



Skills for Sustainability



Manufacturing Skills Australia

About quantifying benefits & costs

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About quantifying benefits & costs



About quantifying benefits and costs

This guide provides general information about quantifying benefits and costs. It explains the basic concepts and demonstrates that a range of options might be relevant, depending on the context.

The information is relevant to several units of competency in the MSS11 Sustainability Training Package; however the guide is **not** aligned to a specific unit of competency or AQF level.

Background/principles

The units of competency ask for a benefit/cost analysis (mathematically the inverse of a cost/benefit analysis) because:

- it is the benefit that we seek and which is important
- the benefit needs to outweigh the cost, or we are going backwards
- in situations where we cannot undertake all possible actions, or need to decide which order to do them in, those which yield the greatest benefit for the lowest cost (i.e. highest benefit/cost ratio) should be pursued first.

As the old saying goes, you can't compare apples and oranges, so to determine a benefit/cost ratio we need to have both the benefit and the cost expressed in the same units (usually dollars but could be anything else – e.g. pieces of fruit to continue our analogy).

In some businesses the sources of data will be managers or others who are responsible for accounts, finances, marketing, maintenance or engineering.

However some businesses may not have clear roles in some of these areas. In other cases useful data may not be available. So while sometimes we can get accurate dollar figures for benefits and costs, usually these are estimates and this is acceptable for the purposes of these units of competency.

These estimates may be based on measurements and calculations or they might require converting 'soft' information into quantifiable units.

Any assumptions which may have been made in coming up with these estimates should be stated for the sake of transparency in the workplace and to allow others in the workplace to challenge these assumptions and so the estimates.

This information aims to help to identify indicators and convert them to quantities.



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Quantifying benefits

Benefits are often measured in dollars. They may be sales or income improvements or costs that are not incurred. Others are harder to quantify.

The accounts department will have costs for most items, although possibly only for the organisation as a whole. Consumption by the work area may need to be estimated. Accountants can usually help with this.

The table below lists some typical benefits and suggests how that benefit might be given a dollar value. The table tends to have the items which are easier to quantify and the top and more difficult to quantify towards the bottom. An estimate should be made for all items if at all possible.

Item	Benefit	Basis of dollar cost
1	Solid, liquid or gaseous emission, fugitive emission or waste reduced	If this is a raw material use the purchase cost/unit If this is waste product, use the selling price/unit If this is an intermediary, make an estimate of value between material cost and product price depending on how far through the process it is. So, if the emission occurs 90% of the way through the process, it probably should be costed at 90% of the selling price.
2	Better material properties	Depending on the properties this could result in reduced costs through reduced amounts required, lower cost of material, fewer rejects, improved longevity of equipment and lower maintenance costs.
3	Waste to landfill reduced	Cost of disposal + cost of the material wasted as per 1.
4	Trade waste reduced	Cost as per trade waste licence + cost of the material wasted as per 1.
5	Electricity saved	Cost per kW.h ¹ as per the electricity bill. kWh can be estimated for an individual area by getting the power rating (in kW) for each item of equipment/appliance (see rating plate affixed to each item) and multiplying by the time it is turned on (in hours). This might be an average or an estimate. A smart power meter will provide better information.
6	Water saved	Cost per kL as per the water bill + cost per kL of trade waste if the water goes to trade waste. If water is part of the product, then a higher cost might be justified (see 1).
7	Fines and penalties avoided	These result from a breach of regulation. Cost is (probability of a breach) x (likely imposed penalty). Penalties can include the cost of cleanup and remediation which might be uncapped and the cost of compensation.

¹ This is the shorthand symbol for kilowatt *times* hours. It is also commonly shown as kWh.



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Item	Benefit	Basis of dollar cost
8	Negative market impact avoided	<p>The cost to sales of adverse consumer sentiment. The sales or marketing manager² would be best at estimating this.</p> <p>Questions to ask them might include:</p> <ul style="list-style-type: none"> • what decrease in product sales would you expect to result from XXX? • has there been an example when sales went down because of bad press/consumer sentiment? • what was/would be the dollar impact of this?
9	Positive market impact achieved	<p>Positive consumer sentiment can lead to increased sales <i>vis a vis</i> competitors and may also lead to the ability to command a premium price for being a sustainable product/company.</p> <p>Again talk to the sales or marketing manager.</p> <p>Questions to ask them might include:</p> <ul style="list-style-type: none"> • what increase in product sales would you expect to result from XXX? • has there been an example when sales went up because of good press/consumer sentiment? • what was/would be the dollar impact of this?
10	Share price increase	<p>Share price can be impacted by stock market sentiment. There is a market for 'ethical investments'. Share price can affect senior management reward packages (a cost) and also the ability of the company to raise capital on the capital markets for expansions and other major work. An extreme example of the adverse impact on the ability to raise capital is the BP Deepwater Horizon³ disaster when BP was being obliged to spend on average \$US54.5 million/day to try and stop the oil leak and minimise its environmental damage, but no bank would lend them money as the liability threatened to bankrupt BP.</p> <p>The finance manager would be the best person to talk to.</p> <p>Questions to ask the finance manager include:</p> <ul style="list-style-type: none"> • how much impact would XXX be likely to have on the finance market? • what change in our share price would you expect this to cause? • what impact would you expect this to have on our ability to raise finance?
11	Preferred employer profile improved	<p>Companies with a good reputation typically find it easier to recruit and retain employees. This can be a significant benefit when you factor in costs such as:</p> <ul style="list-style-type: none"> • temporary staff • advertising and recruitment costs • training • severance costs • lost productivity <p>The HR or personnel manager is the best one to talk to here.</p> <p>Questions to ask them might include:</p> <ul style="list-style-type: none"> • what impact could XXX have on recruitment and retention of staff? • what is the dollar impact of this?

² The terms 'marketing manager', 'finance manager' etc are used to indicate the person who has the responsibility for this function in your organisation, or some other suitable person.

³ The disaster was actually caused by a drilling contractor of BP, but BP was responsible none the less.



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Quantifying costs

Quantifying costs is usually easier than benefits. Typical costs are shown in the following table. Here costs have been restricted to the cost of implementing the proposed change.

Keep in mind that some of the benefits listed above could be calculated as costs instead. For example if a negative impact is high probability you could factor in the cost rather than the benefit from avoiding it.

If there are organisational standards as to how to approach this then they should be followed.

Item	Cost	Basis of dollar cost
A	Labour increased	<p>$(\text{Hours of work on project}) \times (\\$/\text{hour})$</p> <p>$\\$/\text{hour} = \text{hourly labour rate (gross)} +$ allowance for leave (annual, sick long service etc) + superannuation and other loadings + taxes etc</p> <p>The accountant is the best person to provide this data. In total the labour rate may be 1.5 to 2 times the base rate which the person actually receives.</p>
B	Material costs increased	<p>This might be due to additional material being used or different material that costs more.</p> <p>$\text{Materials cost} = (\text{cost per unit}) \times (\text{number of units})$</p> <p>Units may be tonnes, litres, items etc</p> <p>$\text{Cost per unit} = \text{purchase price per unit} +$ handling/storage allowance + other allocated costs</p> <p>The accountant is the best person to provide this data.</p>
C	Cost of finance increased	<p>Most businesses operate using other people's money, typically as a loan. Any money spent might attract an interest charge as an additional cost.</p> <p>Negative share market sentiment can also have an effect here, making it harder and/or more expensive to raise capital.</p> <p>The accountant is the best person to provide this data.</p>
D	Business overheads increased	<p>Business overheads are costs that do not relate directly to production; for example electricity, rent, administration and IT.</p> <p>Many businesses allocate a share of these costs to different sections or divisions, based on floor space, number of staff or other criteria.</p> <p>These might be significant if you are looking at changes such as increasing the size of your work area, running additional equipment or extending shift hours.</p> <p>The accountant is the best person to provide this data.</p>



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Other methods of quantification

Semi-quantitative data

It is desirable to quantify in dollars when possible as this is a common unit of measure which is understood by management and others. It also allows for comparison with other possible projects requiring the expenditure of effort and perhaps money. Where it is not possible to bring benefits or costs down to dollars, other methods of estimating relative quanta may need to be used. These may be regarded as semi-quantitative methods. As long as all data is compared using the same approach, the results can still be justified.

Semi-quantitative methods may also be justified when there is a long list of possible projects, each with a difficult path to achieving dollar benefits and costs. Here the semi-quantitative methods can be used to reduce the list to those offering the greatest benefit which can then be subject to a more formal dollar based benefit cost analysis.

Semi-quantitative methods are also useful when a strict financial analysis does not give a clear answer and a rational method of making the decision is required.

Indirect measures

There are a range of indirect measures which are often used as a proxy for hard data. Some of these are mentioned below. These can often be turned into semi-quantitative data and monitored over time to look for trends and patterns. The actual numbers generated may not be all that significant, but the changes to those numbers are frequently significant. They might also be used to make a comparison between options.

Examples of semi-quantitative data

So where might semi-quantitative data come from? It is about counting, measuring, quantifying or ranking things that are not already numerical.

Media coverage is a good example because it is often used to measure aspects of social sustainability such as community image or profile.

This might be done by counting the number of articles and/or measuring the 'column inches' (or column millimetres) in the newspapers. This is a simple measure of whether or not you are being noticed – the longer the article (more inches/millimetres) and the more articles the more you are being noticed (column inches are added). You can apply this to radio and TV, except it will be minutes of news coverage, comment by the reporters or audience 'talk back'.



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You might want to look at the items and the column inches for positive mentions (i.e. you're reported for doing something good) compared with negative ones (something regarded as bad). You could compare local, city wide or national/international items.

Counting complaints is also a useful measure. Customer complaints typically reflect their view of some aspect of quality (amount, specification or timing). However, there may also be other complaints through letters or emails or directly from your organisation's web site. These should be monitored. Complaints may also show up as 'letters to the editor' in either the local or national press. You should decide whether these will be counted as complaints or as media coverage.

Similarly you could count web page hits and click-throughs as a measure of public interest in your business. You can also track whether web users look at your profile and sustainability information or just your products.

Facebook, Twitter and LinkedIn can also provide 'data' about the number of 'likes' 'tweets' and connections that you generate. Again, you can analyse these for positive and negative feedback and for different topics.

Surveys are also sometimes used to determine people's attitudes. Some organisations routinely conduct both internal and external surveys to determine 'opinion' or 'mood'. Marketing surveys are also often used. The data from these can sometimes be used to estimate response to a proposed change, or sometimes an organisation will conduct a survey to determine the possible response to a proposed change.

Where budgets, timelines or other factors don't allow for a survey, but you want survey type data, interviewing a few 'opinion leaders' will often yield almost as good a result. It usually only takes a bit of observation or a few questions to determine the handful of people who help form opinion. In the community it might be the activists or the council members. In the workplace it may be the union delegate or the person who is always talking to everyone during breaks. Sometimes it is those with formal leadership positions. A quick chat will usually extract more information than formal questioning. Responses can then be categorised on a consistent scale to allow for easier interpretation.

Internal data is also often available. Staff turnover and sick days is often used as a proxy for staff morale. Labour productivity (i.e. output per person) is also a valid measure of staff morale. These are lagging indicators (i.e. they tell us after the event), but if they show morale is declining, it is an indicator that something should be done. Staff morale is part of social sustainability.

Even less formally, if your workers wear a recognised uniform at work, are they prepared to walk around the shopping centre or go to the pub in it or do they get changed and only go incognito? Do your employees tell people where they work, or do they avoid the issue? Again this is a lagging indicator and difficult to quantify, but it is a real measure of community opinion. The issue can be fairly easily quantified



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by estimating the proportion of employees who are happy to walk around the community in their uniform – a simple five point scale is sufficient and may be obtained by causal chats over a cup of coffee or a formal interview. Or it may just mean sitting in the local shopping centre after knock off time and counting the employees there and noting how many are in uniform.

These measures might be crude, but they do provide useful data.

Quantifying and ranking semi-quantitative data

First, what sort of rating scale should be used? One that's typically used to rank the impact of incidents is:

- impact only within the site – very low rank – say give a score of 1
- impact only in the local area – low rank – say give a score of 10
- state wide impact – moderate rank – say give a score of 50
- national impact – high rank – say give a score of 80
- international impact – extreme rank – say give a score of 100

On this system, the lower the score the better.

Alternatively we may look at how long the impact lasts:

- less than one day, self remedying – very low rank – say give a score of 1
- less than one day but requires remedial action – low rank – say give a score of 10
- permanent change, cannot be remediated – extreme rank – say give a score of 100 (or higher)

Obviously these two systems can be combined therefore giving an impact matrix ranging from 1 to 1000 (rankings are always multiplied, not added).

Weighted rankings

The use of weighted rankings is one method of discriminating between competing alternatives. This is best done with an expert group, or virtual group (i.e. individuals acting alone but whose input is then combined). The use of a real group, if practical, allows for easier discussion of possible rankings.

To use this method:

- agree the decision criteria
- give each criterion an importance ranking from 0 to 10, 10 being the most important
- give each criterion a probability score from 0 to 10, 10 being most likely to deliver (or likely to deliver the most of this criterion)



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- multiply probability and importance scores to obtain a weighted rank
- repeat for each alternative
- add the weighted ranks for the alternatives – highest score wins.

So, as an example, do we put in a wastewater treatment plant or construct a wetland on some vacant land next door?

The engineers have costed each alternative and found that (on a discounted cash flow basis) they have similar costs. The environmental section has found that the water flowing from each is of similar quality. Which to do?

Criteria	Importance	Wet lands			Treatment plant		
		Probability	Calculation	Weighted score	Probability	Calculation	Weighted score
Attracts birds	1	10	1 x 10 =	10	0	1 x 0 =	0
Community support	8	10	8 x 10 =	80	0	8 x 0 =	0
Low ongoing maintenance	8	7	8 x 7 =	56	2	8 x 2 =	16
Low initial capital outlay	8	2	8 x 2 =	16	8	8 x 8 =	64
Positive media profile	7	7	7 x 7 =	49	3	7 x 3 =	21
Act as carbon sink	3	6	3 x 6 =	18	0	3 x 0 =	0
Totals				229			101

So, the wetland wins. An advantage of this method is that the decision process is transparent and easily done and demonstrated.

