WHITEPAPER

AlisQI

# Good quality is good business

Building the business case for Quality Management

Abstract

Many of us in the quality domain struggle to financially quantify our efforts and successes. Recent research shows that only a minority of the manufacturers deploy a Total Cost of Quality model to systematically track the financial impact of good and poor quality. In this whitepaper, we present a simple but effective approach to quantify your quality business function.

With this Total Cost of Quality model you can:

- Assess where your spend on quality goes
- Calculate the ROI of any quality related investment
- Benchmark your quality business function with your peers

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# Quality as a business function

Nobody in manufacturing would say that Quality Management is not important, of course not. Still, only a few organizations have an established culture of quality, where everyone in the organization is aware of quality and takes ownership. All too often, the quality function has a low reputation in the rest of the organization and is perceived as the quality police with unclear contribution to overall corporate success.

This perception has historical roots: Quality Management evolved as a distinct function that just checked and potentially rejected output of the production process. This made quality a cost center, with no other value than detecting off-spec production.

However, with the emergence of lean manufacturing, and increasing amounts of Quality Control and Quality Assurance data that feeds continuous improvement processes, the Quality Management function has become intertwined with most processes of the modern factory. Its value evolved from just error detection to prevention and continuous improvement, ultimately improving the margin of well-organized factories.

As such, quality deserves a seat at the boardroom table. Yet, Quality Management is still suffering from its historical reputation. And just telling the boardroom that Quality Management is important doesn't cut it. As the saying goes: 'perception is reality'. So, to change the perception and earn that seat at the boardroom table, you must prove the value of Quality Management.

The most obvious way to change perception is money: boardroom commitment can be achieved a lot easier if you quantify the financial value of Quality Management. No executive rejects a business case with a positive return on investment (ROI). As quality leaders, it is our role to build this business case: the required investments and solid calculations on their returns. Being unable to justify the business case for quality will block the road toward the boardroom table, and will slow down the acceptance of quality as a mature business function. A solid financial model for quality management will help quality leaders to get management commitment and drive quality innovation in their organizations.

The motivation for quality leaders to deploy a Cost of Quality model can be diverse:

- Prioritizing quality improvement opportunities to reduce costs or risks
- Identifying unknown quality improvement opportunities
- Eliminating root causes of quality costs or risks
- Communicating how quality improvement opportunities or risks impact the bottom line
- Demonstrating the benefits of investing in preventing quality issues

Whatever your main motivation may be: having a good model for the Cost of Quality is simply good business practice. It is an effective cost management tool and translates quality's impact into hard dollars.

In their 2022 Cost of Quality Survey Report, research firm Gartner found that despite its effectiveness, less than a quarter of the respondents have a standard Cost of Quality model in place. This raises the question: why?

### The invisible cost of quality

Many of us in the quality domain, including seasoned Quality Managers, struggle with the financial quantification of the cost of quality. There are many reasons for this. As quality is intertwined with most business functions in an organization, it is not easy to calculate its impact. Basically each and every function in manufacturing is impacted by (poor) quality. Capturing this impact in a single model is far from easy.

Additionally, the full impact of quality is not visible to everyone. Aspects like rework and Quality Control costs are easy to measure and understand, and they are visible to most people. However, these costs of quality are only the tip of the iceberg. Less obvious costs actually have a way bigger impact on the total cost of quality. For example: all your rework consumes additional energy, leads to

excessive wear on your equipment and might demotivate your team with an effect on your staff turnover. Similarly, it's obvious that quality incidents can lead to customer claims. But the less visible impact on your customer satisfaction, brand image and lost sales is likely to be of a whole different magnitude than the immediate claims. These are all derived costs that one might not see immediately but do have a serious impact on your baseline. That's why the iceberg metaphor is such a good fit. The hidden costs underwater represent the biggest share of our total cost of quality.

These are just some examples of the hidden costs of poor quality. Figure 1 shows the iceberg of visible and hidden costs of quality. While the figure is not aiming to be complete, it raises awareness of how far-reaching the impact of poor quality can be.

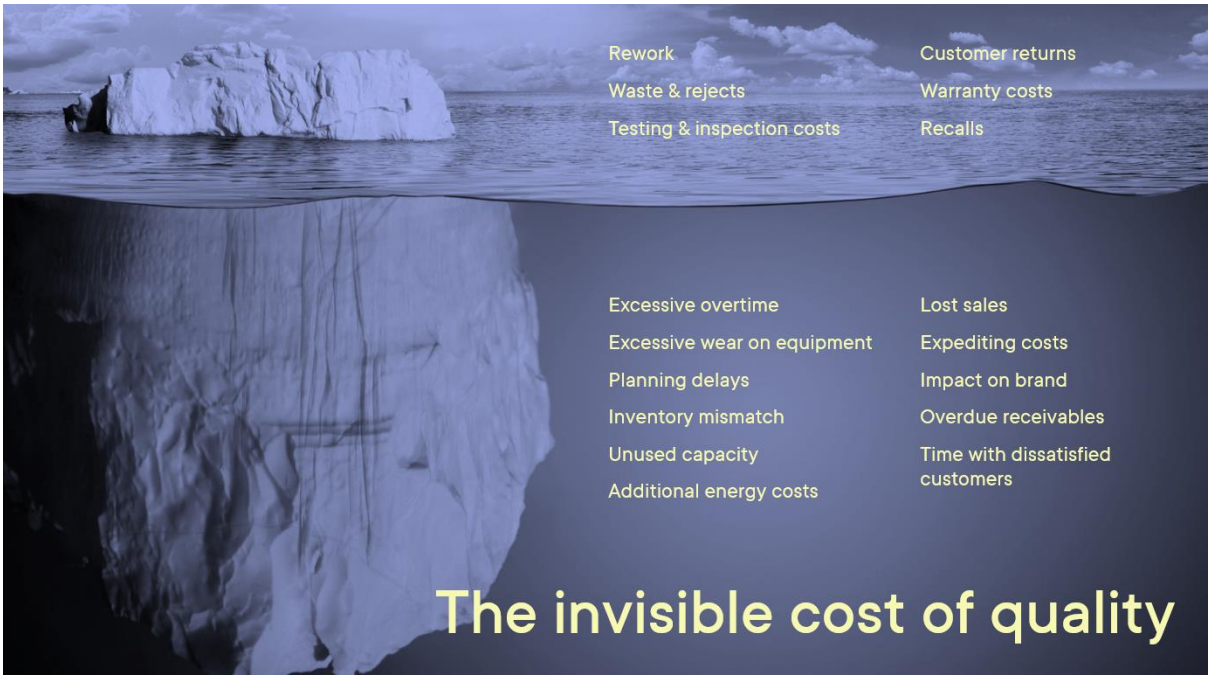


*Figure 1: the cost of quality iceberg*

To quantify our quality operation and be sure that we cover all costs of quality we need a more structured approach than this segmentation along the lines of visibility.

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# Total Cost of Quality

To help us visualize the total cost of quality, we can stand on the shoulders of giants, in this case, Val Feigenbaum. Feigenbaum was an American quality expert that devised the concept that ultimately led to Total Quality Management. In his research he proposed the segmentation of quality costs into either Good quality and Poor quality.

- Good quality represents everything that you organize proactively for
- Poor quality represents all quality incidents and their effects

This model is referred to as Feigenbaum's PAF model (Prevention, Appraisal, Failure).

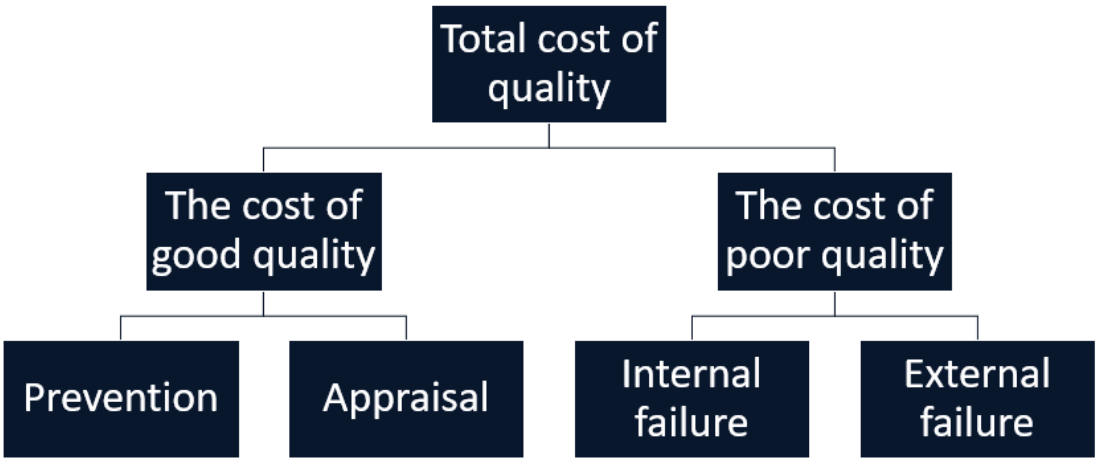


*Figure 2: Feigenbaum's PAF model*

### Good quality

Good quality is broken down into Prevention and Appraisal:

- Prevention is every activity deployed to prevent quality incidents from happening.
- Appraisal is everything you do to assess or quantify the state of affairs of your products or processes.

### Poor quality

Poor quality is the sum of costs triggered by quality incidents. This spans from rework and replacements to investigation, and corrective actions. The internal failure and external failure differentiation is a physical differentiation:

- Internal failure is detected by your team on the factory grounds
- External failure is detected down the supply chain

This may seem like a small difference, but be aware...

### The 1, 10, 100 rule

This classification as either internal and external failure is very relevant as the (monetary) impact increases drastically as soon as your goods leave the factory grounds. As a rule of thumb, use the 1, 10, 100 rule to quantify the impact of a deviation. The monetary impact of every quality issue that is not detected increases exponentially in every step of the supply chain.

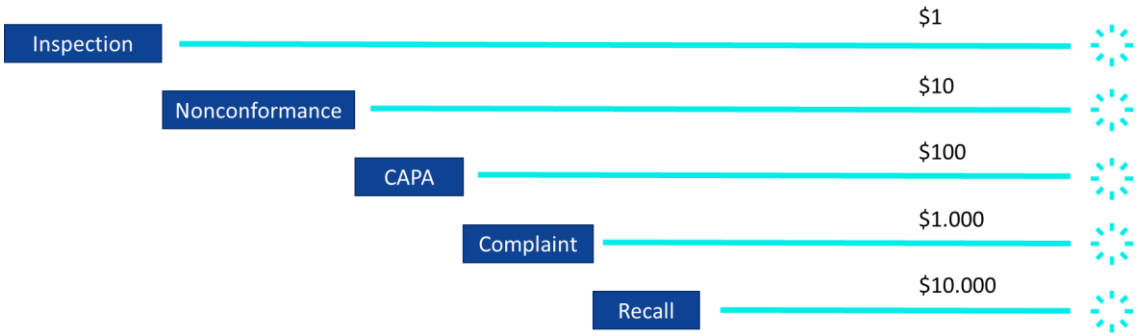


*Figure 3: the financial impact of internal and external failure*

This clearly points out why you want to track the internal and external failures separately in your cost modeling.

### The quality optimum

While benchmarks teach us that it makes sense to invest in quality, these investments still have a reputation of being too high. This is because some costs of quality are relatively easy to quantify: for example, the people that work in the lab and their equipment. However, the other costs of quality are not easily visible, particularly in less mature quality organizations. These usually don't know how much they spend on quality: ad hoc quality management simply does not have the tools to prevent deviations and their associated cost,

and so, organizations will spend most of their time fixing poor quality. As quality management matures, the prevention to failure ratio will tilt more towards prevention.

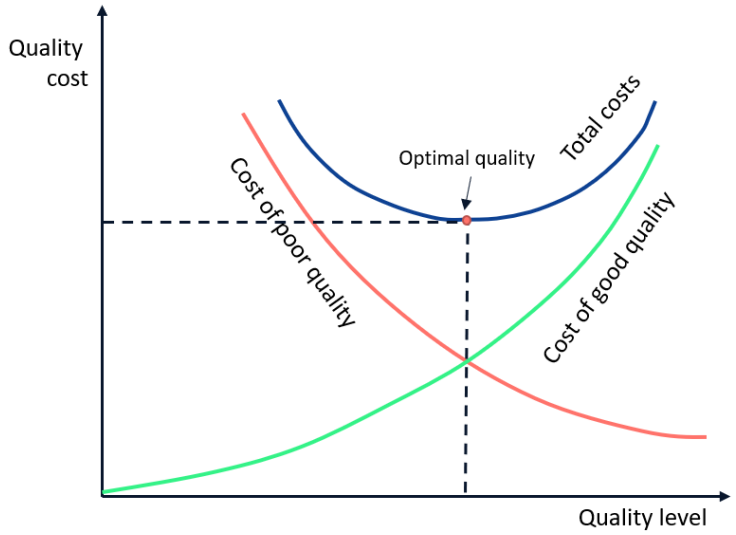


*Figure 4: the Quality optimum*

Figure 4 shows the trade-off between failure and prevention costs. If you spend more on good quality, you will need to spend less on fixing bad quality. Conversely, if you spend less on good quality, you are going to spend more on fixing failures. The sum of failure and prevention costs is the Total Cost of Quality.

As the graph shows, the quality optimum is where the lines of Cost of good quality and Cost of poor quality intersect: this is where you achieve the optimal Total Cost of Quality. Spending less or more than this optimum will quickly increase the total cost of quality.

It is important to stress that there is no universal optimum– this will vary from industry to industry. NASA is an extreme example where preventive cost accounts for almost 100% of quality spend; NASA cannot recall its products once they are in space. But for other manufacturers, costs of poor quality may be much more acceptable.

This optimal Total Cost of Quality for your products and markets is determined by:

- The regulation and legislation in your industry
- The regulation and legislation in your geographical market(s)
- Corporate positioning and differentiation
- Customer expectations

In all cases, it must be *your* optimum. It should be the result of deliberate analysis and reflect your strategic considerations regarding quality. It is always a balancing act between the costs of good and poor quality.

## Cost of quality activities

The breakdown of the Total Cost of Quality into the four categories of Prevention, Appraisal, Internal failure, and External failure enables us to classify all quality management activities into one of these four categories. This helps us to get an all-encompassing understanding of our cost of quality.

Any mature manufacturer will find themselves operating 30+ different quality management activities. Most of these can be assigned to one of the four categories, while some of them fall into multiple categories.

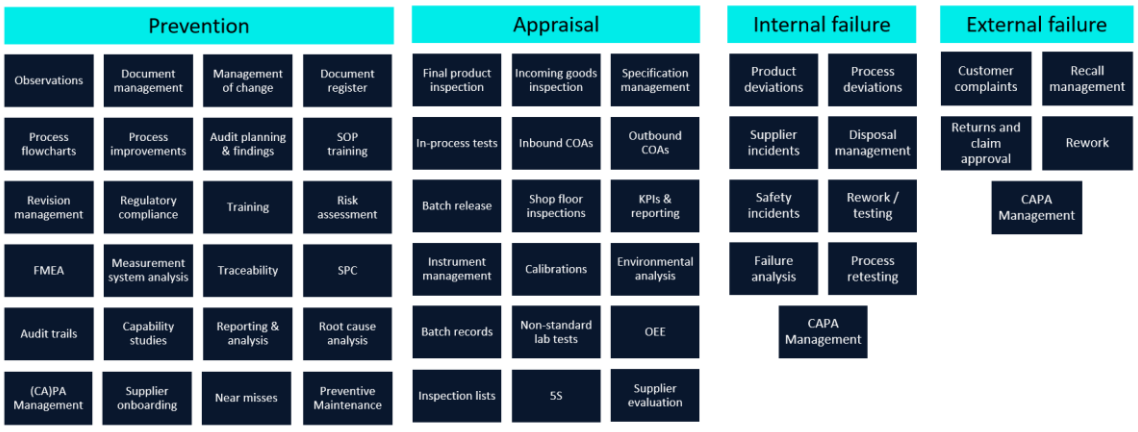


*Figure 5: Quality Management activities*

### A pragmatic approach to activities

This overview of all Quality Management activities is really useful to help an organization understand the depth of quality management, and plan the different activities.

However, gathering and analyzing data for each of these 30+ activities is impractical for most organizations. To make a TCoQ model more practical, we reduce the activities into 3-5 bigger topics per category:

| | |
|---|---|
| Prevention | • Quality assurance staff<br>• Process controls & audits<br>• Continuous improvement efforts<br>• Supplier management |
| Appraisal | • Quality inspection<br>• Quality control equipment & tooling<br>• Quality process management |
| Internal failure | • Rework<br>• Scrap<br>• Supplier quality<br>• Delay and stand still |
| External failure | • Customer returns, claims & recalls<br>• Complaint handling process<br>• Fines, penalties & discounts |

With this more pragmatic set of topics, we continue building our business case.

“In the phrase ‘quality management’ the word quality does not have the popular meaning of ‘best’ in any absolute sense. It means ‘best for certain customer conditions.’ These conditions are (a) the actual use and (b) the selling price of the product. Product quality cannot be thought of apart from product cost.”

Armand V. Feigenbaum
p. 1 - Quality Control: Principles, Practice, and Administration. 1951

03

# Building the business case

Let's return to the finding from Gartner that only a quarter of respondents of the Gartner survey have a complete TCoQ model. The question still remains: why?

A whopping 57% indicates that they only report the failure costs, ignoring the cost of good quality in their cost of quality reports. The remaining 14% have no or an incomplete model. Ignoring the Cost of good quality means we miss 40% of the total cost of quality in our reports. For every $50m revenue this adds up to $920k of costs that we are not monitoring.

The reason for manufacturers to ignore many elements of Cost of Quality is the perceived complexity to get to reasonable data. It is relatively easy to calculate the sum of goods replaced or claims approved. However, underlying elements, such as lost production capacity and additional energy consumption related to rework, are harder to quantify. Similarly, quantifying the time spent on preventive actions or risk assessments might be hard.

However, things do not need to be that complicated if we make some assumptions about the costs of individual actions.

Looking back at the activities in the four categories of the PAF model, we have a framework to compute the total costs per category and overall. All we need is to quantify each individual activity. Easier said than done? Yes, of course, but not too difficult either.

If we allow ourselves to work with a standard unit price for every risk assessment, every customer complaint, and every audit etcetera, we are able to compute the costs by simply multiplying this number of events per activity and then multiply the result with the standard price per activity. If we spend some time identifying valid assumptions for these unit prices, we have a pretty accurate model.

In order to build the business case, we need to assign monetary values to the model. Industry benchmarks are a great way to assign monetary values to each of the categories and topics of Cost of Quality.

## Industry benchmarks

In their 2022 survey on cost of quality, research firm Gartner surveyed 100+ international companies. They found that the Total Cost of Quality (TCoQ) expressed as percentage of the total annual revenue ranges from just over 1% to close to 10%, with an average of 5.1%. In their 2018 survey, however, they even reported it to be as high as 27%. While this maximum value might be an exception, it demonstrates how big the monetary impact of quality can be.

To put this into perspective:

- A manufacturer with an annual revenue of $50m has a total quality spend of around $2.3m
- For every billion in revenue, the cost of quality approaches $46m

In their Cost of Quality benchmark Gartner reports the cost allocation in each of the four categories of the PAF model as a percentage of the total cost of quality. This provides a great opportunity to compare any quality operation against your peers.

The numbers show that the Cost of good quality makes up 45% of the total costs, and Cost of poor quality around 55%.

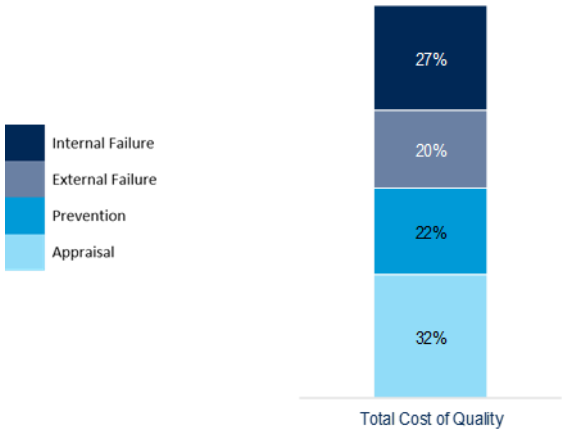


*Figure 6: Cost of Quality per category*

## A pragmatic approach to cost calculation

Combining the breakdown of the total cost of quality model based on our pragmatic bundling of activities, and the industry benchmarks from Gartner, we built an ROI calculator that assesses the financial impact of any quality investment.

Departing from the industry benchmarks, the sole inputs are a manufacturer's annual revenue and the anticipated reduction per cost center. Subsequently, you enter the anticipated improvement (in percentage) per cost center and the sheet provides you with an ROI figure!

| Benchmark | Cost of Quality category | Distribution | Cost per type | Improvement | Saving |
|---|---|---|---|---|---|
| 27% | **Internal failure cost** | | | | |
| | Rework | 20% | $ 74.358 | 10% | $ 7.436 |
| | Scrap | 30% | $ 206.550 | 10% | $ 20.655 |
| | Supplier quality | 5% | $ 34.425 | 10% | $ 3.443 |
| | Delay and stand still | 25% | $ 172.125 | 10% | $ 17.213 |
| | Other | 20% | $ 137.700 | 10% | $ 13.770 |
| | | *100%* | | | *$ 62.516* |
| 19% | **External failure cost** | | | | |
| | Customer returns, claims, recalls | 55% | $ 266.475 | 10% | $ 26.648 |
| | Fines, penalties & discounts | 15% | $ 72.675 | 10% | $ 7.268 |
| | Complaint handling process | 10% | $ 48.450 | 10% | $ 4.845 |
| | Other | 20% | $ 96.900 | 10% | $ 9.690 |
| | | *100%* | | | *$ 48.450* |
| 22% | **Prevention cost** | | | | |
| | Quality assurance staff | 40% | $ 224.400 | 10% | $ 22.440 |
| | Process controls & audits | 15% | $ 84.150 | 10% | $ 8.415 |
| | Continuous improvement efforts | 15% | $ 84.150 | 10% | $ 8.415 |
| | Supplier management | 10% | $ 56.100 | 10% | $ 5.610 |
| | Other | 20% | $ 112.200 | 10% | $ 11.220 |
| | | *100%* | | | *$ 56.100* |
| 32% | **Appraisal cost** | | | | |
| | Quality inspection | 45% | $ 367.200 | 10% | $ 36.720 |
| | Quality control equipment & tooling | 25% | $ 204.000 | 10% | $ 20.400 |
| | Quality process management | 10% | $ 81.600 | 25% | $ 20.400 |
| | Other | 20% | $ 163.200 | 10% | $ 16.320 |
| | | *100%* | | | *$ 93.840* |
| *100%* | | | | **Return** | **$ 260.906** |

*Figure 7: Cost of Quality calculator*

As this ROI calculator is built upon the foundation of the PAF model, it spans the entire quality management footprint. This makes it a universal tool to assess the impact of any quality related investment. Whether it involves additional quality testing to detect issues, state of the art risk mitigation programs or a customer complaints coordinator, we've got your back!

Curious to compare your quality operation with your peers? Or looking for a financial validation of your investments? Download the Cost of Quality calculator on the Resources section on our website.

When using the calculator, you may get pushback from your coworkers about the assumptions used in the model. We argue though, that using assumptions is far superior to having no model at all or ignoring the cost of good quality. Or even worse: spending months to collect data, and frequently not even knowing if it is fully accurate. The model allows you to tweak the weight of topics and estimated reductions, so you can always use that to enter numbers that make sense for your organization.

04

# An eQMS and Cost of Quality

As with anything, using the right tool will make your job a lot easier. Using a digital Quality Management System (eQMS) can both provide better insights and proactively lower the Cost of Quality.

## From assumptions to data-driven

In our Cost of Quality Calculator, we use assumptions to quantify the costs of activities. For many manufacturers, this is a great starting point for building their business case.

However, if you do have reliable data available, nothing is holding you back from a real time cost of quality dashboard. After all, many manufacturers already record their quality activities and events in an eQMS for compliance reasons. So provided we use realistic unit prices, we can build a real-time Cost of Quality dashboard.

With AlisQI we standardize this process. Our Cost of Quality dashboard provides immediate insights into your quality. The costs are segmented into the four categories of the PAF model and presented over time.

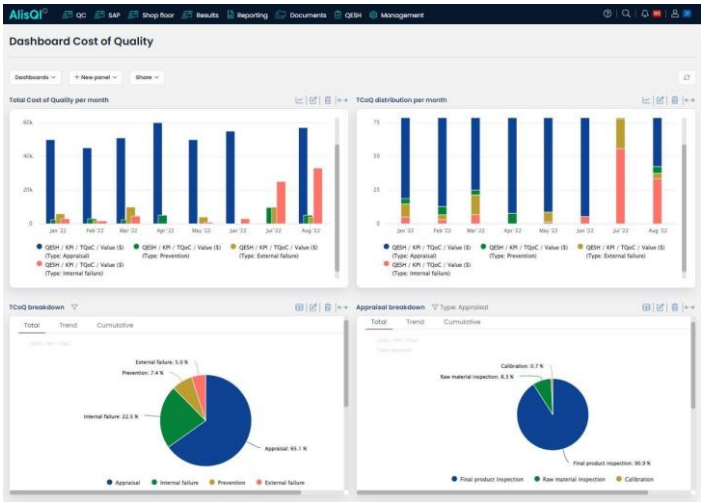


*Figure 8: eQMS Cost of Quality dashboard*

With this dashboard manufacturers will benefit from a standardized approach and improved understanding of the total cost of quality. Provided you have a culture of quality and accurately track the relevant data, you will get real-time insights into your Cost of Quality.

## Lowering the Cost of Quality

In itself, any good eQMS will lower the cost of good quality, simply because anyone involved in quality will be able to do their job more

efficiently and effectively. Automating recurring tasks, having the right reports at your fingertips, triggering automatic alarms and being able to provide audit-data at the touch of a button are all examples of how a good eQMS can help lower costs.

Similarly, you can lower the cost of poor quality by detecting anomalies earlier and the ability to respond faster to errors as they occur.

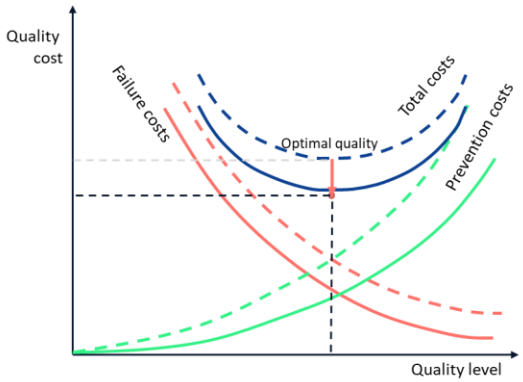


*Figure 9: eQMS and the new optimum*

Together, lower costs of good and poor quality lead to a new optimum that allows manufacturers to compete at better margins. The gap between reported and actual costs narrows as manufacturers gain more insight into their quality management processes.

Both of these will help quality leaders to change the limiting perception, be seen as business partners and earn that coveted seat at the boardroom table.

Manufacturing companies that are working with a state-of-the-art integrated quality management solution routinely report and experience total quality costs as low as 1.5% of revenue.

### Example

For the AlisQI Quality Management Software we expect an overall cost reduction of at least 10%. For a manufacturer with $100m in annual revenue this leads to over $420k savings per annum.

Comparing this to the investments, you're provided with an all green ROI sheet! You're welcome :-)

# Discuss your case?

Do you want to discuss your case with one of our experts? Please contact us and we will schedule a call to discuss ROI for your quality function.


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