INFRASTRUCTURE ASSET MANAGEMENT, MAKE EVERYTHING AS SIMPLE AS POSSIBLE, BUT NOT SIMPLER

Ross Waugh, Director, Waugh Infrastructure Management

Abstract

In a world consumed with complexity Albert Einstein's dictum 'make everything as simple as possible but not simpler' is a good challenge for infrastructure asset managers

Understanding that simple well - conceived solutions are sustainable solutions, the paper will unpack infrastructure asset management knowledge and measure it against the test of being 'as simple as possible'

The major infrastructure asset management components of levels of service, demand forecasting, risk management, lifecycle management, financial forecasting, systems and processes, improvement programs and asset information systems will be examined for being 'as simple as possible'

The paper will provide insights and value to practitioners from small, rural and remote communities and those from rapidly developing countries. Practitioners from large complex municipalities will also gain value as the paper discusses how to develop simple, sustainable infrastructure management solutions.

Key Words: Infrastructure Asset Management. Asset Management Practice. Simplicity in Practice

Are we making Infrastructure AM too complicated?

The question being asked in this paper is 'Are we making Infrastructure Asset Management too complicated?'

Having practiced in this field for over 30 years my observation is that I think in many cases we are.

There are multiple reasons for this – ranging from a desire to meet perceived regulatory requirements, organizational policy, individual choice, and just the sheer amount of data and analysis tools now available to the industry.

Many of us enjoy complicated analysis, and the ability to present the results of this analysis.

My concern is that collectively we can get 'buried' in the technical detail of infrastructure asset management and in doing so run the twin risks of:

- Paralysis by analysis
- Missing the 'right debate' with decision makers and communities

As a result of this concern this paper sets out the challenge of simplicity, with the desire to inspire you to apply this to your infrastructure asset management practice.

Moving AM from 'Art' to 'Science'

In the past decade or so Infrastructure Asset Management has moved from an 'Art' that was developed by very experienced practitioners applying many years of knowledge in the field, to more of a 'Science'.

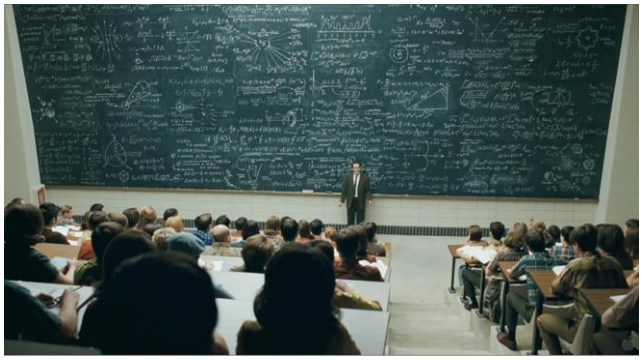
This shift from 'Art' to 'Science' is evidenced by:

- The wide range of national and international manuals, standards, guides and books that are now available and in use
- The introduction of ISO55000
- Sophisticated asset management information systems available
- The development of sophisticated models and modelling packages for analysis of optimised solutions – an example would be the IDS/Deighton dTIMS collaboration here in New Zealand.
- Increasingly sophisticated and automated asset data, condition and performance information to recognised standards
- Adoption of standardised materials testing and analysis
- A wide range of relevant university lead research and analysis across the world, that is available to industry practitioners
- Diploma, Graduate, and post-Graduate training and courses available to the industry
- A wide range of industry associations and government bodies supporting infrastructure asset management. IPWEA being one of these internationally

The risk of all these tools, training and techniques is that in the depths of our 'science' we lose the perspective and ability to communicate the key messages of infrastructure asset management.

These of course are not new issues to 'science' fields, and the challenge to our profession is how to manage this issue as we move forward.

Engineers like complexity – Why?



One of the intrinsic challenges of any STEM based profession, and Engineering / Infrastructure Asset Management is included in this, is that these professions attract people who excel in math, analysis, management of programs and projects. People who enjoy the use of complex and clever analysis and tools to explain issues and problems.

This is desirable based on the fact that these are the sort of skills that are needed in these professions, and over the course of time these skills have led to human and civilizational advancement in multiple fields.

This also has the potential to create problems, as these very skills that are desirable can also lead to over-complexity and developing more and more detail in analysis, that becomes harder and harder to explain to anyone else. Coupled with this is the issue that in STEM based professions very complex analysis and presentation is often used a proxy for 'intelligence' and 'expertise' – it can be an acceptable way to show others how expert and clever you are – in professions that place high value on these attributes. So there is plenty of incentive to develop in this direction, including affirmation from industry peers.

By adding layer upon layer of complexity, we in turn run the risk of turning Infrastructure Asset Management into a 'scientific religion', where the infrastructure asset manager becomes the 'Very Impressive Clergyman' – ably demonstrated by this image of Peter Cook in the cult movie 'The Princess Bride'.

For some professionals, this can be a further development of the 'I am expert and clever' attributes, which coupled with the 'scientific religion' and almost 'mystery' around the results, leads naturally to the unstated demand of – "Trust me, I know what I am doing"

If the past two to three decades has demonstrated anything in western society, it has been that communities on a whole are far less trusting of STEM professionals than they previously were – that applies to scientists, engineers, medical professionals, infrastructure asset managers and of course 'very impressive clergymen'.

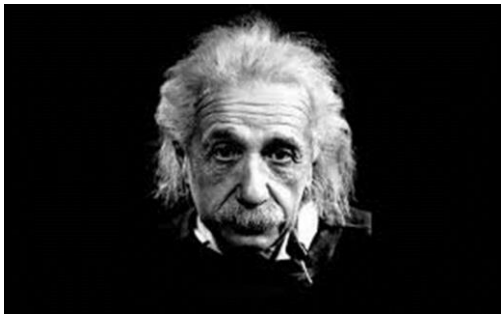
When "Trust me, I know what I am doing' is accompanied by requests for billions of dollars of public funding, as is the case with infrastructure asset management, then the response from communities and politicians has uniformly been – 'you had better explain some more, and better yet, convince us you are right'.

Sadly, often the counter-response to this request by Engineers and infrastructure asset management professionals has often been to build ever more complex models, based on larger and larger data sets (because we can), at higher and higher costs, to prove we are right.

Maybe this is not the best response to the question, because the response is based on industry internal dynamics that tend to more complexity in development of 'proof'.

The Challenge of Simplicity

The issue of complexity in STEM professions, areas of study, and analysis is not a new issue. In fact it has been around as an issue for a long time, and has attracted comment from some very famous and well known people. I offer two examples from the many available.



Albert Einstein stated: 'Make everything as simple as possible but not simpler'

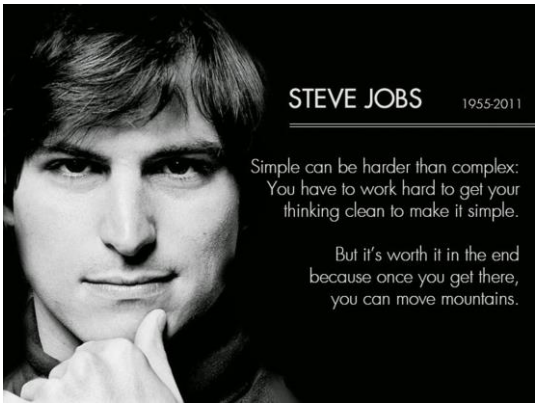
This is in fact a profound challenge to a STEM professional and in our case an infrastructure asset manager. Einstein's dictum poses some definition challenges straight up – what is as 'simple as possible' and what parameters would I use to define that? What is 'not simpler' and how would I know when this limit has been reached?

Once you start to think about these two very simple statements in relation to the work that you do, then believe me, it will really mess with your mind, your thoughts on the subject, and the way you think about, and approach your subject. It is a very good challenge, one that I would encourage you to take up.

Of course, you could always just go 'Einstein, what did he know?' and ignore the challenge.

To me the genius of Einstein is encapsulated in the simplicity of E=mc2. He could have filled boards with the mathematical proof of this theory, but he chose to express it very simply. The elegance of this equation is profound – I don't for a minute profess to understand much at all about nuclear physics, or the ins and outs of the interrelationships between energy, mass and the speed of light, and yet though Einstein's equation I can grasp enough of it to understand core principles.

It is that sort of genius, simplicity, and profound elegance that I would like to see us apply to the science of infrastructure asset management.



Steve Jobs stated: 'Simple can be harder than complex. You have to work hard to get your thinking clean to make it simple. But it is worth is in the end because once you get there, you can move mountains'

Simple can be harder than complex – Steve Jobs was not kidding there – in our profession, anyone with some level of skill and experience can make something more and more complex, but it takes hard work, a high level of skill and thinking differently to make something simple.

My challenge to you is to try this some time – making something significantly simpler than it currently is – it will really stretch you, and use all the skill and experience you currently have. The results are definitely worth it, as Steve Jobs observed.

If we briefly examine what Steve Jobs was part of building, Apple as a company, and the incredibly elegant, highly engineered and complex devices that Apple produces - that focus on a seamless and simple user experience, you can see the practical outworking of this philosophy. You will also see the world's most valuable company that has the highest margins in its industry – incredible.

Is it possible to apply this philosophy of simplicity to infrastructure asset management, and reap similar benefits?

I think we can, but to do so we need to change our thinking, and to focus on delivering simplicity, not complexity.

It is worth noting that Apple has incredibly complex products, built on the latest advances in computing, chip design, materials design, interface design etc. – but presented in a relatively simple, usable manner.

Please do not read this challenge wrong – we will still need our asset inventories, metadata, asset condition and performance analysis, optimisation models, service level trade-offs, capital improvement programs and models, risk models, capacity models, financial models and all the associated analysis and understanding – some of which is very complex in its components.

The challenge is – how do you get your thinking 'clean' to make things simpler. This requires the challenging of preconceptions and assumptions; of re-thinking, re-framing, re-imagining and re-analysing problems to come up with cleaner and simpler solutions.

To simplify you must fully understand

To simplify practice, analysis, delivery, or reporting you must have a full understanding and mastery of the subject or topic.

This is what both Albert Einstein and Steve Jobs respectively recognised and challenged.

You cannot explain nuclear or particle physics succinctly unless you fully understand an incredible complex topic.

You cannot reimagine and redesign computing as we know it unless you fully understand the current design limitations, bottlenecks, issues, problems, code, interface, power and a myriad of other issues.

Likewise, with infrastructure asset management, you cannot re-design, improve, and simplify unless you have a very good understanding of the topic and practice.

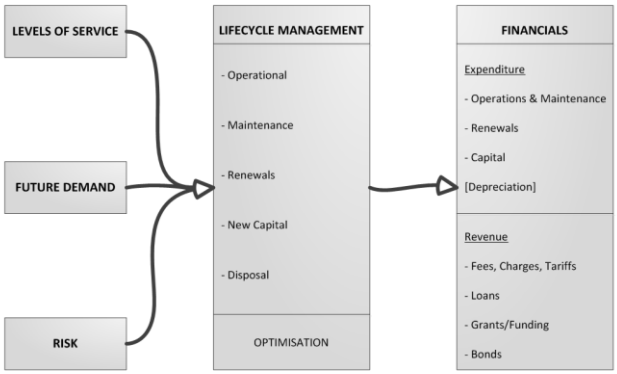
Conversely, if you try to re-design, improve and simplify, you will need to gain a very good understanding of the topic, which in itself as a professional is a very useful and helpful exercise.

So simplifying is much more of a professional challenge than just adding complexity.

Simple Infrastructure AM

How then, do we attempt to simplify infrastructure asset management, particularly so it can be used effectively across countries, industries, and from large authorities with complex assets and processes through to smaller authorities with simpler assets and processes?

I think the starting point is a review of the essentials of infrastructure asset management as set out in this Simple IAM Diagram



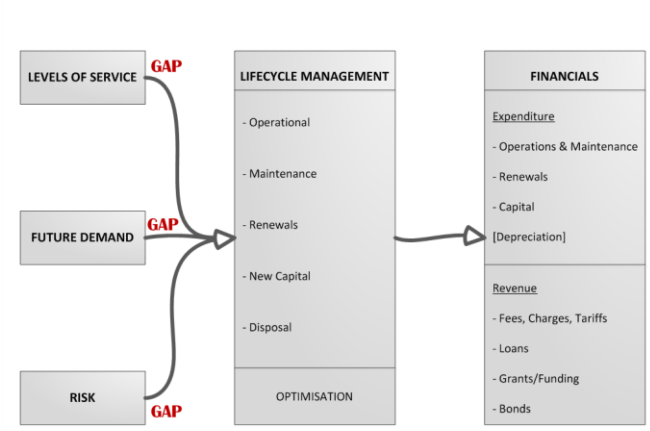
As inputs to asset lifecycle management we have levels of service, analysis of future demand, and analysis of risk.

Lifecycle asset management takes these inputs and develops lifecycle operational, maintenance, renewal, new capital and disposal programs and expenditure projections. These programs are analysed using available information (including asset condition, performance and risk) to optimise the programs.

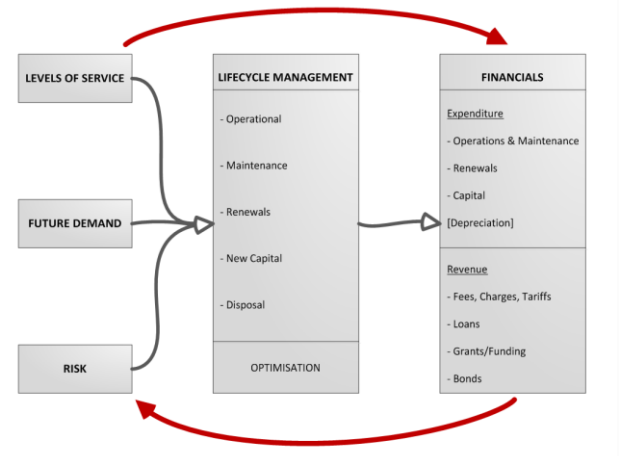
From the lifecycle asset management projections financial analysis and projections are developed – both of projected

expenditure and projected revenue. Optimisation analysis may also be applied to the financial analysis.

Information and analysis not shown in the simple diagram of asset inventory, systems and processes, people, management, improvements and the overall 'asset management system' (refer ISO 55000) support this core of infrastructure asset management.



Following the initial development of infrastructure asset management information and analysis, gaps will be noted in the inputs – levels of service, future demand, and risk, as shown in the second diagram above.



The resolution of these gaps, and associated assumptions may require re-examination of the lifecycle management analysis and subsequent financial projections. The cycle repeats though subsequent iterations as shown in the third diagram above.

When you reduce infrastructure asset management to its core, this is it.

I have used this diagram with my clients over the past year as we have completed another cycle of asset management plan updating here in New Zealand. My question to clients with this diagram has been - with all the technical detail and analysis are you clearly and succinctly discussing the core elements of infrastructure asset management:

- Levels of Service
- Future Demand
- Risk
- Lifecycle Management
- Financial Projections

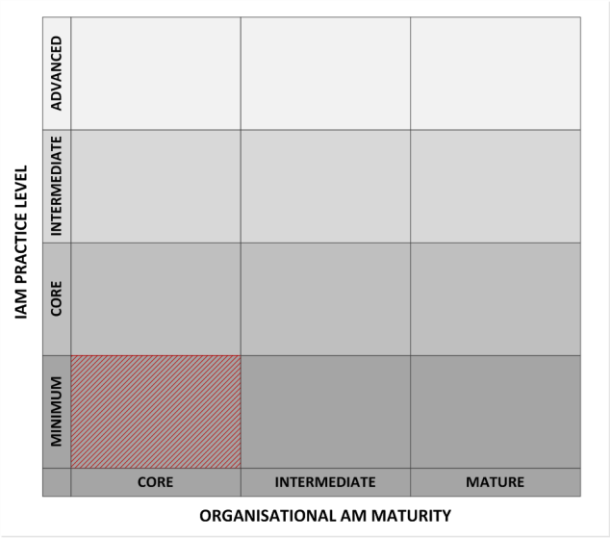
Further – are the linkages between these core elements, and the impacts of each element clearly and succinctly discussed?

It is so easy to get lost in the technical analysis and detail, and lose the ability to demonstrate how everything works together, where the impacts are, and how this influences the result presented.

Even though many are on their sixth iteration of asset management plans here in New Zealand, my clients have found answering these questions based on this diagram very useful. It has assisted them in getting the 'thinking clean' to quote Steve Jobs again.

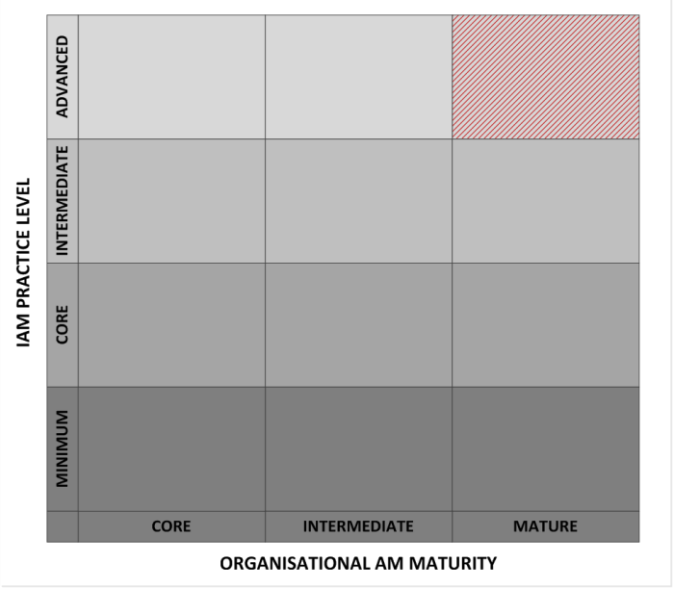
Simple Practice and Maturity

Let's take a simple look at this quadrant diagram with two axis – x being Organisational AM Maturity, with the three levels being core, intermediate and mature; y being infrastructure asset management practice level, with the four levels being minimum, core, intermediate and advanced; as set out in the International Infrastructure Management Manual 2011 edition.

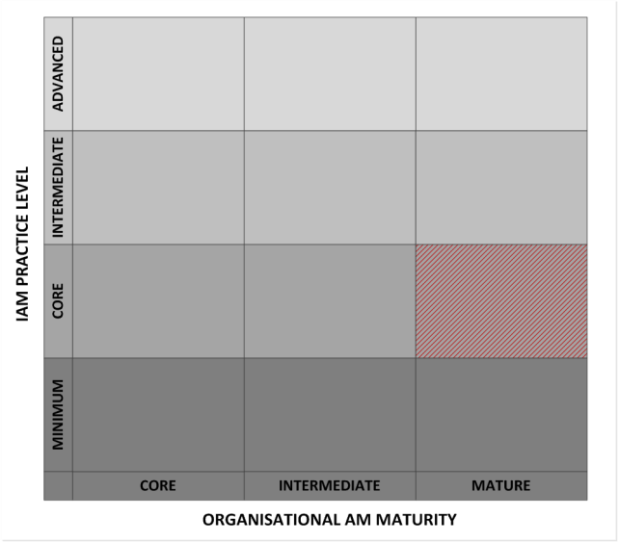


Initially every organisation starts its IAM journey with core organisational maturity and a minimum IAM practice level, and that is a good place to start.

Instinctively we all want our organisations to be in the position shown in the next diagram, that is Mature organisational maturity, and Advanced IAM practice level – because that is what we are meant to achieve? We all know how this game is played at that part of the diagram represents the best doesn't it?



Well, not necessarily. For some organisations, for the assets they manage and the communities they represent the following diagram might represent the best position to achieve.

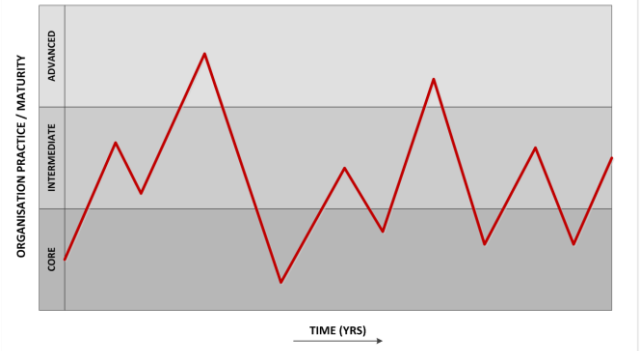


A Core IAM practice level and a Mature organisational maturity level might be the ideal position for that organisation. This also represents part of the path to simplicity – knowing what level of asset management practice is sufficient for your organisation, community, assets.

Once you know the level of asset management practice that is sufficient, the challenge is keeping to that – as previously discussed, our inclination as STEM professionals is to complexity, and being the 'best'. The challenge of this set of diagrams is to manage to be the 'best appropriate'.

Simplicity – Avoiding the Saw Tooth

For many years the 'saw tooth effect' represented in this diagram has been observed in organisational asset management practice.



The first presentation I saw on this effect was over a decade ago by Roger Byrne, then with GHD in Australia.

The effect is organisations expend a lot of effort and reach a relatively advanced level of asset management practice only to fall back over time to lower levels of practice, often to repeat the cycle again.

Observations of the reasons for this include key individuals coming and going from organisations, lack of embedding of IAM practice in the organisation and lack of management support (with associated resource allocation) to IAM.

This then becomes a study in organisational dynamics and the difficulty of organisational culture change, which might be the subject of a future paper.

I do know that across the world we are still observing this effect, and there isn't any easy answer to it.

I think that parts of the answer might be the application of the principles of the ISO 55000 standards, focussing on appropriate practice, and focussing on the challenge of this paper – keeping practice as simple as possible, but not simpler.

We will know in time whether these observations are accurate or not, it has been an issue for at least two decades now, so it is unlikely the solution will be easy or rapid – if it was it would already be resolved.

Simplicity – Communicating the 'Right Debate'

In his 2007 report to the New Zealand Parliament 'Matters Arising from the 2006-16 Long Term Council Community Plans' http://www.oag.govt.nz/2007/ltccp, Kevin Brady, the New Zealand Auditor General at that time raised the issue of the 'Right Debate'. The Auditor General's report highlighted the fact that NZ Councils as asset owning and managing authorities must provide clear information to the public about important issues, choices, and the implications of those choices.

This is a requirement of the New Zealand Local Government Act 2002 Section 93(6) http://www.legislation.govt.nz/act/public/2002/0084/latest/DLM172344.html.

So this communication of infrastructure asset management issues, choices and costs is still key, and still a mandated statutory requirement in New Zealand. This communication is required to communities, governance (both local and national) and to organisations management

The question is, 8 years after this challenge was raised by the Auditor General, how well are we really doing this communication?

My own answer based on my observations of the sector in the past few years - is that we are definitely doing better than 2006, where the sector got buried in a lot of technical detail and compliance related information.

As a result of further refinement of LTP summaries, AMP summaries, and the more recent requirements for audited LTP Consultation Documents and 30 year Infrastructure Strategies my observation is the communication is clearer, the big issues are better identified, and they are being communicated with more clarity.

A good recent example of just how far we have progressed since 2006 is the Selwyn District Council 2015 LTP Consultation Document. http://www.selwyn.govt.nz/council/plans/long-term-plan-20152025

This Selwyn DC Consultation Document is clear, makes good use of infographics and provides a concise overview of the key issues around each activity that Council is involved with. It is still 62 pages long. The infographics on pages 8, 9 and 10 provide a succinct overview of the key issues and expenditure.

Could we do better with this communication?

My answer is yes, we can still do much better. Improvements can still be made around:

- Clear communication
- Community participation and engagement
- Further unpacking of the impacts of 'big' issues:
    - Demographic change
    - Economic/Population growth
    - Economic/Population decline
    - Changes in local economies
    - Labour force availability
    - Infrastructure renewal investment
    - Technology changes
    - Climate changes
- Procurement of services

To enable this clearer and better communication our industry is going to have to rise to the challenges laid out by Albert Einstein and Steve Jobs – that is take ever more complex models, huge data sets, and sophisticated analysis, and express it simply so that a non-technical audience can understand the key issues.

I suspect we are also going to need a lot of help from communications specialists going forward – to assist us in testing and clarifying these messages.

Conclusion – Keep it Simple

Our challenge as a profession is to apply appropriate analysis to the management of our infrastructure; to simplify to the right level wherever possible; and then to communicate simply and clearly our infrastructure management issues to our communities, governance and management.

Based on observations of good progress made in the last 8 years since the Auditor Generals 'Right Debate' challenge, and my knowledge of the people, skills and passion in our industry, these challenges are ones I know we can meet.

The challenges I would like to leave you personally from this paper are:

- Make it simple
- Get your thinking clean
- Apply this to your work, and
- Communicate clearly

References

IPWEA, 2011, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au

Acknowledgements

Albert Einstein and Steve Jobs for great ideas, great inspiration and laying down the challenge of simplicity

Brief biography on the Presenter:

Ross is the founder of Waugh Infrastructure Management and is an asset management and systems integration specialist with 32 years' experience in municipal infrastructure asset management and engineering.

Ross has been consulting in infrastructure management for 16 years, in the practice areas of transportation, utilities, community facilities, parks and property.

Ross has contributed to a number of New Zealand national data capture, research, advisory, government enquiry, and infrastructure standard setting projects, and is a section author of the International Infrastructure Management Manual 2011 and 2015.

Ross is passionate about assisting people to practice infrastructure asset management holistically and comprehensively yet practically. His strategic analysis of client practices is balanced with a strong practical background that always ensures results not theory.

Ross has experience of five cycles of integrating infrastructure asset management planning with long term financial planning within the New Zealand context. Ross has also completed infrastructure asset management assignments in Australia and the Pacific. 70% of New Zealand Councils are clients, serving 85% of New Zealand's population.

Ross is a regular speaker on infrastructure asset management and has presented at peer reviewed conferences organised by IPWEA (NZ), NAMS (NZ) IPWEA International (Australia), IFME (Finland), TRB (USA) and ICMPA9 (USA)

Ross takes an active interest in on-going International infrastructure asset management trends and is the author of two infrastructure asset management related blogs - Waugh Blog, which has a New Zealand focus http://waughinfrastructure.com/waugh-blog/ and Inframanage Blog, which has an international focus http://inframanage.com/inframanage-blog/

Presenter's contact details

Ross Waugh

WAUGH
ideas | analysis | solutions

Waugh Infrastructure Management Limited

Level 2, 18 Woollcombe Street

PO Box 827

Timaru 7940

New Zealand

Mobile: +64 21 249 6547

Ph: +64 3 686 6994

Fax: +64 3 688 9138

Freephone: 0800 4WAUGH

email: ross@waugh.nz

internet: www.waughinfrastructure.co.nz