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Managing Quality and Innovation
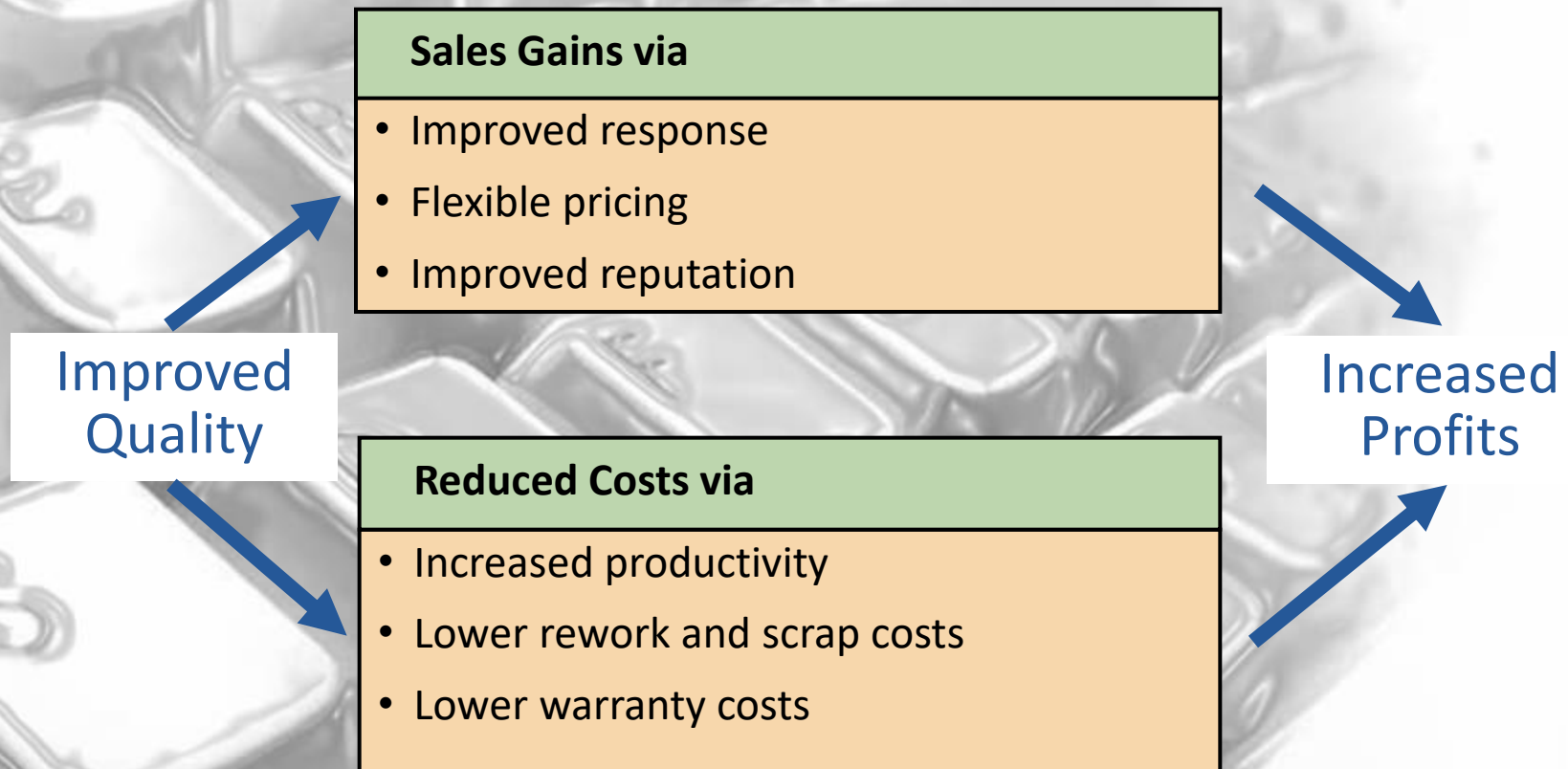
PowerPoint presentation to accompany
Heizer and Render
Operations Management, Eleventh Edition
Principles of Operations Management, Ninth Edition

PowerPoint slides by Jeff Heyl

Quality and Strategy

- ❑ Managing quality supports differentiation, low cost, and response strategies

- ❑ Quality helps firms increase sales and reduce costs

- ❑ Building a quality organization is a demanding task

Two Ways Quality Improves Profitability

Improved Quality

Sales Gains via
- Improved response
- Flexible pricing
- Improved reputation

Reduced Costs via
- Increased productivity
- Lower rework and scrap costs
- Lower warranty costs

Increased Profits

THE FLOW OF ACTIVITIES

Organizational Practices
>Leadership, Mission statement, Effective operating procedures,
>Staff support, Training
>*Yields: What is important and what is to be
>   accomplished*

Quality Principles
>Customer focus, Continuous improvement, Benchmarking, Just-in-time, Tools of TQM
>*Yields: How to do what is important and to be
>   accomplished*

Employee Fulfillment
>Empowerment, Organizational commitment
>*Yields: Employee attitudes that can accomplish
>   what is important*

Customer Satisfaction
>Winning orders, Repeat customers
>*Yields: An effective organization with
>   a competitive advantage*

DEFINING QUALITY

An operations manager's objective is to build a total quality management system that identifies and satisfies customer needs

DEFINING QUALITY

The totality of **features and characteristics** of a product or service that bears on its ability to **satisfy stated or implied needs**

American Society for Quality

DIFFERENT VIEWS

- **User-based**: better performance, more features

- **Manufacturing-based**: conformance to standards, making it right the first time

- **Product-based**: specific and measurable attributes of the product

IMPLICATIONS OF QUALITY

1. Company reputation
   - ▶ Perception of new products
   - ▶ Employment practices
   - ▶ Supplier relations

2. Product liability
   - ▶ Reduce risk

3. Global implications
   - ▶ Improved ability to compete

Malcolm Baldrige National Quality Award

- ❑ Established in 1988 by the U.S. government

- ❑ Designed to promote TQM practices

- ❑ Recent winners include

    Lockheed Martin Missiles and Fire Control, MESA Products Inc., North Mississippi Health Services, City of Irving, Concordia Publishing House, Henry Ford Health System, MEDRAD, Nestlé Purina PetCare Co., Montgomery County Public Schools

Baldrige Criteria

Applicants are evaluated on:

CATEGORIES	POINTS
Leadership	120
Strategic Planning	85
Customer Focus	85
Measurement, Analysis, and Knowledge Management	90
Workforce Focus	85
Operations Focus	85
Results	450

ISO 9000
International Quality Standards

❑ International recognition

❑ Encourages quality management procedures, detailed documentation, work instructions, and recordkeeping

❑ 2009 revision emphasized *sustained* success

❑ Over one million certifications in 178 countries

❑ Critical for global business
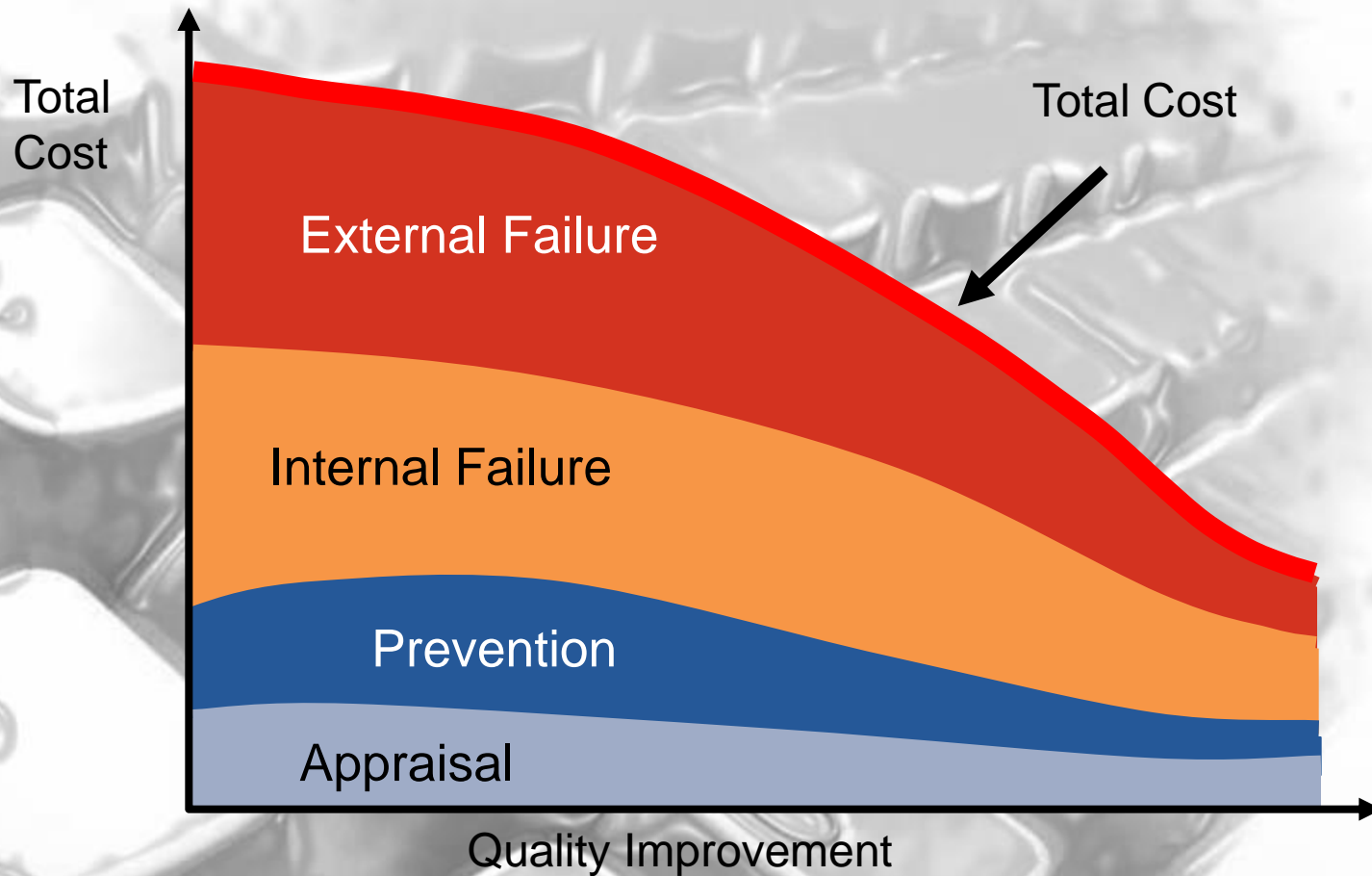
ISO 9000
International Quality Standards

Management principles

- ❑ Top management leadership
- ❑ Customer satisfaction
- ❑ Continual improvement
- ❑ Involvement of people
- ❑ Process analysis
- ❑ Use of data-driven decision making
- ❑ A systems approach to management
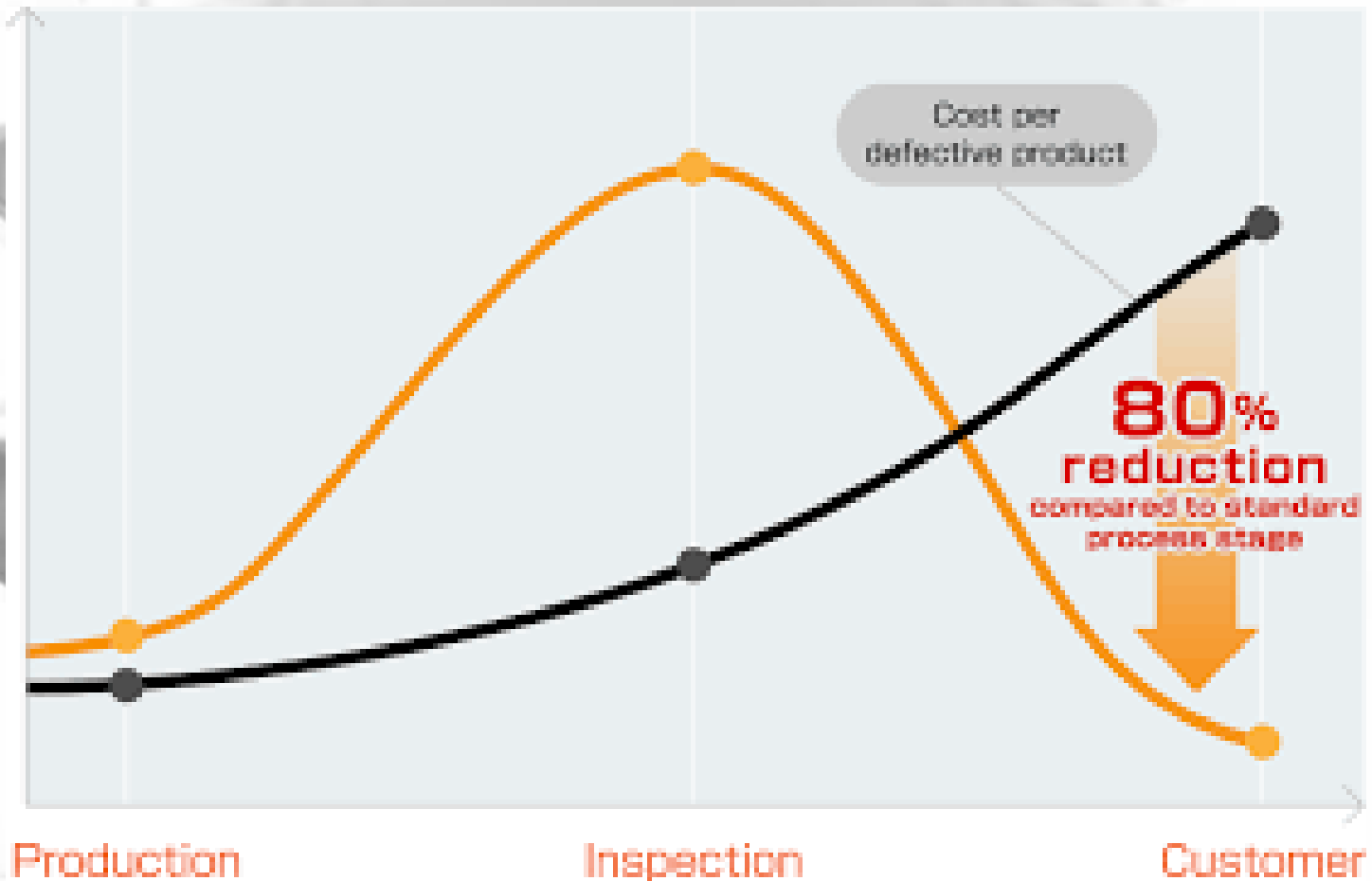- ❑ Mutually beneficial supplier relationships

Costs of Quality

- *Prevention costs* - reducing the potential for defects

- *Appraisal costs* - evaluating products, parts, and services

- *Internal failure costs* - producing defective parts or service before delivery

- *External failure costs* - defects discovered after delivery

Costs of Quality

Cost of Defect Product

Cost per defective product

80% reduction compared to standard process stage

Production   Inspection   Customer

Leaders in Quality

LEADER	PHILOSOPHY/CONTRIBUTION
W. Edwards Deming	Deming insisted management accept responsibility for building good systems. The employee cannot produce products that on average exceed the quality of what the process is capable of producing. His 14 points for implementing quality improvement are presented in this chapter.
Joseph M. Juran	A pioneer in teaching the Japanese how to improve quality, Juran believed strongly in top-management commitment, support, and involvement in the quality effort. He was also a believer in teams that continually seek to raise quality standards. Juran varies from Deming somewhat in focusing on the customer and defining quality as fitness for use, not necessarily the written specifications.

Leaders in Quality

LEADER	PHILOSOPHY/CONTRIBUTION
Amarnd Feigenbaum	His 1961 book Total Quality Control laid out 40 steps to quality improvement processes. He viewed quality not as a set of tools but as a total field that integrated the processes of a company. His work in how people learn from each other's successes led to the field of cross-functional teamwork.
Philip B. Crosby	Quality Is Free was Crosby's attention-getting book published in 1979. Crosby believed that in the traditional trade-off between the cost of improving quality and the cost of poor quality, the cost of poor quality is understated. The cost of poor quality should include all of the things that are involved in not doing the job right the first time. Crosby coined the term zero defects and stated, "There is absolutely no reason for having errors or defects in any product or service."

Ethics and Quality Management

- ❑ Operations managers must deliver healthy, safe, quality products and services

- ❑ Poor quality risks injuries, lawsuits, recalls, and regulation

- ❑ Ethical conduct must dictate response to problems

- ❑ All stakeholders much be considered

Total Quality Management

- Encompasses entire organization from supplier to customer

- Stresses a commitment by management to have a continuing companywide drive toward excellence in all aspects of products and services that are important to the customer

Deming's Fourteen Points

| Deming's 14 Points for Implementing Quality Improvement |
| --- |
| 1.   Create consistency of purpose |
| 2.   Lead to promote change |
| 3.   Build quality into the product; stop depending on inspections to catch problems |
| 4.   Build long-term relationships based on performance instead of awarding business on price |
| 5.   Continuously improve product, quality, and service |
| 6.   Start training |
| 7.   Emphasize leadership |
| 8.   Drive out fear |
| 9.   Break down barriers between departments |
| 10. Stop haranguing workers |
| 11. Support, help, and improve |
| 12. Remove barriers to pride in work |
| 13. Institute a vigorous program of education and self-improvement |
| 14. Put everyone in the company to work on the transformation |

Seven Concepts of TQM

1. **Continuous improvement**
2. **Six Sigma**
3. **Employee empowerment**
4. **Benchmarking**
5. **Just-in-time (JIT)**
6. **Taguchi concepts**
7. **Knowledge of TQM tools**

1. Continuous Improvement

- **Never-ending** process of continual improvement

- Covers people, equipment, materials, procedures

- Every operation **can be improved**

- *Kaizen* describes the ongoing process of unending improvement

- **TQM and zero** defects also used to describe continuous improvement
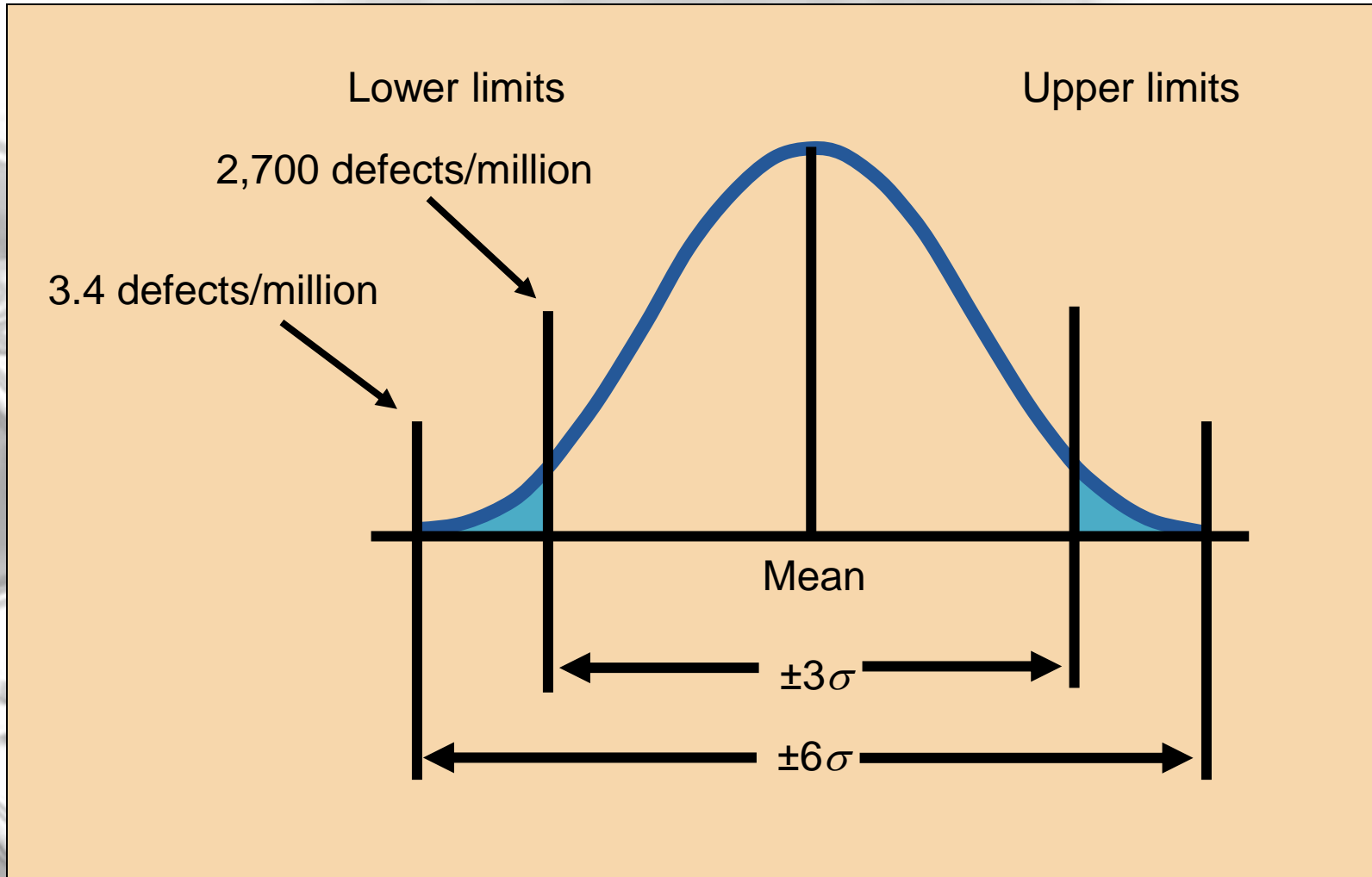
Shewhart's PDCA Model
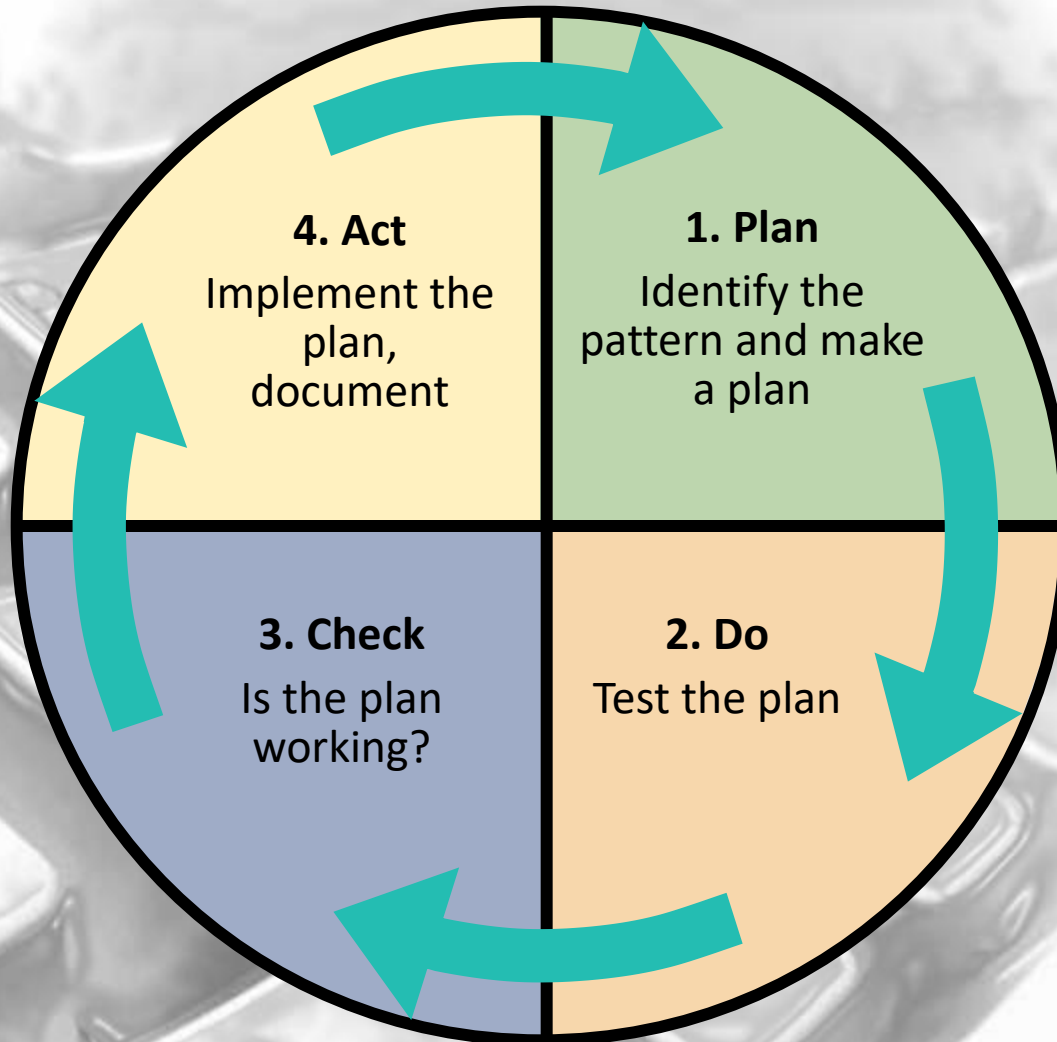
2. SIX SIGMA

❑ Two meanings

➢ *Statistical* definition of a process that is 99.9997% capable, 3.4 defects per million opportunities (DPMO)

➢ A *program* designed to reduce defects, lower costs, save time, and improve customer satisfaction

❑ A comprehensive system for achieving and sustaining business success

Six Sigma

Six Sigma Program

❑ Originally developed by Motorola, adopted and enhanced by Honeywell and GE

❑ Highly structured approach to process improvement

▶ A strategy

▶ A discipline – DMAIC

▶ A set of 7 tools

SIX SIGMA

1. *Defines* the project's purpose, scope, and outputs, identifies the required process information keeping in mind the customer's definition of quality

2. *Measures* the process and collects data

3. *Analyzes* the data ensuring repeatability and reproducibility

4. *Improves* by modifying or redesigning existing processes and procedures

5. *Controls* the new process to make sure performance levels are maintained

DMAIC Approach

Implementing Six Sigma

- ❑ Emphasize defects per million opportunities as a standard metric

- ❑ Provide extensive training

- ❑ Focus on corporate sponsor support (Champions)

- ❑ Create qualified process improvement experts (Black Belts, Green Belts, etc.)

- ❑ Set stretch objectives

This cannot be accomplished without a major commitment from top level management

3. Employee Empowerment

❑ Getting employees involved in product and process improvements

> ► 85% of quality problems are due to process and material

❑ Techniques

1) Build communication networks that include employees
2) Develop open, supportive supervisors
3) Move responsibility to employees
4) Build a high-morale organization
5) Create formal team structures
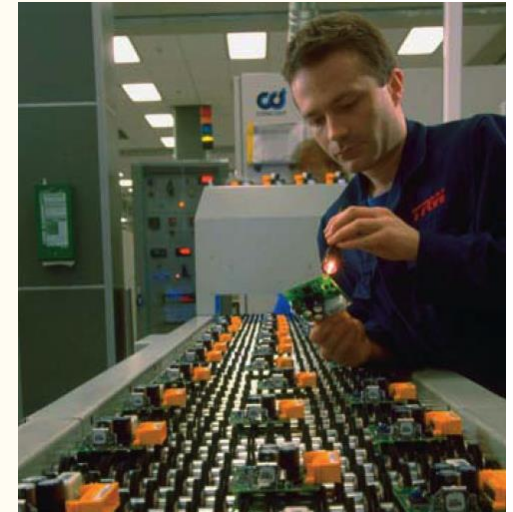
Quality Circles

- Group of employees who meet regularly to solve problems

- Trained in planning, problem solving, and statistical methods

- Often led by a *facilitator*

- Very effective when done properly

Quality Circles

Quality Circle adalah **kelompok kecil** untuk melakukan **kegiatan pengendalian kualitas** pada unit kerja yang sama. Kelompok kecil ini secara berkelanjutan menjadi bagian dari aktivitas pengendalian kualitas untuk **pengembangan diri dan peningkatan dan pengembangan bersama** dengan melakukan lokakarya, menggunakan teknik pengendalian kualitas dengan **melibatkan semua anggota** yang berpartisipasi (Ishikawa).

4. Benchmarking

Selecting best practices to use as a standard for performance

1. Determine what to benchmark

2. Form a benchmark team

3. Identify benchmarking partners

4. Collect and analyze benchmarking information

5. Take action to match or exceed the benchmark

Best Practices for Resolving Customer Complaints

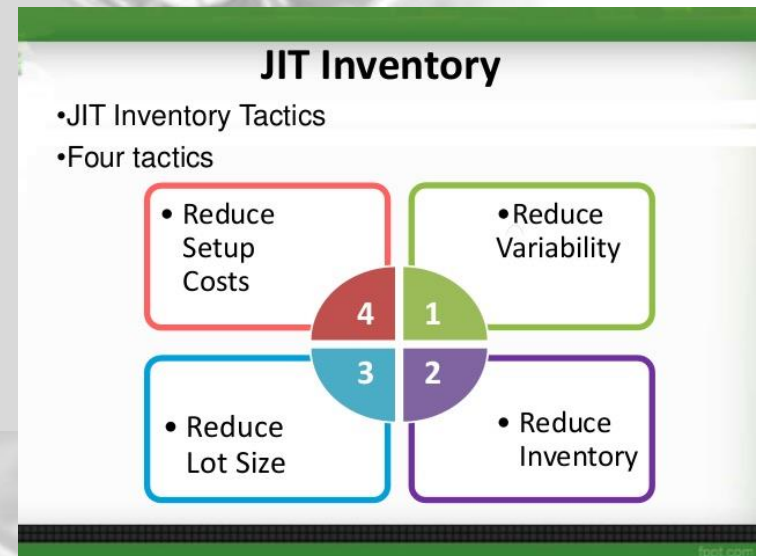| BEST PRACTICE	JUSTIFICATION
Make it easy for clients to complain	It is free market research
Respond quickly to complaints	It adds customers and loyalty
Resolve complaints on first contact	It reduces cost
Use computers to manage complaints	Discover trends, share them, and align your services
Recruit the best for customer service jobs	It should be part of formal training and career advancement

Internal Benchmarking

❑ When the organization is large enough

❑ Data more accessible

❑ Can and should be established in a variety of areas

5. Just-in-Time (JIT)

Relationship to quality:

❑ JIT cuts the cost of quality

❑ JIT improves quality

❑ Better quality means less inventory and better, easier-to-employ JIT system

JIT Inventory

•JIT Inventory Tactics

•Four tactics

- Reduce Setup Costs — 4
- Reduce Variability — 1
- Reduce Lot Size — 3
- Reduce Inventory — 2

Just-in-Time (JIT)

- ❏ 'Pull' system of production scheduling including supply management

  - ► Production only when signaled

- ❏ Allows reduced inventory levels

  - ► Inventory costs money and hides process and material problems

- ❏ Encourages improved process and product quality

6. Taguchi Concepts

□ Engineering and experimental design methods to improve product and process design

  ► Identify key component and process variables affecting product variation

□ Taguchi Concepts

  ► Quality robustness
  ► Quality loss function
  ► Target-oriented quality

Quality Robustness

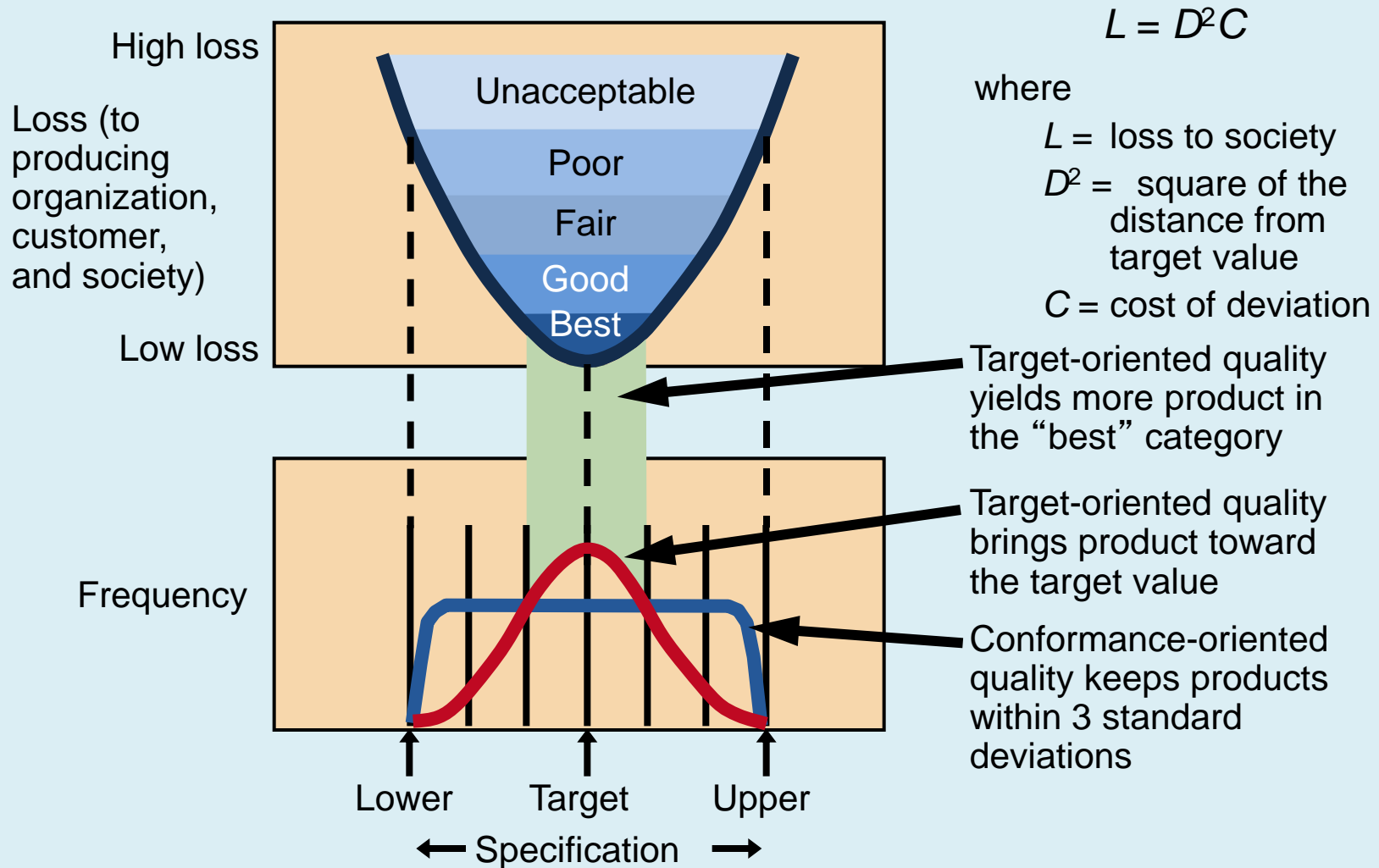Ability to produce products uniformly in adverse manufacturing and environmental conditions

- ► Remove the *effects* of adverse conditions

- ► Small variations in materials and process do not destroy product quality

Quality Loss Function

❑ Shows that costs increase as the product moves away from what the customer wants

❑ Costs include customer dissatisfaction, warranty and service, internal scrap and repair, and costs to society

Target-oriented quality

❑ Traditional conformance specifications are too simplistic

Quality Loss Function

$$L = D^2 C$$

where

$L =$ loss to society

$D^2 =$ square of the distance from target value

$C =$ cost of deviation

High loss

Loss (to producing organization, customer, and society)

Low loss

Unacceptable

Poor

Fair

Good

Best

Target-oriented quality yields more product in the "best" category

Target-oriented quality brings product toward the target value

Frequency

Conformance-oriented quality keeps products within 3 standard deviations

Lower   Target   Upper

← Specification →

7. TQM Tools

- ❑ Tools for Generating Ideas

  - ➢ **Check Sheet**
  - ➢ **Scatter Diagram**
  - ➢ **Cause-and-Effect Diagram**

- ❑ Tools to Organize the Data

  - ➢ **Pareto Chart**
  - ➢ **Flowchart (Process Diagram)**

- ❑ Tools for Identifying Problems

  - ➢ **Histogram**
 - ➢ **Statistical Process Control Chart**

SEVEN TOOLS OF TQM

(1) **Check Sheet**: An organized method of recording data

| Tipe Cacat Kejadian Peristiwa (Hari)	Hari							TOTAL
	Minggu	Senin	Selasa	Rabu	Kamis	Jum'at	Sabtu	
Cacat 1	0	3	4	2	2	2	2	**15**
Cacat 2	0	2	1	2	1	1	3	**10**
Cacat 3	1	0	1	0	1	1	1	**5**
Cacat 4	0	3	3	1	1	0	0	**8**
Cacat 5	1	0	1	1	0	0	1	**4**
Cacat 6	3	4	4	3	3	4	4	**25**
Cacat 7	1	1	1	1	1	0	1	**6**
Cacat 8	0	1	1	1	2	1	1	**7**
Cacat 9	0	2	2	1	2	3	1	**11**
Cacat 10	0	1	0	1	1	0	0	**3**
TOTAL	6	17	18	13	14	12	14	94

SEVEN TOOLS OF TQM

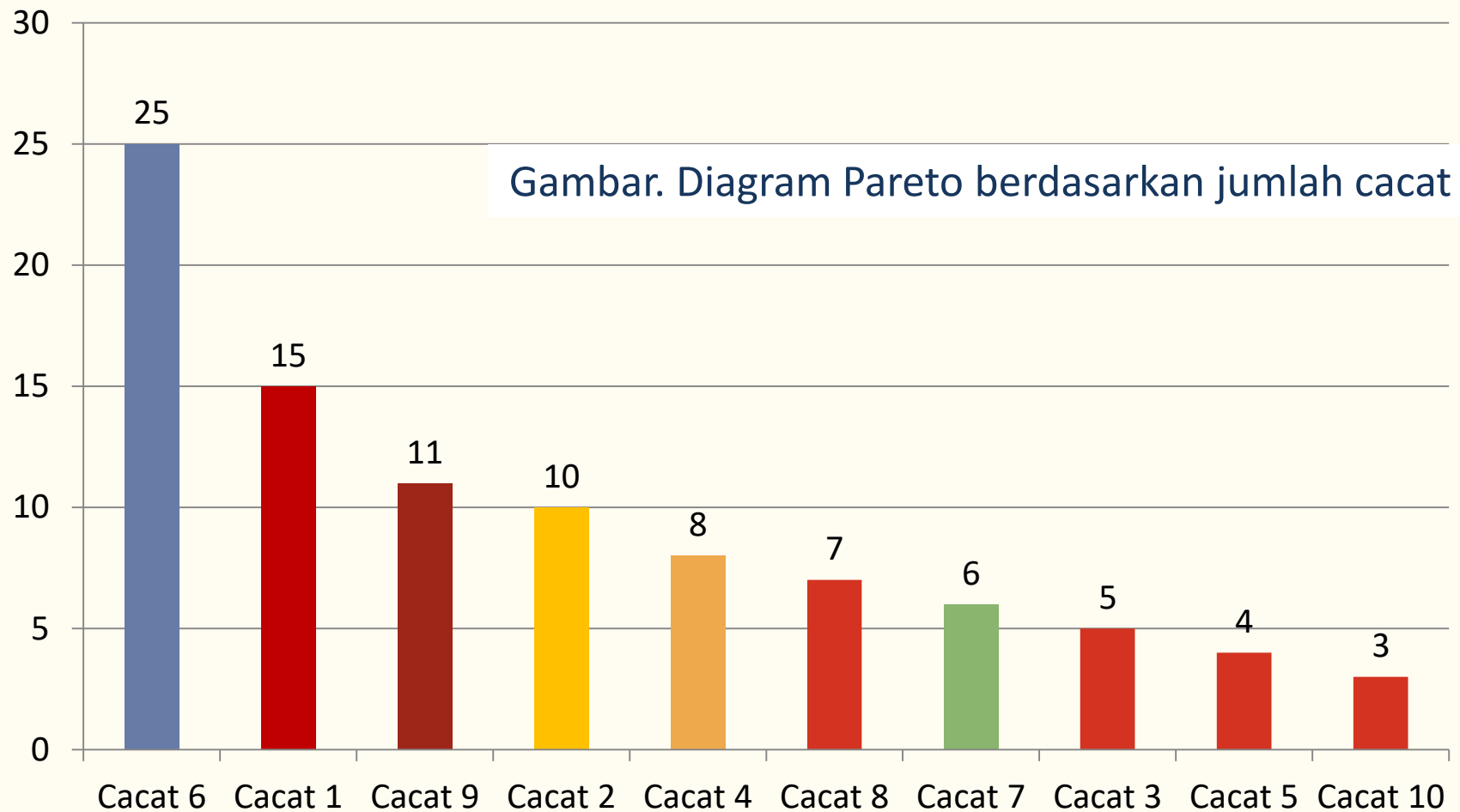(2) **Scatter Diagram**: A graph of the value of one variable vs. another variable
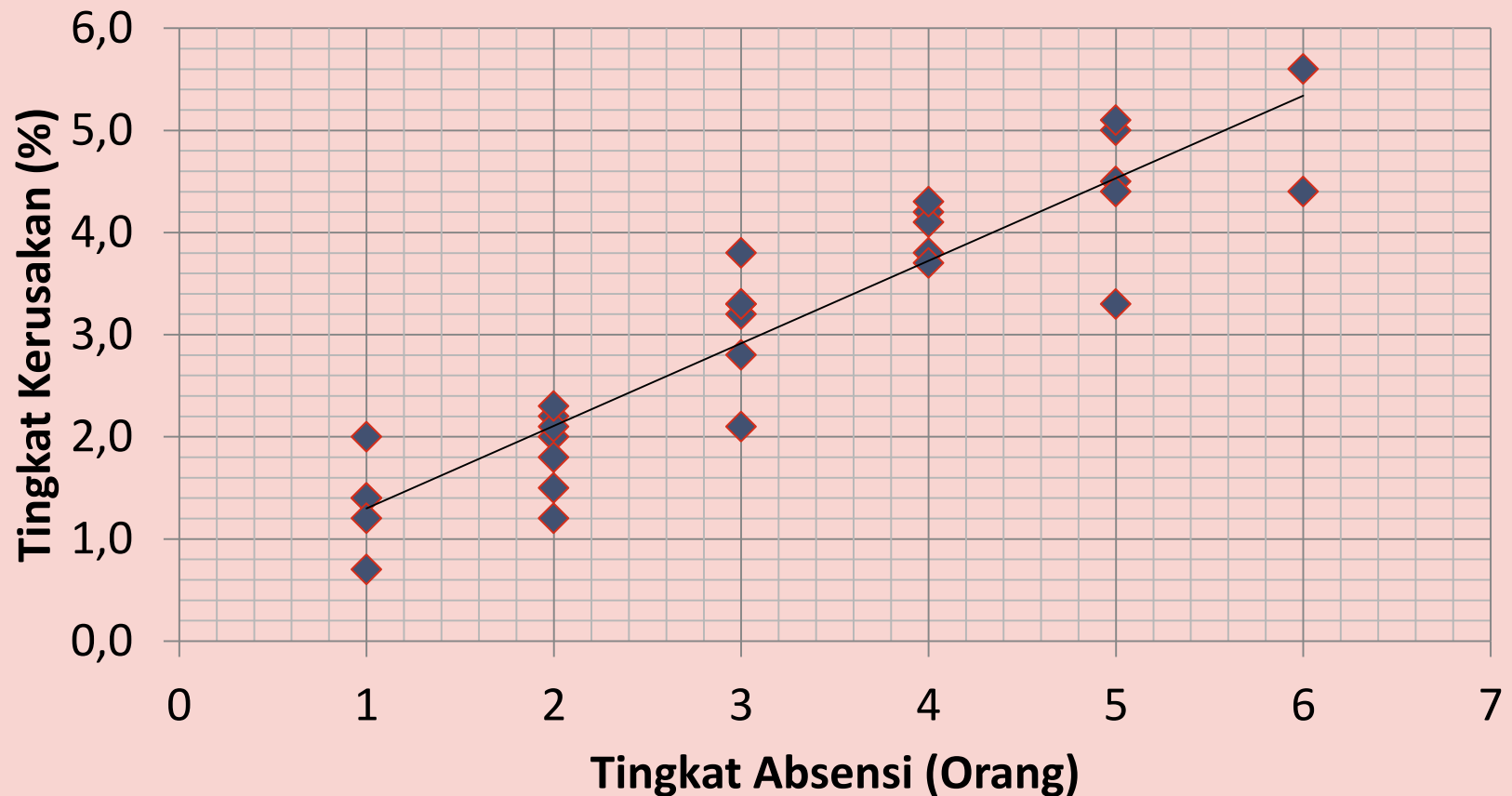
SEVEN TOOLS OF TQM

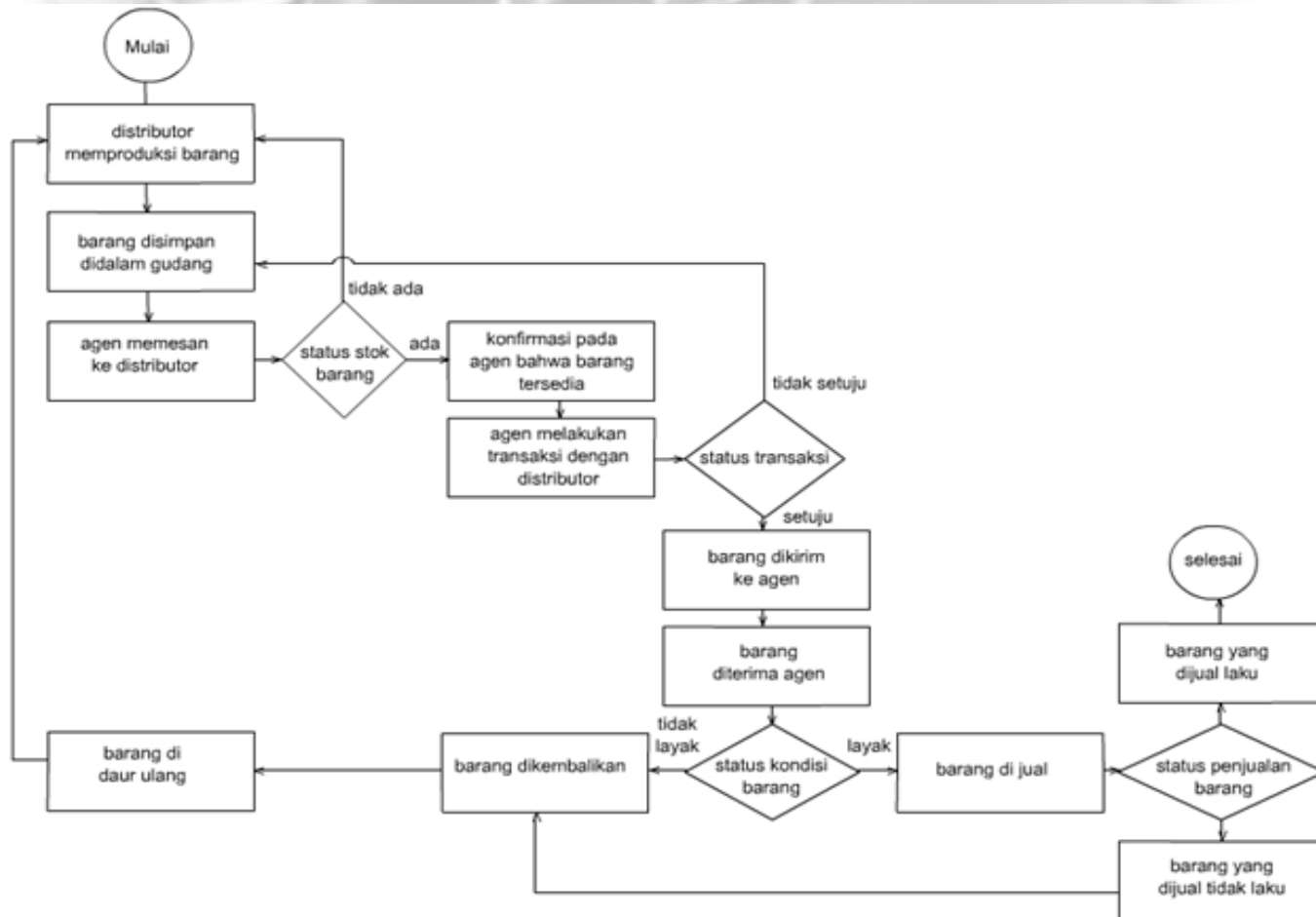(3) **Cause-and-Effect Diagram**: A tool that identifies process elements (causes) that might effect an outcome
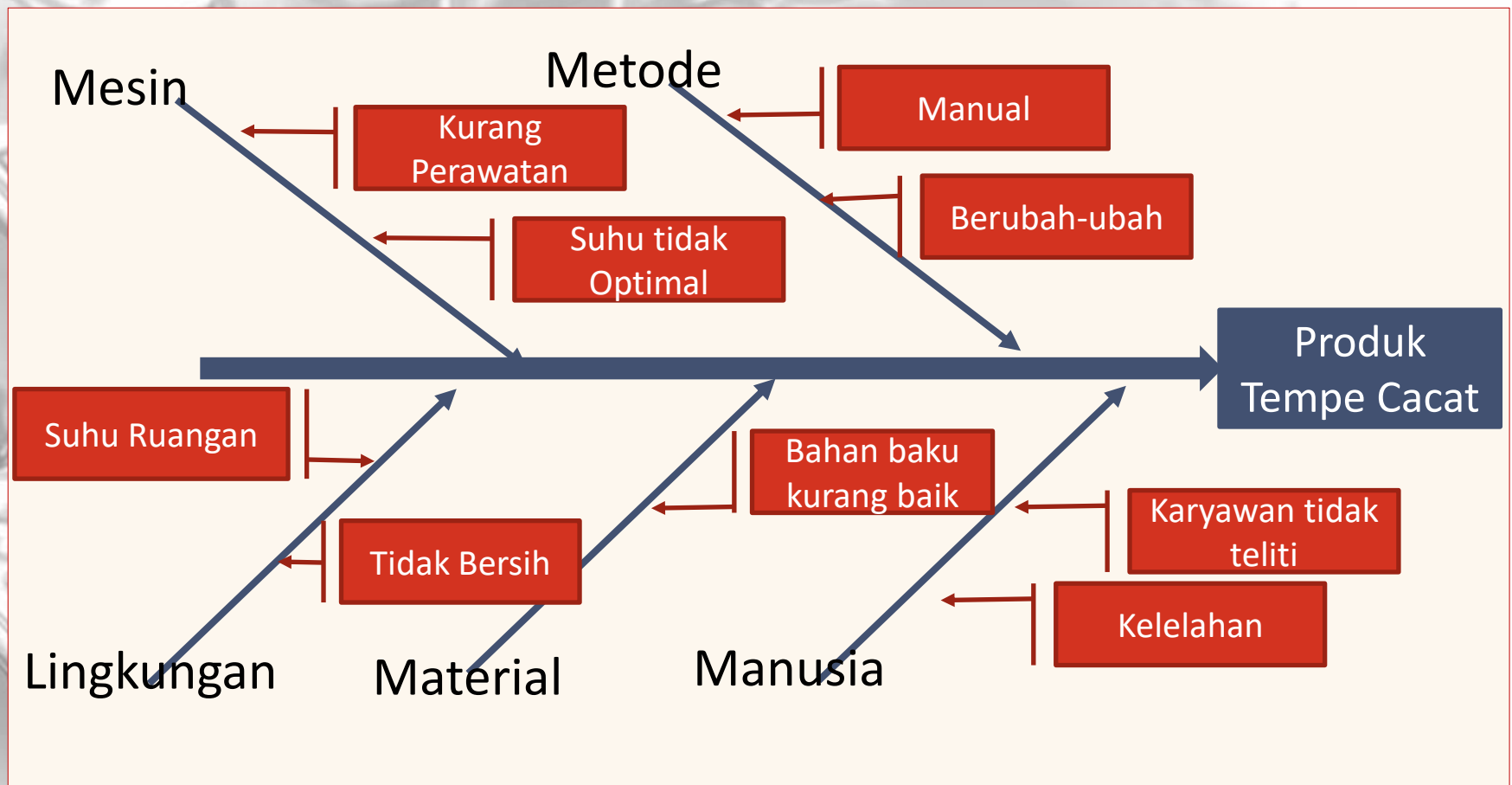
SEVEN TOOLS OF TQM

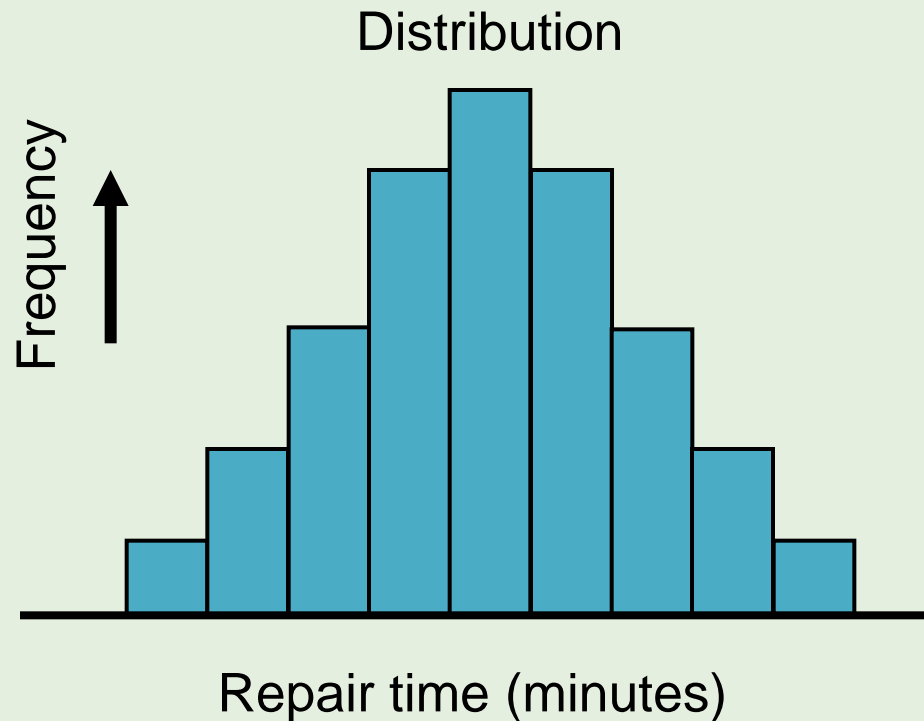(4) **Pareto Chart**: A graph to identify and plot problems or defects in descending order of frequency

Gambar. Diagram Pareto berdasarkan jumlah cacat

(5) **Flowchart (Process Diagram)**: A chart that describes the steps in a process

(6) **Histogram**: A distribution showing the frequency of occurrences of a variable

(7) **Statistical Process Control Chart**: A chart with time on the horizontal axis to plot values of a statistic

Upper control limit

Target value

Lower control limit

Time
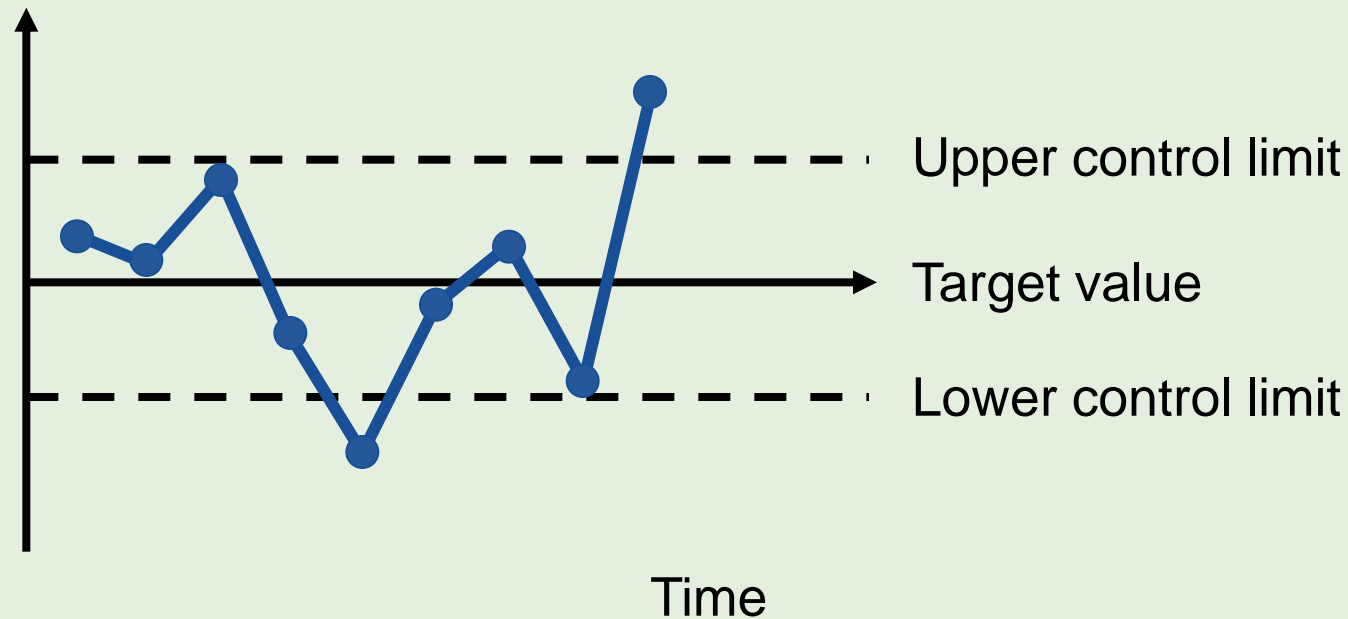
Inspection

- ❑ Involves examining items to see if an item is good or defective

- ❑ Detect a defective product

  - ➢ Does not correct deficiencies in process or product
  - ➢ It is expensive

- ❑ Issues

  - ➢ When to inspect
  - ➢ Where in process to inspect

When and Where to Inspect

1. At the supplier's plant while the supplier is producing

2. At your facility upon receipt of goods from your supplier

3. Before costly or irreversible processes

4. During the step-by-step production process

5. When production or service is complete

6. Before delivery to your customer

7. At the point of customer contact

Inspection

- Many problems
  - Worker fatigue
  - Measurement error
  - Process variability
- Cannot inspect quality into a product
- Robust design, empowered employees, and sound processes are better solutions

Source Inspection

- Also known as source control
- The next step in the process is your customer
- Ensure perfect product to your customer

Source Inspection

- **Poka-yoke** is the concept of foolproof devices or techniques designed to pass only acceptable product

- **Checklists** ensure consistency and completeness

TQM In Services

- Service quality is more difficult to measure than the quality of goods

- Service quality perceptions depend on

  1) Intangible differences between products
  2) Intangible expectations customers have of those products

Service Quality

The Operations Manager must recognize:

- The tangible component of services is important

- The service process is important

- The service is judged against the customer's expectations

- Exceptions will occur

Service Specifications
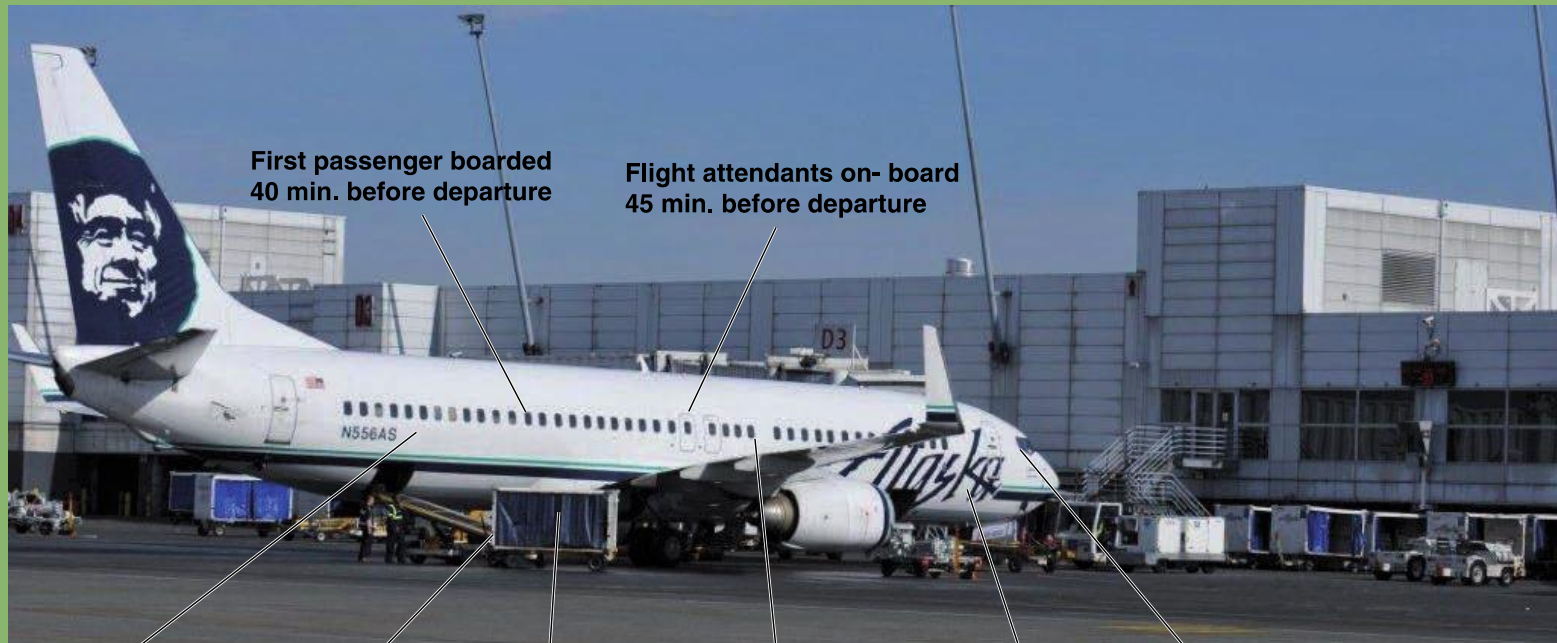
First passenger boarded 40 min. before departure

Flight attendants on- board 45 min. before departure

Aircraft 97% boarded 10 min. before departure time

1st bag to conveyor belt 15 min. after arrival

Cargo door opened 1 min. afer arrival

On board count- check-in count 5 min. before departure

All doors closed 2 min before departure

Final load closeout 2 min. before departure

Determinants of Service Quality

Reliability involves consistency of performance and dependability
Responsiveness concerns the willingness or readiness of employees to provide service
Competence means possession of the required skills and knowledge to perform the service
Access involves approachability and ease of contact
Courtesy involves politeness, respect, consideration, and friendliness
Communication means keeping customers informed and listening to them
Credibility involves trustworthiness, believability, and honesty
Security is the freedom from danger, risk, or doubt
Understanding/knowing the customer involves making the effort to understand the customer's needs
Tangibles include the physical evidence of the service

Service Recovery Strategy

❑ Managers should have a plan for when services fail

❑ Marriott's **LEARN** routine

  ➢ Listen

  ➢ Empathize

  ➢ Apologize

  ➢ React

  ➢ Notify