

Quality Costs

Honda – East Liberty

1st Annual Education Expo – September 19, 2007

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Before We Begin!

- Top management understands the language of money
- Tracking quality costs does not solve quality problems
- Costs of inefficient processes and other forms of waste must be accounted for.



Quality Professionals and Executive Management



Quality Professionals Say			Top Management Understands
σ	DPMO	PPM	
Cpk		RPN	
Ppk	Cp	GRR	
	Pp	Quality Level	
%on-time		Defective Rate	

Breakdown of Quality Costs



- Costs of Conformance:
 - Prevention Costs
 - Appraisal Costs
- Costs of Non-Conformance (Failure)
 - Internal Failure Costs
 - External Failure Costs



Prevention Costs



- Costs associated with activities to prevent poor quality in products and services
- Examples include (but not limited to):
 - *Quality Planning*
 - *Process Control (including SPC)*
 - *Design Verification / Validation*
 - *QMS Development / Maintenance*
 - *Training / Workforce Development*
 - *Preventive Maintenance*
 - *QMS Audits*
 - *Supplier Capability Monitoring*



Appraisal Costs



- Costs associated with measuring, evaluating, or auditing products / services to ensure conformance to established standards
- Examples include (but not limited to):
 - Incoming Product Inspection
 - Lab-Acceptance Testing
 - In Process Inspection
 - Insurance Policy Review
 - Setup for Inspection
 - Calibration Costs
 - Product Final Audits
 - Field Testing (prior to release)



Internal Failure Costs



- Costs associated with product or service not conforming to requirements prior to its delivery
- Examples include (but not limited to):
 - Scrap
 - Rework
 - Unplanned Downtime
 - Supplier-Caused Losses
 - Extra Production Operations
 - Troubleshooting / Corrective Action
 - Re-inspection
 - Preparing Wrong Order



External Failure Costs



- Costs associated with product or service not conforming to requirements after its delivery
- Examples include (but not limited to):
 - Returns
 - Complaint Processing
 - Replacement
 - Customer Downtime
 - Troubleshooting
 - Product Recall
 - Liability
 - Warranty Charges

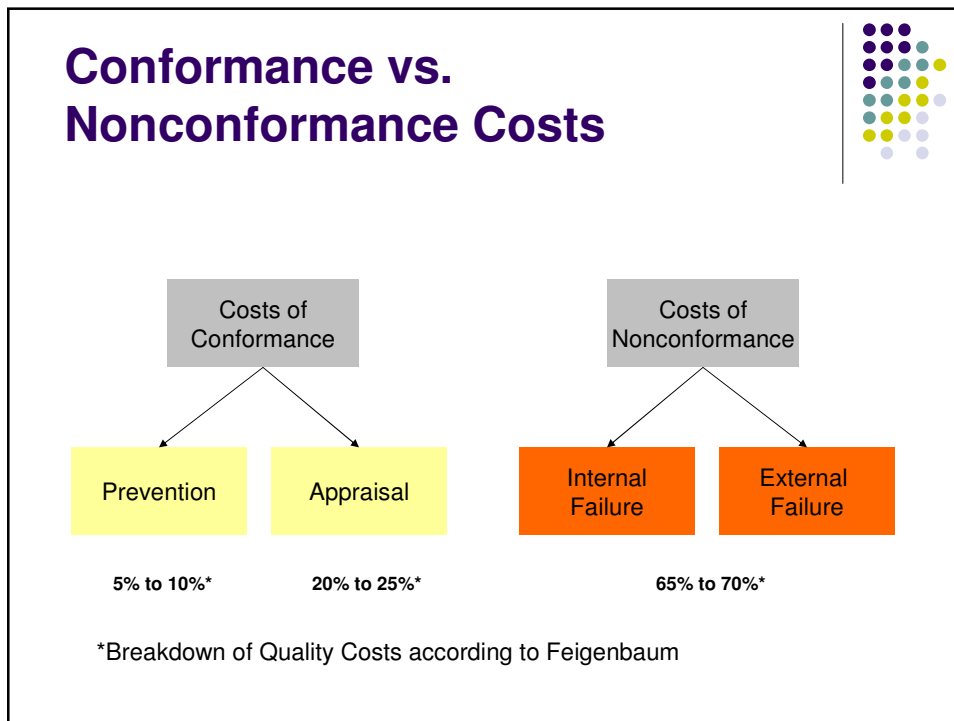


Types of Errors and Results



		Your Product is actually	
		Good	No Good
The Decision of your Internal Quality Assurance is:	Accept	Correct Decision	Incorrect Decision (Type II Error) (External failure results)
	Reject	Incorrect Decision (Type I error) Appraisal System Error	Correct Decision (Internal Failure results)

Conformance vs. Nonconformance Costs

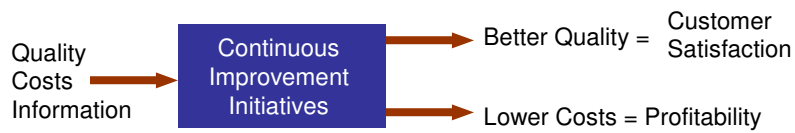


Another Definition for Quality Costs



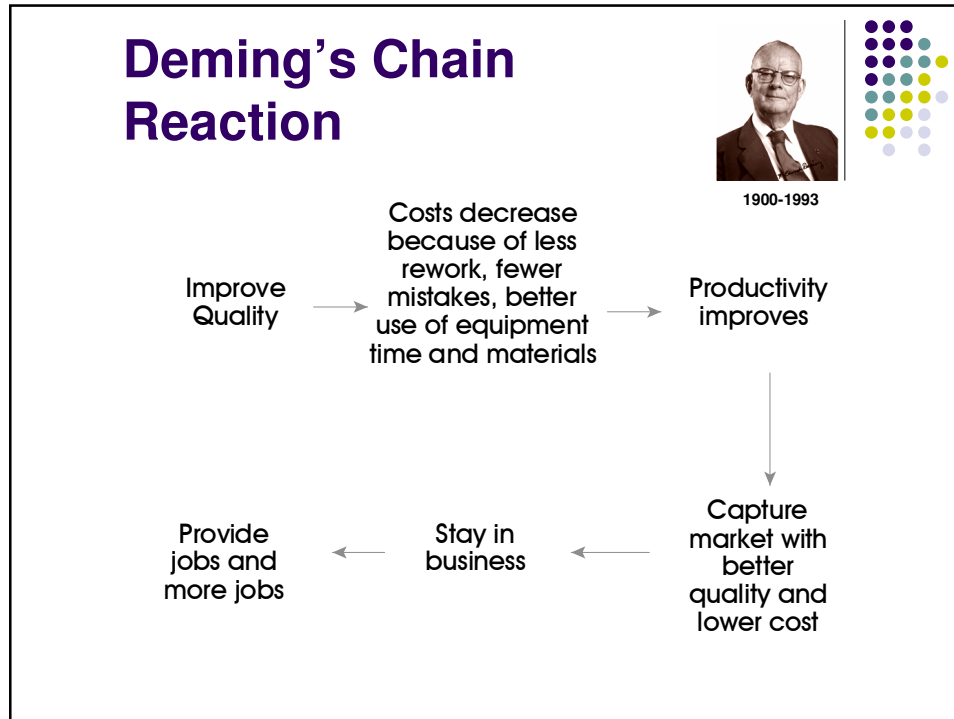
$$\text{Quality Costs} = \text{Actual Cost of Providing Product or Service} - \text{Cost of Only Value-Adding Activities}$$

Quality Costs as Input



Input

Output



- ## Juran on Quality Costs
- “In the US, about one-third (33%) of what we do consists of redoing work previously done!”
 - Examples
 - **Manufacturing:** scrap, rework, additional inspection
 - **Service:** Rewriting insurance policy, Losing luggage, wrong prescription, wrong order returned, re-installing software

Juran on Quality Costs - Cont'd



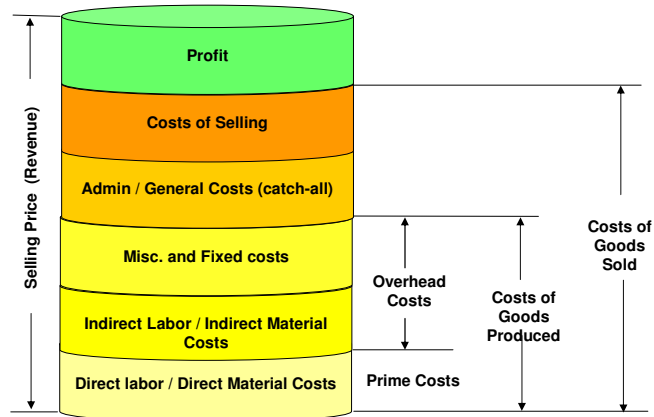
- Quality-related costs are estimated to be between 20% and 40% of sales
- Quality costs extend beyond manufacturing to support and logistics
- The bulk of quality costs are related to poor quality (Failure Costs)

Traditional Cost Structures

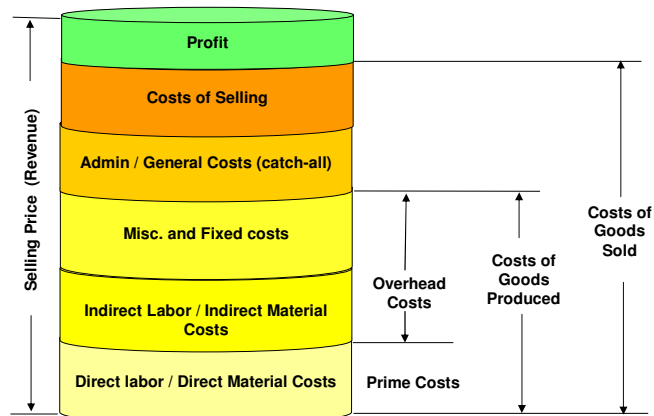


Category	Examples
Direct Material	Plastic product: resin; Hamburger: bun
Direct Labor	Production Operator, Packaging Associate, Cook.
Indirect Materials	Costs consumed in the operation but not a part of the end product or service. Examples: perishable tools, shipping materials.
Indirect Labor	Supervisors, Maintenance personnel, Material handler
Fixed & Misc. Expenses	Depreciation, Taxes, Rent, Utilities, Design Engineering, Scheduling, Customer Service
Cost of Selling	Marketing, Sales, Advertising, Invoicing, Warehousing, Shipping
Admin / General Costs	This is a catch-all category. Examples include Public Relations, Legal, Financial, etc.

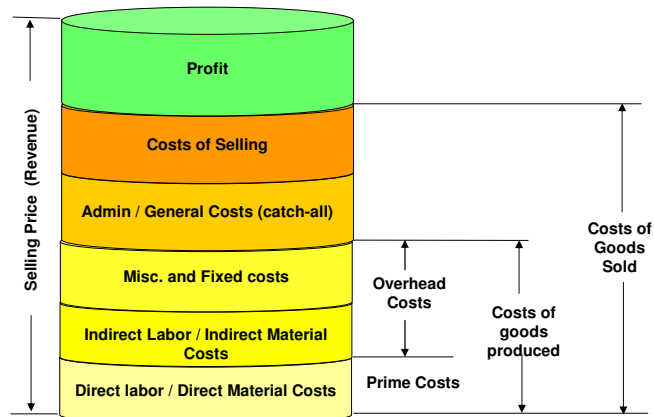
Traditional Cost / Revenue Structure



Increasing Costs of Quality



Decreasing Costs of Quality



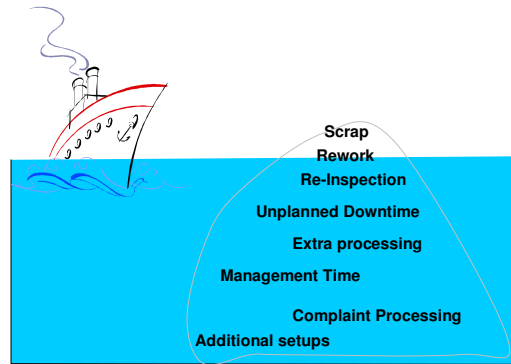
Capturing Quality Costs

- Hidden quality costs are like variation within a process.
- If you do not understand their sources, then you accept them as common causes
- If you design the system to catch them, you'll be able to remove their root causes and minimize them

Hidden Costs of Quality



- Only few quality costs are obvious (tip of the iceberg)
- Westinghouse Electric reported a multiplier effect of 3 to 4 due to hidden costs of failure costs



More Examples of Hidden Costs of Quality



- Extra Inventory
- Premium freight
- Unexpected overtime
- Lost machine capacity
- Re-scheduling production
- Emergency material purchases (small lots)
- Extra wear / tear on equipment

Hidden Costs of Quality

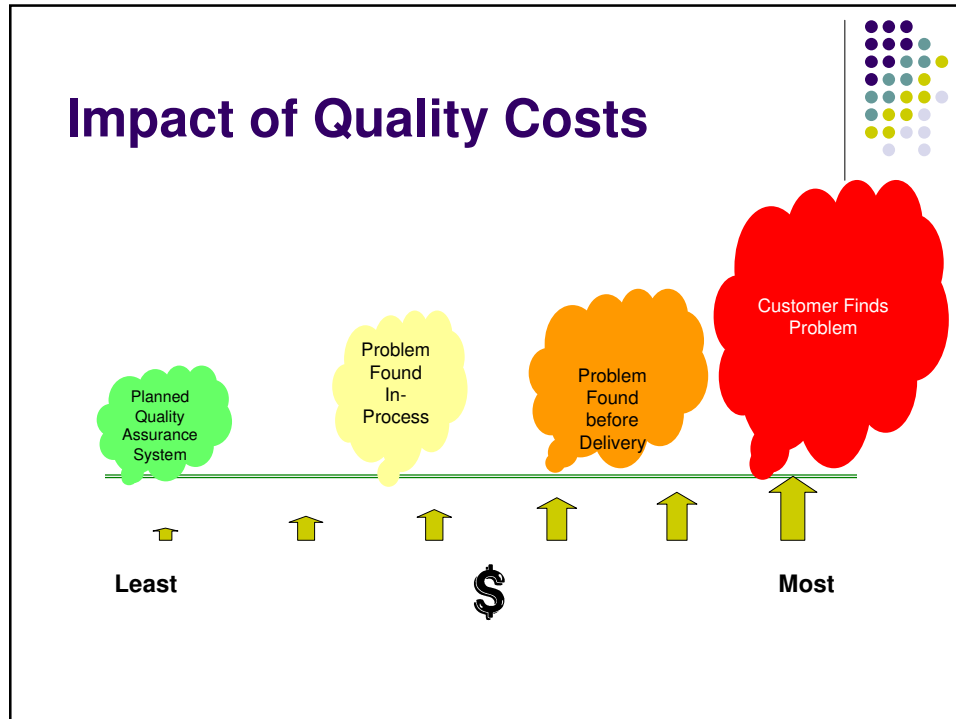


- Most quality costs that are related to failure are hidden because the typical accounting system classifies them by the type of cost, not by their cause
- Historical records of quality costs suggest that for every \$1 of scrap / rework, there is \$6 to \$7 in hidden costs

High Quality Costs Impact



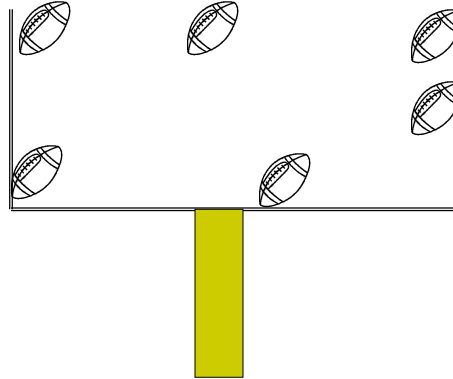
- Increased quality costs inflate production cost which may result in:
 - Utilizing inferior material / service to compensate
 - Increasing the selling price of the product or service
- Increased quality costs results in image problems due to:
 - Defective product
 - Dissatisfaction of customers



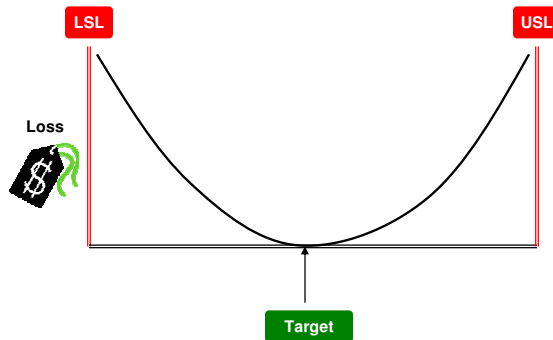
Taguchi Quality Loss Function

- The Taguchi philosophy:
 - Cost cannot be reduced without affecting quality
 - Quality can be improved without increasing cost (also Crosby's "Quality is Free")
 - Cost can be reduced by improving quality
 - Improving quality can be achieved by reducing variation

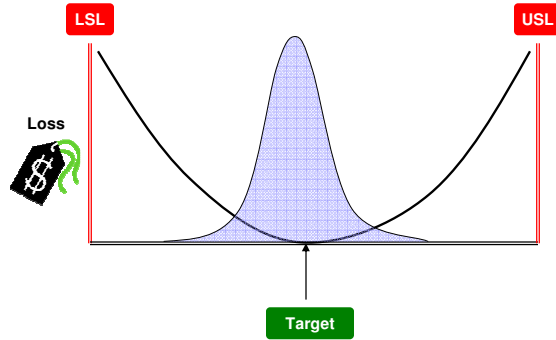
Taguchi Quality Loss Function - Cont'd



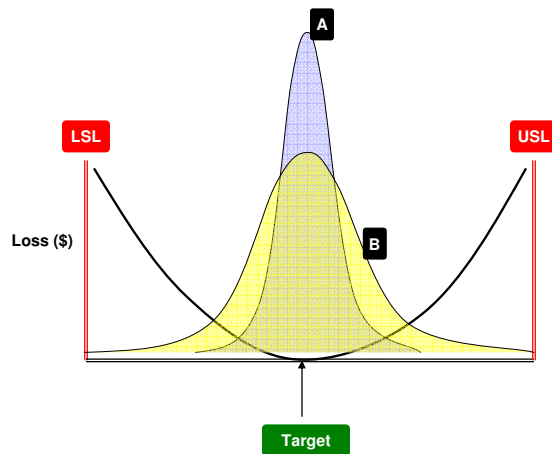
Taguchi Quality Loss Function - Cont'd



Taguchi Quality Loss Function - Cont'd

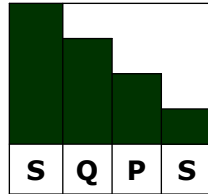


Taguchi Quality Loss Function - Cont'd





Thank You!



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