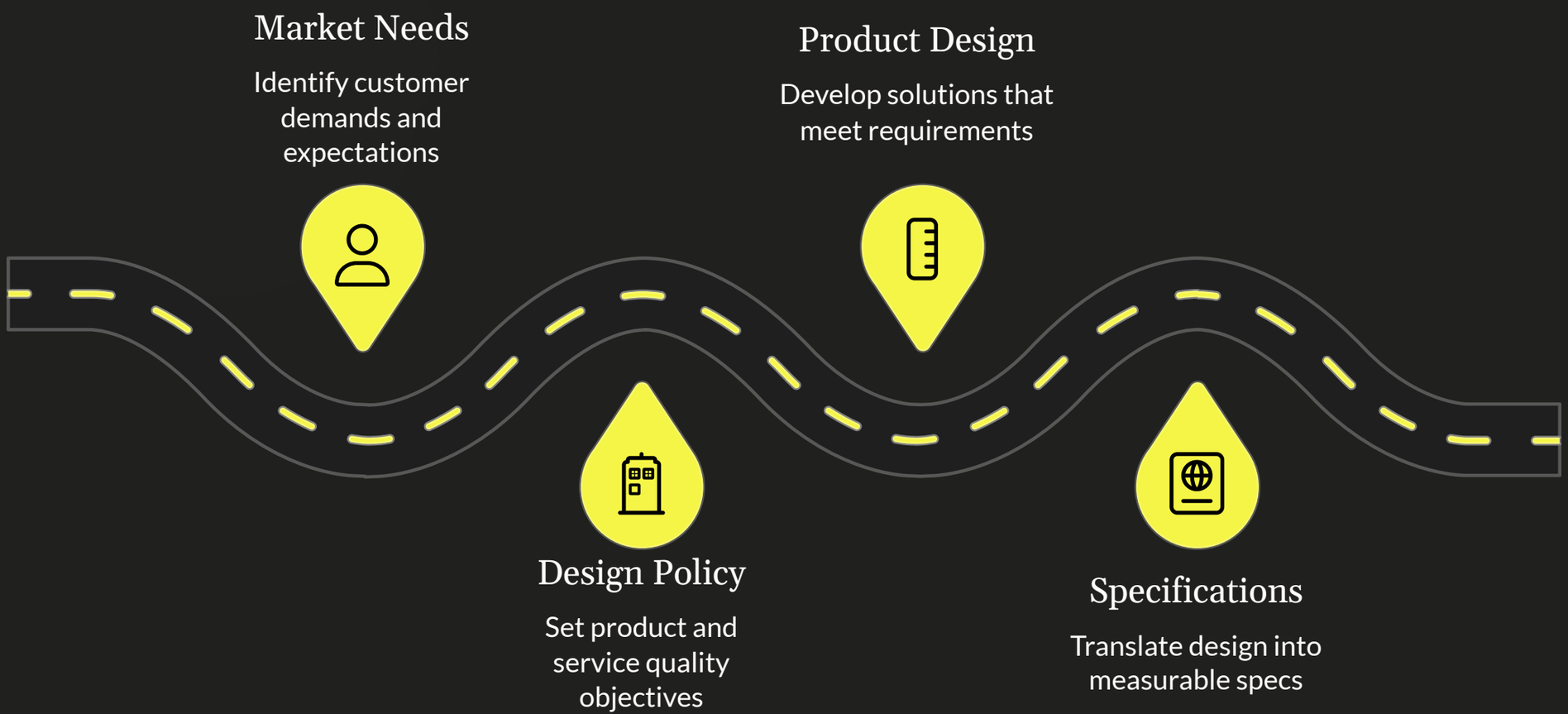
Look, feel, taste, sound

Perceived Quality

Customer's subjective assessment

Quality in the Design Process

From **Market Needs** to **Customer Satisfaction** — quality is embedded at every stage of the design and delivery process.



Each stage feeds into the next, ensuring that customer expectations are translated into measurable specifications and ultimately delivered as a satisfying product or service.

Key Term — Conformance: Confirmation that a product or service meets the requirements of accepted practices, regulations, standards, or contract terms.

The Total Quality Offering

Quality is not a single dimension — it emerges from the **constant interaction** between four interrelated factors. Measuring customers' responses to the product or service received is the key element of ensuring quality.

Hard Factors

SPC charts, Ishikawa diagrams, flow diagrams, and measurable data that quantify quality performance objectively.

Soft Factors

TQM commitment, understanding customer requirements, cultural change, and ongoing training programs.

Product Quality

Designs and specifications that precisely match customer requirements and expectations.

Process Quality

"Right first time" — cost-effective, speedy, and reliable delivery of products and services.

Service Quality: The SERVQUAL Model

PARASURAMAN, ZEITHAML & BERRY (1985)

SERVQUAL measures the **gap between customer expectations** and their **perception of actual experience**. The five dimensions — known as **RATER** — provide a comprehensive framework for evaluating service quality.

Reliability

Ability to perform the promised service dependably and accurately, every time.

Assurance

Knowledge and courtesy of employees; ability to inspire trust and confidence in customers.

Tangibles

Physical facilities, equipment, and appearance of personnel that customers can see and evaluate.

Empathy

Caring, individualized attention provided to customers to make them feel valued.

Responsiveness

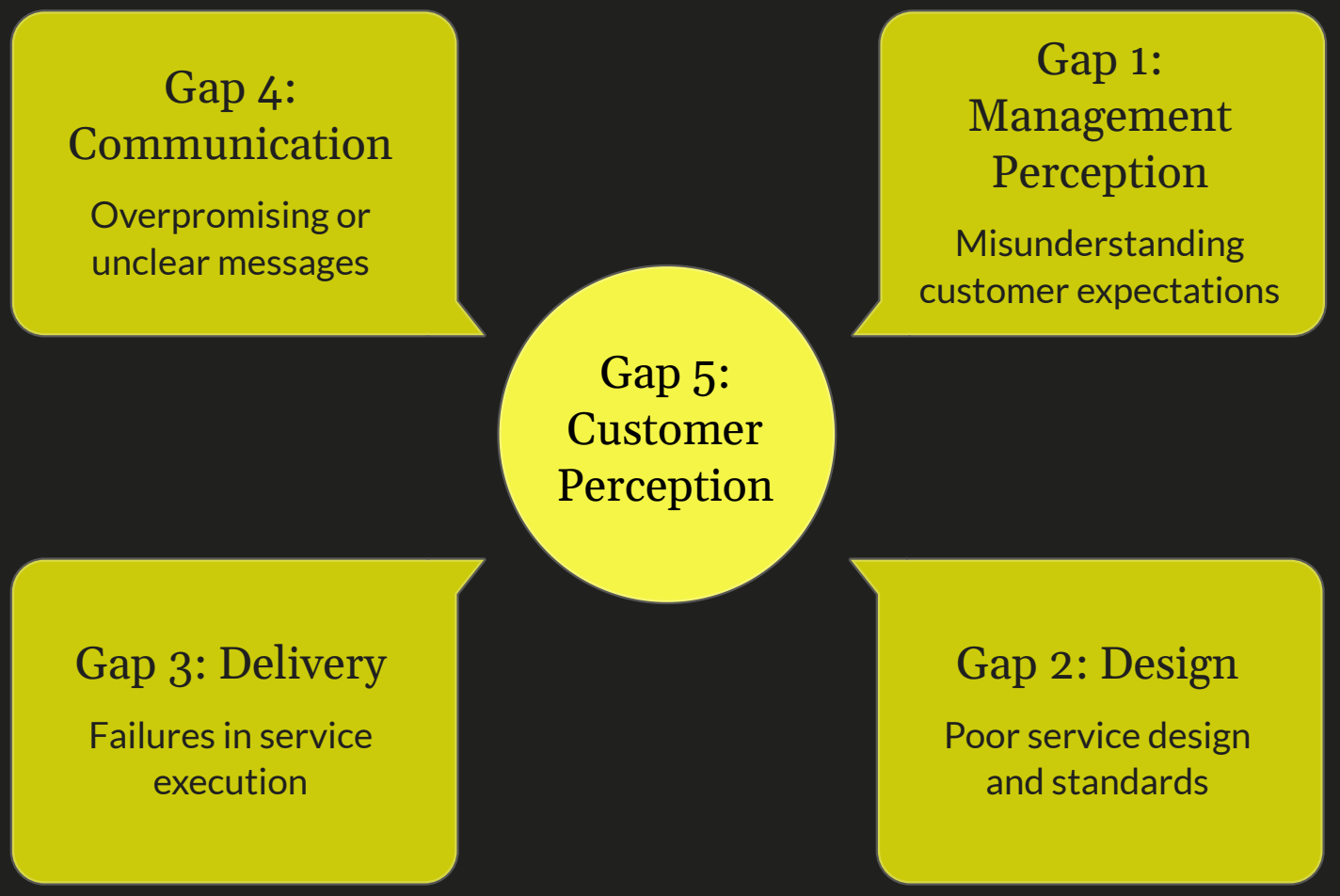
Willingness to help customers and provide prompt, timely service when needed.

The Five Gap Model

Service quality failures occur when gaps emerge between what customers expect and what they actually receive. **Gap 5** — the overall customer perception gap — is a direct function of all four provider-side gaps.

Gap 1	Not understanding the needs of customers — *Management Perception Gap*
Gap 2	Unable to translate customer needs into service design — *Design Gap*
Gap 3	Unable to translate design into implementable standards — *Delivery Gap*
Gap 4	Unable to deliver services in line with specifications — *Communication Gap*
Gap 5	Creating expectations that cannot be met — *Customer Perception Gap*

Key Formula: Gap 5 = f(Gap 1, Gap 2, Gap 3, Gap 4) — The overall service quality gap is a function of all provider-side gaps combined.



Total Quality Management (TQM)

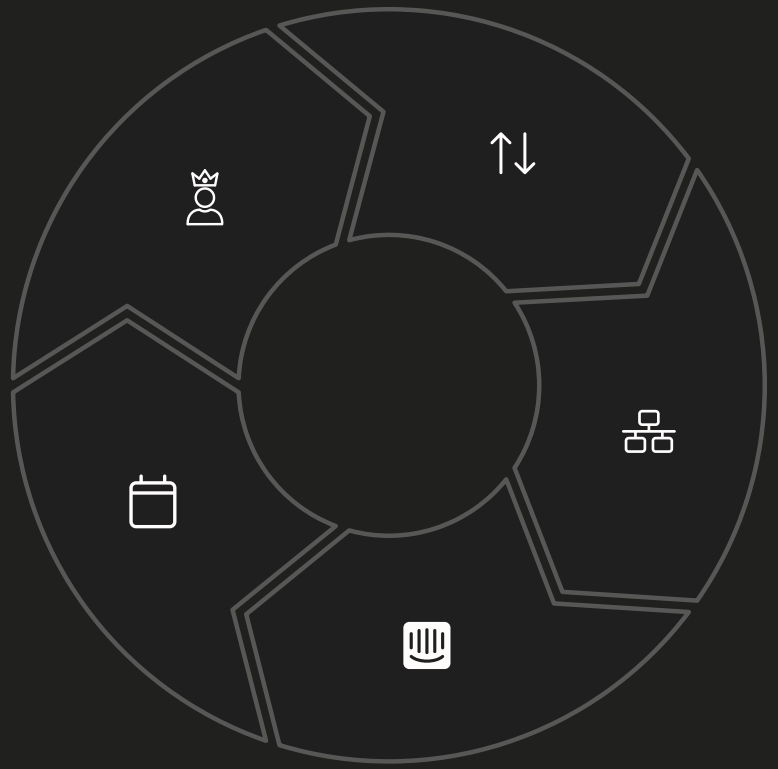
TQM is an approach to control that **integrates quality objectives into all management functions** to continually achieve superior quality. It is not a short-term fix — it requires permanent organizational commitment.

Top Management Commitment

Willingness to invest in training and quality infrastructure

Long-Term Commitment

Permanent organizational commitment, not a quick fix



Continuous Improvement (Kaizen)

Strategic commitment to always improving performance

Company-Wide Quality Control

Every department owns quality outcomes across the supply chain

Customer Focus

Everything begins and ends with customer satisfaction

Stages of Quality Development

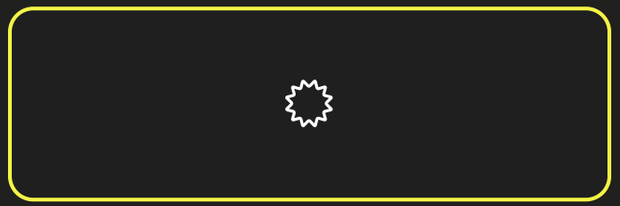
Quality management has evolved through distinct stages — from simple inspection to fully integrated TQM. Each stage builds on the previous, expanding scope and sophistication.

Inspection

Salvaging, sorting, grading, and corrective actions

Quality Control

Quality manuals, product testing, basic quality planning, statistics



Quality Assurance

Third-party approvals, advanced planning, systems audits

Company-Wide QC

Quality measured in ALL areas; employee involvement in continuous improvement

TQM

All principles applied proactively; suppliers, customers, and employees involved in teamwork

Quality Metrics: Measuring What Matters

Effective quality management demands rigorous measurement. These key performance indicators provide the data foundation for quality decisions.

Defect Rate

Formula: (Number of defects ÷ Total units produced) × 100%

Tracks the percentage of non-conforming units in production.

DPMO

Formula: (Total Defects ÷ Total Opportunities) × 1,000,000

Six Sigma target: **DPMO ≤ 3.4**

COPQ — Cost of Poor Quality

Prevention Costs + Appraisal Costs + Internal Failure Costs + External Failure Costs

Typically **15–30% of revenue** in organizations without quality programs.

Cycle Time & Throughput

- **Cycle Time** — Time required to complete one unit
- **Throughput** — Units produced per unit of time

3.4

Six Sigma DPMO Target

Defects per million opportunities at 6σ level

30%

Max COPQ Impact

Revenue lost to poor quality without programs

6

Sigma Levels

Levels of process performance from 1σ to 6σ

Six Sigma: Achieving Near-Perfection

Six Sigma is a **data-driven methodology** aimed at eliminating defects and reducing variability. The goal: no more than **3.4 defects per million opportunities (DPMO)**.

DMAIC Framework

01

Define

Identify the problem and customer requirements

02

Measure

Collect baseline data on current performance

03

Analyze

Identify root causes of defects

04

Improve

Implement solutions to address root causes

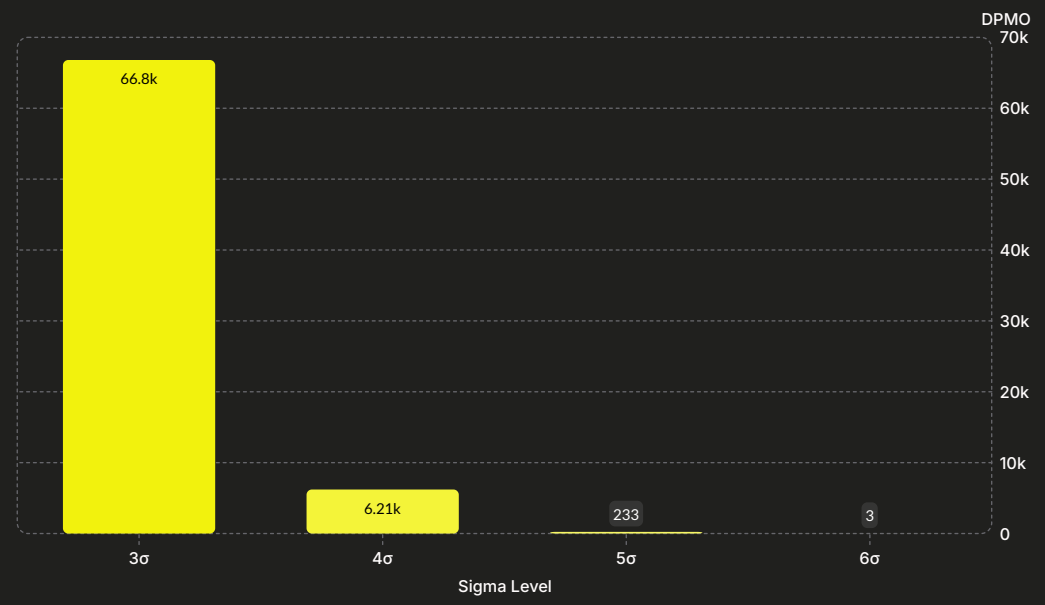
05

Control

Monitor and sustain improvements over time

Sigma Levels & Performance

Sigma Level	DPMO	Yield
3σ	66,807	93.32%
4σ	6,210	99.38%
5σ	233	99.98%
6σ	**3.4**	**99.9997%**



Quality Improvement Tools

The quality toolkit provides operations managers with structured methods to identify, analyze, and eliminate defects. Each tool serves a distinct purpose in the quality improvement process.

Ishikawa (Fishbone) Diagram

Identifies potential root causes across 6 categories: **Machine, Method, Material, Man, Measurement, Environment**.

Pareto Chart (80/20 Rule)

80% of quality problems come from 20% of causes. Prioritize the **"vital few"** over the "trivial many."

Control Charts (SPC)

Statistical Process Control charts monitor whether a process remains in control. Tracks **UCL** and **LCL**.

Process Capability (Cp & Cpk)

Measures how well a process fits within specification limits. **Cp ≥ 1.33** indicates a capable process.

Check Sheets & Flowcharts

Simple data collection and process mapping tools for quality analysis and documentation.

Quality Ethics: Shortcuts vs. Standards

Quality management is not just technical — it involves **moral choices** that affect workers, consumers, and communities worldwide.

Ethical Dilemmas in Quality

- Cutting inspection costs to meet profit targets vs. product safety
- Shipping products that barely pass minimum standards vs. customer trust
- Using cheaper materials that meet specs but reduce durability
- Falsifying quality reports to avoid recall costs
- Pressuring workers to ignore defects to maintain production speed

International Business Context

- Different countries may have different quality standards — is "meeting local standards" always ethical?
- Global supply chains require **consistent quality ethics** across all tiers
- Quality shortcuts in one country can harm consumers globally

Principle: Ethical operations managers maintain quality standards not because regulations require it, but because it is the right thing to do.

Case Study: McDonald's TQM in Practice

TQM APPLIED IN THE SERVICE INDUSTRY

McDonald's demonstrates that world-class service quality uses the **same tools as manufacturing quality** — it's the application that differs.

Simplified Processes

Food preparation broken into small, autonomous units — similar to manufacturing cells

Fresh Inventory Management

Employees empowered to dispose of unfresh food immediately — no compromise on standards

Customer Feedback Loops

Regular focus groups and questionnaires identify quality "defects" in the service experience

Total Monitoring

All phases monitored: purchasing → restrooms → decor → maintenance — nothing is overlooked

Flexible Workforce

Staff shift tasks based on customer traffic — demand-driven staffing for optimal efficiency

Technology-Driven Operations

IT used for scheduling, inventory, cooking procedures, and food assembly standardization

Key Takeaways

Quality Management: **From Concepts to Practice** — seven essential principles that bridge theory and real-world application.

1 Meet and Exceed Expectations

Quality is about meeting and exceeding customer expectations — not just passing inspections.

2 Build Quality In

Quality must be built into the design process, not inspected in afterwards.

3 Culture Change is Essential

TQM requires organizational culture change — top-down commitment and bottom-up participation.

4 Measurement is Non-Negotiable

You cannot manage what you cannot measure — DPMO, COPQ, and defect rates are essential.

5 Six Sigma for Near-Zero Defects

Six Sigma provides a rigorous, data-driven framework for achieving near-zero defects.

6 Ethics Over Cost Minimization

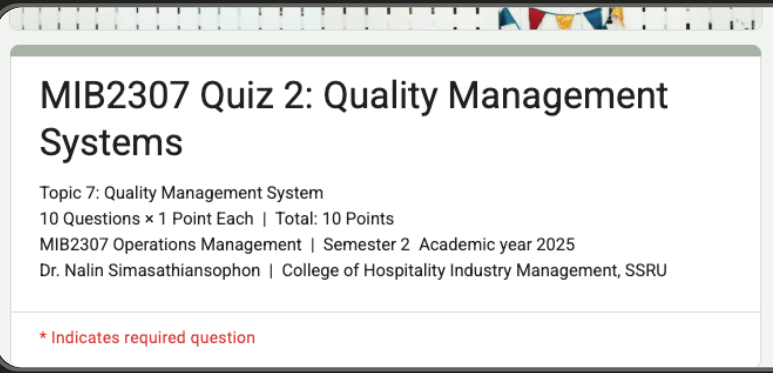
Ethical quality means decisions based on consumer and worker wellbeing, not just cost.

7 Services Need Quality Too

Quality management applies to services just as rigorously as to manufacturing.

Discussion Question: A supplier offers a 15% cost reduction if you accept slightly higher defect tolerances. What are the operational, financial, and ethical implications of accepting this offer?

Quiz 2: Quality Management System



Google Form

Quiz 2: Quality Management System