QUANTIFYING THE WASTE — WITH EXAMPLES AND TIPS

WHY?

Quantifying the waste does three things for you. First, it helps you distinguish between the big-hitters and the nice-to-have improvements so you focus on the most important opportunities first. Second, it makes the organization aware of the cost of a delay in tackling a 'big-hitter'. If a problem is wasting $5 million a year, every week of delay is wasting nearly $100,000, so the organization wants to make sure nothing slows this improvement effort. And third, quantifying the waste enables you to have more meaningful discussions with other parts of the organization whose support you need to change the processes that cause the waste.

HOW?

1) Identify if and how the problem affects the four forms of waste: lost sales, material costs, time, and capital costs. If the problem causes delays, think through and estimate the form of waste that the delay results in. Does it increase capital such as inventory or receivables? Does it delay sales and revenue? Does it cost you customers and future business? Does it require additional people time?

   Many problems will affect more than one of the four forms — lost sales, material, time, and/or capital. For example, excess inventory not only ties up capital, but may increase the number of people who need to manage it, the warehouse costs to store it, and the probability of scrapping it. All these factors can be reasonably estimated with some historical data and getting close enough to the work.

2) Quantify the impact, recognizing that assumptions and estimates will probably have to be made. If you have or can gather data, use the data and document where you got it. If you must use assumptions or estimates, document how you came up with that — who did you talk to? Perhaps document a range that you are pretty confident about. The Conway Waste Calculator can help with the documentation.

3) Do the math to roll it up into annual dollars. The Conway Waste Calculator can help with that.

QUANTIFYING WASTE EXAMPLES

A CABLE COMPANY HAS A ONE MONTH BACKLOG FOR INSTALLATIONS.

Due to a variety of internal factors, it takes approximately 30 days between the time a customer calls to request a new cable installation and the time it is fully operational. Invoicing does not begin until installation, so opportunity

for a day of revenue is forever lost for each day between order and install. What's more, the longer the delay, the higher the number of new orders that cancel before becoming activated.

To calculate the waste, you might ask these questions:

- What is the cancelation rate when the backlog is 1 month? *(answer: 4% on average)*
- How many installs per month? *(answer: it varies, but on average 900)*
- What is the monthly revenue per install? *(answer: $110)*
- What are the costs to us associated with each install? (*answer: it costs us $90 to perform the install, but after that we have no incremental costs)*

With this information, we can quantify the annual waste. The waste in lost revenue and margin due to the cancellation is (12 months * $110/month * 2 years) minus the $90 one time install cost = $1,275 for each cancellation. The business receives 937 orders per month of which 900 are installed and 37 (4%) cancel so the annual lost revenue from cancellations is ($1,275 * 37 cancels per month *12 months) = $566,100. The lost revenue associated with the delay in installs = 900 orders * 1 month backlog * $110 = $99,000 per year. (For this second calculation, you do not net out the installation charge, because the company still incurs it — just one month later). Total waste of lost sales and margin = $566,100 + $99,000 = $665,100.

A BAKERY HAS A PROBLEM WITH THE BREAD SLICING MACHINE.

Periodically the slicer malfunctions and ruins a number of loaves of bread. In addition to having to throw away the loaves, it takes time to fix the machine. And we lose the sales because we cannot start the batch again for a few damaged loaves.

Key questions:

- How many leaves are ruined? (answer: 30 loaves a shift on average)
- How many shifts do you have per week? (answer: we have 2 shifts a day, seven days a week.)
- What is the cost of the loaves? *(answer: $.50 per loaf)*
- How much time does it take to fix it? (answer: It takes two operators about 15 minutes, each shift)
- What do the other workers do when it is being fixed? *(answer: they work on other orders)*
- Does it affect the customer? (answer: we have to short ship. We lose the sale)
- What is the lost profit margin? (answer: each loaf would have produced $.70 of gross margin)
- Have you lost any customers because of shorting them? (answer: no, we spread it around so no one is affected too much.)

So an estimate of the total annual waste from the slicer malfunction would be ($.50 * 30 loaves/shift * 14 shifts/week * 52 weeks = $10,922 in material waste) + (15 min/operator * 2 operators/shift * 14 shifts/week * 52 weeks = 21,840 minutes or 364 hours at a cost of $22/hour = $8,008 people's time) + (30 loaves/shift * 14 shifts/week * 52 weeks *$.70 = $15,288 in lost contribution margin) or a total of $34,218. This value can be compared to the other areas of waste to make sure you are working on the right things.

A FINANCIAL SERVICE COMPANY HAS A PROBLEM INVOICING CLIENTS FOR OUT-OF-POCKET EXPENSES

The internal process for collecting the out of pocket expenses was time consuming and error-prone. They found that invoices totaling $35 Million were in dispute because of errors with Out-Of-Pocket expenses. On average, invoices in dispute for Out-Of-Pocket expenses were paid 45 days later than invoices with no errors. They also found that one-fourth of the twelve person Billing staff was devoted to finding and resolving errors with Out-Of-Pocket expenses. The company was borrowing against a line of credit with a 15% annual interest rate. The excess outstanding receivables have an annual cost of capital of $647,260 (15% * $35,000,000 * 45days/365days). The annual cost of people time wasted on inspection and rework was $135,000 (3people * $45,000).

PRODUCING DEFECTIVE EQUIPMENT

A company manufactures a special type of equipment at full capacity, but the production process sometimes yields defects, and so the company has engaged contract workers to inspect these units. To estimate the cost of waste associated with poor production quality you would want to know the material cost that is scrapped, the cost of the quality inspectors, and the lost profits because we can't make as many units as the market demands.

Here is how we would add up the waste:

Form		**Description**	**Method**
Material	$ 5,460,000	= the $ value of equipment defects wasted per year	30 units per day are scrapped, seven days a week, 52 weeks a year, at a cost of $500 each
Time	$ 873,600	= the $ value of time wasted due to end product inspection per year	2,100 units must be inspected each week, requiring 12 minutes each at a cost of $40/hour
Capital			
Opportunity	$ 7,644,000	30 units each day are unavailable to sell	30 additional units a day, or 210 per week, at a marginal profit of $700 each
Total	$ 13,977,600		

The total waste associated with the problem is nearly $14M per year, or $268,800 per week! If the company were able to reduce the defect rate in half, they could improve the bottom line by about $6.552M which is half of ($5,460,000 + $7,644,000). They will not be able to eliminate the end-of-the-line inspection until they bring the process fully under control.

KEEP IN MIND:

KNOW WHAT COSTS WILL BE AFFECTED

In one of our examples, we described a bakery with loaves damaged by the slicing machine. The standard cost of the loaves scrapped included overhead, but the problem itself had no impact on the overhead expenses, and so eliminating it would not reduce the overhead — just allocate those costs to the other loaves. Nor did it affect the capital equipment requirements, because there was excess capacity with the existing capital. We used only the incremental cost of producing the loaves and did not include overhead or costs of capital equipment.

KNOW WHEN CAPACITY IMPROVEMENTS ADD VALUE

In some situations, a problem consumes any excess capacity and requires adding another big chunk of it, like another warehouse, paint room, production line, plant, office building, etc. In *those* cases, all of the waste of capacity has a very big impact. Failing to include the incremental capital cost as part of the waste substantially undervalues the improvement efforts. Prior to adding capacity, it is always a good idea to look for the ways that existing capacity may be leaking away through rework, waiting, over-processing, and other types of waste. Eliminating the problems driving capacity leaks can indefinitely postpone the expenditure on more capacity.

DON'T ASSUME YOU CAN GET RID OF ALL OF IT

Once you have quantified the waste associated with a problem, a follow-up question must always be: "how much can we eliminate?" For example, the Billing operation described in our examples will be able to greatly reduce the number of errors and the resulting delays in payment, but some errors and delays will probably remain. On the other hand, eliminating capacity leaks from the paint room, can indefinitely postpone the need for additional capital investment. When evaluating what to work on, consider not only the quantification of waste, but also the best estimate of how much can be eliminated by studying and improving the work.

It does not matter *how many* improvements you start and finish, but *how much* they will matter to the business that determines your long term success. Use quantification of the waste to identify the vital few opportunities in your organization.