

Business Case Estimator

The online Business Case Estimator is a tool created to determine the financial value achievable through improvements to reliability, maintenance management and maintenance practices.

Who should use the Estimator

Executives and senior General Managers with responsibilities over maintenance and operations (production or services delivery) in companies with a heavy reliance on the performance of their physical plant (fixed, mobile, utility, and/or infrastructure). You may or may not have a background in Engineering, Maintenance or Reliability – for this, you won't need it, but you will probably need access to those who do, in addition to financial data.

The inputs we ask for should be things you can observe yourself, or ask about and easily get an answer. Some are financial, you will need cooperation from finance for those, and you can probably get those easily. Others are related to maintenance and reliability. You may need help from those responsible, but you will also need to be a little bit careful with their inputs. We provide some definitions to help you make sure that you get the right data.

The Estimator has 4 sections:

1. The Efficiency vs. Effectiveness Assessment (EvE). There are 10 questions which assess the maturity of an organization. Efficiency (the vertical scale) relates to the management and execution of maintenance work. Good practices will increase trades' persons wrench time, effectively using fewer people to achieve the same level of work. Effectiveness (the horizontal scale) relates to the composition of the maintenance program – i.e.: how much of it is the right sort of proactive work to lower the numbers of breakdowns and repairs. Doing the right mix of work will reduce breakdowns along with their attendant repair costs and production losses due to the downtime. An effective maintenance program also increases the ability to plan and schedule work, enhancing the efficiency of the work force. This assessment gives a result showing the relative level of opportunity that may exist if you make improvements affecting reliability and maintenance.

The 10 questions are used to plot your position on the following array. As the colors suggest you want to be in the upper right quadrant. The further from that you are, the greater the improvement opportunity. It is possible to be highly efficient, and yet doing the wrong work. Costs will be high, and reliability will be disappointing, even though maintenance performance looks good. It is also possible to have a well-designed maintenance program (effective) but with poor execution. In that case, performance will be very disappointing - low reliability with high costs. That program is of no value if it cannot be executed correctly and on time, with proper follow-up on problems identified while they are still "minor" in nature.

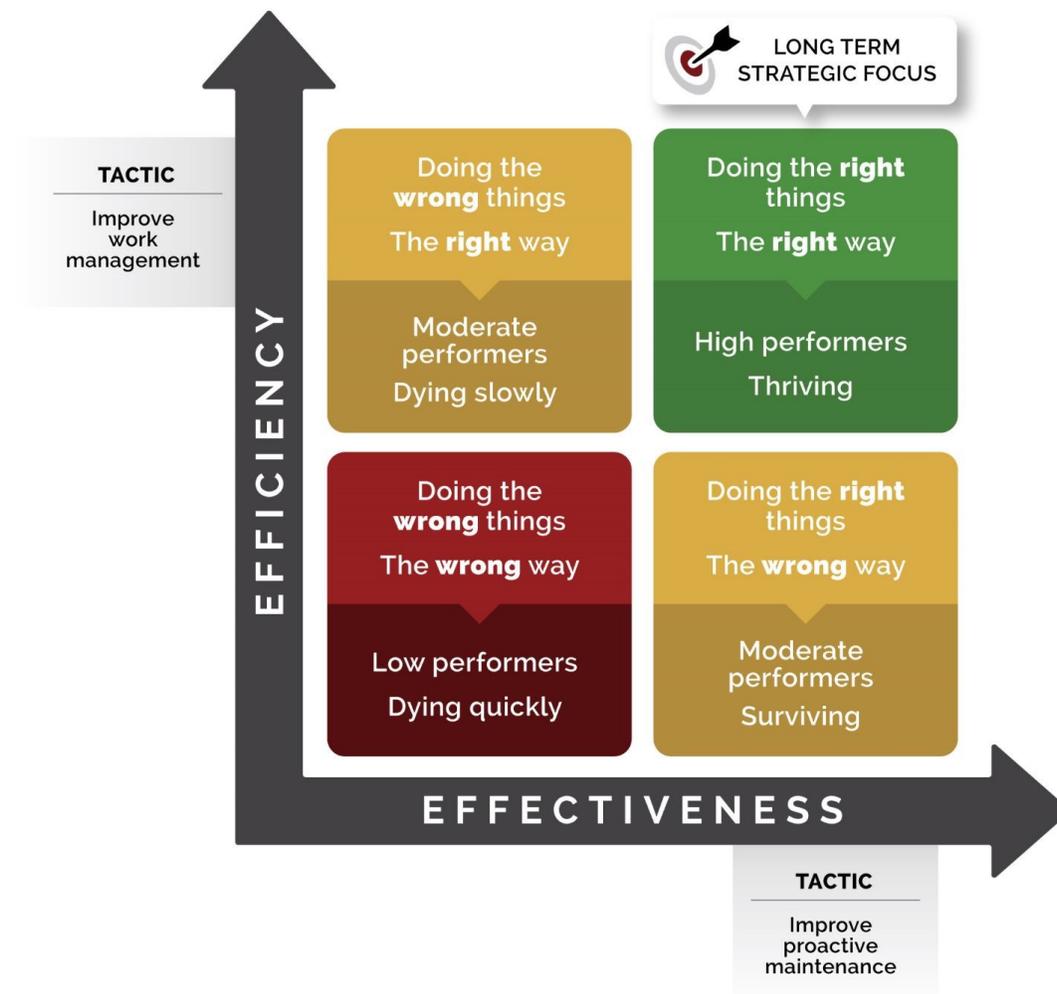


Figure 1 - Efficiency vs. Effectiveness

2. Performance inputs. The EvE Assessment uses a blend of quantitative and qualitative inputs, largely from those responsible for maintenance and reliability. While it can be used to produce very rough ideas of improvement opportunity, we need to add more to develop a business case for change. For that we require some production and financial data.

Revenues and costs associated with production from the assets being maintained are needed. In many cases that will be plant output, vehicle fleet capacity, or infrastructure capacity (e.g.: utility) where output or throughput is used to generate revenues and profits. Adding the financial dimension to the EvE Assessment gives us some solid (and often surprising) results.

3. Results. Maintenance work performance (% planned and scheduled, % compliance) can often be improved to lowering costs. Planned and scheduled work is less expensive than if it is unplanned and unscheduled (e.g.: reactive to breakdowns) by some factor. The “rule of thumb” is three times!

However, lowering costs is not achieved solely by improving planning and scheduling performance. The right maintenance program will reduce the number of breakdowns also. That reduction shifts the balance of work from breakdown to proactive. That translates into a shift from unplanned/unscheduled (expensive) to planned/scheduled (low cost). The reduction in breakdowns also lowers non-productive (money-losing) downtime, so not only do we achieve lower costs, we increase production. Both are positive financial impacts.

Maintainers often focus on the costs, and hence work management, due to the way accounting handles maintenance costs. Treated as an expense, they are often seen as something to be minimized. While that is not incorrect, it is misleading. Spending maintenance money on the right work, actually results in increased revenues too. That well-spent money has the same effect as an investment that accountants often miss. Maintainers, accountants and bookkeepers are somewhat like hammers looking for nails. Their only levers are costs and cost lowering activities. Finance managers usually take a more holistic business perspective and usually “get it” right away.

What we present here is that broader picture, lower costs, increased output, revenues, margin and more efficient use of working capital.

4. Evaluation. EvE uses several very telling process indicators. We have worked with hundreds of organizations improving reliability and maintenance performance. We have a good idea what “good” and “bad” look like and what the indicators will be. Performance results from actions and behaviors.

The evaluation section interprets those indicators leveraging our experience. It is a simple form of rules based Artificial Intelligence that produces a description of what you may be experiencing. It is based on your responses and what those responses usually indicate in the organization. If the responses are accurate, the descriptions will produce a fairly consistent picture of the behaviors that you should be able to recognize within your organization. If you notice inconsistencies in the evaluation results, it is likely that the inputs were faulty, or inconsistent with each other and should be reviewed.

For example, you cannot have high levels of schedule compliance if you have low levels of planned and/or scheduled work. Also, there is no way you are getting results from effective planning if your supervisors or trades are doing that planning. If you report high performance from stores, but lower levels of planning, either the numbers are wrong or you are way over stocked. Preventive work is a subset of proactive work, so the reported proportions should reflect that. If they are at the same level, then either very little is being done, or you are also experiencing a lot of breakdown work.

Understanding the Language in the Tool

Read the definitions provided in the yellow boxes of the EvE Assessment. Inputs that are inconsistent with the definitions will produce misleading results as explained above. Don't be surprised if your questions are misinterpreted by maintainers. The world of maintenance has many inconsistencies in the language it uses and a lot of confusion can arise as a result.

Efficiency			
How much of your work (measurd in hours) is planned? (% should be based on hours not WO count)	0-20		Entry Valid
Plan: The comprehensive description of maintenance work to be done, including task list, parts and materials required, tools required, safety precautions to be observed, permits and other documentation requirements, an estimate of the duration of the work, effort, and costs.	21-40	x	2
	41-60		
	61-80		
	81-100		

Pay particular attention to the first two definitions about planned (shown above) and scheduled. Planning is about WHAT, scheduling is about WHEN. Those are often used interchangeably by maintainers, incorrectly referring to a schedule of work as a plan. They may even hold weekly planning meetings to set the schedule. Those should be scheduling meetings only. Sit in on one. If you hear talk about contractors, personnel or parts not being available and what to do about it, then you are listening in on a planning session for a job. That should have been sorted out before that meeting.

Planned means that all the details of what work will be done and how are known well in advance of the work being executed. Planning is sometimes done just before execution by the trades themselves or by a supervisor. The job has begun (i.e.: the clock is ticking) before they even plan. That cannot achieve the potential benefits of planning.

Scheduling deals with the timing of when the work is done. Schedules are normally produced for work that is fully planned. There is also an intermediate step of confirming availability of all needed resources (people, tools, parts, etc.) before the schedule is produced. Often the scheduler, stores person or a materials coordinator takes care of that intermediate step.

Except for the use of “PM” the other definitions are more widely known and subject to less confusion.

PM has several interpretations – planned maintenance, preventive maintenance, proactive maintenance or even just as a reference to the maintenance program overall. One software company uses it to name its maintenance management module, “Plant Maintenance”.

Maintainers often refer to all proactive maintenance as “preventive”. It is not.

Preventive is only work that is done on a fixed interval (days, hours, weeks, tonnes, kms, etc.) to restore or replace an item that is subject to a form of age related degradation (not random events). To avoid confusion, we (Conscious Asset) usually abbreviate this as PvM.

Predictive maintenance (PdM) is quite different. It refers to Condition Monitoring (CM) and the prediction of failure events based on the conditions being observed. Condition Monitoring is a part of Condition Based Maintenance (CBM), also known as On-Condition Maintenance. The first part is monitoring (e.g.: vibrations, oil condition, etc.) and the second part entails correcting the defects found proactively before they result in a loss of system functionality. Often the two parts are (and should be) done on separate work orders. Sometimes that proactive repair is known as a preventive replacement (which is accurate), but it is not Preventive Maintenance which is only done on a fixed interval.

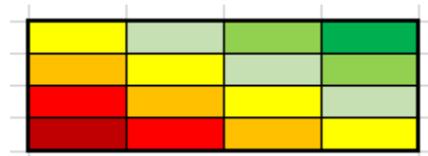
How to input Data for EvE

Note that all 10 questions requires one answer each, chosen from the list of possible answers provided. Indicate your answer with an “x” in the box beside it. If you leave the boxes blank the estimator will produce inaccurate results and the “evaluation” results will show “not rated” for the one(s) left blank. If you enter two or more “x” answers, you’ll see a warning, “choose one”. If you leave two or more chosen, the estimator will use the higher scoring answer.

For seven of the 10 questions in EvE, we ask for estimates of performance giving a range of values. The range is good enough for the estimator. We do not need precision here, but if you do have accurate figures, then there is a place to input those below in the Current Performance Inputs section.

EvE Result

The EvE result is a plot of your position on the scales of Efficiency vs. Effectiveness. You want to be in the upper right of the plot (dark green). The closer you are to the lower left (red), the lower your overall performance and the greater the improvement opportunity.



You can read more about this plot in our blog articles:

<https://consciousasset.com/maintenance-and-reliability-maturity/> and
<https://consciousasset.com/maintenance-and-reliability-maturity-2/>

The EvE assessment tool is the same as that used in the second of those two blog articles. You can also get a deeper understand of these concepts in our book, “[Paying Your Way](#)”.

Current Performance Inputs

The financial output requires financial inputs. In the EvE Assessment you indicated ranges of performance for several metrics. You may have more precise data. If you do, then you can over-ride the calculated and default settings used in the financial forecast. Those values and two defaults are shown in gold colored boxes. The estimator will use those “gold” values unless you over-ride them. You cannot edit those values directly in those gold boxes. To over-ride them, simply enter the value you choose in the blue box immediately to the right of the value you wish to over-ride. The blue value will be used in the calculations.

Input definitions are shown in a table on the following page.

The other inputs required are:

Inputs (annualized figures)	Notes
Fixed assets value (RAV)	May be insured replacement value or other estimate to replace your current capacity today
NOWC	NOWC (Net Operating Working Capital) = Cash + Accounts Receivable + Inventory - Accounts Payable - Accrued Expenses
Other operating expenses	Direct and indirect costs to produce the ouput, not including asset depreciation and maintenance.
Depreciation%	Annual depreciation charges on your fixed assets. Leave blank if you accept default value
Output price/unit	Avg selling price of one unit of output
Production target	Budget prod'n level. Assumes typical levels of plant/asset performance that you can achieve today
Production max sustainable	May not have been sustained in the past, but you believe it should be attainable. May or may not be "nameplate" output
Avg Av	May be an assumption used in determining output (prod'n target). If not known, estimate using bottleneck asset uptime/total time
Max sustainable Av	Can be a proven number of one you believe should be attainable
Quality level	May be "yield" or quality measure typically achieved.
Max sustainable Q	May be "yield" or quality measure proven you can sustain, or believe you should sustain.
Mtc Cost	Input either annual maintenance costs (labor, materials, contractors, O/T, etc.)here, or it will be calculated from % Asset Value entered below. Use only one entry.
Mtc Cost as % asset value	Alternative input to annual maintenance costs figure. If \$ value entered above, then this will be ignored
Estimated % planned Work	If left blank, will use middle of range chosen in EvE responses
Estimated % scheduled work	If left blank, will use middle of range chosen in EvE responses
Estimated % schedule compliance	If left blank, will use middle of range chosen in EvE responses
Target value of Planned & Scheduled	High performers can often achieve 98% planned and scheduled work execution.
Ratio of costs fully P&S vs Un-P&S	Widely accepted rule of thumb is that unplanned and/or unscheduled work is up to 3 times more expensive

If you leave an input blank, you will see warning: beside the blank cell: **Input Required**

If you override a default value (gold cells), then you will see: **Override Used**

If you leave the blue cell empty beside a default you will see: **Default used**

Maintenance cost can be input in two ways, either input the cost or estimate it as a % of replacement asset value. You need to input one of them for the calculation to work. If you input both values, then the cost value will override the %RAV value.

If you input a cost you will see: **Cost Used**

If you input a %RAV and no cost value, then you will see: **%RAV used**

Estimate Outputs

Once all inputs are completed, you will see the results in the Outputs section. It will look something like this:

Outputs			
Estimated change in maintenance cost	-\$	4,625,749	Lowered
Units of output change		698,335	Increased
Cost change per unit of output	-\$	8.42	Lowered
Annual margin change	\$	743,333,567	Increased
Annual revenue change	\$	1,321,948,585	Increased
Annual earning (before taxes) change	\$	738,707,819	Increased
Earnings growth		8%	Increased
Change in capital turnover		73%	Increased
Change in "Return on Capital Employed"		41.04%	Increased

The green indicators are all positive changes. If any of those are red, then they indicate a situation that got worse, not better. If the input values are consistent and realistic, then that should not happen.

Surprised by the results you see?

In two words, don't be!

Reliability is often poorly understood by maintainers and engineers. It is seldom taught in engineering colleges, and then only at the post-graduate level. It requires a blend of technical (academic) knowledge with practical field experience, and that is hard to find. Good reliability engineers are fairly rare.

Reliability is seen as something maintenance (the department) should produce, but the way it is managed the focus is on getting work done, not the results.

Maintainers, usually doing their best at managing work, often fall short on delivering reliability because they don't fully understand it, nor how to achieve it. They are getting work done and sometimes very efficiently, but they may be somewhat ineffective if their maintenance programs are not designed well.

Typically, they have no business education or background, so they fall short in communicating their business case for changes effectively. Non-technical people such as those in finance, operations and general management just don't understand the technical jargon that maintainers use and the maintainers don't understand the business jargon. Both just "don't know what they don't know". The business folks don't mind admitting it, but the maintainers are often embarrassed by the shortcoming and are loathe to admit it.

Our assessments and estimations of business benefits are often surprising. Traditionally minded maintainers may see the cost savings as unattainable or unrealistic. That's because of a lack of understanding of how reliability and maintenance practices complement each other. There may also be fear that those savings mean job losses. They may be right about that, but in most cases, savings can be realized through reduction in contracting (i.e.: insourcing), reductions in overtime and MRO material and logistics costs. Staffing is more likely to be unbalanced than excessive. There may be too many of

one trade, not enough of another. Retraining and some restructuring can often correct that. With so much focus on “lean” (also something that is often misinterpreted), staffing is often low, not high. While it is a rare case for staffing to be excessive, attrition can usually be used to allow numbers to correct, particularly since we still have quite a few aging baby boomers in the workforce who are close to retirement. Another form of attrition, somewhat unique to the younger generation, is their propensity to move to other jobs frequently.

The biggest surprise in the financial results is often the revenue increase that is calculated. That results from an increase in asset availability, but it also depends on those assets being more heavily utilized. Realizing those gains requires operations to utilize the availability being provided. Sometimes, there is a need to modify operational practices to get the most from the assets.

You will probably find that the prize is bigger than you may have thought, possibly much bigger. It’s a good idea to discuss it with us before you decide to act. Knowing you have a lot of money on the table and then depending on your maintenance and reliability people to deliver it may backfire. If they do not see how they can do it, they will resist. If they believe it is an unattainable goal, they will resist. They will probably need help to overcome their own fears of inadequacy. After all, a big prize that they have failed to deliver could easily be seen as a failing, and it really isn’t.

Qualitative Evaluation

In the lower-most section of the tool, you will see an evaluation based on the answers to the EvE Assessment questions. Each “area observed” had 4 or 5 possible responses, each one indicating something different. The indicated situation is described on the right as “likely situation”. You may recognize these as characteristic of your operation.

If not, you may need to look a little closer at what is really happening, or you may need to revisit the inputs. If inaccurate or inconsistent, EvE can produce some surprising yet inaccurate results. Garbage in / garbage out.

While these “evaluation” descriptions give an idea of where improvements can be made, they don’t say what those improvements are, nor how to achieve them. The evaluation can be helpful to set a general direction, but it is not a roadmap. The details may take quite a bit of work with your maintainers and operations people to determine the way ahead.

We caution that you should not use this as a “punch list” for improvement initiatives. There is more to this than meets the eye, especially when it comes to implementation of any changes to achieve the desired results.

Evaluation based solely on inputs provided	
Area observed	Likely situation
Estimated % planned Work	Planning is having positive effect
Estimated % scheduled work	PM Scheduling is working, some benefit being realized, most corrective work likely treated as urgent
Estimated % schedule compliance	Scheduling is working, some benefit being realized
Who provides the planning?	Trade planning is reactive to work arising, scheduling is ineffective, work delays common, trades struggling to keep on top of it
Planning and MRO Integration	P&S and MRO not Integrated nor working well together. Need effort to integrate processes
Reactive / proactive mix	PM program at less than half its potential, even if compliance high, PM needs optimization and some expansion, moderate to high cost
Understanding of reliability	Reliability and work management coming under control, reactive work largely under control, cooperation between Ops and Mtc improved
Mix of maintenance tactics	Mature, good mix of maintenance tactics, costs are low
Reliability culture	Very mature reliability culture, performing in the Sweet Spot
Overall program maturity	Maintenance program likely optimized, likely in continuous improvement mode

Download

You can download the tool as a MS Excel Spreadsheet. There is download link in the bottom right corner of its bottom margin. You can modify your answers either online or on a downloaded copy.

When you download it, that copy will include your answers to the EvE Assessment, your inputs and the calculated results. **If you leave the webpage without downloading, your inputs will be lost.**

Actions

This tool is intended to provide an estimate of the value you may be missing because of reliability and maintenance performance shortfalls. The tool was designed with a wide range of possible applications, so it is not specific to any industry. Varying some of the inputs helps align it with your industry. For example, target availability for a fleet of vehicles (e.g.: 85%) is likely to be quite a bit lower than it is for a fixed plant with a continuous process (98% or more), with batch processes (e.g.: pharma, food, chemicals and brewing) and discrete manufacturing (e.g.: automotive, white goods) somewhere in the range between.

If you wish to discuss and confirm your results we are available for consultation.

An initial consultation should take roughly one to two hours. We can set a mutually agreeable schedule for that discussion via email or by telephone, then you can pay for it online. We offer that at a fixed price regardless of the time it actually takes. We have included an “EvE Consultation” product in our

shopping area online. That consultation is carried out by phone and/or online using Zoom, MS Teams, WebEx, or other video conferencing facility.

We will want to go over your data on a shared screen, so even if we are discussing results on the phone, we will need to be looking at the same information. Because our online evaluation system does not save your data, you will need to have a downloaded copy of your spreadsheet (see above).

In the consultation, we will provide an explanation of the calculations that are performed in the background. It is a good idea to send us your spreadsheet before we talk. We will review it to keep your time on the call short. If we see inconsistencies in your inputs, we will let you know what those are, so that you can investigate them and, if desired, change them.

This estimator does provide ideas on where improvements can be made, but it DOES NOT tell you what those specific improvements are, nor how to make them. For a deeper insight into those, you or your senior maintainers and operators, could take our online Uptime program:

<https://consciousasset.com/courses/uptime-strategies-for-excellence-in-maintenance-management/>

That program includes a full assessment of maintenance and MRO performance as well as an improvement strategy development exercise. It is based on what we do “live” with our customers.

If your efficiency score is fairly high but effectiveness is low, then you might also consider our Basic Reliability Management course: <https://consciousasset.com/courses/basic-reliability-management/>

If you prefer, we can also perform a detailed assessment on site and/or deliver live training. It is advisable to discuss the approach best suited to your situation before deciding. We typically follow up with an improvement plan based a prioritized listing of improvements tailored to your situation. You re embarking on what could be a lot of change but it need not be overwhelming. We often find that our customers can do much of the improvement work themselves provided they manage it well. They do occasionally need help from outside, particularly for training, coaching and program advisory activities.

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