

Costing Six Sigma Projects - A re-education process is required

Author profile

Colm Doran, who is a fellow of the Institute of Chartered Accountants in England and Wales, Six Sigma Master Belt, and a senior member of the American Society for Quality understands how easy it is to mis-state the true financial value of six sigma projects. He has spoken at several conferences about cost of quality. He works extensively in manufacturing and financial services organisations, teaching and mentoring six sigma practitioners and finance staff to deliver significant cost savings and process improvement.



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Most companies do Six Sigma for the savings

“Sound’ finance may be right psychologically; but economically it is a depressing influence” - J Maynard Keynes

Most companies “do Six Sigma” for the savings. They may refer in external and internal communications to “listening to the voice of the customer” or “improving the process capability of all of our key processes to four sigma or better”. When the author was training to be a Black Belt in 1997 the expectation was “All projects must save at least US\$100K”. Another mantra was “Management can expect four completed projects per Black Belt in the first year”. The reader can do the arithmetic: say 20 Black belts per class, 10 classes in the first year, \$100K per project, 4 projects per Black Belt per year, that’s \$80M savings in the first year. Doom postponed in the nick of time. We’re rich! Redo the 5 year plan. By 2000 the consultants’ mantra of \$100K per project had risen to “\$250K per project”. That’s some inflation. Then reality set in. Not everyone completed their projects and so lower savings arose. Management asked why the profits hadn’t gone up by \$80M. Some individual Black Belts and Champions then proceeded to be somewhat extravagant in their savings calculations. For a while everyone was happy until someone suggested auditing the savings calculation process and discovered large variation in savings calculation processes and occasionally more than a little “smoke and mirrors”. That typically gave rise to an edict: that finance must sign off all benefits calculations. This directive resulted in a return to reporting “hard savings only” – i.e. the really easy savings anyone can spot. This had the effect that reported savings dropped; process owners were no longer subject to swingeing cuts from the anticipated Six Sigma gains and peace returned until the next downturn. The process owner’s department was functioning well after all. Customer complaints happened somewhere else.

Different people have different expectations about Six Sigma savings

“We all know how the size of sums of money appears to vary in a remarkable way according as they are being paid in or paid out” – Julian Huxley

Different individuals in organisations have different expectations from Six Sigma savings. If the chief executive personally authorised a Six Sigma deployment then typically he or she expects large savings, so he can tell the analysts, and vindicate his own judgement. The Black Belt also seeks large savings, so he can tell his colleagues and vindicate his own judgement in agreeing to become a Black Belt. He might also get a bonus or promotion. By contrast people in the finance department often seek small savings. Why is that? Reasons include pressure from local management to avoid Six Sigma success being translated into increased profit targets, or to protect their own judgement in the event of a savings audit, or simply lack of recognition or tracking mechanisms for cost of quality and related savings.

What does life in a finance department consist of?

“Any time you see him he is generally by himself because being by himself is not apt to cost him anything” – Damon Runyon

Accountants use a series of costing methodologies, including marginal costing, standard costing, absorption costing and activity based costing. According to an EFQM European Quality award winning submission best practice comprises 33% of time spent reporting and budgeting, 33% of time collecting and paying money and 34% of time providing value added management information. There is a danger that the percentage of time spent on the first two activities can crowd out time for the third. Black Belts cannot expect finance to provide value added financial information about their own project without doing plenty of personal homework first.

Historical cost accounting doesn't identify the hidden factory

"Money is like a sixth sense without which you cannot make a complete use of the other five." - W. Somerset Maugham

Historical cost accounting is simply not set up to identify cost of poor quality in sufficient detail. A few examples follow. Purchase price variance motivates the buyer to increase order quantities to get the best price; ignores quality and delivery. The effects may include mythical cost savings in procurement, real excess inventory and additional inspection costs in production. Machine utilisation variance can motivate the worker in a cell to produce more parts than required. This can have the effect of building the wrong quantity or quality of parts for future consumption and defective parts can be overlooked at point of creation. Hidden rework is included in standard costs with the effect that waste cost is built in and managers are not encouraged to eliminate waste unless cost exceeds standard. Absorption variances motivate managers to produce excess inventory to absorb more expenses with the same effects as noted above.

(Source: Measure Up - Lynch & Cross)

Juran's categories of quality cost

Dr. Juran took a different view in identifying and reporting cost categories, with particular attention paid to "quality costs". He segmented failure costs into before and after shipment costs. His categories of quality cost before shipment included scrap, rework, failure analysis, scrap and rework due to non-conforming incoming supplies, 100% sorting inspection, re-inspection and retesting of products which have been reworked, avoidable process losses, and downgrading product between normal and reduced selling price for quality reasons. His categories of quality cost after shipment included warranty, investigating complaints for defective products services or installation, returned material and associated receipt and replacement costs, allowances, and costs of concessions to meet fitness for use specifications.

He further categorised costs into prevention, appraisal, failure and waste costs. His appraisal costs included incoming inspection & testing; in-process inspection & testing, final inspection & testing, product quality audits, maintaining accuracy of test equipment, inspection & testing of materials & services, evaluation of stock- cost of testing products to evaluate degradation.

Juran's prevention costs included quality planning, new product review (including reliability engineering), process control (status of process not product acceptance), quality audits, supplier quality evaluation, and quality related training, in other words all costs incurred in keeping failure and appraisal costs to a minimum.

He further suggested that reviewers should consider the type of work done, not the department name in which the work was done.

In summary, Juran defined Cost of Poor Quality as = Internal failure cost + External failure cost. He then defined Cost of Quality as = Internal failure cost + External failure cost + Appraisal cost + Prevention cost. We also need to add the cost of the 7 MUDAs:

Transportation, Inventory, Motion, Waiting, Over-processing, Overproduction and Defect Correction.

Have you got an account for...?

Black Belts will not get far by asking finance staff if they have a "Sales director's flight, car hire & hotel to explain late delivery" account. Neither should they ask if there is a "Temporary workers not hired following rolled throughput yield improvement" account. There will almost certainly not be an "Advertisement for new workers, no longer needed, not placed following DPMO reduction" account. Black Belts in companies who do lots of lean enterprise activity may be frustrated to find no "Space saved following 12th consecutive successful kaizen event in this cell but not quite enough to get rid of the lease on that warehouse yet" account.

Finance will be right when they state that the cost has not reduced yet. However, the costs never will decrease unless these types of improvement projects are given some encouragement in the form of reported "soft" monetary credit and then tracked along with all other improvement projects. Whilst cost cutting is an important discipline it is not the only discipline. Measuring process capability in all organisations in two languages, (sigma and money), is still some way off, but Six Sigma practitioners must continue the process of projects savings re-education or they might view finance as the man with the red flag in front of the first automobiles.

Some companies are now beginning to measure their overall process capability, based on a consolidation, not just of the financial results, but of the process capability of the directors' identified key processes in the various businesses.

Pitfalls in the Black Belt / Finance Project Savings Meeting

"Come back next Thursday with a specimen of your money" - Groucho Marx

The last two slides in a typical Six Sigma project presentation are often issues/ barriers and next steps. Sometimes the barriers include inadequate measurement systems, finance staff not available or finance people not trained in Six Sigma techniques. The next steps slide could include the following phrases: arrange meeting with finance to value COPQ / savings; arrange one day six sigma awareness for finance people.

How might the Black Belt's meeting with finance go? Well, it is sometimes postponed twice, first by a nervous Black Belt, and then by a busy finance manager. When the meeting finally takes place the Black Belt starts to explain his process maps with their KPIVs/KPOVs, his FMEA, ANOVA, 2 sample t, Null hypotheses, Cpk, Ppk, gauge R & R, COPQ, process capability, standard deviation. To the finance department these terms are simply jargon (type a). Finance staff usually know plenty of jargon of their own. Finance people will start asking questions about what does this project do for the company's standard cost, purchase price variance or labour rate variance. They might frown and explain how this does not meet GAAP. They may ask about cost centre overhead allocation, the effect on fixed costs and variable costs. They will almost certainly ask whether the project delivers a headcount reduction, what the "hard" savings are, the effect on earnings before interest and tax or the effect on burden rates and efficiency. To the Black Belt this will sound like jargon (type b).

The risk of a lack of clarity is high. No wonder both parties postpone the meetings.

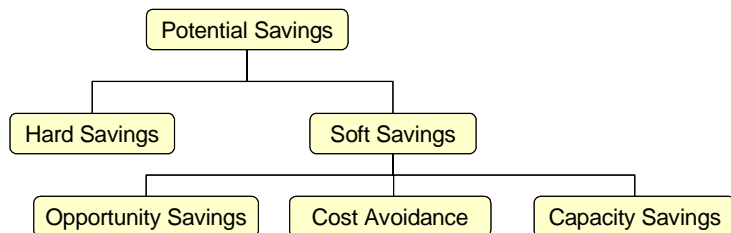
A re-education process is required

"If we don't change direction, we'll end up where we're going." - Prof. Irwin Corey

This communication breakdown requires a re-education process. Typically waste and failure costs are high and management don't want to spend money on appraisal and prevention costs. It takes nerve to add more prevention and appraisal cost whilst waiting for failure and waste cost to fall, but that is precisely what six sigma and lean analysis requires. Furthermore, a degree of controversy exists. Much of the controversy centres on the assertion that these are not quality-related costs but costs that are part of normal operating expenses, and therefore should not be included in cost of quality calculations. An example is the inclusion of overhead on top of direct labour and material cost of scrap and rework, and of rework categorised as "part of the normal process". Suppose all defects disappeared. Would the costs in question also disappear? If yes, they should be included in quality costs; if not these costs should be excluded from quality cost calculations, and therefore from the savings.

Hard savings are easy, soft savings are hard

"Worst cases very rarely happen." - Shih-PingHan



There is often considerable debate about what constitutes Six Sigma project savings.

Hard savings

Hard savings are subject to less debate. Hard savings refer to the absolute removal of expenditure. They directly impact the profit and loss account. Hard savings occur when costs are lower than current operating levels, not versus a budget or plan. Examples include scrap reductions as a result of eliminating defects, rework costs reduced as a result of eliminating defects where the people who perform the work leave the business or where overtime is reduced. If a position is eliminated hard savings arise. If someone in a production or administration position is transferred to fill an approved open requisition, preferably in a growth situation, hard savings may be claimed. If space requirements for an activity are reduced, enabling an organisation to vacate a building or sublet the space to another tenant, the building rent costs saved can be classified as hard savings.

Soft savings

Soft savings are more difficult to quantify and are open to much more debate. They are often, therefore, ignored. Since soft savings primarily create the possibility for future savings they should be tracked as action can turn them into hard savings. Soft savings do benefit an organisation financially but cannot clearly be traced to the bottom line. It is vital to segment soft savings into the three types described below in the project benefit tracking system to enable enlightened management decision making.

- **Opportunity savings** cannot be readily traced to the profit and loss account. For example when space requirements for an activity are reduced, but the building is not vacated or sublet these costs are opportunity savings. Capturing the cost of saving 30% of a person here, 25% of a person there, can add up to significant opportunity savings. These can be turned into hard savings if additional work is done such as reassigning staff instead of hiring new employees and restacking to free up manufacturing/office space which could be sublet to generate the hard savings from reduced operating overheads. Management need to know where these opportunities lie.
- **Cost avoidance savings** would definitely have appeared if the project was not done. These types of costs can be very large. Examples include avoidance of regulatory fines in previously non-compliant processes in food, drug or financial services industries. The financial effect of resolving severe customer complaints before the customer withdraws business must be captured. Designing out a known problem from future products, processes or services can have an enormous financial benefit. When future manpower needs are reduced because of identifiable process improvements this should be captured as soft cost avoidance savings, even if the additional people were included in the budget.
- **Capacity savings** increase the capacity of a process without capital or revenue expenditure. If increased capacity is not currently required, this constitutes future potential savings when shown to arise directly from this improvement project. These savings only become hard savings when the extra output is both needed and generated. If the process output was instantly required it would be classified as hard savings. If not they are soft capacity savings. It is vital to track capacity benefits right across an organisation to allow capacity balancing both within and between cost centres and plants. Quantifying all the local benefits can help avoid parochial decision making, and allow senior management to make decisions for the good of the whole company.

Soft benefits will not become hard savings on their own. They must be tracked, quantified, and amalgamated into similar cost types and monitored by senior management. This gives management the information they need to take the actions necessary to realise the soft savings as further hard savings.

Balance sheet savings

Normally balance sheet savings are not considered hard savings. If for example inventory or receivables are reduced by effective projects there can be enormous cash flow impact. However, if real P & L benefit is derived from a project, this benefit should be reflected in the categories listed above. The interest saving should be included as a hard P & L saving and the overall cash flow effect should be captured, but should not be included in the hard savings total. One off bad debt provision reductions, inventory write-off provision reductions and reduced depreciation on fixed assets which can be directly attributed to the six sigma improvement project should be included as they affect the profit and loss account. The cash flow effect of balance sheet savings should be captured in a separate balance sheet savings column, but not aggregated with P & L hard savings.

How to proceed

"The opposite of creativity is cynicism." - Esa Saarinen

Six Sigma deployment champions should create a company specific Six Sigma COPQ template. An excel spreadsheet will suffice, but it must be comprehensive, and specific to your company so that people can more readily identify with the types of overt and hidden costs the Black Belts and Green Belts are likely to encounter in their improvement projects. Paloma Consulting Limited can help interested organisations develop such templates. At least 50 separate costs of quality cost types should be identified. They should be segmented into pre- and post- shipment costs, prevention, appraisal, internal and external failure costs and waste costs in each department. This will help both the Black Belt and finance staff realise that when something goes wrong the extent of the often considerable knock on cost effects in other departments or divisions of the organisation. Drop down sort menus can be developed which the Black belt can use to generate a project specific, comprehensive cost of quality spreadsheet. Sometimes this single device has been the key tool needed to secure management buy-in for the proposed solution. Regulatory fines avoided should be tracked, but kept in a separate column. They are soft costs, but they would become all too real hard costs if the fines were to be incurred. The Black Belt's job is to reduce defects per million opportunities, but unless he or she talks the language of finance don't expect finance to be sympathetic- they're just too busy. Money still talks. Unless the Black Belt captures the project's true costs no-one else will.

Summary

There is a real risk of frustration in spending several weeks improving a process only for finance staff to reduce the savings to such small amounts that if they were really so small that knowledge should have led to the project being cancelled at the outset. It is therefore essential that the Black Belt does a thorough job of capturing as many prevention, appraisal, internal and external failures costs and waste costs as possible. Furthermore there may be large opportunity costs where if the project was *not* done significant costs or lost revenue would occur. All assumptions should be properly documented on project cost of quality spreadsheets so that the risk of misunderstanding during the Black Belt/ finance meeting is minimised. After all, "Without the right information, you're just another person with an opinion."

Six Sigma is an effective process improvement methodology. Unfortunately, poor reporting of the true cost of quality and savings can cause management not to understand that. As St. Matthew wrote in his Gospel 15:14 two thousand years ago (presumably he wasn't referring to costing Six Sigma projects): *"If the blind lead the blind, both shall fall into the ditch."*

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