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Stretch Your Shrinking Budget with RCA

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Root Cause Analysis can be one of the strongest tools your maintenance organization ever puts its hands around.

When economics inspire belt-tightening, corporate leadership often cuts programs that don't scream savings and profit. After all, those programs cost money to implement and maintain, and their effectiveness and return on investment often is unproven.

For a program to survive this scrutiny, it must stand on its own value. Root cause analysis (RCA) is one such program. Executives who are not close to the RCA process might notice only the expenses for employee training (or perhaps they only notice the high profile RCAs that occasionally occur). People closer to the RCA program have an intuitive sense of the program's value--*enough to know that it should serve as the cost-cutting tool rather than becoming a victim.*

When management is evaluating the maintenance function, it may be fairly easy to see how RCA is helping to cut costs, but not so obvious that it is generating revenue. Historically, many managers have not shared information about business revenue and profit margins with the maintenance team. In some cases, the managers themselves do not know the profitability metrics. When this occurs, maintenance teams might not be aware of their own bigger-picture revenue impact. Thankfully, this situation is beginning to change.

So, how can RCA program champions in maintenance develop a tangible understanding of the associated benefits, cost savings and profit generation within the context of revenue goals? Further, how can the RCA champions effectively inspire senior leaders to recognize the return-on-investment? What exactly are the results, why are they worth calculating and sharing, and how is this best accomplished? Can the case be presented powerfully enough for executives to recognize that investing more in the RCA program will pay off in the short and long term?

Sample RCA results

APOLLO A version of this article was published when our team was known as Apollo Associated Services.

Client savings data indicates that many companies see the immediate return on money invested in RCA training. In our company's experience, a fair estimate of initial training costs per person--*including software and training courses*--is about $1500. In most cases, if one trained person completes just one RCA and implements solutions, the savings alone pay for an entire group training class twice over. So there's an immediate 100% return on investment (ROI). This return grows exponentially when additional people from the same class perform RCAs on a regular basis.

Once the RCA program is up and running, the paybacks start to roll in, as the following companies reported.

1. A global chemical company evaluated over 100 RCAs performed by its reliability engineers and found the average value returned on each to be $75,000 USD per year. The average cost per RCA, including solutions, was $1500, yielding an ROI of 4900% after one year. RCA also is a key part of this company's safety program, where it has realized more than a 75% improvement in its injury and illness incident rate--*from 2.4 to 0.59*--in an eight-year period.

2. A second global chemical company found that each RCA resulted in $17,000 USD per year savings by eliminating maintenance problems. This organization's average ROI on each RCA was 1100% after the first year.

3. A manufacturing company saved $1,300,000,000 USD through RCA, by discovering an innovative solution to one of its product problems. In that same RCA, this company also discovered $19,000,000 USD per year in previously unknown waste that could be eliminated.

4. A global telecommunications company has saved millions of dollars by using RCA to analyze and correct problems in its global mobile phone and networking business through reduced service interruptions and outages.

Calculating RCA results

It's surprising that so many companies fail to calculate and communicate payback or ROI on RCA, considering the impressive results that these types of analyses so often deliver. Plain and simple, there's a perception that it's too difficult--*or even impossible*--to obtain the data needed. For most of us who don't design rockets for a living, having exact data is rare. (For those who do design rockets, having exact data also is rare.) Still, by using conservative data, an organization should be able to develop defendable metrics that demonstrate the value of its RCA. Remember, data is used to draw conclusions for the end-

goal of making a decision. With a little digging, sufficient data normally is available to make very solid decisions--*resulting in admirable payback.*

Herein lies an opportunity to understand that you can be conservative, and thus relatively accurate, without having exact data. When calculating payback, you need close estimates. If an organization spends a great deal of time seeking the ultimate precision in this data, it likely is spending more time than the situation warrants. The result is diminishing utility from the additional precision, as well as from problems that are allowed to linger on a little longer and cost a little bit more. Penciling in conservative estimates is the safest. Even if other people reviewing the data are inclined to poke holes in your approach, you can objectively respond that the savings or income is probably much higher.

Since arriving at these figures may seem easier said than done, why and how did the previously mentioned companies do it?

Calculating the results of qualitative programs enables their champions to evaluate program effectiveness individually and collectively. Calculating ROI illuminates needs for program improvement and--*when done thoroughly and reasonably*--earns credibility within the organization.

Return on investment

Return on Investment (ROI) = Net Savings/Cost x 100%

Where:

Net Savings = Annual Cost of a problem before RCA minus annual cost of problem after RCA solutions are implemented minus cost to implement RCA and solutions

Cost = Annualized Cost of: (RCA + Solution + RCA training)

- What are your initial costs, including training, software and hardware? For RCA training costs, if you don't know for sure, a one-time cost of $1500 per person is common.
- **What does it cost to conduct an RCA?** When in doubt, guess high to generate a conservative estimate that will be considered credible. It would not be out of line to see the following: Four people might each spend 2.5 hours involved in a single RCA, totaling 10 hours. In addition, the facilitator might spend approximately 10 hours researching the problem, securing the RCA team, preparing for

the RCA and writing the follow-up report. Estimating that each of those combined 20 hours is worth about $100, the cost of this RCA would be approximately $2000.

- **What are your assumptions regarding your capacity and value?** For instance, if you implement a project that streamlines a process and increases capacity, did the additional product sell? When there are incremental increases in throughput, uptime, equipment reliability and maintenance savings, there may be revenue improvement. The key is whether there is enough demand to sell all of the product you are able to make. Every additional unit sold contributes to the bottom line. The value of the additional profit resulting from the additional sales should be included in the RCA "value." In the eyes of executives, that's where the real value is. Use product profitability values that are recognized by the business' accounting department, when possible. These are the numbers common to the leaders—and *what are typically used in other business decisions.* If your leaders are unaware of the profitability numbers, kindly seek out the business accountant who does know the numbers and then share that data broadly. Once people understand the business profitability numbers, better "spend" decisions will be made across the board.

- **Will you use revenue or Net Profit in your calculations?** Net Profit is recommended. In its simplest form, Net Profit is the price you charge your customer for your product minus the cost to produce it. It's important to factor in a "cost of goods sold" that includes overhead, utilities, labor, raw materials, etc. If you simply use "revenue" (product sales price multiplied by the sales volume), your numbers will be very high (probably four to five times too high). When calculating your costs, include expenses related to analysis, problem solving and solutions. In a typical equipment failure situation, an average maintenance shop might add up the costs of equipment, parts and labor. That's a good start, but it's not the whole picture. There are many other ancillary costs that are important to tally, such as safety inspections, insurance premium increases, fines and litigation. What is the total cost to the organization beyond the maintenance department?

- **What are your safety assumptions?** What value do you place on a near miss, OSHA reportable or lost time injury? A commonly used figure is $35,000.

- **Will you include manpower--*you would pay the individual regardless?*** Be careful! You should only take credit for maintenance labor savings if your organization, as standard procedure, reduces headcount as reliability improves and work is eliminated. For example, if the solutions from your RCA on a chronic compressor failure completely eliminate future failures, unless you reduce the paid

hours of your full-time or contract maintenance personnel, you are not saving maintenance money and should not take credit for this in your payback calculations.

Example ROI calculation

The following problem description and calculations illustrate the return on investment from a successful RCA.

A product dryer was experiencing 30 failures per year. Lost profit from lost product sales due to dryer downtime was approximately $750,000 per year. Out-of-pocket repair costs were running approximately $150,000 per year. The RCA resulted in a solution with a capital cost of $180,000 and an annual operating cost of $10,000. The RCA costs (team meeting and lab testing time) totaled $25,000. The failure rate after solution implementation went to less than one per year. (Note: a conservative assumption of one failure per year will be used.) Assume five-year life for capital, RCA and training costs. (Note: a conservative assumption will be made to charge all training costs against this RCA. In reality, this cost would be spread over many other RCAs.)

So, if we annualize one-time costs over a five-year period we come up with the results in the worksheet shown in Table I.

Table I. Calculating ROI From RCA: Chronically Failing Dryer Example *(Annualized Costs Over a 5-Year Period)*

ROI = Net Savings/Cost x 100%

Net Savings = (Reduction in total costs – Cost to implement RCA - solutions)/(Cost to implement RCA + solutions)

Net Savings/yr = [(30-1) (failures/year) x ($750,000+$150,000)/30 (cost/failure)] = $870,000/yr

Cost of training/yr = $1500/5 x 5 people on team = $1500/year

Cost of solution/yr = $180,000/5 (capital) + $10,000 (operational costs) = $46,000/year

Cost of RCA/yr = $25,000/5 = $5000/year

Cost to implement RCA + solutions = $46,000 + $5000 + $1500 = $52,500

ROI = ($870,000-$52,500)/$52,500 x 100%

ROI = 1557%

Beyond the numbers

The ROI figures reflected in the sample worksheet in Table I are actually low compared to the average return on investment for RCA. That ranges between 2000% and 3000%. Thus, if your maintenance organization is seeking to stretch a shrinking budget, Root Cause Analysis can be one of the best tools you have. RCA will not only reduce costs, it will improve net profitability when applied to capacity-limiting problems. If you are not performing RCA—*or if you're under-utilizing it*--and you are feeling the pressure to cut costs and show value, RCA should be high on your list of priorities.

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