SALIENT

# Cost of Quality
## Salient Management

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# Cost of Quality

## Introduction

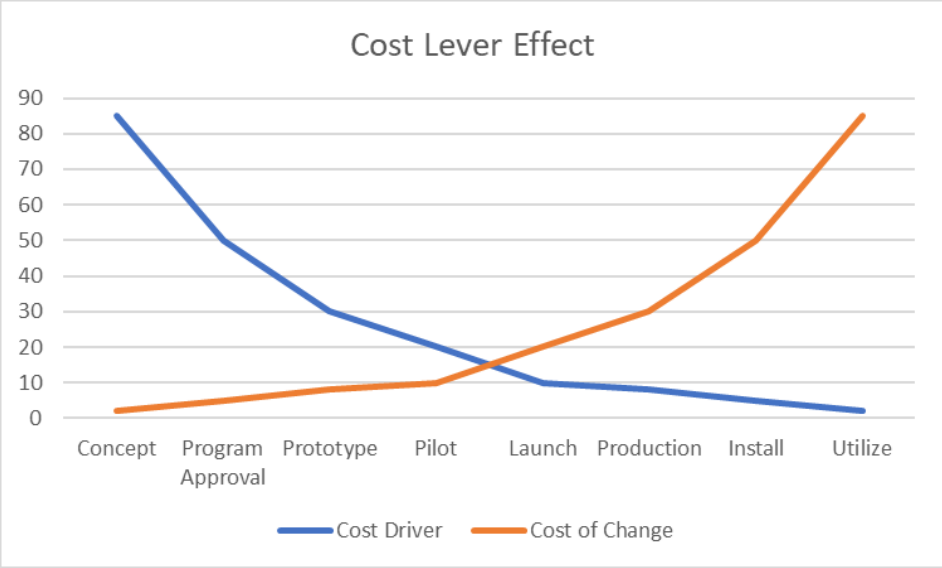
Companies strive to meet and exceed the goals of their key stakeholders. Sounds simplistic, but the reality is that a public company's key measurement is their stock price, and a private company focuses on growth, profitability and/or other financial measures defined by their owners. Coincidentally, there is a growing focus of companies on non-financial goals – whether it is environmental, societal, employee, customer, future preparedness, risk and uncertainty navigation, etc. But how does a company know whether it is tracking and improving?

We discussed remedies for complimenting any financial or continuous improvement system with Salient Performance Management in *Relevance Found*[1]. This is fundamental to any Total Quality Management program in which the Cost of Quality is a key measure. Let's explore.

## Behind Cost of Quality

Cost of Quality (COQ) is a categorization of all costs related to Quality. The goal is to reduce the total COQ while moving most of the costs from Cost of Poor Quality (Internal Failure, External Failure) - to Cost of Good Quality (Preventive, Appraisal). The more effort you put into Preventive (e.g. training, design, preventive maintenance, etc.) the lower the overall Cost of Quality since "an ounce of prevention is worth a pound of cure". For example, preventive maintenance is typically 1/5 the cost of reactive maintenance.... etc. The Cost Lever Effect example illustrates this concept.

So, what is Quality[2] (and the respective quality costs)? Since we are likely focused on companies that make/sell products and services, conventional definitions include the concepts of meeting the customers' needs, and meeting/exceeding a standard. The customer is the recipient from a previous process step, so it is extremely important to continuously provide quality – from beginning to end. But, that's not the total definition of quality.




[1] Relevance Found - Salient Performance Management, 2020

[2] Eight dimensions of quality

You could provide a quality part to the customer, but you may have wasted several parts to provide that one "good" part. So, Quality also includes an understanding of waste, which we define as any effort or resource beyond the ideal (standard). So, if I scrap a few parts in order to produce one good one, my measure of quality suffers. But wait – there's more.

What about avoidance and mitigation of risk, the considerations for uncertainty, the enhanced utility (functionality, how customer's value it) beyond competition, .... As you can see, Quality can take on quite a broad spectrum of meaning. Suffices to say, however, what matters is how your company defines its scope and intent. Once you lock down what Quality means, then it's a matter of capturing the Cost of Quality drivers and categorizing them.

You can stretch most of the revenue, cost and asset COQ drivers to be assigned to one of the four categories - although the basic Cost of Goods Sold (COGS) may be an exception. But even in COGS, you can make a case that the amount of materials, direct labor, and burden could be affected by improving quality.... However, many of the COQ drivers are hidden and not accounted for directly in the General Ledger. The resolution is to take an Activity Based Costing approach, which Salient enhances with a capability to be timely and specific at the speed of thought, with unprecedented capabilities to track direct and allocated COQ drivers, while continuously capturing the actual results and continuously adjusting the business assumptions based on those results. (see *Relevance Found - Salient Performance Management, 2020*).

## Quantification of Benefits

Quality costs are the results of value leakages across the organization, from product development through delivery and utilization by the customers. The severity of costs will depend on the company capabilities. For example, companies achieving 4 Sigma capability (quality measure for defects per million) will experience Costs of Quality (COQ) in the range of 15-25% of revenue, while companies of 3 Sigma capability will spend 25-40% of revenue. And these costs are the results of Cost of Poor Quality (Internal, External Failure) and Costs of Good Quality (Preventive, Appraisal).

Companies strive to dramatically reduce the Cost of Poor Quality by institutionalizing more Preventive methods. Let's say you are a 4 Sigma capable company, with total COQ 20% of revenue, of which 15% is in Cost of Poor Quality and 5% in Cost of Good Quality. And let's say you are striving to be a 5 Sigma Level. Your goal could be to reduce the Cost of Poor Quality to less than 10% (while increasing Cost of Good Quality only 2-3%). This would be consistent with 5 Sigma capable companies, with Total COQ in the 5-15% of Revenue range. In this example, the bottom-line impact could be 5 to 7% of Revenue! This can be a combination of improved Revenue, reduced Costs, and more effective Asset utilization.

**Cost of Quality**

| Sigma Level | DPMO | Cost of Poor Quality* | Cost of Quality* | |
|---|---|---|---|---|
| 2 | 298,000 | 30-40% | >40% | Non Competitive |
| 3 | 67,000 | 20-30% | 25-40% | |
| 4 | 6000 | 15-20% | 15-25% | Industry Average |
| 5 | 233 | 10-15% | 5-15% | |
| 6 | 3.4 | <10% | <1% | World Class |

* Cost as % of Revenue

The improvement would require process, technology, and organizational considerations including product design methods, supply chain management, operations improvements, personnel diligence, etc. This improvement will be due to investments in overall enterprise changes, including design (e.g. PLM, CAE), ERP and Supply Chain Management software, process technology (equipment, gauging), training, and an overriding Quality Management System (QMS).

For example, the QMS total benefits achieved will be dependent on the scope of QMS implemented, which includes business processes addressed (engineering, operations, supply chain…), breadth of organization (enterprise-wide, division, geography…), and current level of maturity (manual, partially automated, integrated….). Anecdotally, LNS Research (2017)[3] surveyed 1200 Quality Executives globally and found that the mean benefits of an enterprise wide QMS deployment resulted in a 1% of Revenue improvement in Operating Income.

| COQ | | |
|---|---|---|
| Prevention | Good Quality | New product Review, Quality Planning, Supplier Surveys, Process Reviews/Design, Defect Cause Removal, Quality Teams, Education, Training |
| Appraisal | | Inspection, Testing, Process/Service Audits, Evaluations, Problem Analysis, Calibration, Checking Activities |
| Internal Failure | Poor Quality | Scrap, Rework, Repairs, Re-Inspection/testing, Excess Cycle Times/Inventory, Unplanned Services, Downtime, Redesign, Wasted Capacity, Defect Removal, Loss Process time, Material Downgrades, Re-doing Activities |
| External Failure | | Warranty Claims, Administration and Billing reductions from Customer Complaints, Field Maintenance/Service, Returns, Recalls, Retrofits, Legal exposure/costs, Liability Claims, Poor Availability, Malfunction, Replacement, Poor Safety, Lost Sales |

QMS is much more impactful than just efficiency and productivity. The benefits are achieved across the Income Statement (P&L) and Balance Sheet in terms of revenue, cost, and capital. The following table provides the method of quantifying these benefits:

| P&L, Balance Sheet Impact | Source of Benefits | Quantification | Quality Management Systems |
|---|---|---|---|
| Revenue | Capture at-risk products, customers; Capture previously lost business due to compliance, audit issues; Improve On-Time Delivery and competitiveness | % of Revenue impact * Revenue * Gross Margin % | Document Control, Audit, APQP, Risk Management |
| | Reduce New Product introduction cycles | Additional periods of Revenue and Gross Profit | APQP, PPAP |
| | Reduce Chargebacks | Additional Revenue | Document Control, Audit, APQP, Risk Management |
| | Establish disciplined, standardized processes | Perceived benefits in assimilation of new businesses, and synergy of existing businesses, creating quicker revenue and gross profit generation | All QMS modules |

[3] LNS Research, 2017

| P&L, Balance Sheet Impact | Source of Benefits | Quantification | Quality Management Systems |
|---|---|---|---|
| Material Costs, COGS | Reduce complaints, returns, repeat problem; Benefits are reflected in reduced returns freight and replacement, customer satisfaction surveys | Return freight costs impact of total freight; Replacement COGS and supply costs | CAPA/NCR/ Complaint Management, Risk Management |
| | Reduce New Product introduction cycles | Reduced material, labor, and burden waste | APQP, PPAP |
| | Establish disciplined, standardized processes | Perceived benefits in assimilation of new businesses, and synergy of existing businesses, creating quicker revenue and gross profit generation | All QMS modules |
| | Reduce supplier defect rate and collaborative negotiation on material costs | Impacts material costs | Supplier Management |

| P&L, Balance Sheet Impact | Source of Benefits | Quantification | Quality Management Systems |
|---|---|---|---|
| Freight Costs | Reduction of returns to suppliers due to improved supplier management; reduction of customer returns due to improved quality and service | Freight costs plus disposition costs beyond standard | CAPA/NCR/ Complaint Management, Supplier Management, Inspection and SPC |
| Penalties | Reduce Audit Penalties; Customer penalties for lateness, rejects, terms; Supplier penalties (paid, due) from terms | Capture penalties paid and Penalty costs impact % | Audit, Document Control, Risk Management, Supplier Management |

| P&L, Balance Sheet Impact | Source of Benefits | Quantification | Quality Management Systems |
|---|---|---|---|
| Productivity | Increased productivity of employees<br>• Reduce task cycle times<br>• Eliminate paper flow<br>• Elimination of non-value-add tasks<br>• Increased visibility<br>• Reduce escalations | Minutes, Hrs. per person * annual compensation (salary, benefits) | All QMS modules |
| | Manage by exception by focus on outliers and/or value add that need attention | • Minutes, Hrs. per person * annual compensation (salary, benefits)<br>• Quantifiable value from value-add | All QMS modules |
| | Improved inventory availability, measured by improved fill rates | Indirectly improves P&L and Balance sheet through improve OTP, asset utilization, productivity | Inspection and SPC, Supplier Management |
| | Reduced excess Audit & Inspection Costs | Minutes, Hrs. per person * annual compensation (salary, benefits) | Inspection and SPC |

| P&L, Balance Sheet Impact | Source of Benefits | Quantification | Quality Management Systems |
|---|---|---|---|
| Operating Costs, Margin | Reduced scrap, rework, while increasing yield measurements | • Minutes, Hrs. per person * annual compensation (salary, benefits) for Direct Labor wasted, Material Cost waste<br>• Freight costs plus disposition costs | Inspection & SPC, Supplier Management |
| | Increased employee retention (1) Reduced hiring; (2) Reduced training; (3) Reduced productivity loss due to new employee ramp-up | (1) $ for recruiting (upfront, contingency); (2) $ for training (internal, external); (3) Minutes, Hrs. per person * annual compensation (salary, benefits) | Training Tracking |
| | Improved asset utilization and production rates as measured by (OEE) measures = Standard Variances, Availability, and Yield measures | Impact is in reduced overtime (labor) and reduced depreciation, capital costs | Inspection and SPC, Supplier Management |

| P&L, Balance Sheet Impact | Source of Benefits | Quantification | Quality Management Systems |
|---|---|---|---|
| Inventory | Improved inventory availability, measured by improved fill rates | Indirectly improves P&L and Balance sheet through improve OTP, asset utilization, productivity | Inspection & SPC, Supplier Management |
| | Decreased inventory levels, measured as Inventory $ balance, although if business level changes, then should use annual COGS/Average Inventory = Inventory Turns | Inventory $ and Inventory Carrying Costs | Inspection & SPC, Supplier Management |
| Fixed Assets | Improved asset utilization and production rates as measured by (OEE) measures = Standard Variances, Availability, and Yield measures | Impact is in reduced overtime (labor) and reduced depreciation, capital costs | Inspection & SPC, Supplier Management, Guage Calibration |
| | Improved inventory availability, measured by improved fill rates | Indirectly improves P&L and Balance sheet through improve OTP, asset utilization, productivity | Inspection & SPC, Supplier Management |

CAPA – Corrective and Preventive Actions

NR - Non-conformance report

APQP – Advanced Product Quality Planning

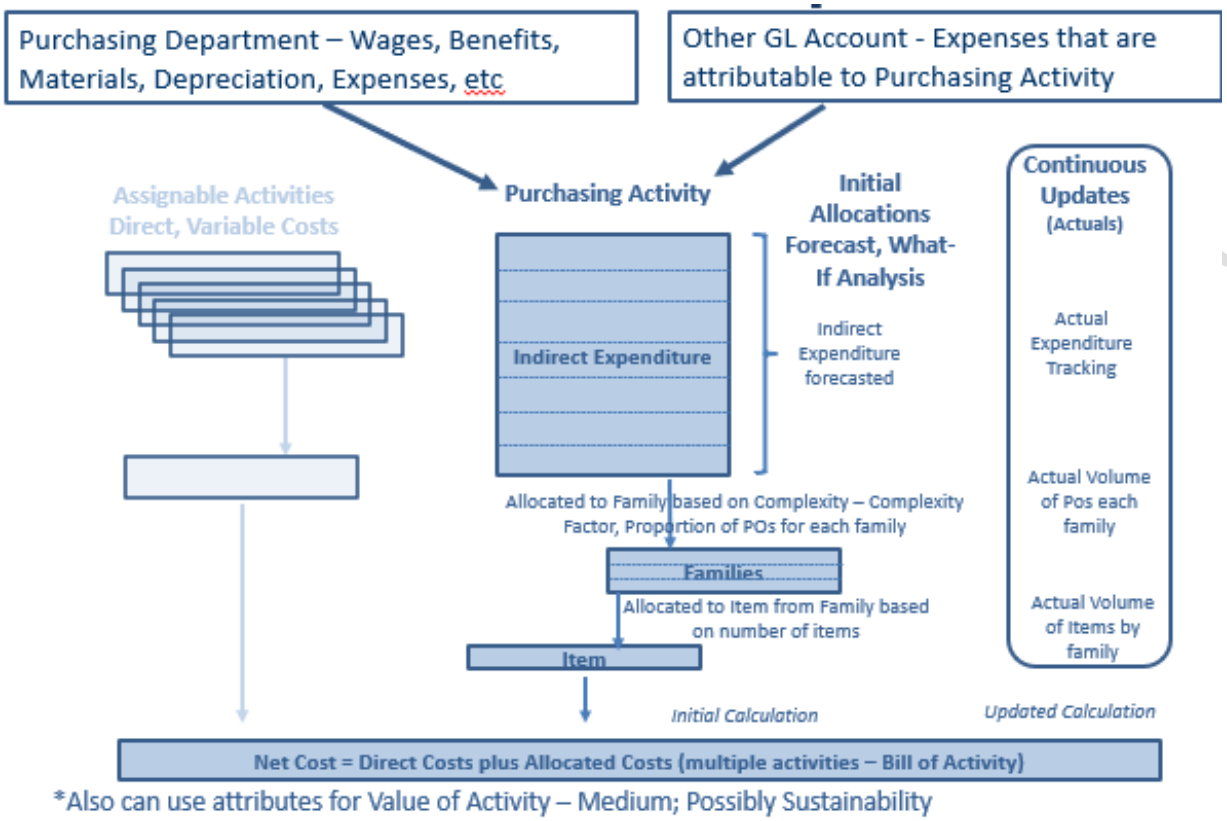
PPAP – Production Part Approval Process

While this identifies QMS methods to improve COQ, other methods (e.g. CAE, PLM, ERP, SCM, etc.) will also have COQ impact across the P&L and Balance Sheet. In summary, the intent is to reduce the Cost of Bad Quality, while shifting more effort into Cost of Good Quality activities – especially the Preventive cost drivers.

## The Salient Approach to COQ

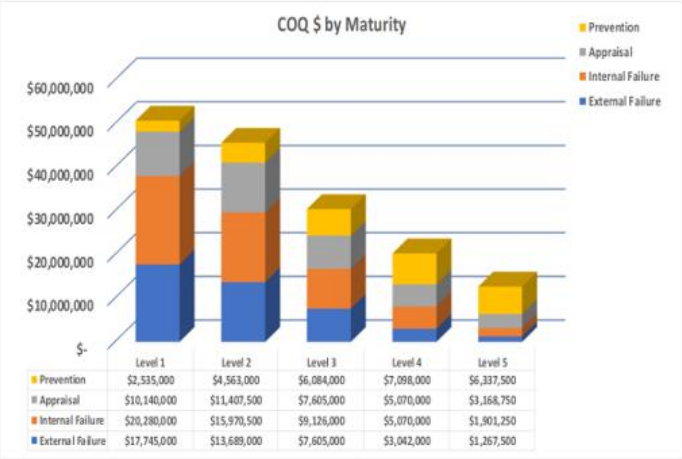
Salient Management Company recognizes the urgency for accounting of value over time created by the business processes and individuals, and the imperative to enable insights for continuous improvement. Salient's approach to Cost of Quality is the same as its enhanced approach to Activity Based Costing, as outlined in *Relevance Found - Salient Performance Management, 2020.* The COQ cost drivers are assigned COQ attributes. It will systematize and automate with continuous feedback on the relevancy of chosen methods for attributing those costs. Simply, you can track the actual "realization" of the chosen cost drivers, with the option of adjusting "on the fly".

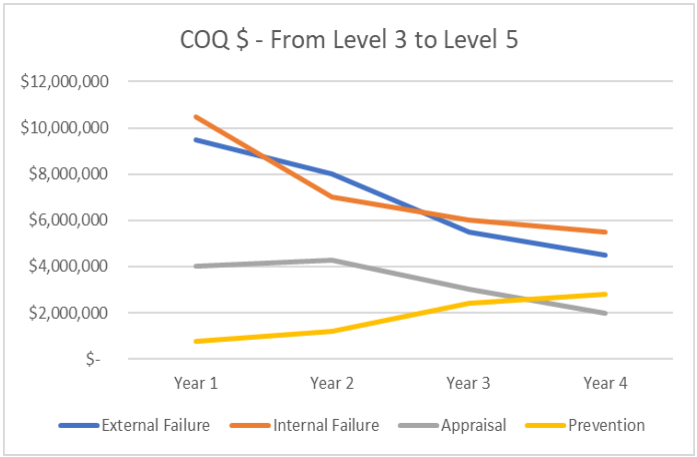
The following illustration reflects Salient's ABC model:




More on how Salient's Allocations Advanced enables a precise accounting.

The following are illustrative graphics that reflect progress in COQ. We will provide more details in subsequent publications.



## Realizing COQ Improvement with Salient

The tracking of COQ metrics is consistent with the Salient Management Philosophy, in which the individual contributors that are closest to the action (COQ drivers) are invaluable for assessing the root cause of underperformance and taking continuous improvement action – in line with the company business objectives (what Management wants). By providing the precise accounting of the COQ drivers, and by empowering and incentivizing the individual contributors, they can identify the needed methods, investments, and change management to reduce the Total Cost of Quality, while redistributing the costs from Cost of Poor Quality – to Cost of Good Quality (especially Preventive).

> "Never limit the pace or direction of inquiry or the quality of the answer; make it easy to do; and, most of all, make it so fast and flexible that there is never a reason not to know."
> Guy Amisano, CEO, Salient Management Company