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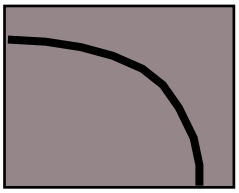
For Practitioners, Policy Makers and Planners in Public Infrastructure

Change your thinking - change your options!



We are all familiar with this traditional depiction of the infrastructure decay curve - initial slow decline followed by more rapid decline. This understanding colours our advice for early intervention - to prevent greater loss later on. And it lies behind the desire to keep condition at 75% or greater - before the curve turns over. This is costly but we argue that it is worth doing to prevent the greater costs of full reconstruction.

But is it true? (and how do we know it is true?)

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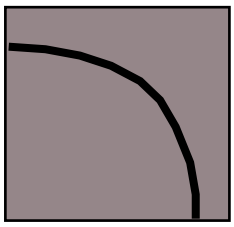
Editor: Dr Penny Burns, AMQ International
PO Box 75 Salisbury South Australia 5108
Telephone 61 (0) 8 8281 5795
Email: amqi@amqi.com

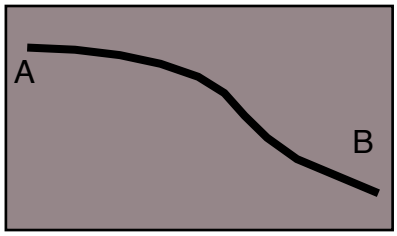
An accidental discovery

Documenting the 'End of Life' Sharp Decline



Anthony Ogle (Manager Infrastructure, Ashfield Council, NSW) set out to provide pictorial proof that if his council did not intervene when roads reached that critical section of the condition decay curve as it is about to turn sharply down, that the road asset would be irrevocably lost and the only option would be expensive reconstruction. In other words, he wished to demonstrate the shape of the decay curve to the left that we are all familiar with. He took photographs of roads that were in poor condition and then came back and photographed them some years later. They should have seriously deteriorated. *But they, in fact, showed very little change, even after heavy rains.*

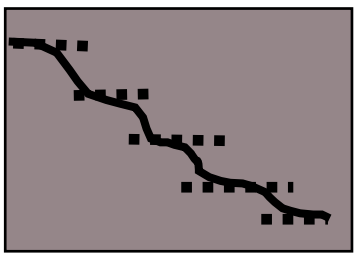
The results were *not* consistent with the traditional decay curve. In fact they were much more consistent with a decay curve that looks somewhat like the diagram to the right, showing a certain level of stability at two levels.



The London Underground

The results Anthony obtained, however, were quite consistent with an observation made to me some time ago by the Asset Manager of the London Underground who said that he could manage the infrastructure at a high level (A in the diagram above) or at a low level (B in the diagram above). For lightly trafficked lines, B would be OK, he said, but to achieve high volumes of traffic he required the condition to be set to A. (in other words, different service levels required different asset conditions).

When I mentioned this to Ashay Prabhu (SAM 119 and 120 on a Service Centric Approach) he was quick to point out that *once we focussed on service* there could be not two but multiple stopping points. We could choose whether we wished to maintain roads (and other infrastructure assets) at any of a number of points representing different service levels, giving us many more options. **- We just need to look for them!**



Observer Bias Can Lock Us Into Old Ways of Thinking

When a road is new, we expect to see it in good condition. If we take condition readings we take them at large spaced distances, reasoning that it is hardly worth doing more. But when the road has deteriorated we are likely to take more readings and at closer distances to demonstrate the wear and tear that has taken place. Without intending to, we can end up biasing our own results.

> There is an interesting story told, probably about the 1927 Solvay Conference in Brussels. On one side of the room were scientists who believed that energy was particles and when they looked all they could see were particles. On the other were scientists who believed energy was waves and when *they* looked all they could see were waves. Well at last one of the particle guys convinced one of the wave guys to come over and see if he could find particles. And now, when he was looking for them, that's exactly what he did find. How could that be? he thought. A moment ago all he could see were waves, and now all he can see are particles!
>
> This may be an apocryphal story but it makes the point that you often end up seeing what you expect to see. In the social sciences this is known as observer bias. Error is introduced into measurement when observers overemphasise behaviour they expect to find and fail to notice behaviour they do not expect. This is why medical trials are normally double-blind rather than single-blind.

How does this affect us?

Well, if we expect to see a degradation curve that turns sharply down, then we will look for evidence that proves that.

More dangerously, we may take action based on the assumption that this is the case, *and that action itself may blind us to the possibility that reality could be otherwise.*

Thus we may intervene at an early stage in the life cycle to 'prevent collapse'. When the collapse does not occur, we are confirmed in our original belief.

> But then so was the crow that crowed his heart out at 5 every morning so that the sun would rise!

The only way to see new possibilities is to look for them!

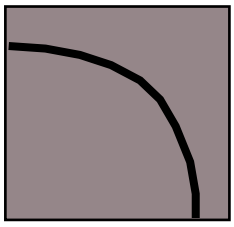
In the next few pages there are a number of new possibilities that you can look for - all of them providing prospects for new, lower cost, or better outcome options.

Change your thinking - and you can change your options

(The next 3 pages were inspired by, and use information from, a presentation by Anthony Ogle, Manager Infrastructure Ashfield Council, NSW, to the IPWEA Conference in Cairns. For further information, Anthony can be contacted at anthonyo@ashfield.nsw.gov.au **)**

We are now in a position to test the proposition that Roads decay in the pattern shown.

For a long time we have accepted as reasonable the traditional degradation curve for roads (and by extension, other infrastructure), that is that condition declines slowly at first, but after a point declines rapidly. The argument has been that we must intervene before the point of rapid decline. This view of road degradation has been derived from modelling done for high density traffic and then extrapolated to local roads. And most of the studies have been done in North America where icy winter conditions present a very different situation to the dryer conditions in Australia.



It is time to reconsider and we are now at a point where we have many roads in their end of life period and have the opportunity to examine how they fail in service functionality from both a condition *and a user perspective*.

When we do this, says Anthony Ogle, what we find is that many roads have greatly exceeded their design life but are still serviceable and acceptable to the public.

> *A case in point is the road outside my house. It was constructed 35 years ago and has not been resurfaced. I have been advising Council for over a year to renew it but basically they told me to "get in line, we have roads out there that have been waiting 40 years!" I have mentioned it to my neighbours but, since there isn't a sea of pothole repairs yet, they are not concerned. The worst of the areas (not surprisingly, the bend and intersection) have patches. But the rains over the last few months haven't greatly accelerated failure. Most likely this is because the only loads are the garbage trucks.*

Anthony's own explorations suggest that the degradation curve, at least for many council roads in Australia, may not fall away dramatically as in the diagram (see "An Accidental Discovery" on p.2) and thus there may be the option for maintaining roads either at the higher level (75% condition or above) ***or*** at a lower level (perhaps 30% or so) depending on needs and required service levels. If so, this means that asset managers have a wider set of options to choose from.

So, don't assume - do the studies!

Performance - From Whose Perspective? (Seeing through different eyes)

Engineers see *different types of* ***failure****:* load, wear, damage; age/UV; environmental.

Customers see *benefits*. They tend to judge by personal experience and media exposure. If they can still get where they want to go, and it is reasonably comfortable, safe and convenient then it satisfies their current wants/needs. They don't care about dollar valuations, depreciation and rate of deterioration.

Is Congestion Road Failure?
it seriously impacts service delivery

Accountants *actually see benefits too*. Although they *record value and decline in value (depreciation),* under the new accounting standards, public infrastructure value is based on the benefit going to those for whom the asset is provided. Their view is that if the public can and do drive on the road, and don't complain, they must be getting a benefit, even if the view of the engineer is that road integrity is at risk.

The new accounting standards require reporting on assets to match the true behaviour of the consumption of economic benefit.

Given the scarcity and competition for the large sums of public money for infrastructure and services, we are moving toward a more ***evidence based approach*** to our management of roads, and using the tools and language of accounting.

We are at a point where we have many roads in their end of life period, and we can examine how they fail in service functionality and from a user perspective. An examination of a number of case studies suggests that ***we may be underestimating the true service potential of roads***, and affecting our credibility in the competition for an increased share of the public purse.

Thinking 'Service Levels' Opens Up New Options

In this regard consider the work of Ian Greenwood, Opus International in SAM 175 where he pointed out that the user perception of road comfort was a combination of the quality of the road surface *plus* the quality of the car's suspension. Given that suspension quality is increasing, road surface quality *could decline and yet the user could experience the same service level!*

Users are influenced by equity and perceived 'fairness'. If, for example, one side of the road has been resurfaced but the other side has been only 'patched up', this can create the perception of poor service, where an equal treatment (*or lack of treatment!*) would not. (By extension one could surmise that the reason many users think our roads are 'bad' is because we continually tell them they are! **Change the message and we can change the perception.**)

Spending More is NOT a sign of AM Excellence

but Spending Differently may well be!

Some years ago the Facilities Management Association in the USA spent many years and a great deal of money to determine a scale of excellence in facilities management - and their answer? Whoever spends the most money is the most excellent!

Because we are convinced that maintenance and renewal have been under-provided for in the past, we often act as if spending more is a virtue. It's not.

More money for one purpose means less for others. And, today, there are a great many other spending options if communities are to maintain their living standards. Consider the following comparison of expenditures that Anthony Ogle provided in Cairns.

Major Personal Expenditures in 1973
- mortgage
- car
- medical
- public infrastructure and services
- charity

Major Personal Expenditures in 2007
- mortgage
- 2 incomes, 2 cars, childminding
- superannuation
- Carpet, security, air con
- OS Holidays, recreation
- medical
- Colour plasma 42" TV, video, DVD, stereo, ipod, freezer, microwave, PC
- HECS, private school fees
- Public infrastructure and services, signalling, DDA and various compliance, etags, meters, lighting

Spending Differently means Thinking Differently

50% of some local roads are parking lanes. For convenience we have tended to renew the entire road but do we have to?

Or, consider the European solution of putting bicycle lanes between the footpath and the parking lane to provide a safer buffer for cyclists - thus encouraging more bicycles and reducing road demands.

Thinking Differently means Being Aware of Changes

1. When proposing a new pavement we typically use a 75-85% confidence limit for local roads, and higher for arterial. Applying the same limits on Global Warming predictions, can we afford to NOT factor in the sea level rises that include the partial or full loss of the west Antarctic shelf or Greenland glaciers (6 and 20 metres). Failures of roads in the foreseeable future could include tidal inundation, saturated ground, foreshore erosion etc. How does this affect our design lives?

2.Asphaltic concrete although a commodity, is not necessarily constant over time and producers. As the higher end oil products change, so will the residue. Modern asphalt does not have the coal tars of old and is breaking up sooner than older roads.

Five Golden Rules for Increasing Asset Productivity

(From Network South East, British Rail)

The first issue of the "Asset Management Quarterly" (the forerunner to the current 'Strategic Asset Management) came out in March 1994. A good many of the ideas that we reported in those early issues are still good today. Each month I select one of these 'golden oldies' for the amqi.com website. The September Selection is the following, which was from a keynote address by C.E.W. Green to the Conference on Railway Engineering, Adelaide, September 1991. As you read it, reflect on the fact that it was written 16 years ago! And if you would like to see more of these Asset Management ideas why not access our Archives at www.amqi.com?

1. Any Asset Not Sponsored by a Business must be Scrapped!

Every single asset should be pinned down to a single business owner and then down again to a single owner within a business. Common assets "held centrally" are a recipe for waste. Application of this principle has reduced the locomotive fleet by 17% and wagons by 25%, saving $A210m.

2. If in Doubt, Cut the Asset Base Down

The trick is to live mean at periods of peak demand. Only 2/3 of the train assets and half the infrastructure and station capacity is needed off-peak. NSE has been able to handle a 20% increase in commuting with a reduction in coaches, and still reduce overcrowding. Timetables are rewritten at least twice a year to match changing demand patterns and no trains are scheduled for maintenance or cleaning in the peak. A 5% reduction in assets is worth $A26M per annum to NSE in reduced depreciation.

3. Sweat Those Assets!

Fenwick Street Station is a lean asset with only four platforms serving a daily throughput equal to Gatwick airport. It commands a huge station trading potential and new shops, pubs and buffets now yield a second and growing profit. Situated in the heart of the city, in an ultra expensive are of land, the sale of airspace above the station has been exploited to the ultimate. Two rival office developments were built across the top of the station - yielding even more profit to the shops underneath. In another case, falling traffic led to the closure of a station, re-direction of the route, and the station made way for office development. It is now earning 30 times as much as before.

4. Asset Synergy or Lateral Thinking

Encourage lateral thinking between groups of assets: two plus two equals a profitable five! A good example lies in fill-in electrification schemes such as South Hampshire where a pocket of old diesel trains operated in a largely electrified network. The traction function's problem was to make a financial case for new diesel trains but the solution came from the infrastructure group with a proposal to electrify the route instead for the same capital cost as the diesel trains. The operations function then demonstrated that they could 'sweat' the surrounding electric fleets avoiding purchase of any new electric trains.

5. Think Smart!

Low cost ingenuity can save millions of dollars of new assets. One division with a major communications problem but no hope of getting the $A11M capital investment from NSE, determined to solve its problem and finally hit on a short term solution of pocket 'pagers' for all staff. For set-up costs of $A30,000 and running costs of just $A33,000 per annum, the Control Office can bleep every member of staff whether on train, stations or trackside and send a 40 word consistent message detailing a cancellation, an emergency service or the business results of the day.

Vacant or under-utilised assets - how much are they costing you?

If a house is empty for, say, two weeks at every changeover whilst undergoing general cleaning and repair and, on average, house rentals change over every 2 years, then this amounts to one week per house per year during which house rentals are not being earned. What is this worth? Well, we could calculate the cost in terms of lost revenues. But if the service is being subsidised, then the lost revenues are only part of the story.

An alternative method that automatically calculate an NPV of future savings from reducing the changeover time is to calculate how many extra houses the downtime equates to.

If you have an average vacancy rate of one week per year and a housing stock of, say, 20,000 houses, halving your vacancy rate would be the equivalent of increasing your housing stock by 20,000/104 or 192 more houses.

Now calculate what 192 more houses would cost you and you know how much you could save from more efficient maintenance practice.

STAR RATINGS

Following the work on Star Ratings in the last few issues, I have had a lot of inquiries about our Special Interest Group.

I have uploaded some presentations, templates and notes on usage that have been supplied by Adrian Duff and Dean Taylor. They are available in the Downloads Section of the www.amqi.com site

but only if you are a registered member of the Special Interest Group.

We now have members from Australia, Canada and New Zealand.

If you would like to be registered and be able to ask and answer questions from other members and access the extra download material, it is free but you need to register your interest.

So just write to me at info@amqi.com and put Special Interest Group- Star Ratings in the subject line.

Penny Burns
Editor