

Example Summary of how to calculate Six Sigma Savings:

Six Sigma calculations are based on current period actual activity vs. prior period actual activity. Reported Six Sigma Direct Savings must therefore tie with all quarterly causal reports.

Types of Savings:

There are three primary types of Six Sigma Benefits: Direct Savings, Cash Flow Benefits and Indirect Benefits.

Direct Savings are those types that result in increased Segment Income during the current period versus the same period of the prior year.

Cash Flow Benefits result when net working capital accounts such as accounts receivable, inventory or accounts payable balances are improved as the result of a project.

Indirect Savings are any savings other than Direct. The most common examples are:

1. improving the capacity of one segment of the production line without increasing the total production line capacity in the current period
2. a business process has become out of control in the current year - a Six Sigma project results in regaining process control thereby saving costs, but does not reduce costs over prior year
3. Interest savings from avoiding planned capital spending through capacity improvements are considered as Indirect Savings

Establishing a Baseline:

Ideally, the baseline should consist of 12 months of actual cost data immediately prior to the beginning of the project. However, if data is not available, a well reasoned estimate may be determined with input from the Project Champion, Black Belt and Controller. If estimates are used, they should be reviewed and updated with actual cost data collected no later than three months after the commencement of the project. (Commencement is defined as the first work day after the first week of Black Belt Training.)

Reporting Savings:

There are two fundamental reporting processes: Black Belt certification and Quarterly reporting:

Black Belt Certification:

Summary of Black Belt Certification

1. Completion of approved Six Sigma MAIC training process
2. Demonstrated, effective use of all key tools of Six Sigma
3. Successful completion of a minimum of 2 projects, with a \$250,000 direct financial benefit target per project. Successful completion is defined as meeting or exceeding the benefits targets as approved by the group Six Sigma Steering Committee for that project charter.
4. Delivery of meaningful results - a total of \$500,000 direct financial benefits from 2 projects, or a total of 3 successfully completed, approved projects.
5. Approval by the Black Belt's Champion, Master Black Belt mentor/trainer, Financial Controller, and Group Steering Committee.

Black Belts must demonstrate success in attaining direct cost savings in order to be certified. A black belt candidate must deliver a minimum of \$500,000 in Annualized Direct Savings within the first two projects. When calculating savings for certification purposes, each project must be measured for at least three months - and in many cases longer than three months - in order to determine certification. The **first** of the two projects must be measured for up to 12 months after project completion with a minimum of three months. The amount of time the first project is measured for certification depends on completion date of the second project. If the second project only takes three months to complete, then the first project would be tracked for six months (three months during the first project + three months minimum to measure the second project. The savings figure reported that is less than 12 months must be annualized. For example:

A Black Belt completes the first project in five months and the second project in four months. That would allow for the first project to be tracked for seven months and the second project to be tracked for the minimum three months. Both project savings would then be annualized.

	<u>Mo.1</u>	<u>Mo.2</u>	<u>Mo.3</u>	<u>Mo.4</u>	<u>Mo.5</u>	<u>Mo.6</u>	<u>Mo.7</u>	<u>Mo.8</u>	<u>Mo.9</u>	<u>Mo.10</u>	<u>Mo.11</u>	<u>Mo.12</u>
Project #1	Project Phase					Post-Project Measurement Phase						
Project #2						Project Phase			Post-Project Meas. Phase			

If the annualized savings of the two projects are greater than \$500,000 then the Candidate is eligible to be certified. If the savings are less than \$500,000 a successfully completed third project is necessary to be eligible for certification (provided that all 3 projects were authorized by the group steering committee).

EARLY REALIZATION OF PROJECT SAVINGS FOR CERTIFICATION PURPOSES

In order to encourage the earliest possible achievement of project savings and to avoid penalizing a black belt for achieving early, partial project savings (i.e. an annualized savings rate lower than post-project savings) there is a special handling of realized savings prior to the closing of the project. If, prior to the completion of the Black Belt project, direct savings are already attained, the Black Belt may request that the controller begin measuring these direct savings. Any savings that are realized prior to the completion of the project will added to the annualized amount for post project savings. For example, a black belt achieves savings of \$50,000 during the project phase. During the post-project measurement phase the black belt achieves an annualized savings on the project of \$200,000. The amount used for certification purposes is \$250-,000.

2) QUARTERLY REPORTING

Similar to Causals, all reported savings for Six Sigma projects are calculated by taking the difference between actual costs in the current year versus actual costs in the prior year at current year volume rates. Stated in its simplest mathematical formula Six Sigma savings for manufacturing and variable nonmanufacturing projects is:

$$[(\text{Prior Year Rate} - \text{Current Year Rate}) * \text{Current Year Volume}] - (\text{incremental project expenses} + \text{depreciation on project capital expenditures})$$

For most non-manufacturing and manufacturing fixed costs the equation is:

Prior Year Cost - Current Year Costs

Categorizing Savings:

The attached flow chart will help to classify savings. In addition, other addenda to this guide offer a sample "Data, Assumptions, and Calculations" worksheet and a "Six Quarter Financial Horizon" worksheet to aid in understanding and tracking the results expected from each project.

Project Savings Calculations

Below are sample calculations. Most often a project will have multiple benefits. In these cases the samples below can be combined to calculate the total project savings. Each projected benefit must have its own baseline number to be measured against. Process measurements outside existing financial systems may have to be consulted for baseline measurements or to verify underlying changes expected to generate savings.

A) Manufacturing Projects

One very important point to note regarding Manufacturing Projects is the bottleneck issue. Many projects may involve the improvement in cycle times and output in one part of the production line only to move the capacity constraint to another point in the process. Direct Savings are recognized ONLY to the extent the final output is increased and sold. To the extent that constraint is moved elsewhere only an Indirect Savings is realized.

In the case where projects are required in several processes to improve final line output, the benefits from the final line output may be allocated to the various projects. Allocating the benefits is primarily a certification consideration as end of line output increase is what shows in financial statements.

Also, reducing REWORK costs will often be a result of improved processes. Any change in rework cost should be included in reported savings as a result of the project.

1) Direct Material

In all cases, the TOTAL effect of the change must be considered. Some changes may cause lower quality per part, increased labor required, or addition of other parts. When calculating yield improvements, any change in recovery credits must be considered (calculate NET improvement).

1) Material Change

(Old part cost - new part cost) x current period quantity used

Direct Material Continued

2A) Improved Yield - Alternative 1

(increased throughput quantity x part cost)

Looking at Yield as Reduced Input per Output

Input Qty	Part Cost	Input \$	Output	Cost/Output	Output Cost
120	\$ 5.00	\$600	100	\$ 6.00	\$ 600
100	\$ 5.00	\$500	100	\$ 5.00	\$ 500
				1 Lower cost/output	
			100 Output		
			100 Value		

Looking at Yield as Incremental Output

Input Qty	Part Cost	Input \$	Output	Cost/Output	Output
120	\$ 5.00	\$600	100	\$ 6.00	\$ 600
120	\$ 5.00	\$600	120	\$ 5.00	\$ 600
			20 Incremental Output		
			5 Part Cost		
			100 Value		

2B) Improved yield - Alternative 2

$((\text{Old Input Quantity Required per Output} - \text{New Input Quantity Required per Output}) * \text{Price} * \text{Output Quantity}) - \text{change in recovery value.}$

Note: **If** there is any increase in price resulting from fewer parts purchased because of higher yields, these price increases must offset the cost improvements.

3) Material Price Change

$(\text{Previous part cost} - \text{current part cost}) * \text{quantity used}$

4) Elimination of Materials in the Bill of Material:

$(\text{Price old} - \text{Price new}) * \text{Quantity}$
 $\text{Price new} = 0$

In other words, the prior period's purchase price * the current number of units produced is the amount of cost savings.

2) Personnel Costs

- 1) Labor Cost Reduction due to a change in either work content or a change in the applicable labor rate** $((\text{Base Compensation \& Benefits } \$/\text{Unit}) - (\text{New Compensation \& Benefits } \$/\text{Unit})) * \text{Units}$

Removing labor from a process may have three fundamental results:

- A) Cost Takeout
 - Must include the total effect of the project to avoid shifting costs from one process to another.
 - May arise from reducing headcount, reducing overtime, improving machine run-time availability, or achieving greater output with same level labor.
- B) Reduction of NVA
 - Labor time required is reduced, but not sufficient to reduce PAID hours per unit of output. This type of result is an INDIRECT financial benefit.
- C) Improved yield - (For Lean Process Lines)
 - Improved Yield (Work Content x increased output quantity x variable labor rate*)
 - Improved Process (Previous Work Content - current Work Content) x output quantity x variable labor rate starting labor rate for position + variable benefit cost
 - Work Content is the time to produce one unit of output, good or bad.

3) Capital Expenditure Avoidance Project

Achieve desired output by avoiding the alternative choice of capital expenditure.

(Capital Spending Avoided * Cost of Capital (7.85% annual) * period avoided) + depreciation expense for time period.

- Avoid cost of staff to operate capital equipment if capital spending is avoided.
- Spending should have been included in plan before project.

4) Growth/Capacity Expansion

Does the project allow greater final output compared to baseline? Is there demand for the output? (may be seasonal)

If increased sales are realized, project value is:

Calculation: Output Increase * Net Margin/Output.

If not, project may have future value, but no current impact. It is possible to increase capacity and not realized any direct savings if sales activity does not subsequently surpass the capacity prior to the project. This result would be classified as Indirect Savings. It is also possible to achieve partial usage of the increase in capacity. The amount of sales exceeding original capacity is reported as the Direct Savings. The portion of non-utilized capacity is reported as the Indirect Savings.

5) Warranty

Where warranty service expense can be specifically identified and associated to the black belt project savings in service expense can be calculated as:

$$\text{Original Warranty Service Expense} - \text{New Warranty Service Expense} = \text{Savings}$$

If service expense is not specifically identifiable to a defect addressed in the project, Savings is only recognized when the warranty reserve for a given product line is reduced based on historical evidence that actual warranty claims have been reduced. Calculation:

Original Warranty Reserve \$ Amount - New Warranty Reserve \$ Amount = Warranty Savings

Warranty and Service expense will only be calculated after a year of warranty service experience. Where internal quality metrics may be considered an indicator of external quality, the change in internal metrics may be used upon the agreement of the steering team including the Controller.

6) Price Improvement

Premium Delivered by Superior Product Quality/Service:

Project improves product quality or service to such a degree that a price premium can be charged. Price increase excludes market price change or economic material factors.

Calculation: $(\text{increased Price} - \text{Initial Price}) * \text{Quantity of Product Sold}$

7) Logistics Cost Savings

Any decrease in logistics costs such as the number of expedited premium freight costs, number of multiple shipments, change from more expensive form of transportation.

Logistics Calculation: $\text{Quantity of premium freight reductions} * (\text{premium} - \text{normal freight costs})$

Logistics Calculation: $\text{Reduce number of shipments} * \text{average cost per shipment}$

Logistics Calculation

$\text{Quantity of higher cost freight reduction} * (\text{Avg. cost of more expensive transportation} - \text{Avg. cost of lesser expensive transportation})$

B) Non-Manufacturing Projects

1) Working Capital Improvements:

This includes a reduction in Accounts Receivable balance, improvement in Trade Payables balance, or Inventory reduction. Working Capital Improvements are classified as Cash Flow Savings on the Project Summary Report.

A/R Calculation:

$(\text{Prior Year Receivable Balance adjusted to Current Year Sales Volume} - \text{Current Year Receivable Balance})$

A/P Calculation:

$(\text{Current Year Payable Balance} - \text{Prior Year Payable Balance adjusted to Current Year Sales Volume})$

Inventory Calculation:

(Prior Year Inventory Balance adjusted to Current Year Sales Volume - Current Year Inventory Balance)

2) **Reduce Administrative Costs**

Calculation: Prior year non-personnel costs at current **volume** - **Current** Year non-personnel costs

Calculation: Prior year personnel costs at current volume - Current Year personnel costs
If the project claims personnel cost savings, it **must** be proved that headcount is reduced or that productivity is increased.

Six Sigma Offsetting Expenses

Any expenses or capital expenditures that are incurred to implement project savings must be netted against gross savings:

1) **Cost of Implementation Incremental Expenses**

Any incremental expenses that are incurred to generate project savings must be subtracted from the reported "Gross" Savings to arrive at a "Net Savings" amount.

2) **Cost of Implementation Capital Expenditure**

When capital expenditures are involved to achieve project savings the Depreciation expense for given time period must be used to offset the "Gross" Savings to arrive at a "Net Savings" amount.

Six Sigma Definitions for Controllers:

Charter - The foundational document that is used to communicate the essential components of a Six Sigma project, including financial baseline and goals.

Cost of Poor Quality (COPQ) - Costs associated with poor quality products or services.
Examples: Product, Inspection, Sorting, Scrap, Rework, and Field Complaints.

COPQ Baseline - The historical costs (usually trailing 12 months data) directly related to a Six Sigma project.

COPQ Goal - The annual, projected costs directly related to a Six Sigma project after a new process is implemented.

Capital Expenditure Avoidance -The estimated capital expenditures that would have been incurred if the project had not been implemented. Capital Expenditure Avoidance amounts are **not** included in the "bottom-line" operating income Six Sigma savings, but are separately identified.

Cash Flow Improvement - The one-time (i.e. one year) result of a project that results in improving any aspect of Free Cash Flow, excluding an increase in Management Income. (For example: permanent reduction in Accounts Receivable or Inventory, increase in Accounts Payable, or other favorable results for balance sheet accounts).

Cost Avoidance - The estimated costs that would have been incurred if the project had not been implemented. There are two types of cost avoidance: Savings compared with Plan and savings not visible at all in the financial statements. Cost Avoidance amounts are **not** included in the "bottom-line" operating income Six Sigma savings, but are separately identified.

Cost Savings (also Direct Savings) - The 12-month COPQ Baseline less the 12-month **actual** amount of material and labor costs recorded after a new process is implemented. A positive result is a cost savings. A negative result is a cost increase.

Entitlement - What the measurements would be if there were no defects. The COPQ \$ associated with a project. The COPQ is almost always zero.

Execution Costs - The costs incurred at the local entity to implement the Six Sigma project (excluding Six Sigma training-related expenses).

Incremental Margin - The increase in segment income resulting from an increase in units sold (usually relating to a specific customer or customers), price increase or cost reductions other than material or labor savings.

Incremental Capacity - The dollars associated with the increase in actual units produced that exceed project baseline unit capacity.
The dollar margin benefits are included in Segment Income savings/improvements.

Indirect Savings - Any savings that do not result in cost savings versus the prior year segment income. (For example, cost avoidance projects, although valuable to the organization, do not improve the segment income over the previous year. Rather these projects primarily **prevent** increases in costs in the current year, and therefore **prevent** erosion of segment income.)

Non Value Added Activity - Activity in the production process that does not add value to the final product.

Net Non Value Added Savings - The result of a project that does result in cost savings in which non-value activity is transferred to a value-added activity. Non-Valued Added Savings is an indirect benefit. There is also a "No-benefit" NVA savings when the NVA is reduced, but not transferred to value added activity.

Projected Savings - The 12-month COPQ Baseline Costs less the 12-month projected (i.e. COPQ Goal) costs recorded after a new process is implemented. A positive result is projected cost savings. A negative result is a projected cost increase.

Rolled Throughput Yield - The multiplication of all the individual first pass yields of each step of the entire process.

Sustainability - The documented, proven ability to permanently deliver \$ cost savings as a result of project implementation especially relating to the control process.

Value Added Activity - Activity in the production process that adds value to the final product.