An Introduction to Cost of Poor Quality
Course Content

• Background
• What is Waste?
• What is COPQ?
• Why is it important?
• Examples in Real Life
• COPQ Process
• Conclusion
“Studies of Cost of Quality data collected over the past 50 years shows a consistent pattern. Enterprises that do not make a significant connection between their quality systems and their financial performance waste a significant sum of money every year. Average estimates for this waste are 25% of sales in a manufacturing environment and 40-50% of operating expenses in a service environment.”

-Philip Crosby and Assoc.
What is Waste?

Waste is an activity that is non-value added, an activity that the customer would not be willing to pay for, if they knew about it.

Seven Forms of Waste:
- Overproduction
- Inventory
- Waiting
- Transportation
- Motion
- Extra Processes
- Defects
Seven Forms of Waste

Overproduction – production of service outputs or products beyond what is needed for immediate use.

Inventory – keeping money wrapped up in materials that are not needed right away and cannot earn interest, or any work-in-process that is in excess of what is required to produce for the customer.

Waiting – items sitting in queue or in process that are not being worked on, or any delay between when one process step/activity ends and the next step/activity begins.

Transportation – unnecessary movement of materials, products or information.

Motion – Needless movement of people, or information between computer systems.

Over-processing – Adding more value to a service or product than customers want or are willing to pay for.

Defects – any item that is not done correctly the first time, and must be redone in order to meet the customer needs.
What is the **Cost of Poor Quality**?
- The financial cost estimate of these "wastes" and how they impact the company
Why focus on COPQ?

When we reduce or eliminate COPQ, it results in:

- Job Security through increased sales and orders from the satisfied customers
- Improved company performance - stock investments, pay raises, bonuses, cost savings and avoidances
- Higher job satisfaction
- Reduced cycle time from order to delivery
- Freed up resources to focus on other areas in need
Why is COPQ so powerful?

- Speaks the language of management!
  - Money gets mgmt attention, not yield rates and defect quantities
- Justifies need for upfront planning and design and development spending
- Helps identify opportunities for improvement
  - helps prioritize resources in the right areas
- Helps with ROI calculations and cost-benefit analysis
- Keeps people priority-focused on biggest issues, not chasing minor problems
Only the tip of the iceberg!

Total COPQ = Measurable + Unmeasurable

Manufacturing COPQ
Unmeasurable = Measurable X 3

Service COPQ
Unmeasurable = Measurable X 6

http://www.biz-pi.com
Helpful Ideas

• Estimates only! Not a financial tracking tool
• Finance owns report and numbers
• Is cost of collecting data more than impact to business?
• Who is responsible to improve each category?
• CoPQ cannot be zero, but you should set it as the stretch goal
• Normalize data (% of sales or output)
• Don’t compare groups to one another, each business will have different levels of CoPQ
## COPQ Example

### DEFECTS FOUND AT EACH PROCESS STEP

<table>
<thead>
<tr>
<th></th>
<th>Receiving Inspection</th>
<th>Automated Assembly</th>
<th>Sub Test</th>
<th>Manual Assembly</th>
<th>Final Test</th>
<th>Total Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product A</strong></td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td><strong>Product B</strong></td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td><strong>Product C</strong></td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td><strong>Product D</strong></td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

http://www.biz-pi.com
## COPQ Example

### DEFECTS FOUND AT EACH PROCESS STEP

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Product A</th>
<th>Product B</th>
<th>Product C</th>
<th>Product D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving Inspection</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Automated Assembly</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Sub Test</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Manual Assembly</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Final Test</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Defects</strong></td>
<td><strong>7</strong></td>
<td><strong>8</strong></td>
<td><strong>10</strong></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

### COPQ Example Costs

- Receiving Inspection: $12
- Automated Assembly: $25
- Sub Test: $60
- Manual Assembly: $40
- Final Test: $120

### Total Costs

- Product A: $12 + $25 + $60 + $40 + $120 = $267
- Product B: $12 + $25 + $60 + $40 + $120 = $267
- Product C: $12 + $25 + $60 + $40 + $120 = $267
- Product D: $12 + $25 + $60 + $40 + $120 = $267

### Summary

The COPQ Example shows how defects accumulate at each process step, and the total defects and costs for each product.
## COPQ Example

### DEFECTS FOUND AT EACH PROCESS STEP

<table>
<thead>
<tr>
<th>Process Step</th>
<th>COPQ</th>
<th>Product A</th>
<th>Product B</th>
<th>Product C</th>
<th>Product D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiving Inspection</td>
<td>$12</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Automated Assembly</td>
<td>$25</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Sub Test</td>
<td>$60</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Manual Assembly</td>
<td>$40</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Final Test</td>
<td>$120</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

### COPQ Calculation
- **Product A**: $12 \times 2 + $25 \times 0 + $60 \times 2 + $40 \times 0 + $120 \times 3 = $504
- **Product B**: $12 \times 0 + $25 \times 1 + $60 \times 4 + $40 \times 2 + $120 \times 1 = $465
- **Product C**: $12 \times 3 + $25 \times 3 + $60 \times 1 + $40 \times 3 + $120 \times 0 = $291
- **Product D**: $12 \times 1 + $25 \times 2 + $60 \times 0 + $40 \times 4 + $120 \times 2 = $462
Reactions to Expect

The following reactions should be expected:

• Denial (just cost of doing business...)
• Anger (numbers are wrong!)
• Rage (why are we wasting so much money?)
• Disagreement (numbers are estimated incorrectly for my area!)
• Fear (someone will be fired for the numbers)
• Acceptance (numbers are good estimates)
• Hope (numbers can be improved!)
• Excitement (numbers have been improved!)
Purchasing a new MP3 player online

Cost = $300
Shipping/Tax = $20
Total Cost = $320
### MP3 Player Example

**But it doesn’t work...**

<table>
<thead>
<tr>
<th>Customer COPQ</th>
<th>Manufacturer COPQ</th>
<th>Total COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

http://www.biz-pi.com
# MP3 Player Example

<table>
<thead>
<tr>
<th>Action</th>
<th>Time to Complete (Min)</th>
<th>COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer troubleshoots and tests out MP3 player with friend, verifying that the player is actually bad</td>
<td>60</td>
<td>$30</td>
</tr>
<tr>
<td>Customer sends email to website, requesting return information</td>
<td>10</td>
<td>$5</td>
</tr>
<tr>
<td>Manufacturer reads email, enters info into database, and replies to customer with address and instructions</td>
<td>10</td>
<td>$10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer COPQ</th>
<th>Manufacturer COPQ</th>
<th>Total COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>$35</td>
<td>$10</td>
<td>$45</td>
</tr>
</tbody>
</table>
### MP3 Player Example

<table>
<thead>
<tr>
<th>Action</th>
<th>Time to Complete (Min)</th>
<th>COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer reads reply, fills out return form with explanation of problem, relabels and re-packages player into box</td>
<td>60</td>
<td>$30</td>
</tr>
<tr>
<td>Customer drives to post office to mail the player back</td>
<td>20</td>
<td>$10</td>
</tr>
<tr>
<td>Manufacturer pays for shipping costs via COD</td>
<td>0</td>
<td>$10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer COPQ</th>
<th>Manufacturer COPQ</th>
<th>Total COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>$75</td>
<td>$20</td>
<td>$95</td>
</tr>
</tbody>
</table>
## MP3 Player Example

<table>
<thead>
<tr>
<th>Action</th>
<th>Time to Complete (Min)</th>
<th>COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer receives package, enters info into database, troubleshoots player, retests, refurbishes player</td>
<td>60</td>
<td>$60</td>
</tr>
<tr>
<td>Manufacturer replaces unit with brand new player, confirms new product into database, and packages and labels new player for shipment</td>
<td>15</td>
<td>$15</td>
</tr>
<tr>
<td>Manufacturer resells the repaired player on an auction site at 50% less profit than if it was new</td>
<td>0</td>
<td>$75</td>
</tr>
</tbody>
</table>

### Customer COPQ  Manufacturer COPQ  Total COPQ

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$75</td>
<td>$170</td>
<td>$245</td>
</tr>
</tbody>
</table>
# MP3 Player Example

## Cost of Poor Quality

<table>
<thead>
<tr>
<th>Action</th>
<th>Time to Complete (Min)</th>
<th>COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer ships player back to customer overnight</td>
<td>0</td>
<td>$15</td>
</tr>
<tr>
<td>Customer receives package, opens it, retests the player, and confirms that it is working</td>
<td>20</td>
<td>$10</td>
</tr>
<tr>
<td>Manufacturer calls customer to confirm that new player is working fine, then closes out entry in database</td>
<td>20</td>
<td>$20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Customer COPQ</th>
<th>Manufacturer COPQ</th>
<th>Total COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>$85</td>
<td>$205</td>
<td>$290</td>
</tr>
</tbody>
</table>

http://www.biz-pi.com
## MP3 Player Example

<table>
<thead>
<tr>
<th></th>
<th>Customer COPQ</th>
<th>Manufacturer COPQ</th>
<th>Total COPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>$85</td>
<td>$205</td>
<td>$290</td>
<td></td>
</tr>
</tbody>
</table>

### Player Cost and COPQ

- **Player Cost** = $320
- **COPQ** = $85

Customer actually paid $405 for this product.

### Sale of Player and COPQ

- **Sale of Player** = $300
- **Cost to Build Player** = $200
- **COPQ** = $205

Customer was going to make $200 profit on the sale, but instead lost $105.
MP3 Player Example

- That's not all the COPQ!
- Product Recall
- Word of Mouth
- Reputation
- Lost Competitive Advantage
- Engineering Support for Design Change
- Customer Reimbursement
- Potential Litigation and Lawsuits
What can you do?

1. Help identify waste in your area
2. Estimate the costs spent dealing with the problem
3. Collect data over time if necessary
4. Determine root cause of problem
5. Brainstorm and cost-justify solution
6. Quantify actual savings after implementation
7. Look for new opportunities
How do we get started?

• Brainstorm types of waste in your company
• Calculate rough estimates of each type of waste
• Prioritize wastes from largest to smallest
• Determine which wastes can be easily measured (not exact costs)
  • Detailed investigation into databases/systems
• Begin data collection of obtainable wastes
• Determine plan for addressing difficult/hard to measure items with high dollar impact
• Begin monthly CoPQ report by wastes, with normalizing numbers
• Create teams to improve biggest contributing wastes
  • By product, process or area
Why aren’t these costs looked at?

- Estimates may seem too difficult or too complicated to obtain
- Estimating figures takes a long time, and attempts try to be too precise
- Costs are “hidden” and not easily defined or obtainable
- Customers don’t realize they are paying for these costs, or they would charge us for them
- Costs are often considered “part of doing business”
You learned:

• Why Cost of Poor Quality is important
• How CoPQ relates to your company
• What to expect with a CoPQ report
Business Performance Improvement

http://www.biz-pi.com