AMQ International

Strategic Asset Management

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Greetings—and Happy New Year!

We begin one of our new occasional series in this issue— problem solving. Try your hand at the problem on the back page—our ideas will be in the next issue. If you want to send us yours, they can be too.

Advisory Panel for this Issue

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Does it Really Pay to Defer Maintenance?

The Snowy Mountains Hydro Electric Commission submitted the following problem. In one form or another this is an issue which causes a lot of ill feeling between asset managers, technical and finance people, who often have very different views on the answer.

Before you read our solution, over the page, what's your view? (We are not questioning the technical information, only what we do with it.)

Problem

"The pipeline costs about $100m to replace. Its life can be extended by painting it internally. If you paint before major corrosion sets in, say, every 20 years, then you can get about 6 repaints before you need to replace, which means a life of about 140 years. If you delay painting until rust marks are evident then the corrosion has already started to weaken the pipe. Delaying painting until the 25 year mark and painting in a 25 year cycle will save you money on painting but you will only be able to get two repaints before you need to replace.

The pipeline is now 20 years old and if you choose Option 1 (repaint every 20 years) then $5m of painting is due now. If you choose Option 2 (repaint very 25 years) then you can defer the spending of $5m for another 5 years but you will shorten the life of the pipeline from a total of 140 to only 70 years.

Whenever I do the sums the answer always comes out to defer the maintenance painting, but is this right? "

P.S. Assume an 8% discount rate

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Is this your response?

This problem was submitted to a number of asset managers.

Responses varied from the intuitive "gut" feel of those who have witnessed neglect at first hand many times, such as:

"Without doing the economic calculations, my first reaction is to do anything I can to prolong the life of the pipework NOW. I prefer to do something positive during my lifetime, rather than subjecting the pipework to calculated risks on future actions."

"Do it now! Anticipated future savings may not be reliable, and also can depend too much on the good sense of the next generation, if not taken over by other priorities in their budget allocation."

"If I delay the repainting now, I cannot guarantee that they will repaint it in 5 years time, as I cannot guarantee that I will be in the position to make the decision then. On the other hand, by painting it now, I am saving the next asset managers from having to do it, and let them concentrate on other priorities."

To those who did the sums.

"My 'quick and dirty calculations' —comparing the next 50 years for both options– shows the NPV of costs much lower for the "paint later" option than for the "paint now" option so on the surface it looks as if it pays to defer the painting.

Moreover, at the end of 2050 with the "paint later" option you have a brand new asset in place and have only spent $5.25 in NPV terms. With the "paint now" option you have a half deteriorated asset in place and have spent $7.26m (in NPV terms!) needed to make this decision.

To those who thought we may be missing some vital information

(Ed: the following shows a certain amount of suspicion of me, which is no doubt, well merited)

"Is this a trick question?
A whole bunch of assumptions has to be made, namely:

- Is the discount rate the right one, has it correctly allowed for inflation?
- The $100m replacement cost takes into account disposal costs and is net of any salvage values that might accrue.
- There are no service impacts associated with the earlier replacement
- There are no service impacts associated with deferred painting

... and perhaps we should be doing some sensitivity analysis?

And those who knew we were!

Net present value is a great tool if you use it properly. Unfortunately we often don't compare like with like.

For a proper comparison we must look at each option over the same time span—and that time span must include a full cycle for each option. In this case, this is not difficult for we can manage to do this by looking out just 140 years from construction but if, say, option two enabled the pipe to last 75 years, say, instead of 70 years, then we would have to do the NPV analysis over a 2080 year time frame!

Obviously we are tempted to make concessions to accuracy in the desire to get a practical result, but care needs to be taken as the following analysis will show.

I am indebted to Chris Adam of Cardno MBK for helping me to work through the calculations and risk aspects of the suggested solution.

Two Approaches

The Annualised Cost Approach Favours Option 1

Suppose the Asset Manager roughly calculated the average annual cost of the two options as follows:

Option 1
Maintenance $5m every 20 years = $0.25m a year
Plus Renewal $100m every 140 years = $0.714m a year
Thus Total Annual Cost **$0.964m** a year

Option 2
Maintenance $5m every 25 years = $0.20m a year
Plus Renewal $100m every 70 years = $1.428m a year
Thus Total Annual Cost = **$1.628m** a year

Thus Option **1** wins, hands-down, no question!

(Whether the sums are actually done or not, something like this argument normally underpins the gut reactions in favour of extending economic life. No discounting is done since no money is provided up front, it is simply a straight average of the monies that will be paid out over time.)

But the Finance Manager does not see it that way.

He looks at the current situation, now 20 years down the track, and sees that if he adopts Option 1, he will need to pay out $5m in maintenance NOW. With Option 2, he can defer that maintenance payment for another 5 years, that is, he will avoid the interest payment (or interest foregone) on that $5m for 5 years.

True, he will have to pay out the $100m somewhat sooner under this scenario – in 50 years time rather than in 120 years time, but the finance manager knows that "money now" is worth more than "money later", so he does his calculations and calculates the net present value of each future sum payable under the two options. (That is, he calculates what sum of money he would need to invest NOW, in order to get the requisite figure, say $5m, in 5 years time.

He uses a real discount rate, because the maintenance and capital figures he is dealing with are also real figures (that is, they have not been increased to allow for estimated future inflation)

Option 1 $5m/(1+r) + 5m/(1+r)^{20} + 5m/(1+r)^{40} + 5m/(1+r)^{60} + 5m/(1+r)^{80} + 5m/(1+r)^{100} + 100m/(1+r)^{120}$

Option 2 $5m/(1+r)^{5} + 5m/(1+r)^{30} + 100m/(1+r)^{50} + 5/(1+r)^{75} + 5/(1+r)^{100} + 100/(1+r)^{120}$

The Net Present Value Approach Favours Option 2

(*Note that the Finance Manager correctly takes the comparison over complete cycles of both options—a partial comparison can lead to wrong conclusions.)*

Using an interest rate of 8% real, the Finance Manager comes up with the following answers:

Option 1 will cost him, in Net Present Value terms, **$6,375,000** over the next 120 years.
Option 2 will cost him, in Net Present Value terms**, $6,060,000** over the next 120 years.

So in the Finance Manager's estimation, Option **2** wins, hands down, no question!

Note: At this stage, the Asset Manager may be appalled at the 'short sightedness' of the Finance Manager.—and the wastage involved in 'throwing away' 50 years of asset life.

Which one is Correct?

Firstly, both the calculations are right.

On average (and excluding the effect of inflation) the Asset Manager is right to say that with Option 1, the company will only being paying out an average of $964,000 a year, compared with $1,628,000 a year for Option 2

But what he hasn't taken into account is that with Option 1, the maintenance payments come earlier, and the earlier the payments are made (as the Finance Manager knows very well) the more they actually cost the company, when interest is taken into account.
So the Finance Manager is right in saying that, at 8% real interest, Option 2 is the most cost effective option.

Or rather, he would be, if that were all there was to it!

So, who is right, the Asset Manager or the Finance Manager?

Note that, on the present value analysis, the difference between the two options is $315,000 – over 120 years! In other words, the difference is just about $2,600 a year - (the cost, perhaps, of a couple of weeks of extra maintenance: labour + materials). Not really much. So it is worthwhile to see what other factors may affect the final decision.

The Risk Dimension

And the major factor is RISK. Consider the following: We know that the economic life of an asset group is really the mean of a distribution; in other words if the life is 140 years we would expect some assets in that group to start failing at, say, 110 years and some to last as long as, say, 170 years. So the Economic Life in this case is really 140+/- 30.

Now when pipes are ready to fail they usually signal this by the fact that they start to spring leaks requiring emergency maintenance. The number of leaks gradually builds up till it is more worthwhile to replace rather than to continue to patch. So before we reach the economic life point, we start to experience

- Costly emergency maintenance, and
- Loss of water, loss of production time, and
- Loss of corporate 'image'.

All of these losses (and costs) are incorporated in the RISK factor.

The "Risk Shadow"

Before the first asset fails there will be an increase in these risk costs and as more and more of them reach their own individual economic lives the risk costs increase. We can show this diagrammatically (see sketch below) as a distribution 'shadowing' the economic life distribution. This illustrates the increasing incidence of 'risk events'. The cost of such risk events will vary from company to company depending on the seriousness of downtime, loss of production, loss of continuity, impact on corporate image, etc.

What is apparent is that the risk increases when the asset is allowed to deteriorate to renewal stage earlier.

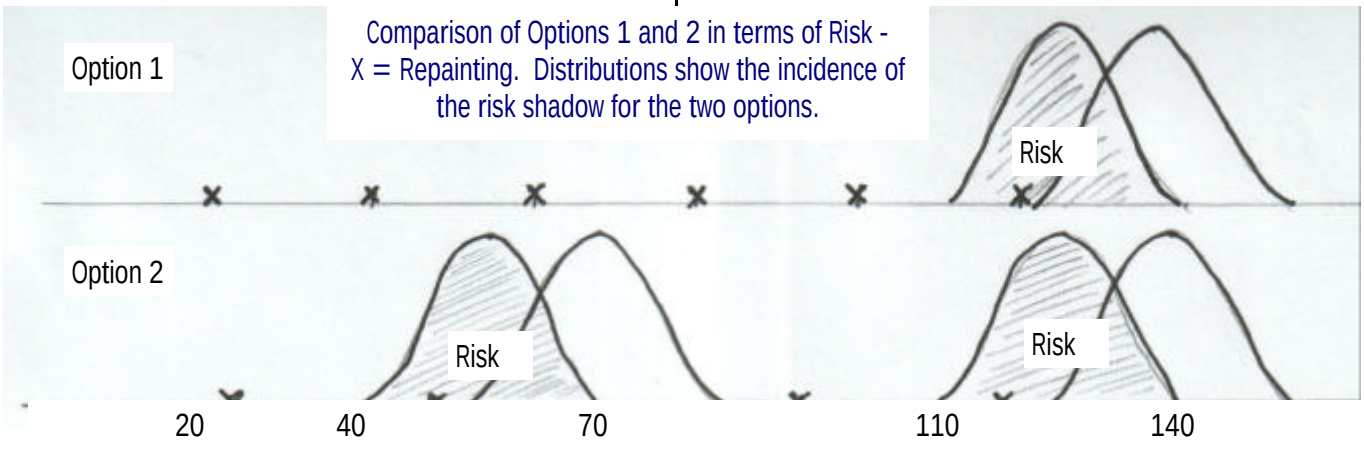
And not only does the risk increase – it is incurred earlier! Thus negating, somewhat, the interest benefits of payment deferral.

The Discount Rate

You may query whether 8% real is the appropriate rate for the Finance Manager to use – but whatever rate is used, the issue of RISK is a critical one for everybody to come to terms with. It is difficult to measure, but is very real. So whether you are an Asset Manager, a Technical or an Operations manager, or Finance Manager, why not get together and work out the real risk implications.

And watch for Issue 55 where we will look at some of the factors to be taken into account when determining what that interest rate should be – as well as questions such as:

- when to use real or nominal rates,
- when to use pre-tax or after-tax rates, and
- whether the discount rate should be the same as the hurdle rate.



Comparison of Options 1 and 2 in terms of Risk - X = Repainting. Distributions show the incidence of the risk shadow for the two options.

How to Reduce Capital Costs for Increased Effectiveness

(from an article by Tom Copeland)

This article is one that all government managers would do well to read—even though the original was directed at the private sector (or perhaps *because* it was).

Governments often believe they are "keeping up the capital spending" in order to create employment—yet, at the same time, they are busy creating unemployment (at considerable expense in handsome payouts) in the name of efficiency!

Here is a way to be simultaneously efficient, socially responsible and create long term sustainable value!

> 'When cutting costs, most companies look to layoffs.' There's a good reason for this, says Tom Copeland, Corporate Finance Manager at Monitor Group, a USA consulting firm: 'the markets usually roar with approval. When Eastman Kodak, for example, announced three years ago that it would lay off 10,000 people, saving an annual $400 million in payroll, its market capitalisation rose by $2 billion within a few days. Similar stories abound.'

But Copeland argues there is compelling evidence that a company can create more sustainable value by sensibly reducing its capital expenditures.

… and if it works in the private sector, why not the public sector?

'How?

Not by postponing or eliminating big spending projects, which are usually less than 20% of the budget anyway, but by conducting a rigorous, disciplined evaluation of the small ticket items that usually get rubber-stamped. Those 'little' requests often prove to be unnecessary – in some cases they duplicate other requests – or are gold plated.

But few managers have time, energy, or inclination to ask about them.

They should.

A solid evaluation of small-ticket capital budget items is straightforward. Just Eight Questions.

It involves a series of only eight questions, and the payoff is enormous. Cutting the capital budget increases cash flow dramatically, which can have an enormous impact on a company's value in the market place.' In fact, according to Copeland's research, 'a permanent 15% cut in the planned level of capital spending could boost some companies market capitalisations by as much as 30%. Better still the company gets to keep the heads – make that brains – that might have been fired. Paying more attention to small items in the capital budget creates that business rarity – a win-win situation.

But the eight questions don't get asked all at once. They should come in three distinct phases.

- Put the first three to y our operating managers as they assemble their capital project requests. The questions will help them submit airtight proposals.
- Put the next three to yourself and your colleagues as you examine the small ticket proposals. The questions will help you root out much of the gold plating and redundancy built into budget requests.
- Pose the last two questions at the end of the process. They will help you improve it for next time.

Why Small Requests Go Wrong

The root of the problem is that senior managers with very limited time at their disposal usually feel they can best serve the company by focusing on big-ticket investments. That's not to say that focusing on big-ticket items is wrong – those investments often have huge strategic importance – but one result is that senior managers end up rubber-stamping the small proposals that often make up 80% of the capital budget.

Why rubber stamping causes problems

Rubber-stamping, however, causes problems because the people preparing small-item capital spending proposals typically lack the experience or knowledge to think them through properly. And for a variety of reasons, unit managers will almost inevitably ask for more money than they need. Those reasons can be all too human.

And why it needs to be avoided

Many of the people who generate small-item spending requests are engineers. With the best intentions, engineers often indulge in gold plating. That's a natural by-product of their sensibilities – engineers generally value reliability, redundancy, and technical bells and whistles. Given a choice, they will include top-of-the-line supplies and equipment in their projects.

But it's not just engineers. Anyone at a middle or low level in an organisation is likely to be risk averse, which causes overspending. No frontline manager wants to be blamed for having ordered too few spare parts when a crucial piece of machinery breaks down and creates a product shortage. '

'Finally, a lot or overspending on small items is the result of a perfectly understandable dynamic. Managers on the front line have a natural tendency – even a duty – to focus on their own unit's needs rather than on whether their requests overlap with those of other units. And as we'll see, some duplication may be a consequence of processes and measures put in place by senior managers. In such cases, senior managers who fail to keep an eye on small-item capital spending have only themselves to blame.'

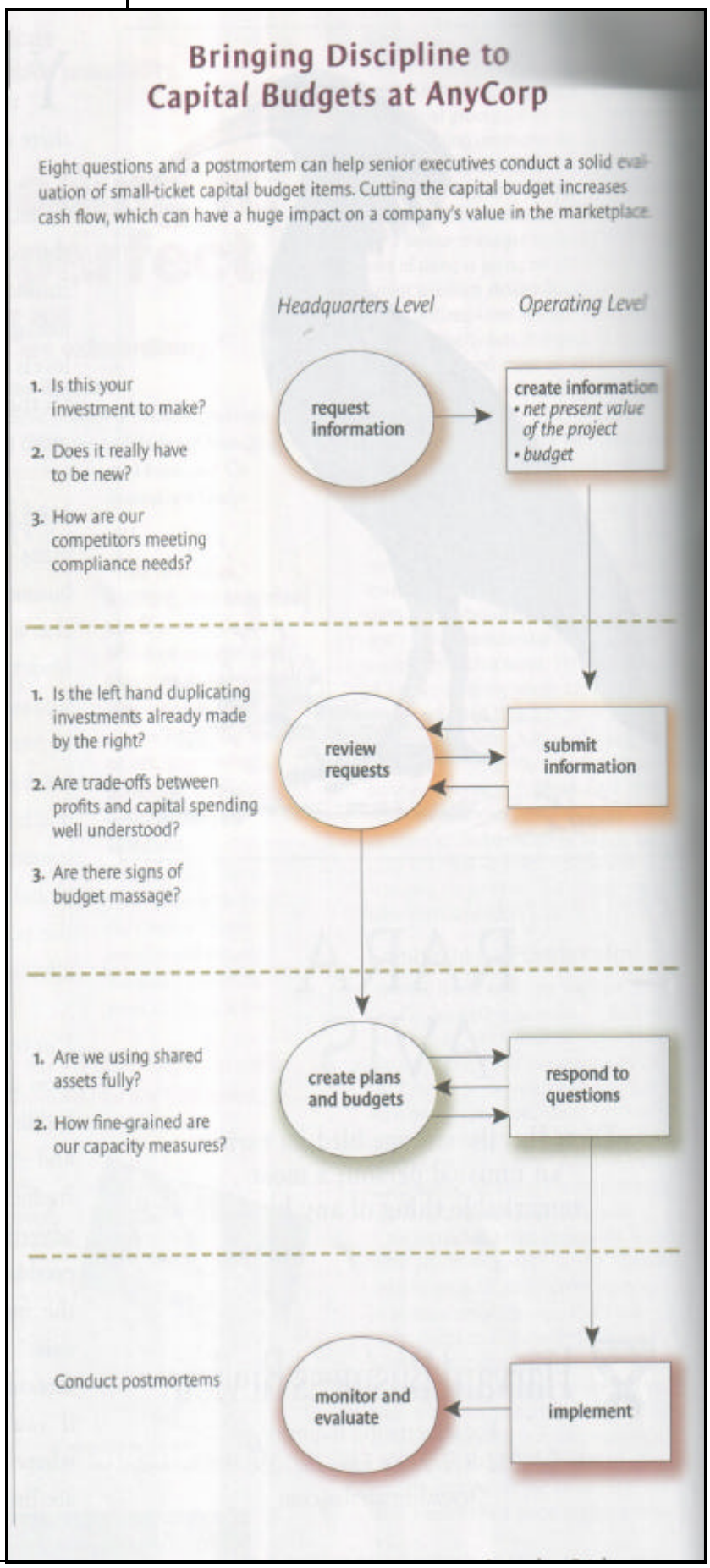
What can you do to root out waste?

For a start, consider the diagram on the opposite page.

'When did you last ask these questions of less than your big ticket items?' says Tom Copeland.

'A good audit can turn up surprising horrors. One of my favourite stories is about a telecommunications company I was advising eight years ago. In the course of reviewing the company's capital spending, I came across an internal rule specifying that all cables be laid at a depth of two meters. I asked the head of engineering about it, and he said that at two meters the cable network would be protected against a thermonuclear magnetic impulse created by the explosion of a hydrogen bomb. "Fair enough", I replied, "but what happens to your customers when the bomb goes off?" The company saved $80 million a year by reducing its cable depth to one meter. If you make the eight questions and an audit a part of your company's small-item capital budgeting process, you may well find a lot of buried treasure.'

***** This is a condensation of an article that appeared in the Harvard Business Review, September-October 2000 pp 155-164. It is worth catching up with the original for it goes into detail on each of the eight questions.



Problem Solving – Coming Next Issue

Every day you encounter real problems in your work, problems that really demand some free time to mull over and consider. You probably don't have this time. Many don't. So they send them to SAM.

"Does it Really Pay to Defer Maintenance?" published in this issue, started its life a few months back as just such a problem. See what you think about the solution we have come up with.

And now here is a request from a harassed local government engineer that we will cover in the next issue – you might like to see how you would have dealt with it, and then compare your answers with ours.

Roads & Priority Setting

"We tried to get ratepayers to use selected roads that we could afford to maintain but they always ended up using the shortest routes regardless of the quality of the road. So, for safety, we had to at least pay minimal attention to all roads, this has spread our maintenance budget so thin we are not able to maintain even our selected roads now. So all of our roads are degrading!"

And if you have a problem that is troubling you, why not send it in – this is a free service to all of our readers. If it looks as if it might be a problem that has application to many we will answer it in these pages. Individual problems we will also respond to, if we can, by phone, mail or email (so include your full contact details).

Send your problem to me at editor@amqi.com