

# QUALITY COSTS

*Asst. Prof. Dr. Özge Nalan BİLİŞİK*

# Quality Costs

For example;

Will the shaft quality which is working to transmit motion to a machine be improved if the design engineer changes its tolerance to 0.005 mm while it is being processed to 50 mm and the tolerance is 0.05 mm?

# Quality Costs

- Quality is the degree of excellence in achieving control of variability in an acceptable cost.
- Quality costs are the costs incurred in order to prevent errors that may occur, resulting from planned activities, planned quality inspections and errors that occur after the delivery of the product or after delivery of the customer.


# Quality and Quality Costs

Company executives assumed high quality, high cost tracking. Higher quality leads to a higher cost of opinion has been questioned by the quality pioneers.

- Juran has studied the economic direction of quality and has reached the conclusion that benefits are more than costs.
- Feigenbaum raised the idea of “Total Quality Control”.
- In 1979, Crosby developed the concept of “quality is free”.

# Quality Costs

- Top management understands the language of money,
- Examining the quality costs does not solve the quality problems,
- Inefficient processes and loss forms must also be taken into account.

<i>Quality Professionals Are Busy Calculating</i>	<i>Top Management Understands</i>
$\sigma$ Error Rate Cpk DPMO RPN PPM Cp GRR Quality Level Ppk Pp Defective Rate % on-time	

# Relationship Between Quality Costs and Total Quality Management

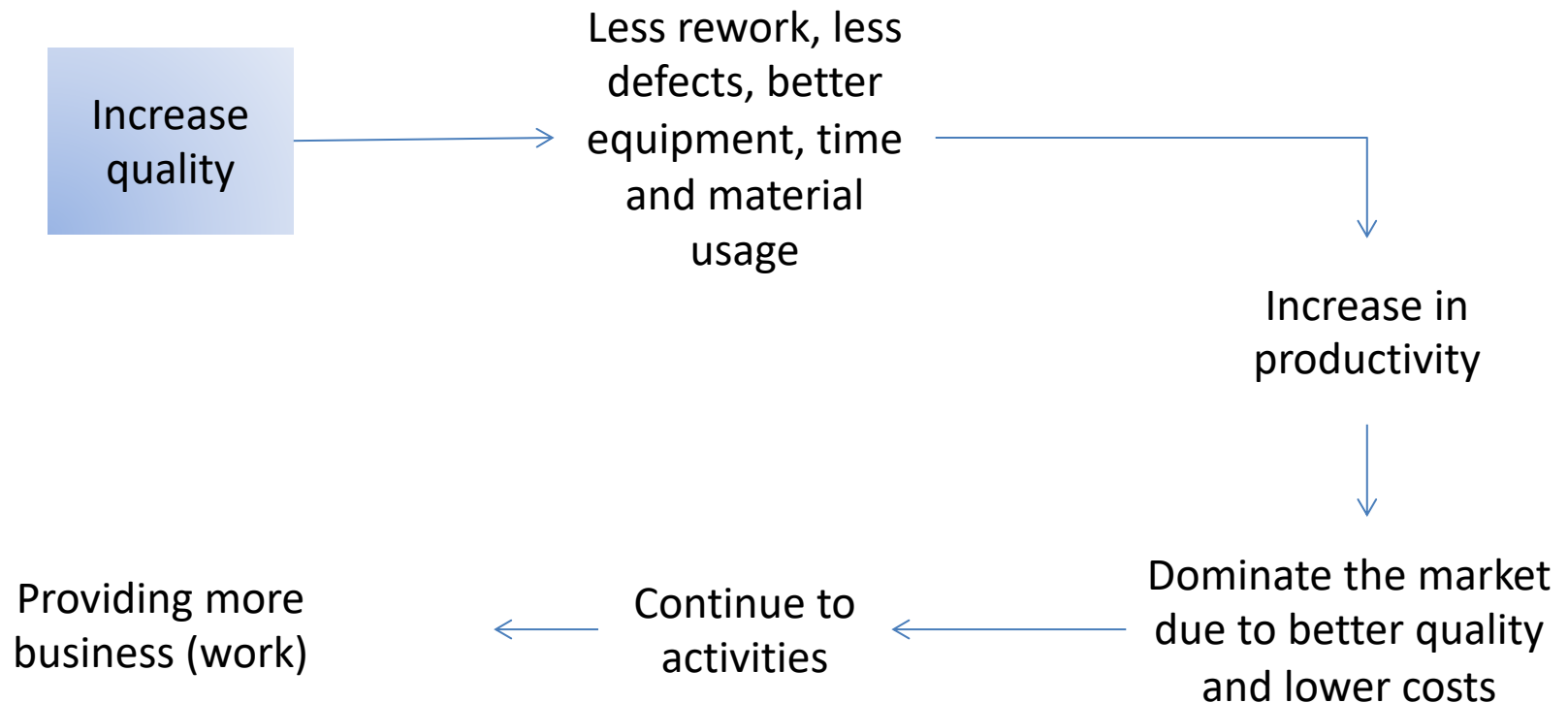
- Total Quality Management aims to add more value to the customer's eye.
- In this respect; decreasing costs, increasing quality, decreasing delivery times, and responding to changing customer requirements.
- The main goal of quality management is to ensure customer satisfaction by reducing the transfer of faulty products to customers, error rates and quality costs in production.
- Therefore, lowering the cost of quality means increasing customer satisfaction.

# Quality Costs

- Some cost elements are used as criteria in the evaluation and development of total quality activities.
- The term 'quality costs' can have different meanings:
  - Costs of reaching quality
  - Cost of running quality department
  - Costs that are caused by insufficient quality (mainly the costs of finding defective jobs and making them perfect)

*In brief, the cost of quality is the sum of costs incurred in order to produce the product or service that the customer requires.*

# Deming Cycle Reaction Model





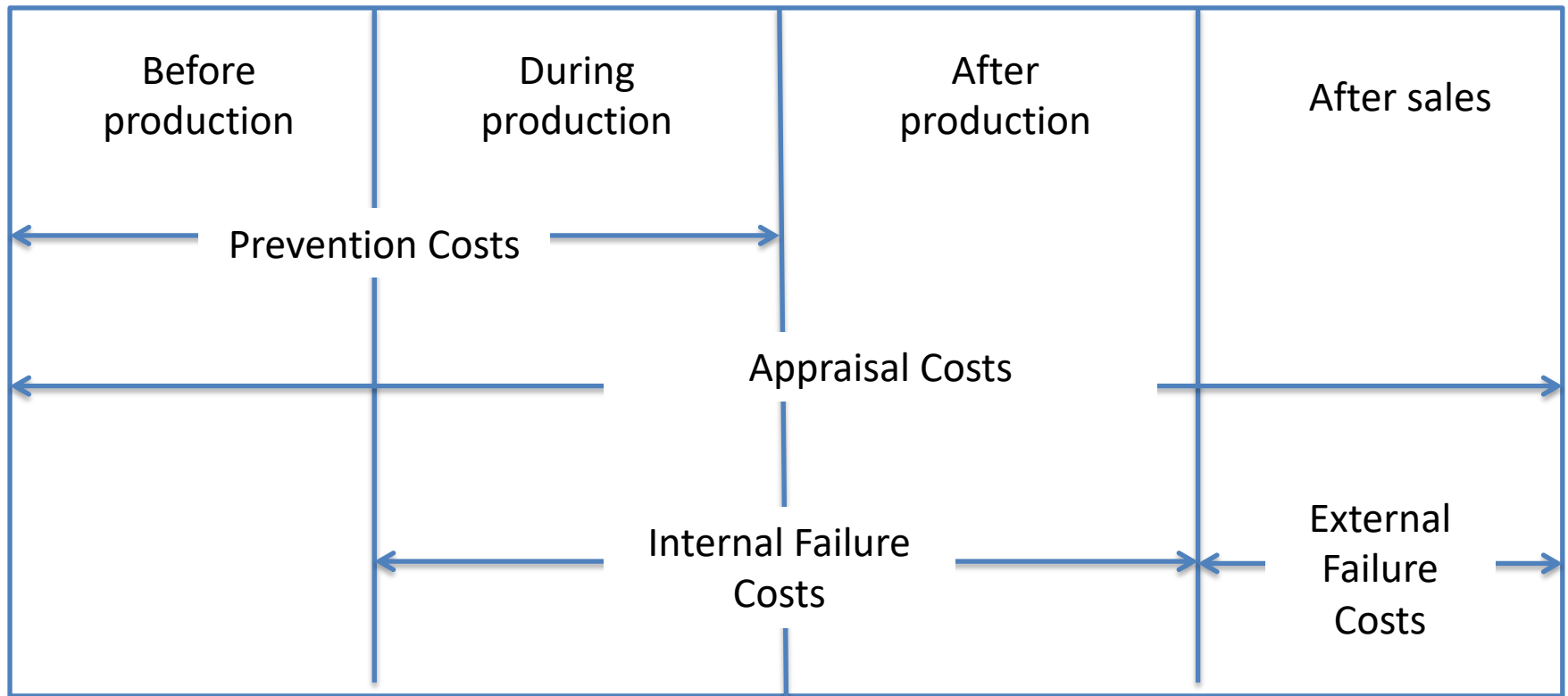
# Quality Costs as an Input



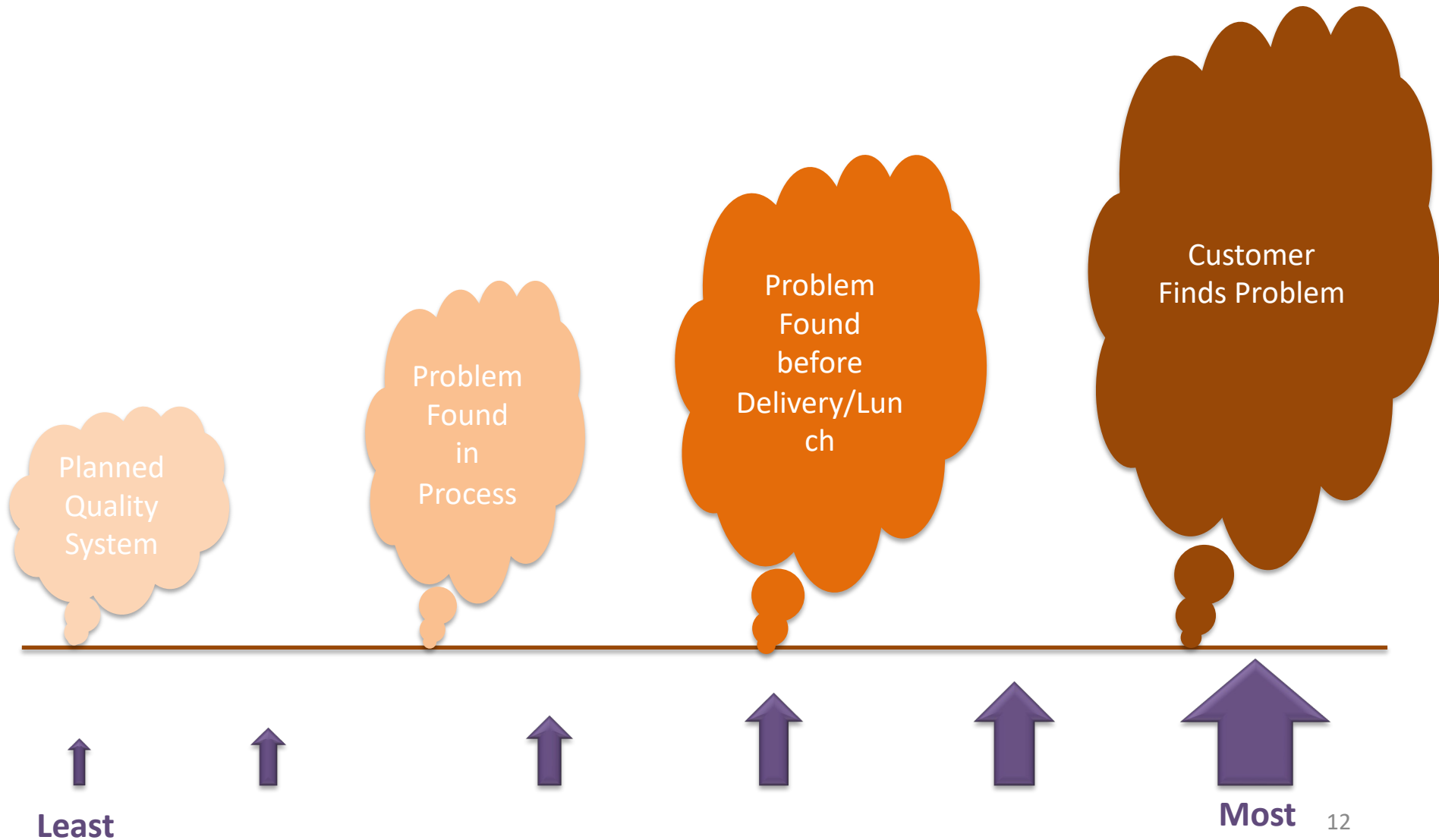
# Types of Quality Costs

- **Cost of achieving good quality**
  - It is the cost of effort to avoid quality failure.
    - Prevention Costs (%5-10)
    - Appraisal Costs (%20-25)
- **Cost of poor quality**
  - It is the cost incurred when 100% guarantee of final product quality is not possible.
    - Failure Costs (%65-70)
      - Internal Failure Costs
      - External Failure Costs

# Time Intervals for Quality Costs

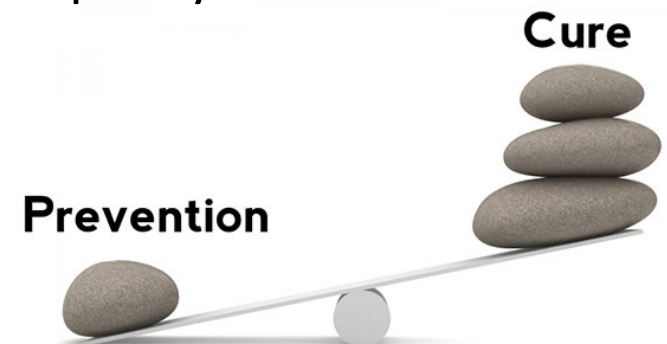


# Effect of Quality Costs



# Quality Costs Types - Prevention Costs

- This is a cost of prevention, if the cost of doing so removes the risk of not affording customer satisfaction.
- The important thing is to prevent defects/errors before they appear.
- Quality producing right in the first time, for every time and at the right time.
- Such costs are more likely to be related to quality planning, review of new produced products, reporting of qualitative information, as well as costs associated with quality-related training, control and reporting activities.



# Prevention Costs

- Quality planning
- Design and development of quality measurement and test equipment
- Quality review and verification of design
- Calibration and maintenance of quality measurement and test equipment
- Calibration and maintenance of production equipment used to evaluate quality
- Supplier assurance
- Quality training
- Quality auditing
- Quality improvement programmes



# Quality Costs Types - Appraisal Costs

At any stage of the quality control process, all evaluation costs are achieved with the aim of achieving desired quality such as quality control and quality verification.

The additional costs incurred for defective products and the costs incurred after re-inspection are not included in the measurement evaluation costs.

If the cost relates to determining the quality standards of products or services or their suitability for performance requirements, this cost is measurement and evaluation cost.



# Appraisal Costs

- Pre-production verification
- Receiving inspection
- Laboratory acceptance testing
- Inspection and testing
- Inspection and test equipment
- Materials consumed during inspection and testing
- Analysis and reporting of tests and inspection results
- Field performance testing
- Stock evaluation
- Data storage

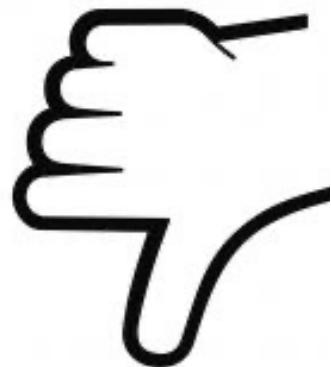


# Quality Costs Types - Failure Costs

If the cost is related to an unsuitable product or service, this cost is a failure cost.

They are the cost of avoiding quality costs that must be incurred to produce quality products or services.

To a very large extent, they cause businesses to disappear.



# Results of Poor Quality

- Organizations lose its reputation.
- Customer satisfaction is reduced.
- Customer confidence is reduced.
- Customer complaints increase.
- Operator's market share decreases.
- The organization may have to pay pecuniary and non-pecuniary damages.
- The organization destroys as a result of increased costs and diminished customers.

# Internal Failure Costs

- This is the internal failure cost which the product or service is realized prior to the submission of the customer.
- These costs incur in re-testing, re-examining and redesigning the defective product, and costs arising in an enterprise due to faults or incompatibilities at any stage of the quality ring.

# Internal Failure Costs

- Scrap
- Replacement, rework and repair
- Troubleshooting or defect/failure analysis
- Reinspection and retesting
- Downgrading
- Downtime

# External Failure Costs

Replacement of defective products with new ones, evaluation of services under warranty and accrued penalties are the costs incurred after delivery of the final products to the customer.

- Complaints
- Warranty claims
- Products rejected and returned
- Concessions
- Loss of sales
- Recall costs
- Product liability

# Relationship Between Quality Costs

- Investigating the relationship between quality costs can be used to determine what kind of changes in other items when one of them changes.
- For example, it may be desirable to know that the decrease in failure costs is caused how much by the increase in the costs of the prevention and how much by the increase of appraisal costs.
- Similarly, in order to achieve a certain reduction in failure costs, it can be determined how much the prevention costs need to be increased.

# Quality Costs Due to Error Types

		Product	
		Good	Bad
The Decision of Quality Assurance	Accept		
	Reject		

# Quality Costs Due to Error Types

		Product	
		Good	Bad
The Decision of Quality Assurance	Accept	Right Decision <b>'No Loss'</b>	'Wrong Decision (Beta Error – Type-2) <b>'External Failure Costs'</b>
	Reject	'Wrong Decision (Alpha Error – Type-1) <b>'Appraisal Costs'</b>	Right Decision <b>'Internal Failure Costs'</b>



# Capture the Quality Costs

- Hidden quality costs are variations in a process.
- If the reasons of these costs are not understood, these costs are considered as the main reasons over time.
- If the system is designed to capture these costs, these costs can be avoided and root causes can be eliminated.



# Hidden Quality Costs



- Extra operations
- Investigation into causes of defects
- Disruptions to schedules
- Emergency procurement of supplies
- Expedited shipping
- Disposal costs

Even these factors do not include intangible hidden costs such as;

- Potential lost sales
- Lost customers
- Potential damage to the brand's reputation