Advances in Project Management Series[1]

Cost of Quality for Construction Projects: a Fresh Look

By Dr. Ron Basu

The Concept of COQ

The concept of 'the cost of quality' is not new. In fact Juran first discussed the cost of quality analysis as far back as 1951. However it is Feigenbaum who should be credited with the definition of the cost of quality when he identified the four cost categories in 1956. These can be classified as Prevention Costs, Appraisal Costs, Internal Failure Costs and External Failure Costs. Both concept and categories have been followed basically in the same format ever since.

Prevention Costs and Appraisal Costs are often defined using one of three terms: as the Cost of Control, the Cost of Conformance or the Cost of Good Quality. Regardless of the label used, this refers to the outlay of setting up and managing a quality management team with clearly defined processes. Similarly, Internal Failure Costs and External Failure Costs are also combined to be known as the Cost of Failure, the Cost of Non-conformance or the Cost of Poor Quality. These are the expenses of defects and reworks arising from poor quality management.

Thus the basic theory is quite simple; however, the challenge lies in defining and measuring each of the sub-components leading to the four major cost categories. As they say, the devil is in the detail. It is a bit like having a baby - easy and pleasing to conceive but rather more painful to deliver!

Traditional and Modern Views

The traditional view is that as the Cost of Control increases the Cost of Failure decreases until it reaches a point beyond which the total cost of quality increases. In other words, from this point the cost of improving quality becomes larger than the derived benefits. This is sometimes called the 'optimum point' of quality effort (see Figure 1)

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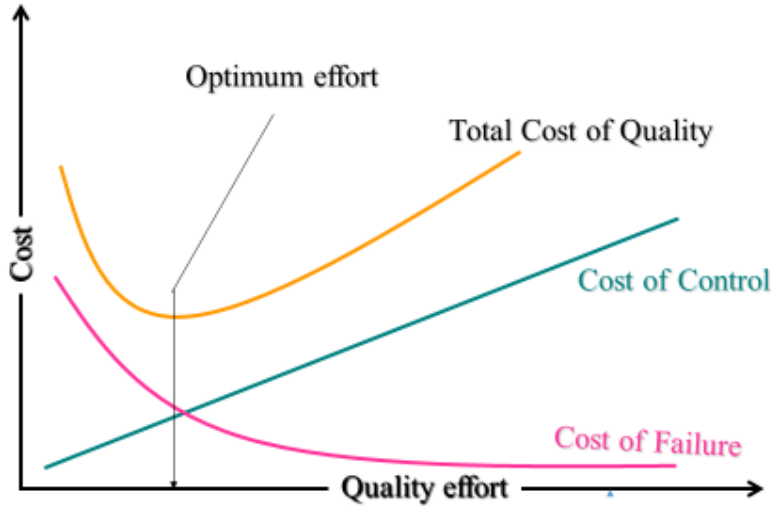

Figure 1. Traditional cost of quality

However with the application of Total Quality Management (TQM) and Six Sigma processes, the traditional view outlined above becomes challenged. Some precision manufacturing operations (and even service operations such as air transport) can accept zero-defect or Six Sigma standards. Furthermore the traditional model implies that the Cost of Control is high in proportion to the Cost of Failure. Increased quality is not achieved by more inspectors but instead by a culture of quality assurance underpinned by initial training. As time progresses they may incur some charges for additional training for improved processes; however this will not be at the same rate as for the early stage of a quality programme.

If we incorporate corrections from the total quality culture then the time-honoured Cost of Quality model would change to the representation as shown in Figure 2. It is true that there may not be enough data to validate the optimum point of the Total Quality Cost. However, the significant savings generated by project-based Six Sigma or Lean Sigma programmes supports the fundamental argument. This is quite simply that a diminishing total cost of quality is achieved by following a sustainable continuous quality improvement programme (Basu, 2011).

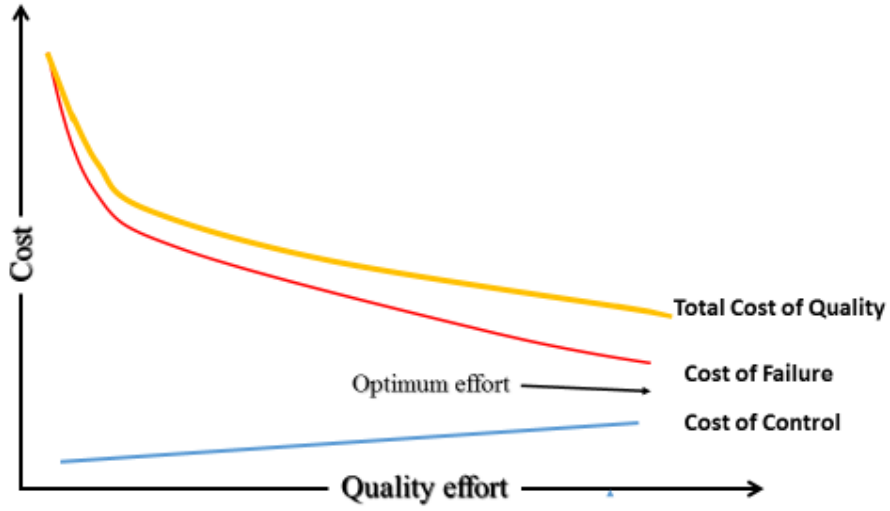

Figure 2. Present cost of quality

COQ in the Construction Industry

Now we can reason that activities related to COQ are showing favourable results in both the manufacturing and service industries thanks to holistic quality programmes. However the picture is very different in the field of project management. A most significant gap in the project management body of knowledge is the cost of quality (Basu, 2014). The application of Six Sigma in major projects is also limited (Basu, 2012). Nonetheless, one project sector in which the potential of COQ is beginning to be recognised is construction (Love et al 2003).

While we appreciate the role of quality in construction projects, we do need to understand much more how we can define and measure the dimensions of the cost of quality. In particular it is vital to gauge the external costs of failure due to poor quality delivery during design and construction. In turn, these external expenses then affect the operational performance and outlay of assets post-handover.

Anecdotal evidence suggests that construction project insurance accounted for 1.5% of project costs. If we conclude that this is caused by a failure in quality then the figure we are looking at amounts to as much as 1.5% of £120 billion (i.e. £1,800 million) annually in the UK alone, an astronomical sum. More reassuringly, there are further nuggets of wisdom to be gleaned that will help us to ameliorate this sort of situation. In order to find them, we need to define and measure by empirical research the key metrics of COQ as applied to construction projects.

The COQ Metrics

As a start, let us attempt to apply Feigenbaum's four categories of COQ with some typical examples of the metrics of each category for construction projects. We would develop Table 1 as an outline, as shown below:

Table 1: Cost of Quality in Construction Projects

Cost of Control		Cost of Failure	
Prevention Costs	Appraisal Costs	Internal Failure Costs	External Failure Costs
Examples of Metrics - Quality Management Systems and Procedures - Quality Related Information System - ISO Certification - Etc.	Examples of Metrics - Quality Management Staff - Quality Audits - Quality Training - Review Meetings - Etc.	Examples of Metrics - Non-conformance - Non-conformance resolution and rework - Certificates of conformance - Etc.	Examples of Metrics - Insurance claims - Maintenance - Asset availability - Etc.

The above metrics in each category are shown as examples only and these are extended depending on the nature of the projects and quality specifications. Cost of Control is usually easily measurable at the early stage of the project life cycle. Major construction projects have started measuring and monitoring Internal Failure Costs during the design and construction phases of the project (Basu et al, 2009). However a key area that remains neglected is the assessment of External Failure Costs which occurs after the project handover. It is a crucial omission since arguably this is the aspect needing most attention. The costs after the handover are likely to provide clients, designers and contractors with data in order to focus their efforts to improve the biggest contributors to the cost of quality.

The Way Forward

In order to make the 'painful' delivery process a success let me suggest some fundamental principles of quality and performance management. These include:

- Each metric should relate clearly to one of the specific four categories
- The metrics must follow the rigour in objectives, the rigour in measurement and rigour in use
- Each metric is unique without any duplication or overlapping in the area of measurement
- Each metric should be clearly described with a definition, formula (if applicable), worked example and purpose
- The metrics should be tested in a pilot study before implementation
- Metrics in each category should lead to root cause analysis by identifying whether it is design related, process related or people related

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About the Author

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Dr Ron Basu is Director of Performance Excellence Limited and a Visiting Fellow at Henley Business School, England. He is also a Visiting Professor at SKEMA Business School, France. He specialises in Operational Excellence and Supply Chain Management and has research interests in Performance Management and Project Management. Previously he held senior management roles in blue-chip companies like GSK, GlaxoWellcome and Unilever and led global initiatives and projects in Six Sigma, ERP/MRPII, Supply Chain Re-engineering and Total Productive Maintenance. Prior to this he worked as Management Consultant with A.T. Kearney.

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