Assets
The Institute of Asset Management magazine February 2019

Routine procedures

How holistic asset management thinking is improving patients' experiences of dialysis

Value by design
Managing assets from the design stage

Q&A with
Incoming IAM CEO Kirsten Bodley

Model inspection
Streamlining inspection with AI

The Institute of Asset Management

First published in Assets, the magazine for Members of the IAM. August 2018

Letter from the CEO

It feels strange to have handed over as Chief Executive after so long. But I remain committed to supporting Kirsten and contributing as Board Member, Strategy & Development. My focus will be Chapters and knowledge/influencing, and our Charter Project.

I have had several discussions recently about how organisations learn – the Corporate Journey we describe regarding asset management leadership and culture. How can culture survive a change of leader? But my own experience of the British Army shows this can be achieved. I am increasingly interested in how asset management professionals can bring organisations the ongoing teamwork and merging of silos that they need.

I welcome Kirsten again, publicly, and look forward to keeping in touch with many of you as the IAM goes from strength to strength. I sincerely believe we are poised for significant growth and influence. Please get involved!

David McKeown – Chief Executive
CEO@theIAM.org

My thanks to David for his support to date – his are difficult shoes to fill! I am very excited about my role as Chief Executive of an organisation that has so much potential, such wide-ranging activities and a committed team.

My focus going forward will be on continuing to ensure we provide increasing value to all our Members, as well as marching forward with our thought leadership. I am truly looking forward to growing our success and to working with all our volunteers who offer such amazing support – thank you.

Kirsten Bodley – Chief Executive
CEO@theIAM.org

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The Institute of Asset Management
St Brandon's House
29 Great George Street
Bristol
BS1 5QT
44(0)845 456 0565
theIAM.org

Hugh Harford, Editor:
Hugh.Harford@theIAM.org

Josh Ellicock, Editor:
Josh.Ellicock@theIAM.org

Advertising enquiries:
Office@theIAM.org

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Assets guidelines and dates for contributions

The **Assets** editorial team considers all contributions from IAM members, so please send your ideas, views on the magazine and suggestions for future content to **Assets@theIAM.org**

Dates for the next issue, published May 2019:

- 4 Mar 2019: deadline for suggesting articles
- 7 Mar 2019: deadline for reserving advertising space
- 5 Apr 2019: deadline for submitting approved articles
- 4 May 2019: deadline for advertising artwork.

Guidelines for submissions:

- The ideal **Assets** feature article explains implementation challenges and how they were resolved, details the benefits and gives guidance on implementing asset management in asset intensive organisations. Note that not all **Assets** articles are features
- The **Annual Assets Best Articles** competition celebrates the features that succeed the best in achieving these aims, as judged by the **Assets** editorial team
- The editorial team reserves the right to edit submissions for grammar, clarity, style and length. The maximum length for **Assets** magazine articles is 2,000 words, but we accept submissions of any length, on the understanding that the article may be cut down or split up. We will send you the revised article for approval before publication
- Please include no more than one graph, chart or diagram per 500 words
- Not all story suggestions or submissions can be included. The **Assets** editorial team will inform you if your suggestion will be taken up following its editorial meeting
- Contributions should not be overtly commercial in tone – but if you would like to take out a quarter-page, half-page or full-page advertisement in **Assets,** please email **Office@theIAM.org** for details and rates.

If your submission is selected to be published in Assets, you will need to provide:

- any pictures as original high-resolution TIFFs or JPEGs for printing purposes

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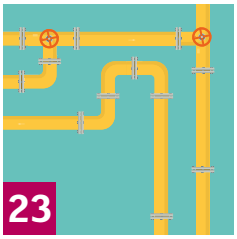

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Anna Will and David McNaught (page 9) are engineers working for Frazer-Nash Consultancy. Anna, a mechanical engineer, has cross-sector asset management experience, in particular in rail and energy. David is a specialist systems engineer whose skill set includes whole systems modelling, multi-criteria decision support and requirements capture and management.

Himanshu Jindal (page 18) has been with the Strategic Asset Management and Digital Transformation team at Downer, Australia since 2017. He is an MBA and engineering professional with more than 10 years' experience of global automotive and rolling stock organisations such as Mazda, Bombardier and China Railways.

Tejaskumar Soni (page 23) is a package solutions consultant at IBM global business services. He has more than 15 years' experience working with enterprise asset management systems and providing solutions in industries such as utilities, manufacturing, transportation and facilities management. He holds a BEng in Mechanical Engineering degree from Karnataka University, India.

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INSTITUTE NEWS

First-time award winners

Seven new IAM Award winners were inaugurated at the Annual Dinner on Day 1 of the IAM Asset Management Conference 2018 in November.

Helen Edmonds from SA Water became the first ever winner of the new Customer Service Award. The first ever Safety, Environment & Quality Award went to the Environment, Water Management, and Waterway Operations teams at the Canal & River Trust.

Source: IAM

For the full list of winners and runners-up, turn to page 13.

Malaysia Chapter's new lease on life

The first ever IAM Chapter, IAM Malaysia, officially re-launched at the IAM Asset Management Conference 2018 in November.

The re-launch will allow IAM Malaysia to incorporate lessons learned through the launch of subsequent Chapters, such as IAM Canada and IAM UK.

Source: IAM

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New addition to IAM UK

The South West Branch of the IAM UK Chapter was formed on 2 November 2018, making it the Chapter's ninth Branch.

The South West region of the UK is home to a diverse range of industry sectors that can derive value from asset management. In addition to those sectors that have traditionally been engaged with the IAM, such as utilities, rail and highways, the advanced engineering sector is also vital to the economy of the South West.

The region hosts the largest aerospace cluster in the UK, and the second largest in Europe. A quarter of the UK's defence spending is allocated to operations within the South West, with several major Ministry of Defence sites and key suppliers located in the region. The city of Bristol hosts government bodies such as the Environment Agency and the Department for Environment, Food and Rural Affairs. And Hinkley Point C, the first new nuclear power station to be built in the UK in a generation, is based in Somerset.

Ray Galeozzie, IAM South West Branch Lead, says: "I'm excited to be given the opportunity to set up a Branch in a region which is home to such a diverse range of asset-intensive businesses and sectors. We want to build on the diversity inherent in the region, encouraging collaboration and learning whilst creating an inclusive Branch that caters to experienced asset management professionals but is open to new sectors, new voices and new ideas."

Kirsten Bodley, CEO of the IAM, says: "Branches are a key part of the IAM's engagement with its Members, providing a great way for them, including newcomers to the field of asset management, to share best practice, as well as develop a strong local network of like-minded professionals. As the IAM's reach increases, Branches are a great opportunity for Members to get valuable insights as well as contribute."

A survey has gone out to Members in the region to help shape the new Branch, and an inaugural event is due to take place in April 2019.

Ray Galeozzie continues: "It's the intention for the Branch to meet on a quarterly basis. Noting the focus on engaging new sectors and different demographics, we will look to support NxtGen events in the region also.

"We have established academic links with the University of Bristol and initial discussions with South West-based Patrons have been very encouraging. We intend to leverage existing relationships with bodies such as the Association for Project Management and the Institute of Risk Management, who are established and active in the region, to explore the relationship between asset management and these related disciplines more fully.

"Recognising that the South West covers such a large geographic region, we will make best use of collaborative and social tools to support the community."

The local committee's drive, coupled with the strong industry presence in the region, will help ensure the South West Branch becomes an active and successful part of the IAM.

To get involved with the IAM South West Branch, or to share views on what you would like to see the Branch addressing, please contact Ray Galeozzie: **SouthWest@uk.theIAM.org**

Membership fees

The IAM is adjusting Membership fees in line with the past two years of inflationary rises. At a time when the organisation is continuing to grow, both in terms of Member numbers and the services and value it provides, the IAM is delighted to be able to keep its existing pricing points unchanged in real terms.

Members of the IAM (MIAM) get discounted access to the Institute's asset management knowledge base and development opportunities, along with professional development and career progression support.

The range of training and capability development services available will expand in 2019, with the launch of a series of seminars and workshops focused on:

- developing and implementing strategic asset management plans (SAMPs)
- key Subject Specific Guidance topics from *Asset management – an anatomy*.

The IAM would like to thank all Members for their continued support and commitment.

2019 Membership subscriptions

Candidate	£	Corporate Member employee	US$	Corporate Member employee
Individual	£130	£110	$195	$165
Student	£26	£16	$40	$25
Corporate	£880		$1,320	
Academic Institution	£275		$415	
NGO	£390		$585	

Additional currencies, including Euro €, will be added during 2019.

INDUSTRY NEWS

Have your say in future standards

Members of the UK's TC251 mirror committee, AMS/1, announced progress on new guidance for applying ISO55001 at the IAM Asset Management Conference 2018 in November. There are now opportunities for interested volunteers to support the development of this international standard.

TC251 is the ISO committee responsible for development of the ISO55000 series of asset management standards. AMS/1 is the British Standards Institution (BSI) equivalent. AMS/1 represents UK asset management professionals and acts as an interface with TC251, supporting the communication of new developments and supporting the ongoing development of both the standards and guidance documentation.

These include ISO55010, Guidance on alignment of asset management, finance and accounting, and ISO55011, Guidance on the development of government asset management policy. Both are due to be published in the next two years.

As global standards and guidance are refined and updated, AMS/1 is keen to draw on more of the UK's asset management experience and expertise. If you have something to offer, or you represent a sector without a voice on the committee, please consider volunteering.

Source: AMS/1

To get involved, contact Tim Ingram, AMS/1 Chair, at **UKAMCommittee@gmail.com** or via the LinkedIn group **UK Asset Management Committee to TC251**.

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BIM standards go international

The International Organization for Standardization (ISO) has launched the world's first series of international standards for building information modelling (BIM).

The new series of standards, ISO19650 (formally Organization and digitization of information about buildings and civil engineering works, including BIM – Information management using BIM) is based on two existing British standards, BS1192 and PAS1192-2. The British Standards Institution announced in 2018 that these two standards would be phased out in favour of the new international standard.

ISO19650-1 (concepts and principles) and ISO19650-2 (delivery phase of the assets) are available now. ISO19650-3 (operational phase of the assets) and ISO19650-5 (security-minded BIM, digital built environments, and smart asset management) are planned for 2020.

Source: Engineering.com

Heavyweight logistics

An 820-tonne, 96-metre petrochemical pipe recently became the heaviest load ever transported through Alberta, Canada's High Load Corridor: a network of roads specially designated for transporting heavy loads.

Following the journey, and in response to a study by the provincial government, Alberta is now considering upgrades worth US$1.2 billion to the High Load Corridor. The work could include strengthening bridges, widening roads and creating overnight rest areas along the network.

The pipe travelled 38 kilometres from Edmonton to Fort Saskatchewan over four days. Edmonton officials and the pipe owner, InterPipeline, had been planning the trip for more than a year. Under the arrangement, InterPipeline pays for any damage directly caused to the road infrastructure by the heavy load.

The 3,500-kilometre High Load Corridor was initially funded by the Alberta department of transportation, with costs recovered from the users of the corridor in the form of permit fees.

Source: World Highways

Systematic spending

In response to a UK Government plan published in November, consultancy WSP has called for industry to implement a joined-up approach to infrastructure projects.

The Government's plan presents a pipeline of public and private sector infrastructure projects – and a projection that infrastructure spending will hit £600 billion within the next decade.

To deliver the pipeline, the industry will need a joined-up plan for all types of infrastructure, including transport, utilities, housing and job growth, according to a WSP press release.

Source: WSP

Water supply project scales up

The government of Rwanda has secured an additional €115 million from the African Development Bank to support the Rwanda Sustainable Water Supply and Sanitation Programme.

The additional financing will mainly support water supply infrastructure, intended to provide 1.5 million more people with reliable and sustainable water supply services. It follows an initial €104 million loan from the African Development Bank and a €43 million Africa Growing Together Fund loan, approved in 2017.

With the additional financing, the programme is currently projected to provide 2.6 million people with improved water services and 475,000 people with improved sanitation. The programme's ultimate objective is to provide universal access to reliable water and sanitation services throughout Rwanda by 2024.

Source: ESI Africa

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In at the ground floor

Why is asset management expertise and support often suspended until the structure is delivered? Involving asset management expertise throughout the contract procurement stage would lead to better enterprise delivery models for building infrastructure.

– AUTHOR: Neil Walker –

Up to 90 per cent of an asset's lifecycle value is determined in the design phases, which means that any compromises in construction can have an adverse impact on costs, performance and longevity. After design and delivery, decision-making can only affect the remaining 10 per cent.

But by applying systems engineering and 'soft-landing' processes to these stages, which involves capturing and monitoring real-time and near-real-time data, the potential for increasing whole lifecycle value can increase significantly.

Queensferry Crossing, the new bridge across Scotland's Firth of Forth, is an example of the new 'always on' information culture. Here, data is analysed around the clock – on everything from wind speed and structural strain levels, to traffic volume and speed, to general wear and tear – as part of condition monitoring, so maintenance requirements can be forecasted more accurately.

Alongside this kind of continuous monitoring, the explosion of digital data sources can also allow asset management teams to create more efficient and value-driven approaches to infrastructure projects – right from the procurement stage.

By placing asset managers and operators within contract delivery teams, traditional asset management tools such as demand analysis and lifecycle value realisation can be used to future-proof designed solutions from the outset, rather than simply to prolong an asset's lifespan and support maintenance and repairs. This change can ensure that the right design is developed and approved before the construction phase, potentially optimising the 90 per cent of the lifecycle value previously inaccessible to asset management thinking and managing asset processes.

Until now, the asset ownership disciplines have had to take back-seat roles in the procurement process, advising designers and developers from the sidelines as opposed to being a project delivery partner working at the coalface of a new contract. This is because of the hierarchical and linear structure of the traditional construction operating model, which is frequently blamed for projects being delivered over-budget, past deadline and below the expected quality levels.

In the UK at least, we're now seeing a welcome change, with the Institute of Civil Engineers' blueprint business model – Project 13 – which has been developed in response to traditional transactional project delivery models failing asset owners, operators and their supply chains. These inefficient models have also had mixed societal impacts, particularly on end customers.

Project 13 will incentivise flatter structures than traditional asset procurement processes and pursue a new 'enterprise structural project delivery model'. This will increase the certainty of project delivery to cost, quality and time, while improving sustainable development outcomes throughout lifecycle phases.

We believe this change will open the door for people undertaking asset management and care functions to take authoritative roles in, and deliver new and much-needed insight to, contract tenders. With closer proximity to both the operational and capital expenditure data, asset management and care teams will be far better placed to provide in-house contract alliances with consultancy that can significantly improve the outcome of a project.

The model is still very much in its infancy. Only a few contract tenders across the water and highways industries have used the approach so far, but we expect adoption rates to increase. Coupled with increasing digital transformation, asset management is set to play a more central role in delivery teams for future infrastructure projects.

About the author

Neil Walker is a Technical Director and Business Lead for Asset Management at Sweco UK. Before Sweco, Neil worked at United Utilities and has held international roles in Australia and Saudi Arabia. Sweco employs 900 people in the UK and consults on engineering projects nationwide via its network of 15 regional offices.

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Optimising the dialysis day

Applied to a healthcare setting, asset management tools have helped improve kidney dialysis patients' experiences of treatment.

– AUTHORS: Anna Will & David McNaught –

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Caring for people with kidney disease is a clinical priority for the UK's National Health Service (NHS), with figures showing that about six per cent of the UK adult population has Chronic Kidney Disease (CKD) at stages 3 to 5[1]. The renal care pathway is a complex system made up of assets, patients, transport, staff and equipment. For the clinical units providing dialysis services, the ability to optimise patient treatment schedules while balancing unit capacity, budgets and staffing levels, and dealing with unexpected events and disruption, is a critical issue.

But the benefits of good asset management go beyond simply reducing costs or increasing efficiency. Minimising the impact of dialysis on patients' lives fundamentally empowers them, enabling them to continue to work or care for their family.

Dialysis machines are high value, bespoke equipment assets which must be operated in a sterile environment. Some CKD patients require three four-hour haemodialysis (dialysis) hospital treatments a week. Their quality of life can be significantly affected by the length of a "dialysis day" (**Figure 1**). Key factors include waiting for transport, transit time, dialysis unit capacity, staff shift patterns, peaks in the treatment day, and balancing dialysis unit occupancy against flexibility. Delays can be very frustrating, and can have a ripple effect – holding up other treatments – particularly if the unit is at capacity.

Aligning the management of the asset system around values that reflect patients' experiences, through a digitally-enabled service transformation, is key to improving service outcomes.

Frazer-Nash Consultancy worked closely with Nottingham University Hospital to demonstrate how systems engineering techniques can provide insight into a patient's day in a renal unit. Through a better understanding of an individual's dialysis day, the project aimed to identify tangible ways to enhance the overall patient experience and to improve outcomes for patients. This project was one of 14 supported by the UK's Department of Health through its Small Business Research Initiative.

Achieving the optimum balance between patients' needs, available clinical and staffing resources, and budgetary constraints is difficult, both from a short-term day-to-day viewpoint and a longer-term strategic planning perspective. Frazer-Nash took a holistic, systems engineering approach to the issues: one which integrated training, equipment, procedures, information infrastructure, personnel, communication, the supply chain, organisation and physical infrastructure elements.

Part of this assessment included understanding the patient pathway, from the time a patient needs to be ready for collection from home, through pre-treatment processes, the dialysis itself, and finally to the point where they can be dropped back home. The techniques used were similar to those Frazer-Nash applies in other safety-critical and highly regulated industries, where processes and behaviours interact to produce complex, difficult-to-forecast outcomes. A person-centric approach ensured that people, processes and infrastructure were all taken into account when considering how to fulfil the objective to improve patient experience.

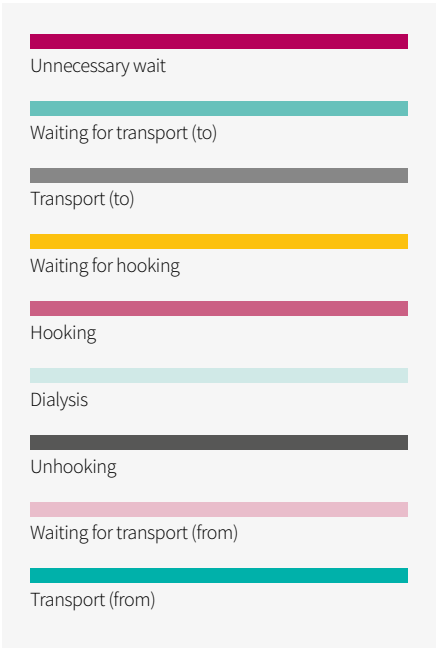


Figure 1: Comparison of three different patients' dialysis days

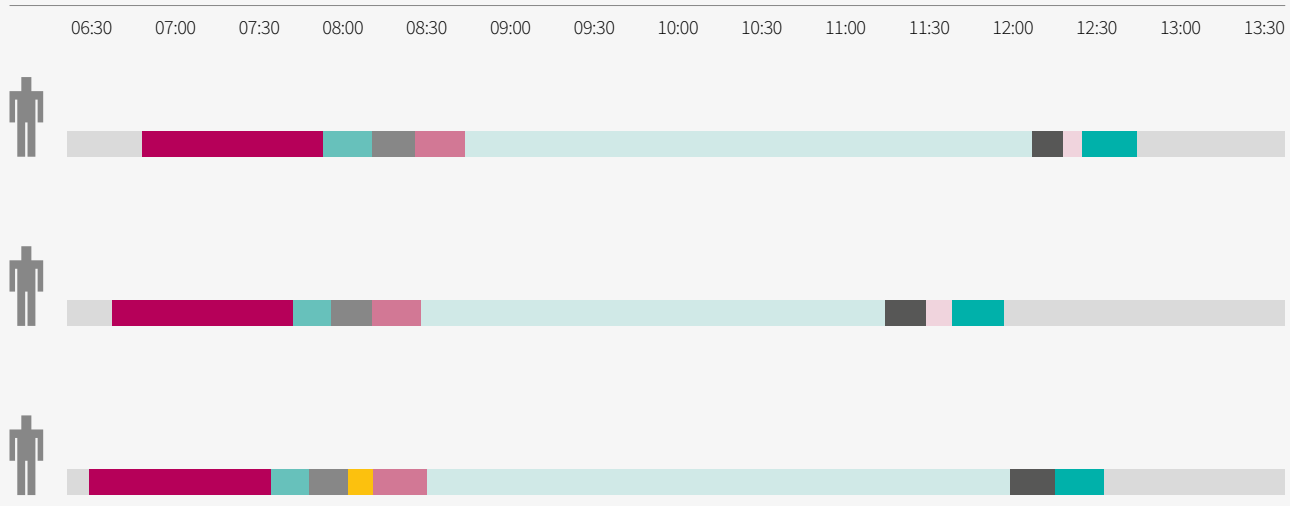
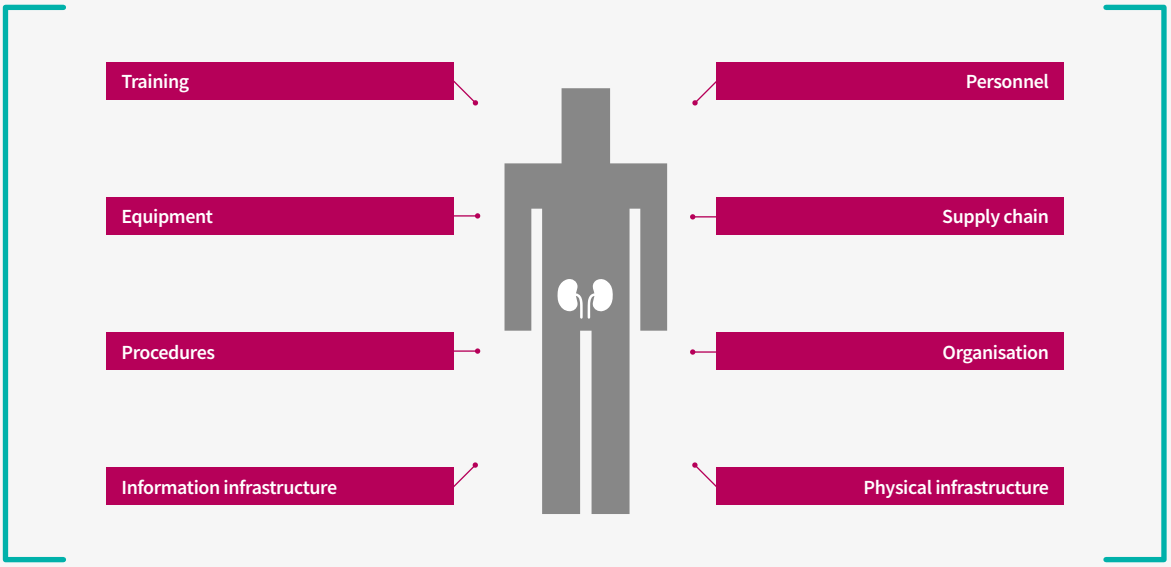


Figure 2: Lines of development framework



To gather the information needed, the Frazer-Nash team used a "lines of development" framework (**Figure 2**), more traditionally applied to projects for the UK Ministry of Defence. This enabled the team to organise and evaluate large amounts of data, and offered a cost-effective way of understanding how a clinical unit and the systems around it functioned.

Quantitative and qualitative data was gathered from interviews and questionnaires with patients and staff, anonymous patient data, staff rotas, appointment schedules and travel plans. Asset availability and infrastructure information were also analysed. Great care was taken to ensure the privacy and dignity of all the patients involved in this work. Frazer-Nash's modelling experts were then able to use this information to build an operational model of the renal care pathway, enabling them to pinpoint delays in the service and identify ways to improve the patient experience.

The model tracked a number of individual patients' pathways through their renal treatment, including transportation to and from their home. It provided clinical management with a clearer insight into how the unit operates under normal day-to-day conditions, and showed a number of potential improvements that could be made. These included optimising the changeover of equipment and improving the scheduling of patients to allow operational resilience to be built in. This would ensure the equipment was ready for each patient when they arrived and allow for disruptions to the schedule – for example, by a late arrival. The model also accurately assessed the impact of various disruptions, so proposed changes could be evaluated before implementation, minimising risk.

One of the key outcomes of the qualitative review was how important patient–staff contact time is to both staff and patients. Increased contact time had a positive effect on the patient experience, but staff felt that they were often too busy and were becoming distanced from the person-centred role that they most enjoyed. Building this contact time into the model allowed staff to positively engage with patients, and still have enough time to complete necessary paperwork.

Another issue was poor communication between the dialysis ward and transport contractor, which was increasing the length of some patients' dialysis days. Proposing the implementation of a better communication strategy was a tangible way to repair damaged relationships between these stakeholders, and would aid integration between the two, improving the scheduling of transport, providing a more effective and efficient transport service.

Frazer-Nash took a person-centric, integrated, systems approach to provide values to measure the overarching asset management objective – to reduce the impact of the dialysis on patients' lives and improve their experience – and to demonstrate this through an operational model of the system.

References

1. Public Health England, National Cardiovascular Intelligence Network, CKD prevalence estimates (October 2014)

About the authors

Anna Will is a mechanical engineer who works as part of Frazer-Nash Consultancy's asset management initiative. She uses her systems engineering approach to help clients maximise their asset value by balancing risk, cost and performance. She has cross-sector asset management experience, in particular in rail and energy.

David McNaught is a chartered engineer at Frazer-Nash Consultancy, with 10 years' experience of a diverse range of projects. He is a specialist systems engineer with a skill set including whole systems modelling, multi-criteria decision support and requirements capture and management. He is currently helping to author the Institute of Asset Management's Subject Specific Guidance on Systems Engineering.

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A valued community

The value of asset management extends beyond the organisations practising it, to the customers and communities they serve, as the IAM Awards 2018 entries show.

– AUTHOR: Richard Wakelen –

The themes of this year's IAM Awards continue trends we've seen building up over previous years. We are receiving more and more entries from outside the UK, demonstrating the global growth of asset management. There were also many entries showcasing increasing maturity in asset management systems thinking.

The new Customer Service Award has clearly been well received; it was the fourth most popular category for submissions.

The entries in this category highlighted the importance of understanding that asset management is not just about managing assets; it is about delivering value to customers. Many entries captured the ethos of understanding and delivering value from physical assets for the benefit of customers, and of wider society.

The new Safety, Environment and Quality Award was also very popular. Entries highlighted how important safety is when managing and operating assets; the impact on employees and contractors, as well as third parties like customers, visitors and wider communities, is obvious. This category also saw strong competition between large, well-established players and smaller organisations with diverse asset bases.

Those entries that focused on the environment indicated an increasing understanding of how asset management principles are being applied to the management of "soft" assets. The asset management of our natural physical environments – the interaction between living species and their habitats, the management of natural resources, climate change mitigation and so on – is just as important as the management of "hard" assets (physical structures); this was a clear theme running through the entries. This is an encouraging sign of how widely the principles of asset management can apply.

The growing practice of managing data and systems as assets was also reflected in this year's entries. Submissions for the Project Award and Team Award emphasised the importance of asset data and its critical role in decision-making and driving value. Digitalisation and innovation in IT systems were identified as ways to deliver whole-lifecycle value to customers and consumers, by capturing knowledge, supporting effective decision-making and automating optimisation.

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The winners

Individual Award

Winner

Lise Tarp-Johansen, HOFOR A/S
For transforming asset management without a burning platform

Runners-up

José Manuel Torres Farinha
ISEC/IPC and CEMMPRE

Victor M Diez-Valencia
ISA

Team Award

Winner

Russell Martin, Leeds City Council
For transforming road draining maintenance in Leeds

Runners-up

Leigh Fraser
National Grid

Ludmila Kantova
IBM

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Safety, Environment and Quality Award

Winner

Environment, Water Management, and Waterway Operations teams, Canal & River Trust
For managing water levels at Belvide Reservoir sustainably

Runners-up

Severn Trent Water & Atkins

Manjula Singh
UK Power Networks

NxtGen Award

Winner

Aaron Johnson, Jacobs UK
For creating robust mathematical links and assessment between designs, asset reliability and train service performance

Runners-up

Cath Ferguson
Canal & River Trust

Sergio Andrews
Jaramillo Lopera ISA – Intercolombia

Innovation Award

Winner

Graham Earp & Stuart Baird, EA Technology Ltd & INEOS
For successfully managing critical high voltage cables through continuous monitoring

Runners-up

Renato Pagotto Bossolan
ISA CTEEP

Andrew Fieldsend-Roxborough
National Grid

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Project Award

Winner

Development Services Digital Transformation Team, Anglian Water
For creating an innovative customer-centric digital platform to ensure line of sight

Runners-up

Helen Edmonds
SA Water

Steven Little
WYG Management Services

Customer Service Award

Winner

Helen Edmonds, SA Water
For integrating smart technology to minimise service disruption and benefit water customers

Runners-up

Development Services Digital Transformation Team
Anglian Water

Chris Plant
Amey & Staffordshire County Council

About the author

Richard Wakelen is the Head of Asset Management for the Canal & River Trust. He looks after 2,000 miles of waterways in England and Wales and has previously managed assets in both the water and power sectors. In 2015 he took up the Chair of the IAM Awards Committee.

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Global views

What would encourage graduates to enter the asset management profession earlier in their careers?

EMEA

Chidi Umeano, Codub Consulting

In order to be prepared for the future, and to encourage the future generation to embrace asset management at an earlier stage, I think it is important to understand where the asset management profession is currently at.

Being a systematic process of developing, operating, maintaining, upgrading, and disposing of assets in the most cost-effective manner, asset management should actually be encouraged from the birth of a baby. This sounds very idealistic, but we know of children who, at the age of five years, say they want to be doctors. Why can't that happen for asset management?

There is a need to articulate what physical asset management is in very simple terms that can really be understood by most people. It is very important and necessary to address the curriculum in our primary and secondary schools and in higher education. This can be achieved quickly by taking advantage of social media – by trying to create an ABC of asset management, while making it trendy. That reminds me that I was tasked to write an idiot's guide to asset management a couple of years ago and I am still at it!

Another way to encourage pre-graduates to embrace asset management is for established asset management companies to offer opportunities to gain experience through internships and work experience programmes. This will offer future graduates an insight into our great holistic profession.

Finally, we also need to correct the notion that to become an asset management professional, one needs to pursue a degree in environmental, engineering or property management. Let us remember that asset management is not about "doing things to assets", but about using assets to deliver value and achieve the organisation's explicit purposes.

AUSTRALIA

Wayne Francisco, Service Line Leader – Asset Management, GHD

I cannot recall the number of times I've heard "asset management means different things to different people". In many cases this is because people have little or no formal education or training relating asset management to the everyday work they do.

My own engineering degree (Monash University, Australia) did not provide knowledge of asset management. I only came to realise what asset management was after being in an asset management role.

Now, though, my former university defines Civil Engineering as "The design, construction, maintenance and operation of infrastructure for the benefit of society". So asset management now appears to be blended into the undergraduate programme. The College of Leadership and Management within Engineers Australia also acknowledges that their members may work in areas that transcend traditional engineering disciplines, "such as asset management".

These two changes illustrate the opportunity to engage in the undergraduate education of the next generation of engineers. The IAM must work with engineering academia to ensure that the competency frameworks, technical guidelines, and other IAM material are seen as go-to resources for teaching materials.

While the focus here has been on engineering undergraduates seeking a path to Chartered Professional status in asset management, the same thinking must apply to other professionals (like urban planners) and paraprofessionals (like engineering technicians) who work in asset management. The IAM should also focus on developing education and training materials relevant to skilled tradespeople, frontline supervisors, and other non-professional people working within asset management.

The education of the next generation of asset managers is the future of asset management. We need to provide a path to Chartered Professional status and work to embed the educational requirements deeply within technical engineering curricula, and in leadership and management courses offered to engineering undergraduates. In the interim, the IAM needs to continue working on a body of knowledge that is increasingly focused on professions, trades, and organisational roles.

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EUROPE

Mick Saltzer, Asset Performance Management Lead, Accenture Industry X.0

The industrial landscape is rapidly evolving with a focus on applying digital technologies and solutions to solve complex issues, improve the efficiency and safety of day-to-day working, and unlock the trapped value of assets for businesses.

This is creating an environment of continuous improvement to transform business operating models and enhance customer and worker experiences, products and services. This transformation necessitates changing skills profiles to adapt to new processes and technologies.

This presents an opportunity to design engaging new entry-level jobs for graduates, utilising their skills more effectively, leveraging their digital fluency and providing top performers with increasing responsibility to contribute to overall business performance.

Seamless collaboration and interaction is required with autonomous machines and the Internet of Things (IoT), which will challenge traditional siloes and hierarchies. There is increasing focus on how work is performed in distributed teams, with workers needing to routinely acquire new skills to remain relevant.

New employees are ready to own and personalise their career paths based on their individual needs, but still expect leaders to guide them. Leaders must encourage a culture of experimentation and innovation, and free employees to make great decisions and take initiative.

In this increasingly smart and connected asset environment, the opportunity to learn and build capability and competence at speed should be seized, driving a culture of innovation, agility and analytics to deliver asset management goals.

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Do I have the right data?

Big data analytics are helping companies like Downer Rail keep their heads above the sea of data – and discover insights that can improve asset management.

– AUTHOR: Himanshu Jindal –

When not just every asset, but every component of every asset is capable of generating sensor data, it's essential to be able to identify which data points are worth monitoring.

As an example, let's look at the heating, ventilation and air-conditioning (HVAC) system on one of Downer Rail's train cars. Downer has access to two different data sources associated with this system: logged event data and programmable logic controller records. Between these two sources, Downer can monitor a variety of data points, including high-pressure and low-pressure signals, refrigerant suction and discharge temperature signals.

Sensors make it easy to collect these data points, producing extensive "time series", or graphs of data points arranged in chronological order. The challenge is identifying which signals are the most relevant to asset condition and maintenance planning.

Advances in data analytics – including statistical and machine learning methodologies – have given us more and more effective ways to analyse asset data. We can model the time-series distribution of the sensor measurements, to determine the probability that an observation will fall within a specified range of values. We can use these models to forecast future values based on previously observed values. And we can use algorithms, such as dynamic time warping (DTW), to measure the degree of similarity between two different time series. One example is the dynamic time warping (DTW), in which the distance between two time series is computed, after stretching or shrinking, by summing the distances of individual aligned elements (**Figure 1**).

By using these big data analytic methodologies to understand the operating conditions of train sub-systems, it's possible to discover new knowledge about the health of each sub-system. The aim is to prevent premature failures related to train sub-systems, extend their remaining useful life, and reduce maintenance costs.

As a case for demonstration, Downer collected and analysed five years' worth of data (2013 to 2018) from the HVAC systems on two trains designed and maintained by the company. These HVAC systems each consist of two identical roof-mounted

Figure 1: Measuring the similarity between two time sequences with dynamic time warping

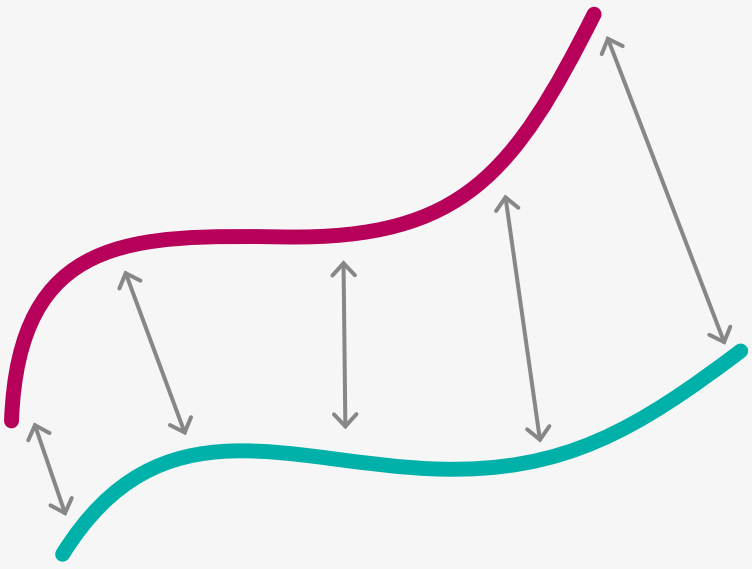

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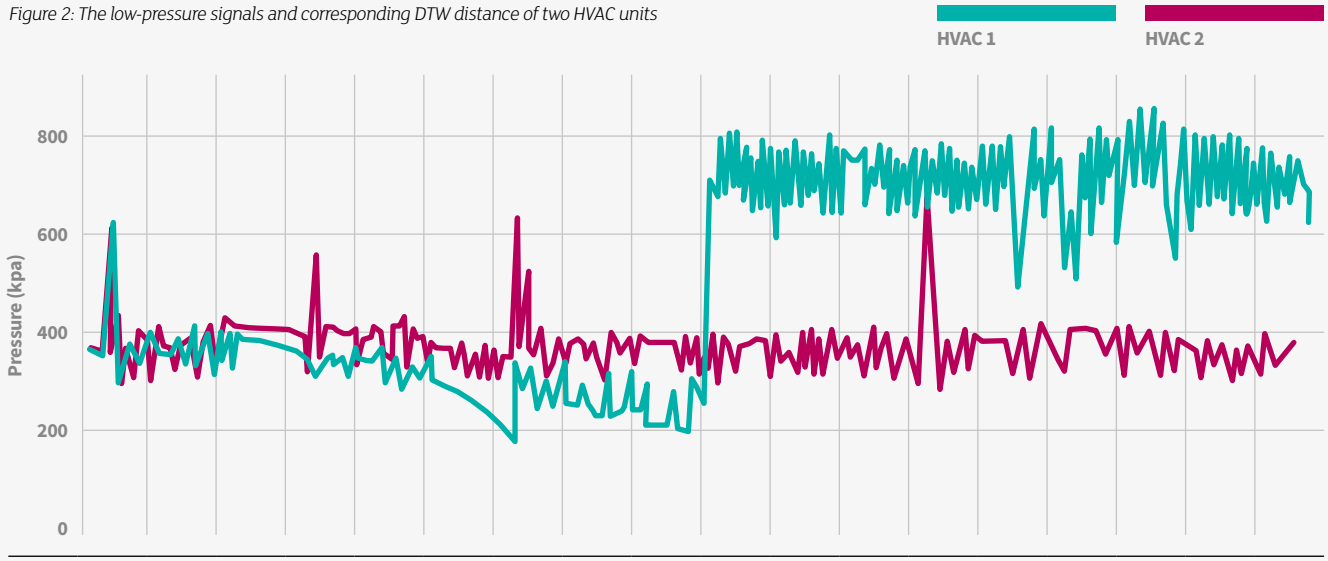
Figure 2: The low-pressure signals and corresponding DTW distance of two HVAC units



Time (h)	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72
DTW	182	126	180	313	235	253	595	347	596	1610	1867	1907	1645	1692	1612	1772	1914	1876

package saloon units, installed in a dedicated roof well in the train car. Each unit supplies conditioned air to the passenger car and the crew cab.

The original five-year time series data samples were analysed using the DTW algorithm. DTW has been successfully applied in fields as diverse as information retrieval, biometrics and gene expression profiling to account automatically for time deformations and different speeds associated with different sets of time-dependent data.

To determine an optimal path that aligns two time series data samples, minimising the total distance between them, one could test every possible warping path between the two series. However, the computational complexity of this method increases exponentially with the lengths of the time series being analysed. Using the DTW algorithm, the complexity approximates the product of the lengths of the two time series.

The output of the DTW algorithm provides rich information for asset management.

One of the useful outputs is the "DTW distance": the minimum global dissimilarity between the two time series, or the "inherent difference" between the time series, regardless of stretch. The DTW distance can be used for further analysis, including hierarchical clustering and classification.

Another useful output is the shape of the warping curve itself, which provides information pertaining to the matched points, so we can inspect which points in each time series correspond with one another.

Based on a 72-hour observation of the two Downer HVAC units, unit 1 started to deteriorate after 36 hours. The DTW distance between the two units' low-pressure signals also sharply increased 40 hours into the observation (**Figure 2**).

After analysing each parameter – high-pressure and low-pressure signals, refrigerant suction and discharge temperature signals – using the DTW algorithm as well as other machine learning algorithms including decision trees and deep learning models, Downer found that the low-pressure signal is the most relevant to the health of the HVAC system as a whole.

Downer has adopted advanced data analytics methodologies to improve its Train DNA platform, which aggregates the sensor data from its rolling stock and not only monitors, but also predicts the health of its assets. This is helping the company transition from condition-based maintenance to predictive maintenance of its rolling stock.

From the HVAC example, it is clear that relevant signals should accompany the use of a suitable method for successful condition monitoring of train sub-systems. Identifying and ascertaining the right data is the first and most important step towards devising an effective predictive maintenance regime for rolling stock.

How the HVAC units work

Each HVAC unit contains two independent refrigeration circuits. These share one evaporator coil and one condenser coil, providing redundancy so there is no single point of failure. Each unit has a nominal cooling capacity of 38.5 kilowatts (kW) and a heating capacity of 24kW.

Air passes through a grille in the ceiling of the car, then passes through a filter before being drawn into the bottom of the HVAC unit. Ambient air is drawn from the sides of the unit by two condenser fans and passes through a horizontally mounted condenser coil, where heat absorbed by the evaporator coil and generated by the compressors is injected into it.

The "return air" from the bottom of the unit and the "condenser air" from the sides of the unit are mixed, and two supply air blowers draw the mixed air through the evaporator coil and main heater banks. This conditioned air is then ducted to six air ducts inside the train car.

About the author

Himanshu Jindal joined the Strategic Asset Management & Digital Transformation team within Downer, Australia in 2017. He is an MBA and engineering professional with 10+ years' experience in global automotive and rolling stock organisations such as Mazda, Bombardier and China Railways. He strives for sustainable transport solutions that include maintenance strategy development and optimisation.

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There's always more to learn

Kirsten Bodley has continued learning throughout her career. Now she's applying everything she's learned as incoming chief executive of the IAM.

Who better to lead a learned society like the IAM than a former teacher and dedicated lifelong learner? "One of the things that's been very important in my career is the opportunity to keep learning – and to keep supporting other people in their learning," says Kirsten Bodley, speaking to Assets soon after becoming CEO Designate of the IAM.

"The thing I always wanted to do is not necessarily to keep climbing vertically, but to build on what I had at each step. At every step there's been a learning opportunity. And at the IAM, I feel that I'm able to put all of that to really good use."

Kirsten's quest for lifelong learning led to a varied career path. Originally a development chemist working on new lacquers and paints, she re-entered education to gain an MBA and become a management consultant with KPMG Consulting. A few years later, she achieved a teaching degree and started teaching 10 and 11-year-olds.

"Teaching Year 6 is probably the most challenging job I've ever had," says Kirsten. "Year 6s are more likely to heckle and ask difficult questions than asset managers! But it was such a brilliant opportunity to impart curiosity and learning in young people's minds."

Kirsten extended that opportunity more widely in her most recent roles with the charities STEMNET and the Women's Engineering Society.

"STEMNET was about providing insight into the world of work for young people, especially to do with STEM – science, technology, engineering and maths careers," she explains. "I took on a regional director role and became chief executive after a few years. Then I became chief exec of the Women's Engineering Society, which was all about encouraging women to progress in their careers, not just in engineering, but across STEM."

It was in this role that Kirsten met Chris Newsome, just before he became President of the IAM. "I was talking to him about bringing support for diversity, not just to Anglian Water, but to the consortium of other providers they worked with to deliver really large infrastructure projects. He talked to me about the IAM and what it did." That was the summer of 2017. The following year, the IAM approached Kirsten about the possibility of succeeding David McKeown as chief executive.

"It was a two-way process," says Kirsten. "They selected me, but I also selected them. I had a long initial interview with half the Board and subsequently had meetings with other members of the Board, as well as with David – so there were ample opportunities for interviews both ways. I got a real feel for the organisation, and they got a real insight into me and the way I operate."

Celebrating 25 years

One particularly relevant aspect of the way Kirsten operates is her clear respect for volunteers. "When you're working with volunteers, which I have for many years, you have to have an appreciation for the value that they bring and the enormous effort that they put in, often alongside their full-time jobs," she says.

"At STEMNET, we managed a very large volunteer programme of over 30,000 people going into schools to inspire young people about different careers. I'm a volunteer myself: I'm a trustee at a charity, as well as a STEM ambassador working with young people. I know how difficult it is sometimes, at the end of a long day, to switch your PC back on and do something. All that work with volunteers has helped me understand that you need to have the understanding, the resilience and the tenacity to keep supporting them. They have so much expertise and value to give the organisation. And the commitment, the loyalty, and the enthusiasm that I see in the staff and the volunteers at the IAM is absolutely fantastic."

Kirsten shares that enthusiasm. "It's a really exciting time for the IAM. We're celebrating 25 years this year. There are lots of exciting developments going on at the moment, with our exams, our Chapter development,

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"The commitment, the loyalty and the enthusiasm that I see in the staff and the volunteers is absolutely fantastic"

our knowledge development, increasing our reach through our corporate recognition scheme, aiming for Chartership and getting the Register of Professionals set up. It's a really good place to be."

Continuity of vision

So will change at the top mean anything different for Members?

"Coming in fresh, I've got no preconceived ideas or assumptions," says Kirsten, "so I'm very much in question mode: why this, why that, how have we done it before, why are we doing it this way? So the execution and focus may be different; I have a different approach to how we might deliver our services. But in terms of my principles – involving Members, working with the Board, working with the Council, communities and Chapters – I'm completely aligned with David and the rest of the Board. Our vision for the IAM remains the same.

"We're just keen to continue to support our Members. We're not about growing the membership per se, but we are about making sure that we grow the influence of the IAM, to encourage more and more Corporate and Individual Members to really understand how they can progress with their careers with the support the IAM can provide. Our two key purposes are writ large for me in terms of our strategy for moving forward: recognising our Members and their competences, and continuing to develop the asset management profession. I'm in the wonderful position of being able to drive that forward, and that's what I'm intending to do."

Given Kirsten's determined pursuit of learning and improvement throughout her career, it's no small thing that she considers her role with the IAM, "the opportunity of a lifetime". After the first interview with half the Board, she knew the role was for her. What made up her mind?

"It was the huge opportunity to continue the IAM's development," Kirsten says. "I can just see the massive potential, and I wanted to be the one who could take it forward."

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Towering achievement

Using remote inspection and artificial intelligence modelling, Australian telecoms company Telstra cut project delivery lead time by 86 per cent.

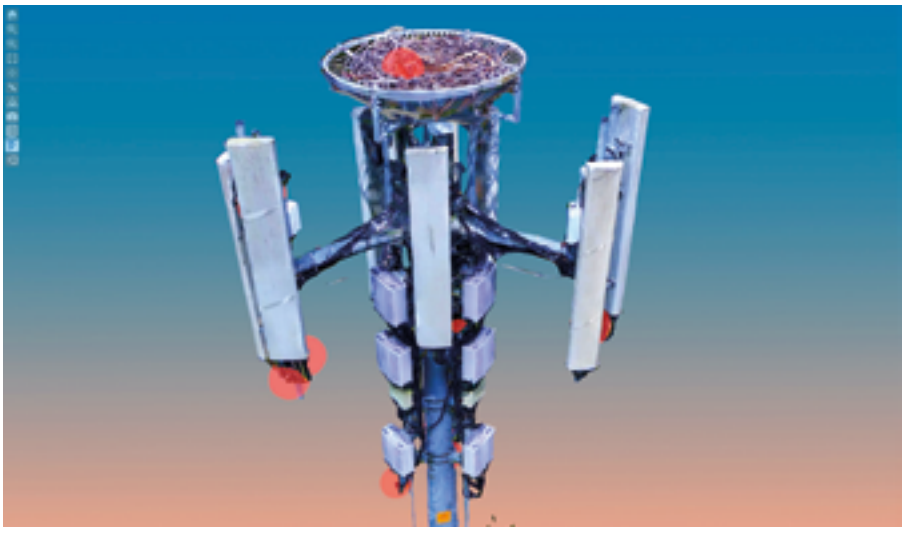
– AUTHOR: Chintana Herrin –

The inspection of cell towers is costly and time consuming. The largest communications company in Australia, Telstra, recently contracted tech innovator, SiteSee, to create a reality modelling solution that would improve safety, cut costs and increase efficiency.

Telstra Communications has a portfolio of over 8,000 cell towers providing coverage across vast distances in Australia. As these cell towers cannot be climbed, traditional inspection methods require mobile elevating work platforms to allow for close-up inspections of the antennas and the equipment. These inspections determine the compliance of the cell tower and when certain elements need to be replaced. While cell tower inspections are vital to Telstra's operations, the inspection process increases operating costs and creates a safety risk for personnel. In addition, the inspections involve shutting down the cell tower, leaving local communities without internet and telephone access.

To find an alternative to these traditional inspection processes, SiteSee provided automated artificial intelligence (AI) for equipment identification, 3D modelling, and analysis for 25 cell towers. SiteSee also captured high-quality aerial imagery of the unascendable cell tower in less than one hour using unmanned aerial vehicles (UAVs). Using the tower data captured by Telstra's internal UAV team, SiteSee's AI-powered analysis service automatically identified tower features, delivering an accurate record of the state of the site and tower equipment. The project team could then use the imagery to produce a detailed, engineering-ready 3D model of the asset and its surrounding environment.

This new process eliminated health and safety risks for the tower climbers, reduced operational expenses, and provided a precise real-world context for the owner's operations decisions. The organisation's work has already been recognised as a globally ambitious and innovative tech solution for virtual infrastructure management.



3D corrosion detection on a cell tower

Another benefit was improved information sharing and collaboration among all involved parties. The ContextCapture application, integrated into SiteSee's service, enabled the team to export a dense point cloud for further analysis using AI, as the application allows for hybrid processing of both images and point clouds. ContextCapture made it simple to take these analyses from the dense point cloud and create documentation of the as-built conditions. Team members could also load the original photograph into ContextCapture, to generate a "reality mesh" of photo and model.

Users could access the reality mesh via a web browser, enabling the client users to view, interact, and analyse its assets, no matter their location. This practice provided a collaborative interface for the engineering team and field crews. The team also linked the reality mesh to its own internal asset information system through the application. This interoperability enabled SiteSee to align client records with data extracted from the reality mesh.

Overall, the 3D reality modelling capabilities that Telstra accessed through this trial highlight the opportunity to reduce asset inspection and maintenance costs, and project delivery lead times. Since the site did not need to be closed for the inspection, Telstra could continually ensure that communities had mobile network coverage and internet access.

SiteSee's efficient telecommunications tower inspection method improved personnel safety, limited site visits, and streamlined workflows. The project team reduced site survey time from 10 days to two. The project team reduced asset inspection and maintenance costs by 69 per cent and project delivery lead time by 86 per cent. SiteSee created an automated, reliable, and repeatable method for inspecting towers that it will use for future projects.

About the author

Chintana Herrin is a reality modelling product marketing manager with Bentley Systems, primarily focused on applications pertaining to 3D photogrammetry and point clouds. She is responsible for Bentley's ContextCapture, Descartes, and Pointools applications. Herrin has nearly 20 years' experience marketing engineering software. She provides current and prospective Bentley users with valuable insights into the advantages the company's technologies provide to their organisations.

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Unbroken history

Keeping track of linear assets like buried pipes can be complex. One US utility is proposing a simple solution to one of the common issues.

– AUTHOR: Tejaskumar Soni –

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Colorado Springs Utilities (CSU), a municipal utility company providing electricity, water, gas and wastewater-related services to the Colorado Springs area, wanted to re-implement its asset information system.

After using IBM Maximo as its enterprise asset management system for a long time, the company wanted to align the processes more closely to its business objectives and industry-leading practices, and to overcome some of the major challenges it was facing with the system.

One of these challenges was uniquely related to managing a water utility network's linear assets – pipes, for example.

Water pipes are regularly maintained, repaired and, when required, reconditioned or replaced, depending on various criteria associated with condition of the pipe and its remaining useful life. Water pipes are quite a long and continuous asset and, when carrying out maintenance, inspections, repairs and so on, it's important to designate the part or segment of the overall pipe that needs to be worked on.

To keep the identification uniform, consistent and easily manageable across the organisation, CSU allocates a unique identifier called a LID (Location Identifier) to each part of the pipe that can be treated as a single unit for maintenance purposes. These LIDs are represented as locations in the asset information system, and this system is integrated with others including a GIS (geographical information system).

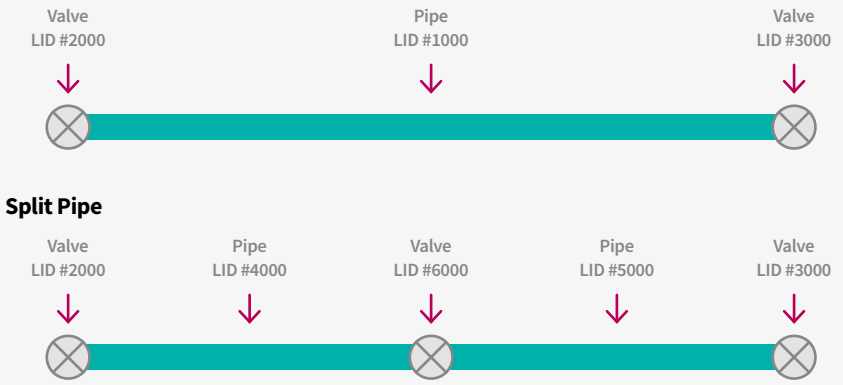
Multiply and divide

LID numbers are generated using a set of rules programmed in a homegrown system. Significant changes to the pipe network, like a pipe segment being replaced or reduced in length – any work that can change the properties of a work unit – result in new LIDs being generated to reference the newly created work unit.

This works fine in most cases, including new installations, replacement of pipes, abandonment of pipes, removal of pipes, and so on. But it does not work well in one case: the "splitting" of pipes.

When a new feature, such as a valve, is introduced somewhere on the pipe, it effectively separates the pipe (represented by one LID) into two parts. The physical pipe remains the same, but is now treated as two units for maintenance purposes. So, as per the rule, two new LIDs are generated and set up in the asset information system and surrounding systems, and the original LID is considered retired or decommissioned. From this point on, any inspection, maintenance, repair, failure and cost information associated with this segment would be collected against the two new LIDs (**Figure 1**).

Figure 1



Lost history

In reality, there has been no change in the physical object or asset. "Splitting" the pipe's LID has no impact on the condition or remaining useful life of the pipe itself. But it does split the asset's maintenance, cost and failure history. The new information being collected will not be recorded against the original LID, and the information collected before the split will not be associated with the two new LIDs. It will not be possible to maintain the cradle-to-grave history of the asset accurately.

From an asset point of view, it makes sense to have just one identifier associated with an asset throughout its life. From a work point of view, if there is a change in the work unit, then that needs to be referenced differently to avoid confusion.

Because of this discrepancy, CSU was finding it quite cumbersome to get the right information or to perform analyses related to assets' remaining life, maintenance cost, resource usage by asset, asset condition prediction and so on.

CSU needed a solution to bridge both the asset point of view and the work unit point of view, while still providing accurate information from the asset information system.

Maximo offered a product built for managing linear assets – Maximo Linear Asset Manager. But seeing the high data management burden and technical complexity this product could add to CSU's overall integrated application landscape, the company ruled that option out. Another, simpler solution was required.

Instead of identifying pipes with LIDs and representing them as location entities in the asset information system, pipes and other physical structures would now be represented as assets and identified by unique asset identifiers. There would be a location associated with each of the pipe assets, representing the geographic or functional location of the pipe. This would have nothing to do with the LIDs associated with the pipe.

LIDs would still apply to each pipe and be associated with its asset record for reference purposes. There could be more than one LID associated with each pipe's asset record, to represent different parts or segments along the length of the asset. Other systems connected to the asset information system would still communicate using LIDs as a reference. On the asset management side, pipe asset records would be identified using the association between LIDs and asset identifiers.

So in the case where a new valve is introduced and "splits" the pipe, the original pipe would be defined as an asset, with a unique asset identifier in the asset information system. The pipe's asset record would also be assigned a LID. Information about work

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orders, cost reporting, failure reporting, condition assessment, downtime and so on would be captured against the asset record and not against the LID assigned to the asset. It would, however, be mandatory to select the applicable LID in any type of transaction, work or reporting against the asset to build the history.

When the valve is introduced, this would generate two new LIDs, but since there is no change to the physical pipe, it would not create a new asset identifier or asset record. The pipe's asset record would simply have two LIDs associated with it (**Figure 2**). The original LID would get overwritten by one of the two new ones, but would still be maintained in the asset record for future reference.

Any work done after this point of time would still be reported against the same asset identifier. However, staff could select either of the two LIDs, depending on which part of the pipe is being worked on.

If part of the pipe is ever replaced, then that is a change in physical structure. The new part would not need to link to the history of the original pipe. So in this case, the new part would be assigned a new asset identifier in the asset information system, along with a new LID. The LID associated with the replaced part of the pipe would no longer be valid, and so would become part of the history. In other words, the replaced part is considered retired and has come to the end of its life (assuming it is not used again). There are now two assets with their own cradle-to-grave history (**Figure 3**).

Here, it is important to identify that the work happening on the pipe resulted in a change to its actual physical structure. The work order against the pipe, which would reference both the asset identifier and the LID, would need to indicate whether or not the change in the LID is because of a change to the actual physical structure, so that the system can recognise whether to create a new asset record for the newly introduced part of the pipe.

Figure 2

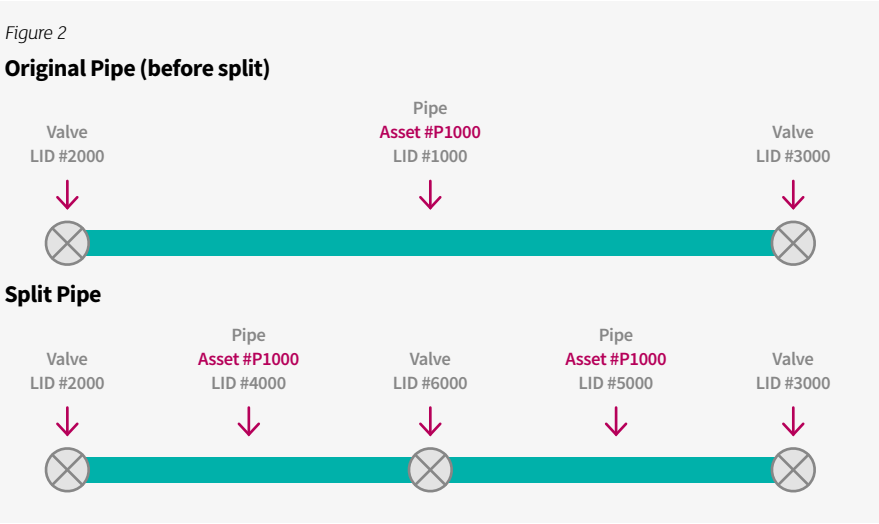
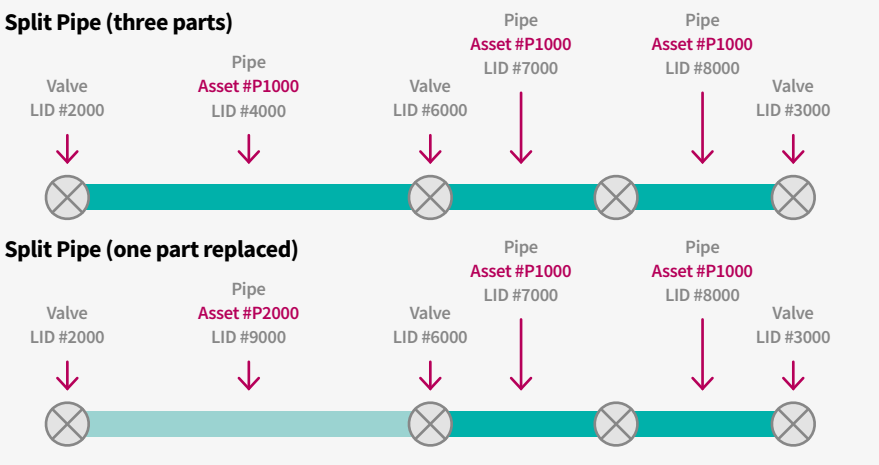


Figure 3



Cradle to grave

With this solution, it is possible to manage work and perform reporting with identifiable "segment" or "work unit" references, while still maintaining the link with the original asset to build a cradle-to-grade history of the physical structure (the pipe itself).

This approach to handling linear asset information in an asset information system has brought about benefits including:

- proper maintenance of assets' cradle-to-grave history, with information such as work, failure, cost, downtime, maintenance and condition, which helps get the right insights about asset availability, asset performance, maintenance cost, asset investment decisions, budgetary projections, reliability analysis and more
- better predictions of assets' useful life, based on accurate installation and removal information
- improved compliance with regulations and legislation
- better visibility of risk exposure and improved management of risks
- establishing the asset information system as the single source of truth for physical assets
- minimising duplication of information representing the same physical objects
- optimising maintenance plans, resource usage and maintenance cost.

About the author

Tejaskumar Soni is a package solutions consultant at IBM global business services. He has more than 15 years' experience working with enterprise asset management systems and providing solutions in industries such as utilities, manufacturing, transportation and facilities management. He holds a BEng in Mechanical Engineering degree from Karnataka University, India. Contact him at soni_tejas@yahoo.com

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Holistic working

Transdisciplinary working is the ideal for successful asset-owning organisations. But what does it look like – and how can we achieve it?

– AUTHOR: Dr Susan Lattanzio –

Successful asset management requires co-ordination across business functions. To achieve this, organisations often introduce interdisciplinary working practices. But for an organisation to work holistically, as truly successful asset management demands, interdisciplinary approaches are not enough.

It has long been recognised, in asset management and beyond, that solving real-world problems requires inputs from different disciplines – or interdisciplinary working. But as far back as the 1970s it was recognised that, while the rewards of interdisciplinary working surpassed those of multidisciplinary working, there existed a still higher level of group working. This was transdisciplinary working.

But what are the differences between multidisciplinary, interdisciplinary and transdisciplinary working?

The foundational work in this field is *Inter- and transdisciplinary university: A systems approach to education and innovation* by Erich Jantsch (1970). Jantsch held that when conducting work in a social context, you need to engage not only the scientific disciplines, but also other dimensions – for example, the social, economic, and political. Using a systems approach, he defined the levels that should be engaged when working towards an objective (**Figure 1**).

Jantsch's system is co-ordinated from the top down. Within an asset-owning organisation, the purposive level refers to organisational objectives. To achieve these objectives requires engagement at the empirical, pragmatic and normative levels.

At the empirical level are the scientific disciplines, such as maths, physics and psychology. Above this, at the pragmatic level, these scientific theories are merged and trimmed to become applied disciplines. Engineering sits within this pragmatic level.

Above ths is the normative level, which incorporates the systems society has created to integrate what it considers to be good or desirable. For asset owners, these might include regulations, legislation and standards.

Based on this pyramid, Jantsch defined five different levels of disciplinary working: multi-, pluri-, cross-, inter- and transdisciplinary.

Multi-, pluri- and cross-disciplinary interactions each occur within one level of the pyramid only. These interactions bring together different disciplines, but are not co-ordinated towards a common purpose.

Interdisciplinary working brings together two levels of the pyramid. In effect, this creates co-ordination but only between related disciplines. Within an asset-owning organisation, this might look like integrated and harmonised processes, concepts, and systems of working for those in asset management roles, but not for those in the sustainability or regulatory functions.

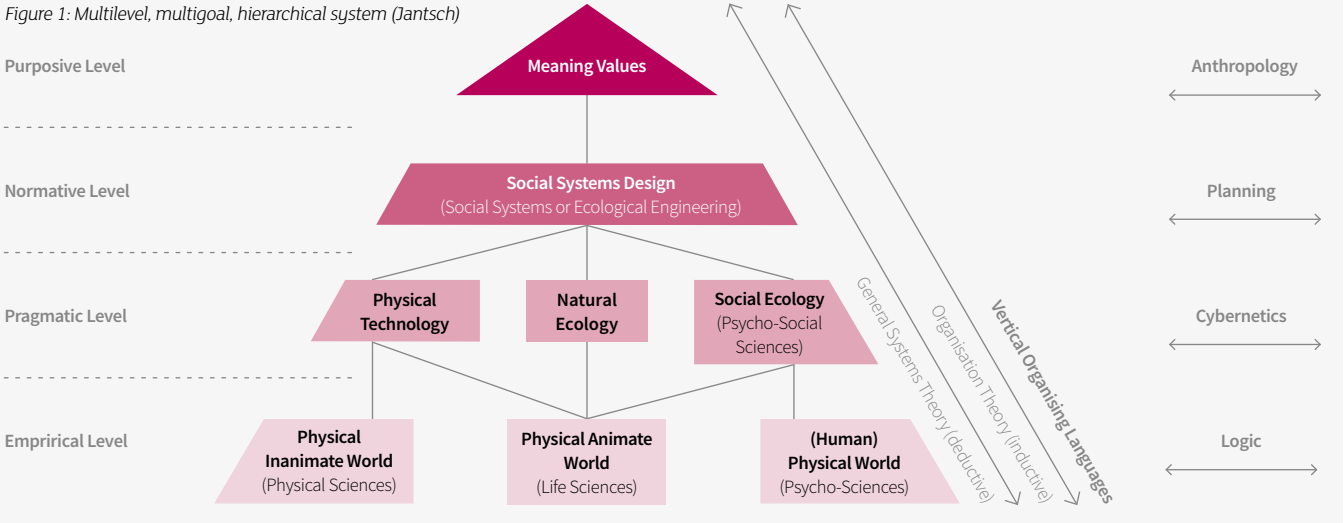
Transdisciplinary working engages all four levels of the pyramid. It is co-ordination among all disciplines and interdisciplines, not just related ones. Simply put, it is where all functions in an organisation are co-ordinated by a common purpose. This top-down approach is a cornerstone of the ISO55000 asset management standard.

Achieving transdisciplinary working in an engineering business is not straightforward. It requires organisation-wide vocabularies, methods, and mental models. The creation of these tools is the focus of the TREND (TRansdisciplinary ENgineering Design) research group, a £1.8 million research project funded by the UK's Engineering and Physical Sciences Research Council. It brings together researchers and academics from the universities of Bath, Bristol and the West of England. In collaboration with Airbus Group Ltd, Moog Controls Ltd, Renishaw PLC and Cubix Innovation, it will create tools to enable transdisciplinary working in engineering.

About the author

Dr Susan Lattanzio is a Research Associate within the TREND group at the University of Bath. Her PhD thesis created an approach for managing the performance of decision support tools used in asset management. It was a collaboration between the Engineering and Physical Sciences Research Council, National Grid and the University of Bath.

Figure 1: Multilevel, multigoal, hierarchical system (Jantsch)



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About the IAM

The Institute of Asset Management (IAM) is an independent learned society and not-for-profit professional membership body dedicated to furthering knowledge and understanding of asset management.

The IAM offers both Individual and Corporate Membership.

Benefits of membership include:

- access to a global network of professionals
- free **Assets** magazine
- discounts for Annual Conference, Lecture and Dinner and other events
- discounts on publications and IAM Qualifications
- online discussion boards and exclusive access to online Knowledge Centre
- eligibility to be elected or appointed to IAM posts and roles.

*Visit **theIAM.org/Join** for more details*

For individuals

Individual Membership allows you to engage with the profession. The grades available are:

- Fellow: must be able to demonstrate superior responsibility as an expert practitioner; entitled to use FIAM post-nominal letters
- Member: must be able to demonstrate knowledge and expertise; entitled to use MIAM post-nominal letters
- Associate: open to any interested person
- Student: must be engaged in a recognised academic course
- Affiliate: free but with limited access and benefits (12 months maximum).

For organisations

Corporate Membership is available to organisations whether large or small; commercial, private or not-for-profit. Special discounts are available for local government and academic organisations. The benefits include:

- demonstrable commitment to the discipline of asset management
- access to Endorsed Assessor and Endorsed Trainer Schemes
- priority access to sponsorship opportunities and contract enquiries
- discounts on IAM Membership, events, products and services for every employee
- free company listing in online directory.

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First published in Assets, the magazine for Members of the IAM. August 2018

annual conference 2019

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Liverpool

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Oct 1-3, 2019 - Chicago, IL

The Institute of Asset Management USA

The Institute of Asset Management Canada

Venue

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Conference Tracks

- The Asset Management Journey
- The ISO55000 Suite of Standards – the Broad View
- Innovations in Asset Management
- Assets in a Changing World
- Building an Asset Management Culture
- Inter-Agency Collaboration, Regulatory Requirements and Legislation

Contact

Andris Nova – IAM North America Senior Administrator
Tel: +1 212 810 4874 – Email: andris.nova@theIAM.org

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Assets
The Institute of Asset Management magazine
May 2019

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IAM Award-winning case study: how new detection technology saved INEOS a costly shutdown

Renewed rigour
Transforming Intercolombia's approach to asset renewal

People as assets
Asset management meets HR

The cowhide premium
Your brand is an asset

The Institute of Asset Management

First published in Assets, the magazine for Members of the IAM. May 2019

Letter from the CEO

I am delighted to have joined the IAM at such an exciting time. Not only are we celebrating the IAM's 25th anniversary, which will be a key feature of this year's IAM Annual Conference, but we continue with our commitment to provide our global membership with professional development support – playing an important role in our members' asset management journeys and the wider asset management community.

It has been a pleasure to meet so many members, sponsors and volunteers. Although there has been a lot to learn, there is no doubt that great things have been achieved throughout the past 25 years and now we can very much look to the future.

I am keen to focus on building upon our core values and vision, adding value to our members and the discipline, sharing knowledge, supporting networking and developing important collaborations.

This year's IAM Annual Conference, which is taking place in June, will provide real insight into the changing world of asset management, particularly the rapidly changing world of digital technology and how this is impacting on our industry. The conference also provides a wonderful forum for cross-sector global networking and includes an inclusive event for all delegates which will celebrate Women in Asset Management. We very much hope you will be able to join us.

We would be extremely pleased if you would be able to join us to celebrate the IAM's 25th anniversary, including at the conference, and continue to support us as we enter a new era for the IAM.

Kirsten Bodley – Chief Executive
CEO@theIAM.org

Assets is the magazine of the Institute of Asset Management

The Institute of Asset Management
St Brandon's House
29 Great George Street
Bristol
BS1 5QT
44(0)845 456 0565
theIAM.org

Hugh Harford, Editor:
Hugh.Harford@theIAM.org

Josh Ellicock, Editor:
Josh.Ellicock@theIAM.org

Advertising enquiries:
Office@theIAM.org

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Assets guidelines and dates for contributions

The **Assets** editorial team considers all contributions from IAM members, so please send your ideas, views on the magazine and suggestions for future content to **Assets@theIAM.org**

Dates for the next issue, published August 2019:

- 10 June 2019: deadline for suggesting articles
- 19 June 2019: deadline for reserving advertising space
- 12 July 2019: deadline for submitting approved articles
- 13 Aug 2019: deadline for advertising artwork.

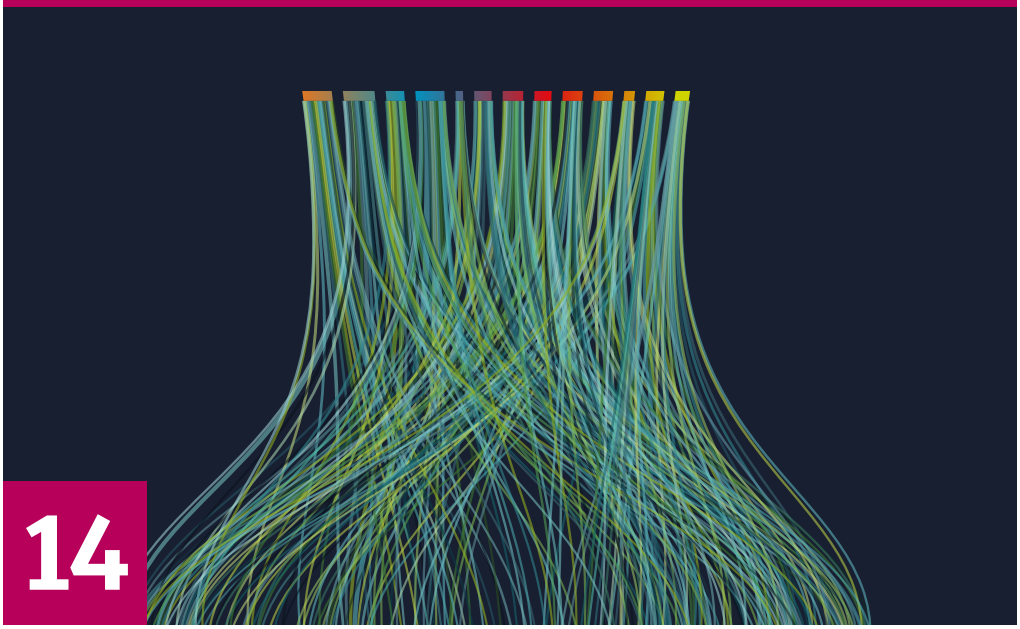
Guidelines for submissions:

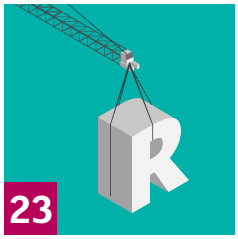
- The ideal **Assets** feature article explains implementation challenges and how they were resolved, details the benefits and gives guidance on implementing asset management in asset intensive organisations. Note that not all **Assets** articles are features
- The **Annual Assets Best Articles** competition celebrates the features that succeed the best in achieving these aims, as judged by the **Assets** editorial team
- The editorial team reserves the right to edit submissions for grammar, clarity, style and length. The maximum length for **Assets** magazine articles is 2,000 words, but we accept submissions of any length, on the understanding that the article may be cut down or split up. We will send you the revised article for approval before publication
- Please include no more than one graph, chart or diagram per 500 words
- Not all story suggestions or submissions can be included. The **Assets** editorial team will inform you if your suggestion will be taken up following its editorial meeting
- Contributions should not be overtly commercial in tone – but if you would like to take out a quarter-page, half-page or full-page advertisement in **Assets,** please email **Office@theIAM.org** for details and rates.

If your submission is selected to be published in Assets, you will need to provide:

- any pictures as original high-resolution TIFFs or JPEGs for printing purposes

Contents





Graham Earp (page 14) is a Principal Consultant Engineer with EA Technology. He is currently responsible for evaluating and implementing innovative technologies for the detection of partial discharge in High Voltage plant and equipment – in particular the development of online HV cable monitoring applications and services. He holds a degree in Electronic Engineering from the University of Liverpool and is a Chartered Engineer with the Institution of Engineering and Technology.

Ludmila Kantova (page 20) has 13 years' experience in asset management. She has defined more than 200 innovations for tools used in strategic asset management and created more than 50 asset management global process documents including policies, directives, education modules and work instructions. She is an experienced mentor and lecturer.

Dr Emily Carey (page 26) is a Research Associate within the TREND group at the University of Bath. Her PhD thesis investigated the need to support efficient access to information and knowledge in complex engineering projects. This was a collaboration between the Engineering and Physical Sciences Research Council and the University of Bath.

INSTITUTE NEWS

Conference celebrates 25 years

The IAM Annual Conference returns to the ACC Liverpool, UK on 24–26 June. Alongside the usual networking opportunities and insightful presentations, this year's conference is a celebration of the IAM's 25th anniversary.

The three-day event will explore the best of asset management in the context of rapid advances in the digital world.

Delegates will have the chance to:

- discuss equality, diversity and inclusivity in our profession in an inclusive, informal Women in Asset Management session (see page 8) – open to all, this session follows the main conference programming on day one
- join the first ever Asset Management Hackathon, run by the IAM NxtGen, on day two – come together to solve current and emerging problems facing asset management professionals, on a theme of digital technology, the value of digital resources and the challenges this may bring
- sit examinations to gain the newly revised IAM Certificate and/or IAM Diploma qualifications (exam sessions will run on all three days of the conference)
- celebrate 25 years of the IAM at a special conference dinner.

Day One

Digital twins and 3D modelling

Highlights:

- The future of digital asset management
- Digital twins: the new reality
- Releasing value through new digital techniques

Day Two

Digital line of sight and information management

Highlights:

- Better business management in the digital world
- Emerging practices creating a digital line of sight
- IAM & ISO updates

Day Three

Right sourcing and digital value chain

Highlights:

- The digital business value chain
- Making the right sourcing decisions in a digital world
- Digital asset management: where next? (panel discussion)

Source: IAM

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To book your place at the IAM Annual Conference 2019, visit **theIAM.org/events/iam-2019-annual-conference**

We are celebrating our 25th year by waiving the £30 fee to join the IAM for a limited period leading up to the conference. For more information about becoming a Member, visit **theIAM.org/membership/individual-membership**

New North American Conference launches

The first IAM North American Conference will take place in Chicago, Illinois on 1–3 October. The event has been created by the IAM USA Chapter, in partnership with the IAM Canada Chapter.

This inaugural North American Conference will focus on asset management professionals seeking first-hand insights and experiences from the methodology and technology innovators who are driving the discipline forward. Seasoned professionals and novices alike will benefit from the chance to meet and hear from standard bearers from around the world.

Source: IAM

To book your place at the IAM 2019 North American Conference, visit **theIAM.org/events/IAM-2019-NA-annual-conference**

A new Chapter opens

The new Ireland Chapter of the IAM launched in Dublin on 2 May, with an event hosted by EY.

Diarmaid O Culáin, Chair of the IAM Ireland Chapter, shared insights about the changing energy and assets landscape. Leaders of major Irish organisations also spoke about their journeys toward asset management maturity and the benefits they have realised along the way.

Source: IAM

First recognised qualification

"In anticipation of market needs, our Board of Advisors and representatives of the Build, Civil and Industrial domains, the curriculum of the Master of Engineering in Maintenance & Asset Management has recently been revised into a state of the art programme."

Jan Stoker, Senior Lecturer/PhD Researcher, University of Applied Sciences Utrecht

The University of Applied Sciences Utrecht has successfully achieved recognition for its Master of Science (MSc) in Maintenance and Asset Management.

This recognition demonstrates that the qualification meets criteria for breadth and depth of content and focus against the IAM competencies framework. The University of Applied Sciences Utrecht is the first to achieve such recognition.

Thanks in large part to the university's application and support with its development, the IAM's recognition scheme has become a robust means of accrediting asset management programmes, and will provide a model for the design of new asset management qualifications.

IAM recognition offers a professional challenge to existing asset management qualifications, while also raising these qualifications' profile to both IAM members and a wider audience.

Find out more at *theIAM.org/Events.*

Source: IAM

Dates for your diary

24–26 JUNE
IAM Annual Conference 2019
Liverpool, UK

26 SEPTEMBER
IAM NL Annual Conference
Haarlem, The Netherlands

26–27 SEPTEMBER
IAM DE Annual Conference
Hamburg, Germany

1–3 OCTOBER
IAM 2019 North American Conference
Chicago, USA

29–30 OCTOBER
3rd Annual CEATI Asset Management Conference
Phoenix, USA

For more information about the IAM recognition scheme, contact **Office@theIAM.org**
For more information about the recognised MSc programme at the University of Applied Science Utrecht, visit **www.maincontract.nl/asset/hu-recognized-iam**

INDUSTRY NEWS

Flood warning

The UK's Environment Agency is expanding a network of remote cameras used to monitor critical flood infrastructure, with a multi-year contract worth up to £2 million.

The existing network is made up of more than 450 remote cameras, installed around the UK over four years. The supplier of the cameras, Meteor Communications, will install up to 800 more as part of the new contract.

The cameras monitor grilles, screens, channels, culverts, storm drains and pumping stations, among other assets. They acquire and upload an image to a secure web portal once every hour, or more often when connected sensors detect high water flow, providing Environment Agency staff with early warnings of blocked trash screens and other critical issues. The cameras can also be manually triggered by SMS or email to give staff a real-time picture of the assets they monitor.

Gordon Wilson, the Environment Agency's Area Flood and Coastal Risk Manager for the Solent and South Downs, said: "These remote cameras can help our operational staff to spot and resolve any issues quickly to help us better protect homes and businesses from flooding."

Matt Dibbs, Managing Director of Meteor Communications, said: "Instead of conducting routine site visits, operational staff can be guided to the locations most in need. This lowers cost and carbon footprint, and improves the speed of response, which is of course critically important for flood infrastructure."

The cameras are most often deployed with a battery pack and solar panel, allowing them to operate all year round in all weather conditions.

Source: Meteor Communications

Emerging market explained

A recent independent study aims to help asset-owning organisations make sense of the growing market for asset investment planning solutions.

Businesses can benefit significantly from these solutions – as long as they can make informed decisions about which is the right fit for their people, processes and information.

Asset investment planning solutions: a market study, published by AMCL, explains the what, how, who and when of the market, and examines six leading vendors' offerings.

Source: AMCL

To download Asset investment planning solutions: a market study free of charge, visit **AMCL.com/AIP-solutions-demystified**

Riga overpass puts "lives at risk"

Riga City Council has come under fire from Latvia's State Construction Control Bureau and interior affairs minister Sandis Ģirģens over the safety of the Deglava Bridge.

Inspectors discovered damage to the supporting structures of the four-lane overpass in mid-April. The State Construction Control Bureau ordered that the bridge be closed. Riga City Council kept the bridge open, though they did limit traffic to vehicles weighing less than 30 tonnes.

On 25 April, interior affairs minister Ģirģens weighed in, declaring the Deglava Bridge a safety risk and announcing that if the city did not close it, the State Police of Latvia would.

Source: World Highways

First published in Assets, the magazine for Members of the IAM. May 2019

Renewal for renewable generation

Two thirds of the UK's onshore windfarms will have reached the end of their planned 25-year design lifecycles by 2040. A new report models three scenarios for renewing these assets.

If these ageing assets are not renewed or replaced, the UK's capacity to generate electricity will be reduced by about 8.3 gigawatts (GW). The power supplied by onshore wind could decrease from 30 to 10 terawatt-hours – a loss of 17 per cent of the UK's renewable energy.

The report by Renewable UK presents an intermediate scenario based on pushing for renewal under current circumstances; a low scenario that assumes substantial technological and sociopolitical barriers; and an optimal scenario that shows what could be achieved with technological progress, a sympathetic approval process and favourable public opinion.

Renewable UK estimates that:

- in the intermediate scenario, the UK would lose 2GW, leaving 6GW of onshore wind capacity – enough to power 4 million homes a year
- in the low scenario, the UK could lose 5.5GW, leaving just 2.7GW of onshore wind capacity – enough to power 2 million homes a year
- in the optimal scenario, the UK could actually increase its capacity by 4GW, so as many as 8 million homes could be powered by onshore wind.

Emma Pinchbeck, deputy chief executive of Renewable UK, said: "Repowering onshore wind is critical to cutting our carbon emissions and closing the looming energy gap. Upgrading our infrastructure with modern onshore turbines is good for consumers, as onshore wind is the cheapest form of electricity available and brings investment to communities around the UK."

Source: Utility Week

Keeping power flowing

Refurbishment work has begun on the 2,075 megawatt Cahora Bassa hydropower plant in Mozambique.

One of the largest hydroelectric dams in southern Africa, Cahora Bassa was built in the 1970s and can generate up to 18,000 gigawatt-hours a year. Mozambique generates significant income by exporting power from the plant to South Africa, Botswana and Zambia.

The asset owner, Hidroeléctrica de Cahora Bassa SA, has appointed a consortium to identify the scope of the rehabilitation need, draft technical specifications, provide technical support when procuring contractors, and supervise the refurbishment works. The project is scheduled to be completed by 2025.

The consortium includes Swedish consultancy Sweco and Brazilian company Intertechne Consultores SA.

Source: Sweco

RheinEnergie aims for ISO55000 compliance

Copperleaf is expanding into new territory with RheinEnergie, the Vancouver-based consultancy's first customer in Germany.

RheinEnergie subsidiary Rheinische NETZGesellschaft (RNG), which manages and operates more than 30,000 kilometres of distribution infrastructure for electricity, gas, water and district heating, began implementing Copperleaf's C55 Decision Analytics system in January.

RNG has proactively set itself voluntary compliance targets – including transparency, unified processes and improved decision-making approaches – with the aim of aligning its asset investment planning and management processes with the ISO 55000 standards.

Dr Ulrich Gross, CEO of RNG, said: "We will further improve our investment decision-making processes with the help of C55."

Jan Patrick Linossier, Head of Network Strategy at RNG, said: "With C55, we can achieve the required transparency and consistency for decision-making in accordance with these standards."

Stefan Sadnicki, Copperleaf's Managing Director, Europe, said: "RNG will benefit from a German user interface and our local German-speaking Customer Experience team."

The implementation project is scheduled for completion in July.

Source: Copperleaf

The value of diversity

The ethos of asset management means the profession should be streets ahead in equality, diversity and inclusion.

by Alexandra Knight

Asset management is an all-inclusive, multidisciplinary profession. It thrives on diverse functions working together to maximise value from assets. With this ethos, the IAM should be leading the way in diversity and inclusion.

Equality, diversity and inclusion (EDI) is now an indisputable factor in successful outcomes for organisations. Without a doubt, people recognise that having a more diverse workforce and diverse leadership leads to more innovation and bottom-line business benefits. However, the formula for achieving this is still elusive. Some initiatives to drive greater EDI in organisations have been celebrated and others criticised, but those who do nothing will be left behind.

In my view, when setting up an EDI initiative the important things are that:

- the vision and objectives are clear
- the plan for achieving the objectives is aligned to the goals
- this is communicated well so everyone understands their role in achieving the objectives
- the outcomes are monitored for continuous improvement
- above all, it is led from the top.

Does this approach sound familiar?

As asset management professionals, we are good at using this approach to maximise value from assets. Maybe it's time we start an initiative together, with the aim of delivering greater value through what we do, by driving towards equality, diversity and inclusion in our field.

Becoming more diverse as a profession should be easier for us. Asset management professionals come from all walks of life – it's more than just engineering-based roles which are renowned for having diversity challenges.

So, where do we start? The diversity agenda encompasses many areas, all of which need addressing, but gender diversity seems a good place to start. The 2017 McKinsey report *Delivering through diversity* states, "gender diversity is correlated with both profitability and value creation". This is significant for asset management.

If you're from an engineering background, you might say the IAM's current gender split (Figure 1 and 2) is fairly typical – but asset management's reach goes beyond this, so why shouldn't we set the bar high and aim for an equal balance of gender diversity across all our Membership levels? We would need to set a realistic timescale to achieve this target but having it as an aspiration would be inspiring.

One day I hope seeing more women in asset management, leadership and business in general is not remarkable and celebrated, it's just the norm. But we're not there yet, and to get there we need focused initiatives to champion and support women and challenge the status quo. Equality is not a women's problem – it's everyone's problem. Majority allies (men) have a huge role to play in this.

The IAM has role models of female senior leadership in the new CEO and Deputy President. You can't be what you can't see, so having women in senior positions in the IAM is fantastic, but what more can we be doing?

On Monday 24 June at the IAM Annual Conference in Liverpool, we will be holding an inclusive Women in Asset Management networking event sponsored by Amey Consulting. This event is open to all, not just women. We want to capture your thoughts and ideas for increasing gender diversity in asset management. If you are unable to attend but still want to contribute your ideas, feel free to contact me.

I look forward to seeing what we can achieve together as an asset management community.

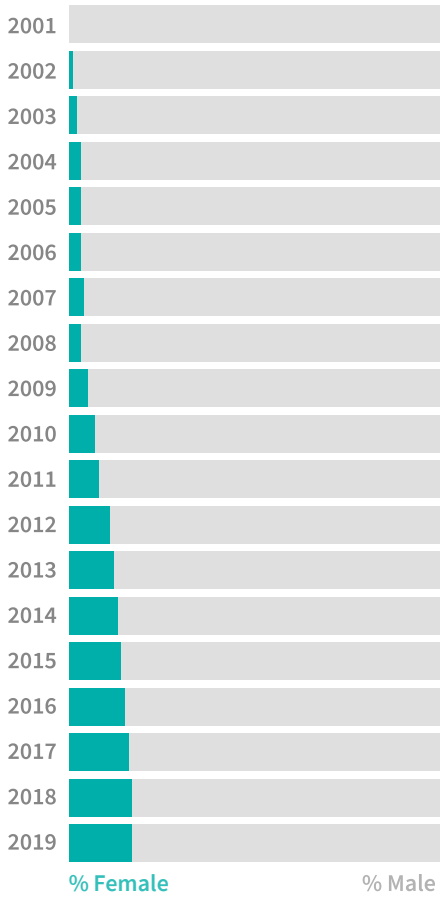


Figure 1: Gender split across all levels of IAM Membership

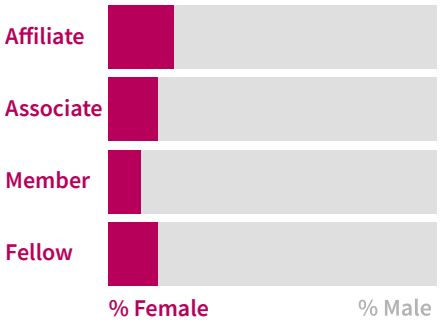


Figure 2: Gender split by Membership level

About the author

Alexandra Knight is a Technical Director with Amey Strategic Consulting. She also sits on AMS1, the UK mirror committee for ISO55000, and on the Women's Engineering Society London Cluster Committee.

First published in Assets, the magazine for Members of the IAM. May 2019

People as assets

Organisations realise value from their people – so why not maximise that value using asset management thinking?

by Paul Gibbons

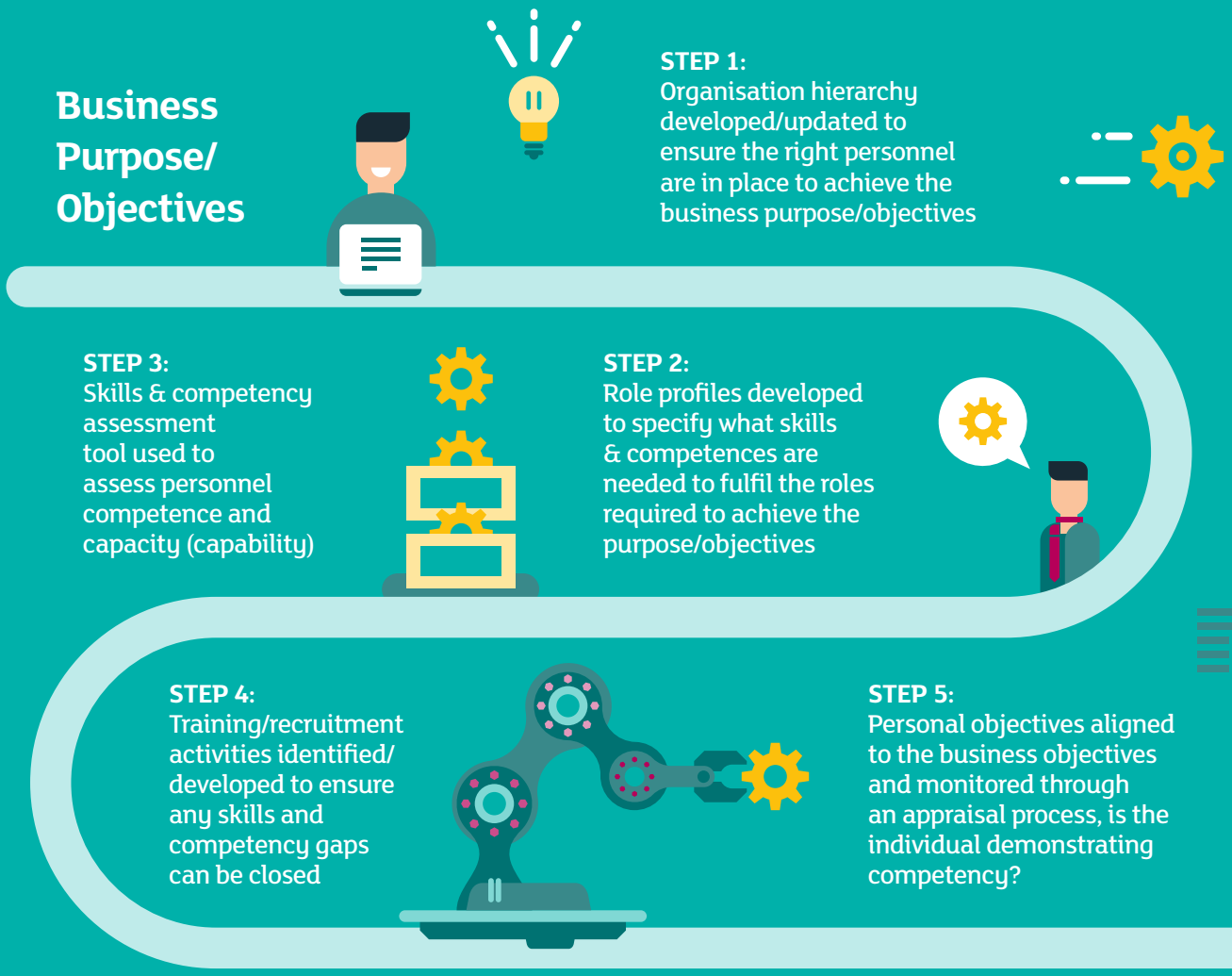


Figure 1: People assets line of sight from their everyday activities to the business purpose/objectives

First published in Assets, the magazine for Members of the IAM. May 2019

What is an asset? Typically, when you think of assets they are physical things like cranes or machine tools or perhaps information or software. What about people, though?

From my experience, people are the most important assets for any organisation. Without them, organisations would never realise the true value of their other assets. Over my years working in asset management, I have developed an approach to managing people as assets, applying asset management concepts like line of sight and the asset lifecycle to people.

The line of sight for people as assets is similar to the alignment of physical assets with the business's purpose and objectives (Figure 1). The first step is for the leadership team to establish an outline organisational design of how they feel the business objectives can best be achieved. Adding detail to this, job descriptions and role profiles are written, again linking up to how individual roles will help the business achieve its purpose.

To develop a capable organisation, the competence and capacity of the required resources must then be assessed, using the detail from the job descriptions to identify the capability requirements. Training and recruitment activities ensure any gaps in capability can be closed. Finally, personal objectives are established in alignment with the business purpose and used to manage the performance of the people assets, perhaps using some kind of appraisal process.

Capacity + Competence = Capability.

As a people leader, I need the right number of people assets with the right levels of competence to be capable.

Building on this line of sight, the people assets lifecycle consists of three phases, starting from when the organisational design has been established (Figure 2).

The Obtain phase focuses on using the job description as the requirements for the recruitment of people assets, in conjunction with assessing capacity needs. The Train phase focuses on closing any competence shortfalls with existing people. And the Retain phase focuses on managing people once they have been recruited, keeping them motivated and developing career development and succession plans, to maintain people asset capability levels.

There is a clear link between the Obtain and Train phases. If you refer to the job

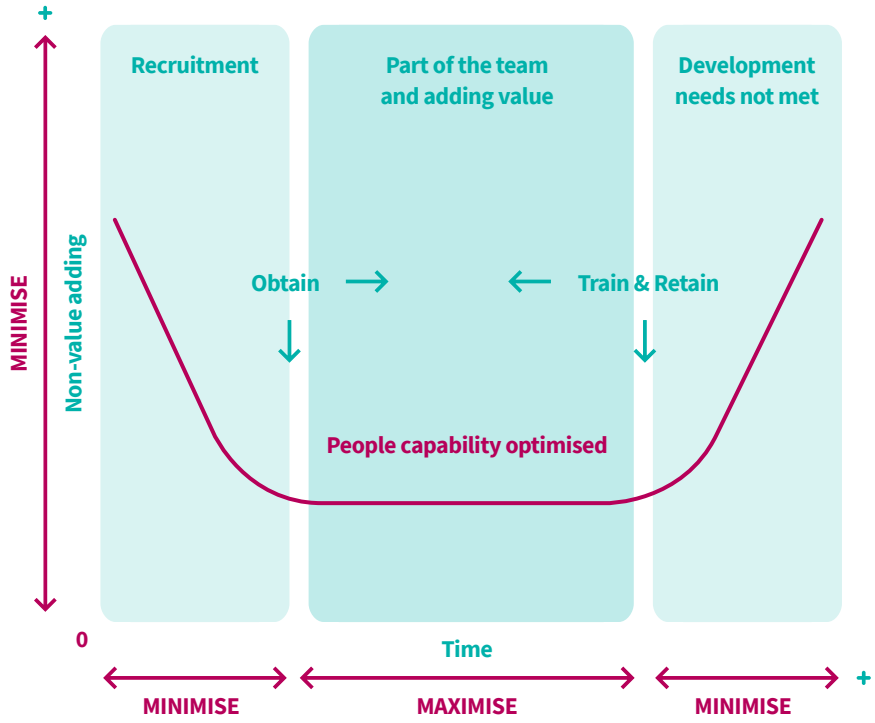


Figure 3: People as assets bathtub curve

Figure 2: The three phases of the people assets lifecycle

First published in Assets, the magazine for Members of the IAM. May 2019

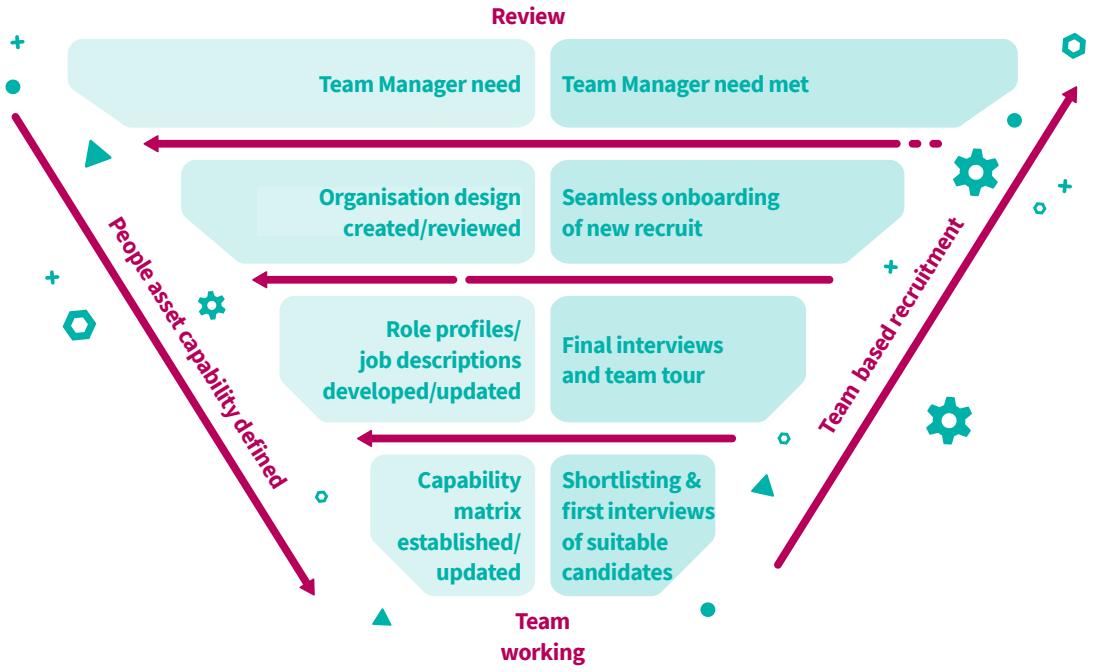


Figure 4: V diagram for people assets

description throughout the Obtain phase, at the end of it you will have an excellent idea of which candidates match the requirements and what potential development any suitable candidates may need. The outputs from the recruitment process should feed directly into the people leader's skills and competency tool so they can understand their team's new level of capability. In some cases, the new people assets may be able to train existing people assets, bringing their external knowledge and experience to increase competency and subsequently capability.

Bringing this all together, the bathtub curve – widely used in reliability engineering to describe how the probability of failure is higher at the start and end of the lifecycle – can also be applied to people assets (Figure 3). The usual y-axis, the failure rate, is replaced with non-value adding contribution of the people assets over time (perhaps their career).

The traditional bathtub curve shows three stages: early failures, where the failure rate is decreasing; random failures, where the failure rate is constant; and wear-out failures, where the failure rate is increasing. The people assets bathtub curve also shows three stages but these are focused on value-adding contribution to the organisation rather than failure rates.

1. Recruitment

Non-value adding can be high if the recruitment phase is not managed correctly. Similarly to physical assets, if the transition from recruitment to expected value adding contribution (handover) is not managed properly, then the assets' true potential will not be immediately realised. The target is to minimise the non-value adding time in the recruitment and onboarding of new people assets.

To improve the link between recruitment and onboarding, the "V diagram" commonly used in system engineering can be tailored to develop a people asset recruitment framework (Figure 4). At the core of the V diagram is a team based approach to recruitment, to make sure new and existing people assets are compatible and there are no surprises to either.

2. Part of the team and adding value

Here, the non-value adding time is at a minimum as the people assets are "optimised". The target is to maximise this stage, ensuring the journey from recruitment to onboarding is seamless and the people assets are kept motivated. For example, this could involve having clear career development plans that suit both the people assets and the needs of the business.

3. Development needs not met

The non-value adding time starts to increase if the people assets are not kept motivated and/or their development needs are not fulfilled. The target is to minimise this stage, ensuring the right people assets are in place to achieve the needs of the business.

A business should value and manage people assets no differently than physical assets. This includes taking the time to correctly specify why you need the asset in the first place and how you correctly bring the asset into the organisation so that it adds value immediately. The assets must then be managed throughout their useful lives to maximise their value, ensuring that they are motivated and have clear career development plans. In short: obtain, train and retain the right people assets.

About the author

Paul Gibbons is a technical director with Jacobs. He is an apprentice-trained machinist with an engineering doctorate and more than 34 years of industry experience in asset management.

First published in Assets, the magazine for Members of the IAM. May 2019

Global views

What are the benefits of 3D modelling for staff in the field? How can this technology improve how field teams work?

DUBAI

Ali Alian, Manager – Asset Management Department, Dubai Roads and Transport Authority

When it comes to people in the field, 3D modelling is a crucial tool for decision-making. Practically, 3D modelling reduces the time needed to make decisions regarding project stages from weeks to hours.

This reduction is achieved by enabling all concerned parties in the field – like engineers, contractors, consultants and designers – to see the same 3D model at the same time and make the right decision. By contrast, with 2D drawings, engineers need to demonstrate different types of design to each party one at a time.

Moreover, 3D modelling increases the efficiency of employees in the field dramatically by detecting clashes early and helping teams avoid re-doing the same work volume more than once. This puts an end to the age-old paradox between designers and people in the field. The traditional 2D drawing is incapable of clearly identifying the clashes between different construction systems such as civils work, electromechanical systems, and heating, ventilation and air conditioning. This allows people in the field to clearly identify clashes at the early stages of the design and make the required changes even before construction starts.

First published in Assets, the magazine for Members of the IAM. May 2019

FRANCE

Celso de Azevedo, Founder and CEO, Assetsman

If there is a group of professionals who have always worked in 3D, it is those in the field. So, with a touch of irony, they did not wait for the emergence of 3D modelling to act on all dimensions of problems, unlike teams in offices, where 2D computer screens have sometimes alienated them from the operational reality of organisations.

More seriously, it is not necessarily in the daily lives of the field teams where we can identify more benefits of this phenomenon. Indeed, 3D modelling should greatly contribute to better identification of the behaviour of assets, and in particular of their dysfunctions, at the management level of asset-owning companies.

Historical issues, such as those about the true mechanisms of degradation and failure modes, have often been reported as simplistic – and therefore incomplete or even inaccurate.

Thanks to 3D modelling, operational reporting gains from the possibility for field agents to assert information, observations and findings that were previously transmitted with limitations and little richness of detail. This can be decisive for a more complex diagnosis.

Another advantage of being able to collect new types of information and data is that of circumventing constraints imposed by current IT information systems (hardware or software) that sometimes cover or omit certain angles of analysis.

Finally, 3D modelling brings to the field a practical tool to expedite the regular use of asset management's new modes of decision-making.

The transformation of technicians into business engineers will play a large part in the contribution of 3D modelling to the monetisation of operational risks; that is, the economic translation of operational performance into professionals' daily lives.

AUSTRALIA

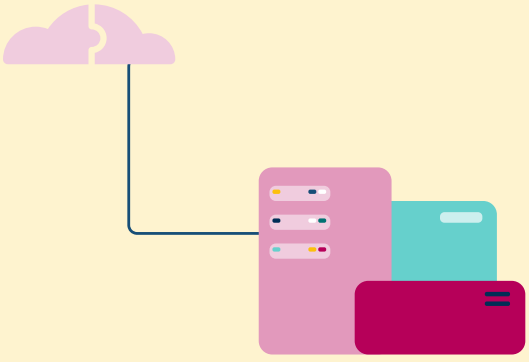
Ernst Krauss, Principal Consultant – Asset Management, Wood plc

Adaption of 3D models creates not only a visual representation of assets, but also opportunities to start connecting master data, operational data and documentation to the model. This can create true asset information hubs that service the whole lifecycle of equipment, plants and assets.

The resulting interoperability enables the radical rethinking and improvement of our traditional ways of maintaining and operating equipment and plant. There are many possible uses. Shutdowns are a good example. A 3D model is eminently useful for shutdown planning and execution, widely impacting traditional execution processes and critically important in making the status of the assets visible to staff, contractors and management as the one source of truth.

Augmented reality and virtual reality opportunities that emerge can be far more effective than we might imagine today. As an example, the traditional way of creating work requests and work instructions to service equipment will change: information will be sourced visually from a 3D model, reducing the need for paper based instructions. Similarly, work planning will also substantially improve through the use of 3D models as will fault finding and repairs.

Inextricably linked are the materials and logistics elements supporting the maintainers and, of course, the operators. The substantial benefits from 3D models include replacing paper based operating instructions to improve operations, training and simulation of processes. 3D models are just the beginning, as technology and innovation will further our thinking about the organisational processes to completely integrate digital technology and innovations into traditional day to day operations.



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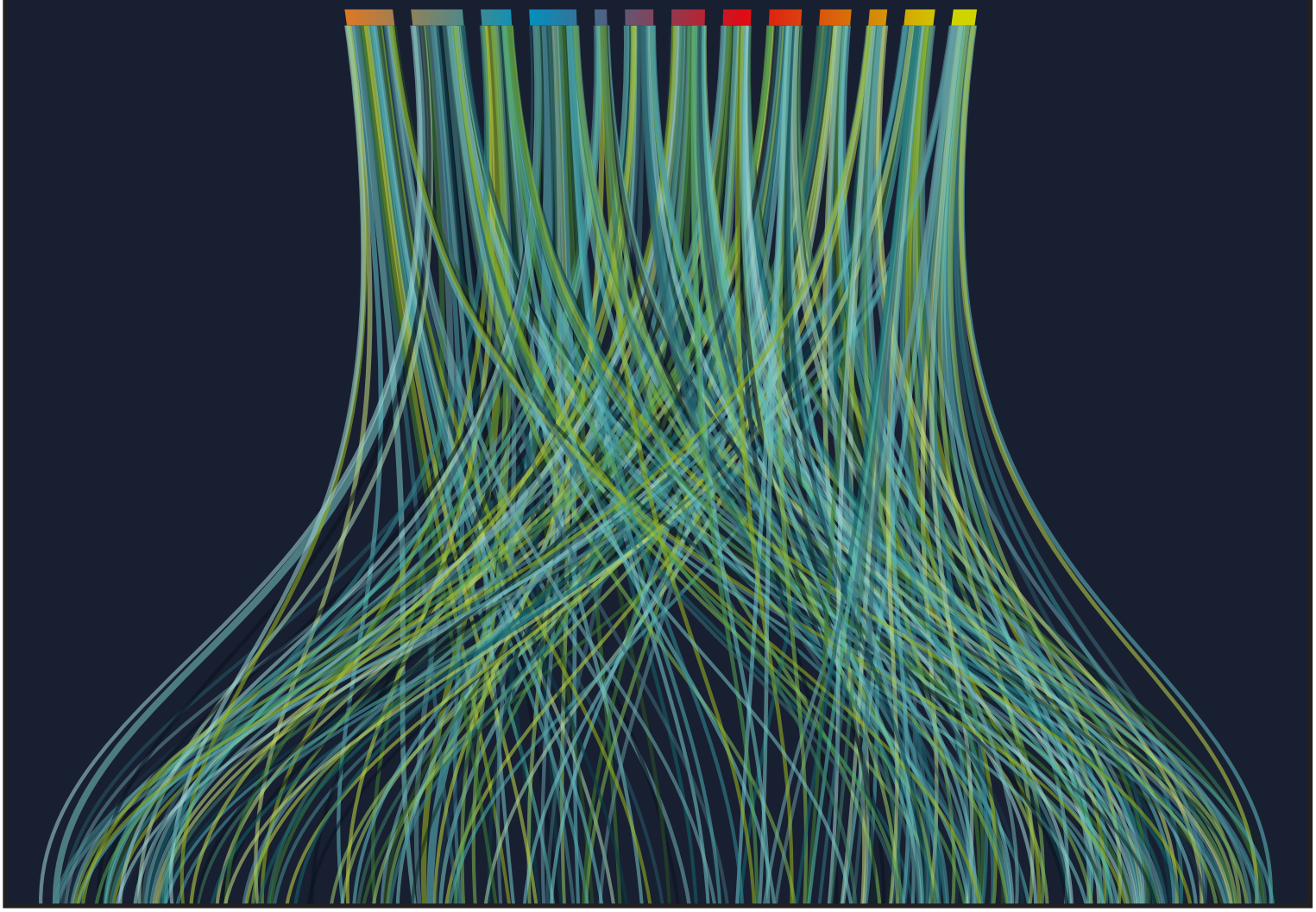
11 months of mitigating risk

Partial discharge, a major cause of electrical failure in the industry, has always been hard to detect until it becomes a problem. However, a pilot of a new detection system by INEOS and EA Technology validated the system, delivered savings for INEOS, and netted the partners the Innovation Award at the IAM Awards 2018.

by Graham Earp



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IAM Awards 2018:
Innovation award
winner

Aware of the issue of partial discharge in electrical networks, INEOS suspected that it may be occurring somewhere within one or more of 18 critical 33kV underground feeder cables on its Grangemouth site. But, in line with industry standards, there was no way to be sure without periodically taking the critical high voltage (HV) cables out of service, physically disconnecting them, and then performing conventional very low frequency (VLF) cable testing. This results in unwanted disruption to both the HV connections and the operation of the plant.

INEOS is a multinational group specialising in petrochemical production. Grangemouth in Scotland is one of its largest manufacturing sites. Home to a crude oil refinery and INEOS' Olefins and Polymers business, Grangemouth requires about 140 megawatts of electricity and 550 tonnes per hour of extra high pressure steam for normal operations. To support this, INEOS operates a combined heat and power (CHP) plant, served by its own private electricity distribution network.

The cables considered as part of the pilot were the ones linking the CHP plant to the main electricity distribution substation. If any one of these 18 cables were to fail, it would disrupt the operation of the CHP plant, which could have a domino effect across the entire site.

With this in mind, INEOS routinely disconnects and tests the cables once a year. This is no small undertaking; it involves temporarily shutting down CHP operations at Grangemouth, which requires considerable preparation and planning.

Early warning

Partial discharge is a breakdown of a small area of insulation that is subject to high voltages. The breakdown does not span the whole distance between the two insulated electrodes – hence "partial". It can be caused by poorly made or poorly installed insulation, or by wear and tear. Once partial discharge starts, it will inevitably degrade the insulation until eventually it fails.

When partial discharge occurs, it emits a very brief, high-frequency pulse of electrical current. The pulse races along the cable away from the discharge location. When it reaches the end of the cable, it is reflected back the other way.

To EA Technology, a consultancy serving the power industry, this small side effect of partial discharge represented an opportunity. Sensors attached non-invasively to cables could continuously monitor for these pulses. Engineers could be alerted to the signs of partial discharge while the cables were still in operation, without the need for a shutdown or to excavate the cables to perform a manual inspection.

EA Technology had a prototype solution based on the pulse monitoring method, known as CableData™ Monitor. INEOS had the electrical network and were keen to embrace innovative technology. The two companies therefore decided to work together on a joint pilot study, using the CableData™ Monitor to test INEOS' 18 critical cables at Grangemouth.

EA Technology installed and commissioned the CableData™ Monitor in partnership with INEOS' power systems engineers, attaching radio frequency current transformer (RFCT) sensors to the 18 cables. These sensors simply wrap around the earth straps at the ends of the cables like a cuff, without breaking the insulation or interfering with the connections.

The sensors connected to a series of measurement nodes installed in the primary substation, which in turn fed the continuously monitored data to a central hub where it was stored and processed. EA Technology's partial discharge experts could then access and assess the collected data from the hub over the 4G mobile network, using a specially designed web interface.

When it came fully online in October 2016, the CableData™ Monitor seemed to confirm the INEOS team's suspicions. The system detected minute high-frequency current pulses in three of the 18 cables.

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Monitor or replace?

By measuring how much time elapses between the original pulse and its reflection from the ends of the cable, it is possible to pinpoint where along the length of the cable the partial discharge is taking place. Using this technique, the team narrowed down the source of the partial discharges to a set of relatively recently installed cable joints.

This was somewhat unexpected. Wear and tear over time means that partial discharge is generally more likely in older components. But it was also good news. EA Technology's experience detecting and measuring partial discharge had taught the team that joints can withstand higher levels of partial discharge than cables themselves, and can withstand them for longer.

If left unchecked, partial discharge will always lead to electrical failure eventually. But the time it takes for the first partial discharge to degrade the insulation to the point of failure is less predictable, dependent on a multitude of external and environmental factors. It is not possible to categorically predict when a cable experiencing partial discharge will fail, only that it will at some point.

However, with continuous monitoring, it is possible to detect trends. In general, if the current pulses from partial discharge are increasing in magnitude over time and occurring closer and closer together, the cable is accelerating towards failure.

EA Technology's in-house partial discharge experts analysed the information gathered by the CableData™ Monitor in detail. Based on the trends, and the identification of the cable joints as the source of the partial discharge, EA Technology concluded that imminent electrical failure was unlikely.

The INEOS team considered the data and EA Technology's conclusion, and the informed decision was that the cables would be monitored closely until the next scheduled planned shutdown of the CHP.

Stay alert

So for the 11 months between the identification of the PD and the next scheduled shutdown, INEOS and EA Technology focused on monitoring and safely managing the risk.

INEOS put in place a number of precautions to manage and minimise the effects of a sudden failure, including:

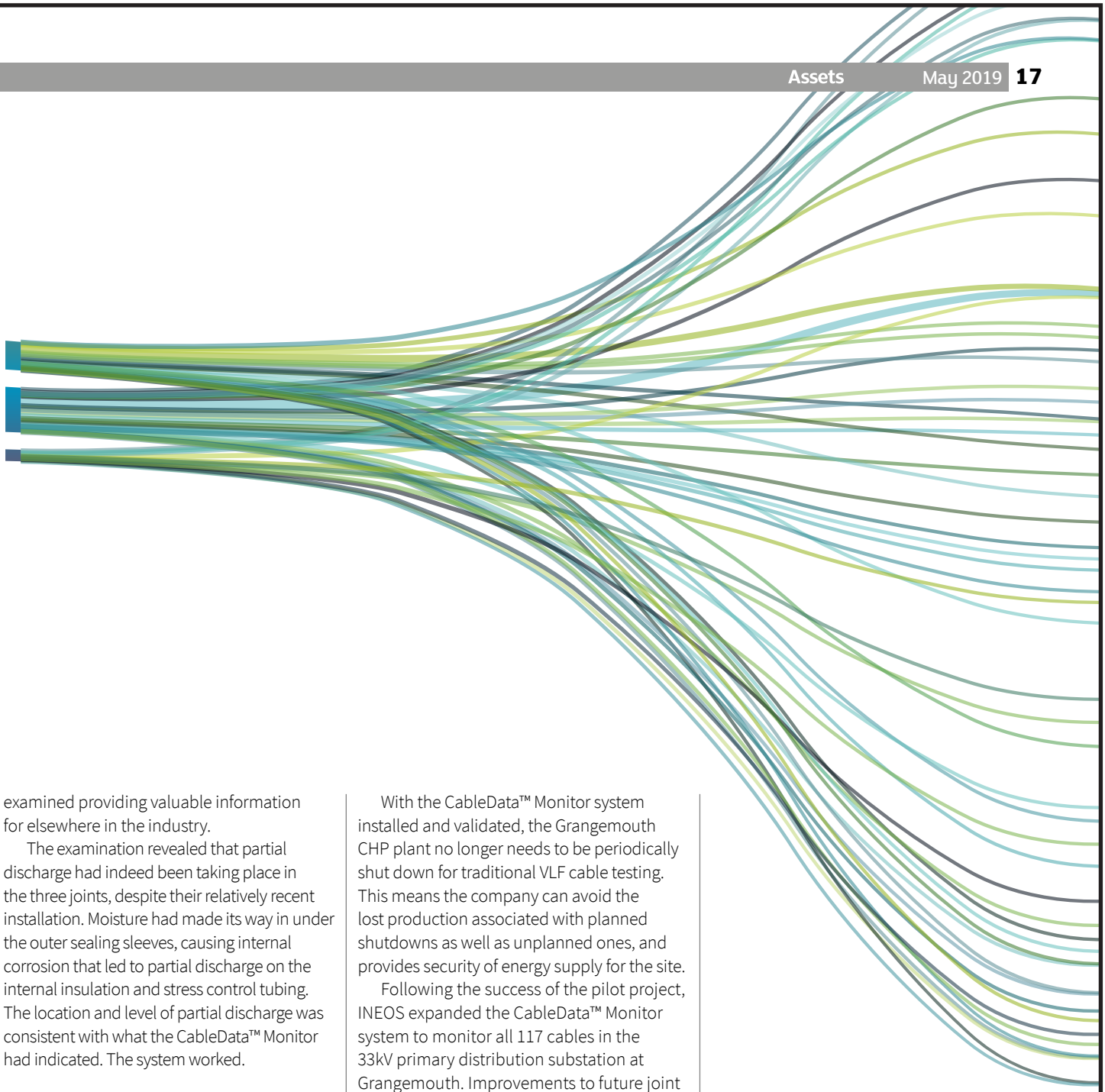
- making sure that resources (personnel, expertise and materials) were immediately available to repair a failure
- making alternative provision for electricity and steam supplies in case of a failure shutting down the CHP plant
- keeping personnel safe by preventing access to the discharging cable joints while they were energised.

At the same time, EA Technology used the CableData™ Monitor to set up automated alerts. They defined parameters that would indicate an increasing likelihood of failure – pulses surpassing a certain magnitude, or increasing in frequency at a certain rate, for example – and instructed the system to issue alerts if its measurements crossed these pre set thresholds.

If the system issued an alert, members of the EA Technology team would immediately receive automated emails and text messages. They could then investigate the readings and report back to INEOS – and, if necessary, review the decision to keep the cables in service.

And the pilot has delivered positive outcomes. The data provided assurance that the cables remained in service without failing until the planned shutdown in August 2017.

The readings from the CableData™ Monitor allowed the joint team to plan how to deal with the discharging cable joints during the shutdown. They were removed from service, replaced, and the ex service joints forensically



examined providing valuable information for elsewhere in the industry.

The examination revealed that partial discharge had indeed been taking place in the three joints, despite their relatively recent installation. Moisture had made its way in under the outer sealing sleeves, causing internal corrosion that led to partial discharge on the internal insulation and stress control tubing. The location and level of partial discharge was consistent with what the CableData™ Monitor had indicated. The system worked.

A successful pilot

By continuously monitoring the condition of these critical cables EA Technology and INEOS avoided either an unexpected failure or an unplanned shutdown to replace the degraded parts.

An unplanned shutdown of the CHP plant to repair or replace the joints could have had significant implications for production at Grangemouth.

The CableData™ Monitor also improved safety for INEOS' personnel. The system pinpointed the location of the partial discharge, so the company could restrict access to that area while the cables were energised, protecting its people.

With the CableData™ Monitor system installed and validated, the Grangemouth CHP plant no longer needs to be periodically shut down for traditional VLF cable testing. This means the company can avoid the lost production associated with planned shutdowns as well as unplanned ones, and provides security of energy supply for the site.

Following the success of the pilot project, INEOS expanded the CableData™ Monitor system to monitor all 117 cables in the 33kV primary distribution substation at Grangemouth. Improvements to future joint methodology have also been introduced based on the forensic findings.

After the three degraded joints were replaced and the cables were re-energised in September 2017, there was no longer any sign of partial discharge. Still, INEOS is continuing to monitor all 18 critical cables closely. The replaced cable joints were just three of many of the same type, all installed at the same time. The CableData™ Monitor provides INEOS with the peace of mind that these similar joints are not currently discharging – and that if they start to, the company will have enough advanced notice to manage them effectively.

About the author

Graham Earp is a Principal Consultant Engineer with EA Technology. He is currently responsible for evaluating and implementing innovative technologies for the detection of partial discharge in High Voltage plant and equipment – in particular the development of online HV cable monitoring applications and services.

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Both implementation and thought leadership: the best of Assets 2018

Assets editors Hugh Harford and Josh Ellicock select and discuss the best articles published in Assets last year.

This is the sixth time we have run this Best Feature competition. We hope this article encourages you to revisit our back catalogue. Reading back is always more interesting than you expect, connecting dots, finding new interactions you'd missed, and more.

There is a huge amount available at theIAM.org/magazine and an article per issue is available for free to non-members.

The Assets readership survey closed in early 2018, with some interesting results. One of the key results we have responded to is the desire to see more "thought leadership" articles. We will seek more of these to augment our fervent focus on illustrating genuine progress in asset management implementation. Additionally, readers indicated a preference for more in-depth articles and those from a global perspective. We have since endeavoured to feature more lengthy articles, getting into the detail of the issues at the core of asset management implementation stories from a variety of regions.

This also means, of course, that the criteria for what makes the Best Assets Feature have to change a little to fit with thought leadership articles.

When determining the Best Assets Feature, we treat articles as either implementation or thought leadership, but not both – it's just easier for now for our simple brains. The competition is scored on five criteria, with the best across all five judged as the best article.

A great range of assets were covered this year, including fleets of buses and naval vessels, and specific areas of asset management in its most holistic sense, including repurposing assets, competence development, and emergency response. More organisations are willing to report measured and clearly defined data on their asset management implementations, with costed and tangible benefits, which is very encouraging. To go alongside this, interesting thought leadership pieces discussed resilience and education in flood defence, systems analyses, Internet of Things security, data and its use in analytics approaches.

Best Assets Feature scoring criteria				
Genuine progress	**Tangible results**	**Linkages and fit**	**How it actually works**	**Integration or implementation**
Implementation articles				
Demonstrating genuine asset management progress, where honesty about hard lessons is a major positive, during implementations in infrastructure owning organisations	Achieving and reporting tangible asset management implementation results, with monetised examples favoured	Showing how the asset management initiative has linked and contributed to the aims and objectives of the organisation	Detailing clearly how the asset management initiative was achieved (either the full programme or specific details of a programme part)	Detailing clearly the logic behind why this new asset management thinking is needed
Thought leadership articles				
Demonstrating genuine asset management progress, where honesty about hard lessons is a major positive, in thought leadership	Achieving and reporting tangible asset management thinking that is genuinely new and definitively makes a difference	Showing how the new asset management thinking fits and develops existing asset management community thought	Demonstrating how cross-silo integration was enabled	Demonstrating where this asset management thinking has already been implemented with good effect

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And the winner is...

The winner of the Assets Best Feature competition 2018, by a tight margin, is **"Smooth Journeys begin with data"** by Luke Phillips and Deborah Platt of Cheshire East Highways (see May 2018 issue).

This feature dealt with how asset management improved highways performance in Cheshire East, and was justifiably the Project Achievement Award winner at the IAM Awards 2017. Clear benefits were measured, including protecting the local authority budget, reducing third party claims by two thirds from their £900,000 peak in 2015/16, and how permanent repairs now constitute 98 per cent of all road repair works.

How this was achieved seems to have been key, really pushing for everyone involved to understand "Where do I fit in", the culture piece of course, and using Total Road Enhancements (TREs) where various types of works are coordinated to run during a single road closure – reducing delays, disruption and carbon emissions as a result.

Congratulations to Luke Phillips and Deborah Platt and all those who worked with them. This is a prime example of real benefits and effective reporting of results in asset management.

Second and third

Second place goes to an interesting and detailed thought leadership piece, **"Can IoT win the war on security?"** (August 2018). On a topic that's often written about, this piece punched through. It was well informed and clear about its application in asset management.

Third goes to a strong feature from Dubai, **"Processing the past, predicting the future"** (May 2018), which reported detailed results, and told a strong asset management implementation story.

Honourable mentions

Two honourable mentions go to other interesting feature articles that reported costed results, and showed a good view of asset management.

"How your asset management system is going to fail" (November 2018) – thanks to Carl Waring for an interesting input. Implementations of asset management the editors have seen don't usually get this far.

"New life for old assets – turning liability to benefit" (February 2018) also deserves a mention. It was interesting to hear about these initiatives. See also Gravitricity (gravitricity.com), who use old coal mine shafts as potential energy storage.

Thanks and further contributions

Our thanks to all the Assets contributors during 2018. Your input is genuinely valuable, and we hope we've done all we can to make it easy to publish your articles.

The Assets team works hard to help contributors produce their best articles, including sub-editing content, which helps reduce the effort required to contribute an article.

Please encourage those with talent, good results or interesting thinking who are pushing for asset management effectiveness to get in touch and contribute.

Visit **theIAM.org/magazine** and log in using your IAM member details to read all recent Assets articles, including those mentioned here.

About the authors

Hugh Harford, MEng, is an editor of Assets. He really seeks good implementation articles to get into the magazine, which you can send to Hugh.Harford@theIAM.org

Josh Ellicock, MEng, is an editor of Assets. He welcomes honest feedback and suggestions for Assets as well as always looking for new contributors to the magazine. Please do get in touch at Josh.Ellicock@theIAM.org

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The map-a-thon runners

IAM Awards 2018: runner-up

An IBM team's work to protect customers during a product change earned them a place on the shortlist for the Team Award at the IAM Awards 2018.

by Ludmila Kantova

Software discovery plays a critical role in software asset management. If information is missing during this process, it can leave the organisation noncompliant with the software manufacturer's licensing terms and conditions – which can lead to financial exposure.

At the beginning of 2017, many of IBM's customers started a massive migration to a new software discovery tool. Until that point, the primary software discovery tool for IBM customers was Tivoli Asset Discovery for Distributed (TAD4D). IBM's Software Centre of Competency (COC), part of the firm's Global Asset Management (GAM) team, had to manage the customers' migration to a new tool, BigFix Inventory (BFI), from a catalogue point of view.

TAD4D and BFI used distinctly different catalogues for software scanning, which caused three major issues for the migration.

1. Manufacturer and component names did not match.
2. The BFI catalogue did not contain all the signatures from the TAD4D catalogue.
3. The BFI catalogue did not contain auditable flags.

Loading new scan data from BFI without first addressing these issues would have resulted in data inconsistency. This would have created enormous workloads for asset analysts and customers. As a solution, IBM's Software COC defined a two-phase approach to the migration.

- **Phase 1:** Map BFI software components to TAD4D component names. Every software component in BFI's catalogue – more than 70,000 unique software component versions – had to be reviewed and mapped to a corresponding component name in TAD4D. If a component did not exist, a new one had to be created. And for each component from BFI, the auditable flag had to be verified.
- **Phase 2:** Recover software components discovered by TAD4D but not by BFI.

For both phases, components belonging to different software manufacturers were divided into Top Priority or Low Priority, based on the potential financial exposure involved.

The Software COC started the project in January 2017. The distribution of project participants across 11 countries presented an interesting challenge for the team, which consisted of:

- 28 licensing experts, one of whom is the Centre of Competency Manager, located in the USA, Mexico and the Czech Republic
- nine software discovery experts located in the USA, the Czech Republic and China.

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The team also collaborated with:

- server administrators located in Argentina, Brazil, Poland, Spain, Germany, India and China, who provided server extracts that were used to build the missing software signatures
- the BFI development team, located in Poland, who were responsible for managing BFI's standard catalogue of software components.

Phase 1

For Phase 1, the team built a set of complex database queries, using Structured Query Language (SQL), to merge the TAD4D and BFI catalogues. The queries contained the rules for matching the data on a component level, as well as on a software signature level.

The SQL queries were imported to IBM's Quality Management Facility, which extracted data from BFI's standard catalogue and the standardised IBM Asset Management catalogue and merged it together. Where a match was found, data was mapped based on the outcome of the SQL query. Where no match was found, licensing experts analysed the data and manually defined the components that would need to be matched.

Progress was reported on a weekly basis to make the status of the project visible to everyone involved in the migration.

To promote engagement and increase motivation, in the style of the software development industry's "hackathons", the team initiated MAP-A-THONS, where teams raced the clock to define matching components. MAP-A-THONS began in Brno, Czech Republic, then when the shift was ending for people there, the team in Mexico picked up the baton.

Phase 2

For Phase 2, the software discovery experts introduced an innovative approach by building a test environment in the cloud, using the application Softlayer (since renamed to IBM Cloud). The test environment was used to install software components on various platforms. Extracts from these servers could then be used to build the software signatures missing from the standard BFI catalogue.

Once discovered and built, these missing signatures were uploaded to a custom BFI catalogue. Customers affected by the migration issue were granted access to the custom catalogue, so they would not have to wait for an official catalogue update to resolve the issue. When the project was completed in June 2018, the team had enhanced the standard BFI catalogue with nearly 2,000 new extended software signatures.

Project timeline

Phase 1	January 2017	Project kick-off
	25 April 2017	98.5 per cent of Top Priority manufacturers' software components mapped
		53.3 per cent of Low Priority manufacturers' software components mapped
	12 September 2017	100 per cent of BFI catalogue software components mapped to TAD4D catalogue software components
		Phase 1 goal achieved
Phase 2	June 2018	Nearly 2,000 new extended software signatures made available to customers in addition to BFI's standard catalogue
		5 million software components discovered by BFI

Smooth transition

One of the main benefits of this project was the data standardisation. By mapping the component versions in BFI's catalogue to standardised component data in the existing GAM catalogue, standardisation was maintained. This ensured there would be no impact on existing software discovery data. The relationships between the standardised software component names and their names in BFI are visible to all customers who contract IBM to perform software asset management services.

Another benefit was the reintroduction of auditable flags, not originally included in BFI's catalogue. These help customers identify which software components require compliance assessment against licensing terms and conditions.

As of June 2018, BFI had discovered 5 million software components. Without the team's SQL queries to automate part of the project, an asset analyst would have had to address each instance manually. Estimated five minutes per instance, this would have taken 208 full-time analysts an entire year to address. The average salary for an asset management analyst is $65,000[1], so this would have worked out at more than $13.5 million.

The mapping project was completed by 37 experts dedicating four hours a day for eight months, at a total cost of $802,000. The team's approach avoided costs of more than $12.5 million.

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1. Asset management analyst salaries on Glassdoor **glassdoor.com/Salaries/asset-management-analyst-salary-SRCH_KO0,24.htm**

About the author

Ludmila Kantova has 13 years' experience in asset management. She has defined more than 200 innovations for tools used in strategic asset management and created more than 50 asset management global process documents including policies, directives, education modules and work instructions. She is an experienced mentor and lecturer.

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IAM Awards 2018:
NxtGen Award
runner-up

Renewed rigour

Sergio Andrés Jaramillo Lopera was shortlisted for the NxtGen Award 2018 for his outstanding contribution to Intercolombia through a vital stretch of its asset management journey.

When Intercolombia, Colombia's biggest electrical transmission company, began its asset management journey, decisions about asset renewal and disposal were based on a combination of technical criteria, cost, and individuals' expert judgement.

Intercolombia has a large and ageing asset base, including more than 10,500 kilometres of network and 90 substations. To properly plan its future investment, the company needed a clear and effective strategy for managing assets approaching end-of-life. But there were important opportunities for improvement in the existing decision-making and renewal processes. Something had to change – and the beginning of the company's asset management journey in 2014 provided the opportunity.

Since the journey began, Sergio Andrés Jaramillo Lopera has led the transformation of Intercolombia's approach to asset renewal and disposal. The company now has a proportionate, integrated criticality, health, and risk-based methodology for deciding the optimum time to renew or replace an asset.

The company's asset management transformation involved several parallel workstreams, each headed up by a thematic leader. Sergio was appointed thematic leader for Optimising Asset Renewal and Disposal. During the asset management project, he advanced from a standing start to become an acknowledged expert in decision-making, renewal and disposal of assets.

He participated in workshops with directors and managers to develop a clear and effective strategy for renewal and disposal. With the strategy agreed, he led the rollout of a renewal strategy aligned to the organisation's goals.

Additionally, the rollout of the decision-making methodology has been successful, largely because it is not a "black box" solution. Sergio has been part of a structured transformation that includes culture, competencies and business processes. It is documented in a manual and enabled by decision support tools and software.

Working closely with colleagues from Intercolombia's maintenance department and regional operations centres, Sergio organised a mixture of formal training, learning by doing, exam testing, and independent validation to support the rollout.

The decision-making methodology gives Intercolombia consistent ways to support decisions using the established SALVO (Strategic Assets: Lifecycle Value Optimisation) process. Implementing the methodology involves ongoing collaboration between multidisciplinary groups of experts, led by a decision owner, supported by a process facilitator, and validated by a financial expert.

Having a collaboratively developed, defined and documented methodology means that the processes and good practices established as part of Intercolombia's asset management transformation are sustainable, and contribute to a culture of continuous improvement. As part of this culture, the methodology is now reviewed at least once a year, and Intercolombia's overall asset management maturity is being assessed by The Woodhouse Partnership Ltd (TWPL).

And decision-making methodology is already yielding significant savings. Sergio's outstanding contribution as the methodology leader for this work has broken down organisational silos, providing a clear sense of purpose and line of sight across the whole company.

Decision	Conclusion	Operating expenditure	Capital expenditure	Risks	Total savings
Whether to purchase a backup transformer	No backup transformer needed	-$26,225	-$1,017,679	+$202,624	-$841,280
Whether to purchase equipment for testing isolated high voltage cables	Hire, rather than acquire	+$97,336	-$119,466	-$19,607	-$41,737
How to approach renewal of the lightning monitor system	Hire the service	+$118,485	-$636,600	+$39,028	-$479,087
How to handle structural steel inventory	Dispose of surplus	-$82,115	-$1,546,556	$0	-$1,628,671
Whether to purchase a 34.5kV mobile cell for maintenance or contingencies	Purchase not worthwhile	+$251,841	-$802,539	$0	-$550,698
Total		**+$359,322**	**-$4,122,840**	**+$222,045**	**-$3,541,473**

These benefits are quantified in terms of present value in 2017 US dollars. They have been validated by the financial department of Intercolombia.

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The cowhide premium

Your brand is an asset. So why do so few organisations treat it like one?

by Matt Boothman

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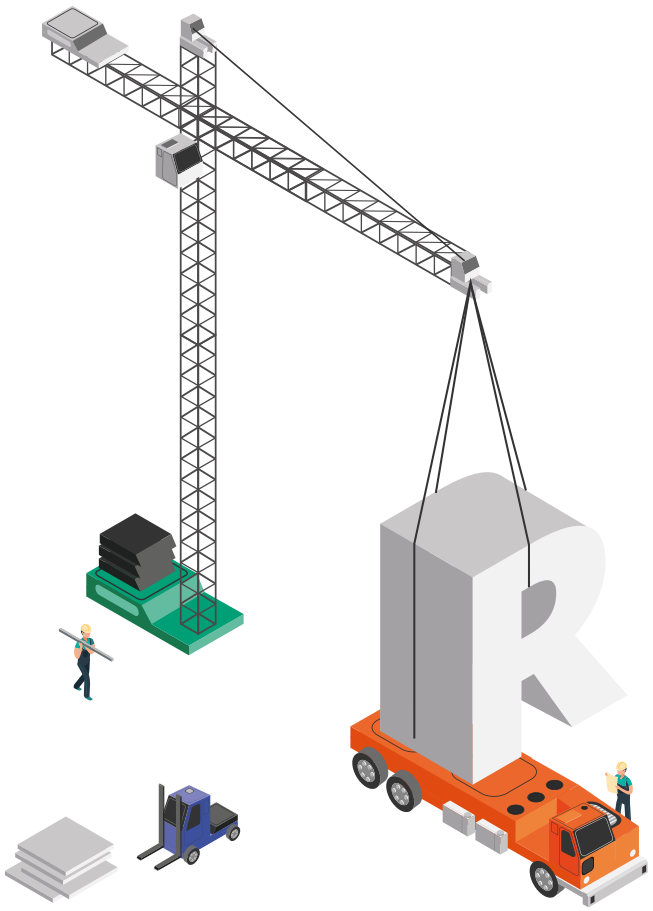

Brands are today where infrastructure and other physical assets were before asset management moved things to a new level: valued purely on the balance sheet, if at all. There's a clear opportunity for asset management thinking to help organisations in every industry realise more value from their brands.

An organisation's brand is the combination of elements it can be recognised by. The logo usually distils down many of these elements, but a logo by itself is not a brand. A brand can encompass colours, typefaces, photographic styles, graphics and iconography, slogans and catchphrases, audiovisual idents and jingles.

The way employees interact with customers and stakeholders, and even with each other, can also be considered part of their organisation's brand. A particular customer service experience or employee culture can be just as recognisable a part of an organisation as its logo. This is one reason why internal communications and employee engagement so often go hand in hand with brand development.

The value of an organisation's brand is easy to acknowledge, if difficult to quantify. Some form of brand, however basic, is part of the price of doing business. A brand that stands out to the right target audience makes an organisation more competitive. A consistent and memorable brand guides potential customers smoothly from awareness of the organisation to engagement with its products and services. A brand that represents its organisation's vision and purpose brings alignment to different business activities, from high level strategy to everyday communication, improving efficiency by giving teams throughout the organisation a set of shared values and priorities to pull towards: that is, it provides a form of line of sight.

The LinkedIn brand is assigned a dollar value on Microsoft's balance sheet

But how much of a given organisation's competitiveness is attributable to its brand? How many potential customers would abandon their journey before engaging, if not for its brand? How much less efficient would the organisation be without the clear vision and shared purpose imparted by its brand? The intangibility of the brand makes it hard to determine how much value is being realised from the brand alone.

This poses an issue for brand and marketing personnel, and for brand agencies like Redhouse – an issue that will be familiar to asset management professionals. Finance directors and other executives can be reluctant to invest in their organisation's brand, because the return on investment is expressed in holistic rather than purely financial terms.

As a result, there has been a concerted effort over the past decade and a half to get brand on the balance sheet.

Until 2005, brands did not meet the International Financial Reporting Standards' (IFRS) definition of an "intangible asset", and could not be recorded on balance sheets. IFRS3, issued on 1 January 2015, changed the rules so that companies were required to add brands they acquired to their balance sheets. So for instance, when Microsoft bought LinkedIn, it added the LinkedIn brand to its balance sheet – but still could not add its own Microsoft brand.

Still, this provided one way to determine the value of a brand to the organisation that owns it: purchase price. The value of a brand is the price the owner could expect to sell it for, or the price it paid to acquire it. This method treats a brand just like physical assets were treated before the adoption of whole-life cost analysis approaches: it goes on the balance sheet at the price the organisation paid for it, and depreciates over time.

Comparing sales of similar organisations can give us an idea of the value brand contributes, over and above the worth of the organisation's more tangible assets. Take the UK mobile phone providers Orange and One2One as an example. Both companies started up and received their operating licences at the same time, both operated in the same regulatory environment, neither had a particular technological advantage over the other,

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A strong brand added billions to Orange's sale value compared to One2One

and both were sold to German firms in 1999.

The main point of differentiation between these otherwise very similar companies lay in their brands. Orange's brand had become associated with reliable network coverage, simple pricing, compensation for poor service, and other customer-focused policies. Mannesmann bought Orange for £19.8 billion, while Deutsche Telekom bought One2One for a comparatively paltry £8.4 billion. The strength of Orange's brand made it more than twice as valuable as its close competitor.

This method of measuring brand value has significant limitations. The purchase price of a brand can only be realised when the brand is sold, so this method does not account for the ongoing value the organisation realises while it still owns the brand. And while the method functions well enough for consumer product brands, which can be bought and sold relatively easily by holding companies, not all brands are suitable for sale. Government departments, industrial firms and infrastructure companies, for example, are highly unlikely to sell their brands, and would struggle to find a market if they tried.

More recently, researchers have designed experiments to determine the value of brands. Participants in these experiments are shown mocked-up ads and asked how much they would pay for that product. The product is the same for all participants, but half are shown a branded version and half are shown a generic version. If, on average, people are willing to pay more for the branded product than the generic one, then that increase indicates the value the company is realising from its brand.

One such experiment, published in 2011, used Gateway computers. Part of Gateway's brand was a distinctive black and white cowhide pattern. Every Gateway computer came in a box decorated with this pattern. In the experiment, university students were shown two different computer ads: one showing a plain box, and one showing a box with a black and white cowhide pattern. The ads were otherwise identical. The study reported that students who were shown the ad with the patterned box valued the computer at about $130 more, on average, than the students who were shown the ad with the plain box.

Based on this study, it could be said that Gateway realised about $130 of value from its brand every time someone bought one of its computers.

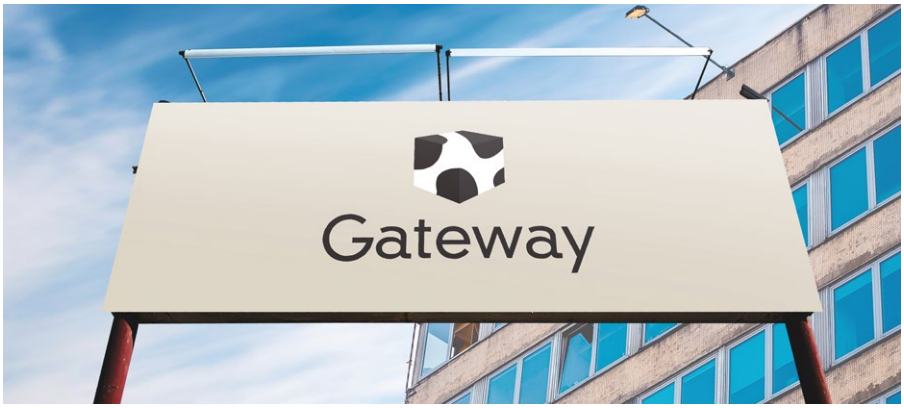
This method does a better job of accounting for the ongoing value an organisation can realise from its brand. However, it is still best suited to businesses selling to consumers. The same experiment would be much less reliable if it asked participants to value something they would never normally consider paying for themselves, like a shipment of airline fuel, the upkeep of a major road, or the management of a power station. This makes it difficult for industrial companies or utilities, for example, to use this method to accurately estimate the value of their brand.

There is a clear need for something like a whole-lifecycle cost model for brands of all kinds. Asset management has changed our understanding of the value of physical assets, taking into account the costs associated with operations, maintenance, downtime, revenue income, upfront purchase, replacement and disposal. Our understanding of the value of brands needs to change in similar ways, to account for factors like the complexity of applying the brand consistently (the equivalent of a physical asset's operating costs), the regularity of brand refreshes (preventive maintenance) and the cost of a complete rebrand (refurbishment or renewal).

Since the ISO55000 series of standards updated the definition of "asset" to include intangible things, asset management professionals have worked closely with software and Internet of Things companies to apply asset management thinking to data. This has also started to showcase the value of asset management outside its heartlands of engineering and infrastructure, especially as managing data becomes business as usual for more and more organisations.

Branding, meanwhile, is business as usual in every organisation. Applying asset management thinking to this ubiquitous intangible asset could introduce even more sectors to the discipline. And asset management thinking would provide the rigour needed to convince executives of the value their organisations could realise by investing in a distinctive and coherent brand. So far, branding is largely unexplored territory for asset management professionals. But for how much longer?

The cowhide pattern in Gateway's logo was a key part of its brand, also appearing on product packaging



About the author

Matt Boothman is a writer, editor and strategist at Redhouse, where he has developed brands for clinical supplies firm Blueleaf, the Government Office for Science, and the Payment Systems Regulator, among others. He has been a member of the Assets editorial team since 2011. ***redhousebrand.com***

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At a glance

Research has shown that presenting key information graphically can reduce the time engineers spend browsing documentation by up to 70 per cent.

by Dr Emily Carey

Excellent asset management is dependent on having timely access to appropriate information and knowledge. Asset management information is typically stored in reference documents. As the amount of reference documents stored by an organisation increases, the challenge is in how engineers can access the relevant information efficiently and effectively.

Research at the University of Bath has shown that extracting key information contained within a document and presenting it as a one page "Super Document" infographic can reduce the time spent browsing documents by up to 70 per cent.

Over time, an asset-intensive organisation will amass a significant amount of current and historic technical, regulatory and procedural documents. The information contained within these documents is fundamental in informing engineering decisions – for example, what repair method to use in a particular circumstance.

However, the sheer number and structure of documents can make it difficult for engineers to identify which, if any, is relevant to their current problem. This impedes the speed and effectiveness of their decision-making. The University of Bath research looked to address this challenge by changing the way documents are presented.

To make sure the outputs of the study would be useful in the real world, the researchers collaborated with an industrial partner in the aviation sector. A survey of engineers working in the partner organisation found that they spend an average of four hours each day browsing the content of documents to find the information they need to support maintenance decisions. Reducing the time they had to spend identifying relevant information from documents was clearly key to their productivity.

The four-year project aimed to establish how engineers used documented information to inform their decisions. What information did they use and how did they use it?

This involved a three stage approach:

- **Stage 1:** Understand the purpose for engineers to use documented knowledge.
- **Stage 2:** Understand what content the engineers were using.
- **Stage 3:** Understand how the engineers use this information to support decisions.

One key finding of these studies was that, when making maintenance decisions, engineers sought visual information. They used visual cues and pictures within the documents to match the fault they were repairing. This finding was significant, because the importance of visual elements when seeking information from documents for engineering purposes had not been fully appreciated until this point.

Engineers' preference to explore or discount documents based on the pictorials they contained was fundamental in shaping the "Super Document" approach. In the Super Document, the visual elements contained within a document are extracted and presented as a single page infographic. This contains the key information an engineer needs to rapidly assess whether the information contained within the document is relevant.

Trials of a Super Document approach by the industrial partner were shown to dramatically cut the time that engineers spent browsing information. Representing key information in a visual way on a single page reduced the average time spent assessing the relevance of a single document from 10 minutes to three minutes – a 70 per cent reduction in time spent. Potentially, on a daily basis this would reduce information seeking time from four hours to one hour and 12 minutes.

Although significant, the time saving was not the only benefit identified. Reducing lengthy documents to one page Super Documents also reduces the amount of information that needs to be transferred between international sites. This mitigated both information security risks and bandwidth usage.

About the author

Dr Emily Carey is a Research Associate within the TREND group at the University of Bath. Her PhD thesis investigated the need to support efficient access to information and knowledge in complex engineering projects. This was a collaboration between the Engineering and Physical Sciences Research Council and the University of Bath.

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About the IAM

The Institute of Asset Management (IAM) is an independent learned society and not-for-profit professional membership body dedicated to furthering knowledge and understanding of asset management.

The IAM offers both Individual and Corporate Membership.

Benefits of membership include:

- access to a global network of professionals
- free **Assets** magazine
- discounts for Annual Conference, Lecture and Dinner and other events
- discounts on publications and IAM Qualifications
- online discussion boards and exclusive access to online Knowledge Centre
- eligibility to be elected or appointed to IAM posts and roles.

*Visit **theIAM.org/Join** for more details*

For individuals

Individual Membership allows you to engage with the profession. The grades available are:

- Fellow: must be able to demonstrate superior responsibility as an expert practitioner; entitled to use FIAM post-nominal letters
- Member: must be able to demonstrate knowledge and expertise; entitled to use MIAM post-nominal letters
- Associate: open to any interested person
- Student: must be engaged in a recognised academic course
- Affiliate: free but with limited access and benefits (12 months maximum).

For organisations

Corporate Membership is available to organisations whether large or small; commercial, private or not-for-profit. Special discounts are available for local government and academic organisations. The benefits include:

- demonstrable commitment to the discipline of asset management
- access to Endorsed Assessor and Endorsed Trainer Schemes
- priority access to sponsorship opportunities and contract enquiries
- discounts on IAM Membership, events, products and services for every employee
- free company listing in online directory.

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*Contact your elected representatives at **Council@theIAM.org**. Visit **theIAM.org/Council** for more information.*

Patrons list

The Patrons of the IAM are an exclusive group of Corporate Members who commit to a high level of activity and engagement with the Institute. Patrons are eligible for a number of exclusive benefits and have exceptional influence on the development of the IAM and the discipline.

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annual 2019 CONFERENCE

24 - 26 June

ACC Liverpool, Kings Dock, Liverpool

The Institute of Asset Management

The Institute of Asset Management's Global Annual Conference attracts over **350 individuals** from around the world. The theme for this years Conference will be **Digital Asset Management**.

Secure your place

Visit theiam.org/Events/iam-2019-annual-conference/registration

This year you can also book an exclusive corporate table for 10 people.
Book a dinner table: events@theIAM.org

First published in Assets, the magazine for Members of the IAM. May 2019

Assets

The Institute of Asset Management magazine August 2019

All aboard the awards

The IAM Global Awards 2019 are open for submissions. Read two past nominees' stories inside and apply online.

Global Views
How can we improve diversity and inclusion in our profession?

Don't go with the flow
Why water companies should think strategically about digital

Pattern recognition
Modelling and machine learning experts forecast our AI future

The Institute of Asset Management

First published in Assets, the magazine for Members of the IAM. August 2019

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The Institute of Asset Management
St Brandon's House
29 Great George Street
Bristol BS1 5QT
44(0)845 456 0565
theIAM.org

Hugh Harford
Editor
Hugh.Harford@theIAM.org

Josh Ellicock
Editor
Josh.Ellicock@theIAM.org

Advertising enquiries
Office@theIAM.org

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Letter from the CEO

The IAM Annual Conference, which we held at the ACC in Liverpool at the end of June, provided a wonderful opportunity to meet many IAM members, volunteers and other partners to hear their views. We also celebrated the IAM's 25th Anniversary with a dinner, attended by many of our past Presidents – providing a snapshot into the Institute's fascinating history.

The conference theme looked at the impact of the advances in digital technology on the asset management industry and we heard about the many challenges and, of course, opportunities that they present.

Alongside this, NxtGen delivered the Newcomers stream, with insights into the world of asset management. This included the first asset management hackathon, with teams looking at how digital technology can — and will — change the world, starting with electrically powered connected autonomous vehicles. It really demonstrated the innovative and multidisciplinary nature of the discipline, with some fantastic video outputs created. One key area of focus for me will be how to encourage young people to enter the asset management profession, working with NxtGen but also many other members, volunteers and partners.

Also highlighted by the talks and networking sessions was the importance of people as assets, a subject of a previous Assets article (see May 2019 issue). It would not be possible to realise the true value of an organisation's assets without people with the required competence, capability and diversity working in a supportive and inclusive culture.

This touches on another area where I will have a specific focus – inclusion. The inaugural Women in Asset Management event at the conference was extremely well received and this is the start of the work the IAM will do to encourage inclusion in its widest sense. We have work to do! Please do join us, we would really welcome your involvement.

Kirsten Bodley – Chief Executive
CEO@theIAM.org

Assets guidelines and dates for contributions

The **Assets** editorial team considers all contributions from IAM members, so please send your ideas, views on the magazine and suggestions for future content to **Assets@theIAM.org**

Dates for the next issue, published Nov 2019:

- 9 Sept 2019: deadline for suggesting articles
- 18 Sept 2019: deadline for reserving advertising space
- 4 Oct 2019: deadline for submitting approved articles
- 1 Nov 2019: deadline for advertising artwork.

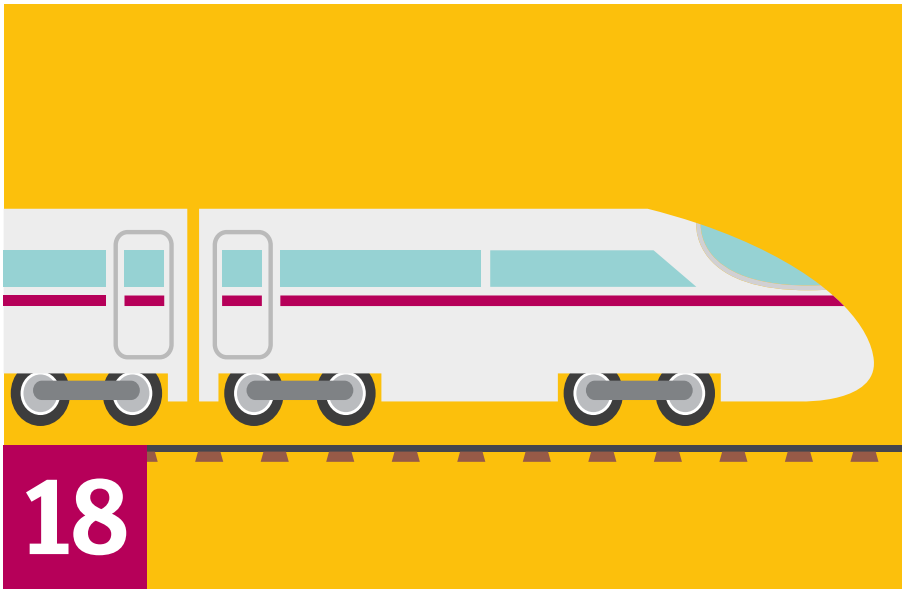
Guidelines for submissions:

- The ideal **Assets** feature article explains implementation challenges and how they were resolved, details the benefits and gives guidance on implementing asset management in asset intensive organisations. Note that not all **Assets** articles are features
- The **Annual Assets Best Articles** competition celebrates the features that succeed the best in achieving these aims, as judged by the **Assets** editorial team
- The editorial team reserves the right to edit submissions for grammar, clarity, style and length. The maximum length for **Assets** magazine articles is 2,000 words, but we accept submissions of any length, on the understanding that the article may be cut down or split up. We will send you the revised article for approval before publication
- Please include no more than one graph, chart or diagram per 500 words
- Not all story suggestions or submissions can be included. The **Assets** editorial team will inform you if your suggestion will be taken up following its editorial meeting
- Contributions should not be overtly commercial in tone – but if you would like to take out a quarter-page, half-page or full-page advertisement in **Assets**, please email **Office@theIAM.org** for details and rates.

If your submission is selected to be published in Assets, you will need to provide:

- any pictures as original high-resolution TIFFs or JPEGs for printing purposes

Contents



Contributors

Aaron Johnson (page 18) is an accomplished mathematician who began his career as a healthcare data analyst. He joined Jacobs' Asset Management team in 2017 and was seconded to support Network Rail on the Transpennine Route Upgrade Programme. Aaron is responsible for the assessment in resilience of approximately 6,000 assets covering earthworks, structures, signalling, telecoms, track, level crossings and overhead line equipment.

Anne-Marie Walters and **David Armstrong** (page 20) work for Bentley Systems, David as Director of Digital Enablement, Anne-Marie as Industry Marketing Director for the oil, gas, and process industries. David was part of the G33 Committee redeveloping the North American configuration management standard. As part of the Process Industries STEP Consortium, POSC Caesar and now MIMOSA, Anne-Marie has long been a spokesperson for international standards for information management.

Dr Mohsen Mohseninia (page 22) has more than 18 years of experience in the telecommunications sector. Currently with Aeris, he previously held various roles at Logica, including establishing its telecoms business in the Middle East and Africa and developing strategy in the UK. Mohsen holds a PhD in numerical computations from the University of Hertfordshire, UK.

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IAM NEWS

IAM welcomes new President

Ursula Bryan is the President of the IAM as of 25 June, taking over from Chris Newsome.

As Head of Engineering and Asset Management at National Grid Electricity Transmission, and a Director of the IAM since 2009, Ursula is a well known, long-standing and committed leader in our profession.

She said: "I am extremely proud to be taking over the reins as President from Chris, supporting Kirsten Bodley, IAM CEO, and the IAM team in encouraging more people to join our community and become asset management professionals, recognised by achieving registration."

During her tenure as President, Ursula will devote her attention to three areas: professionalisation, asset management in the wider world, and inclusivity.

Chris Newsome said: "It is an exciting time to pass the baton to Ursula who, with a strong IAM team, including the Chapter and Branch leadership teams, I am sure will work to ensure the IAM becomes ever more inclusive."

Source: IAM

Award nominations open online

Submissions are now open for the IAM Global Awards 2019. For the first time, you can now submit entries via an online portal.

Formerly known simply as the IAM Awards, the IAM Global Awards recognise outstanding contributions and achievements in asset management, commending those who have worked to improve aspects of an asset management system and generate benefits or enhanced value for wider society.

There are two new awards to enter this year – the Risk and Resilience award, and the Information Management award.

The winners will receive their awards on 27 November at the IAM Annual Dinner and Global Awards Ceremony, part of the IAM Asset Management Conference 2019. The event takes place at the Chelsea Harbour Hotel in London, UK.

Individual Award

For an individual, typically with more than five years' asset management experience, who has made a personal contribution to their organisation or to the asset management knowledge base.

Team Achievement Award

For an operational team or department who have made a significant contribution to their organisation or the asset management knowledge base. The team should consist of people from across the organisation or from different organisations.

Project Achievement Award

For a project which has achieved a good or notable outcome. Examples of projects could be construction, information systems, business change or research projects.

NxtGen Award

For an individual new to asset management (with five or fewer years' experience) who has made an outstanding contribution to the implementation and development of asset management and demonstrates great potential in the field.

Innovation Award

For an individual or team whose innovation in asset management has delivered financial, performance and risk reduction benefits.

Customer Service Award

For an individual or team whose approach has benefited the asset management system in respect of meeting customer requirements and/or improving customer satisfaction and advocacy.
Customers can include internal customers within the organisation, external customers who receive products and services from the organisation, or stakeholders who influence the success of the organisation.

Risk and Resilience Award

For an individual or team with an excellent or noteworthy approach to managing risk (identifying, evaluating and prioritising risks followed by coordinated and economical application of resources to minimise, monitor and control those risks) and/or ensuring resilience (an asset management system's ability to return to a steady state after an intervention).

Information Management Award

For an individual or team whose information management activity has enabled teams and stakeholders to use their time, resources and expertise effectively to make asset management decisions and fulfil their roles.

Submissions

To book tickets for the IAM Global Awards 2019, visit theIAM.org/events/iamglobalawards2019

To book for the IAM Asset Management Conference, Annual Lecture, and Annual Dinner and Awards Ceremony, visit theIAM.org/events/asset-management-conference-2019

First published in Assets, the magazine for Members of the IAM. August 2019

Three-year plan

The IAM released its Strategic Plan for 2019-22 on 25 June, Day 2 of the IAM Annual Conference in Liverpool, UK.

Conference delegates were among the first to review hard copies of the updated plan. A digital version is now available from the IAM website.

Download the IAM Strategic Plan 2019-22 from theIAM.org/about-us/vision-strategy/

Source: IAM

Dates for your diary

theIAM.org/events

26 SEPTEMBER
IAM NL Annual Conference
Haarlem, The Netherlands

26-27 SEPTEMBER
IAM DE Annual Conference
Hamburg, Germany

1-3 OCTOBER
IAM 2019 North American Conference
Chicago, USA

27-28 NOVEMBER
IAM Asset Management Conference 2019 including Annual Lecture, Annual Dinner and Global Awards Ceremony
London, UK

Taking the profession's temperature

Thank you to everyone who responded to the Pains and Challenges of Asset Management Survey 2019.

This short survey was developed by Yotta, an IAM Corporate Member, and distributed to the profession via the IAM network. It aimed to gather insights into the biggest everyday frustrations and challenges currently facing asset management professionals.

The results – and the insights they provide – will be presented at the Asset Management Conference in London, UK in November.

Source: IAM

IAM Asset Management Conference 2019

27 & 28 November 2019
The Chelsea Harbour Hotel
London

The IAM Asset Management Conference is the IAM's Call for Papers event, designed to cover the breadth and depth of asset management.

The sessions will consist of keynote speakers, presentations, workshops, and an IAM Awards stream.

Registration is open!
Secure your place with the Early Booking rate before 30 September 2019

To book your place, visit **theIAM.org/events**

First published in Assets, the magazine for Members of the IAM. August 2019

INDUSTRY NEWS

Updated edition

The second edition of *Asset management*, edited by Chris Lloyd and Michael Corcoran of CAS, is now available from ICE Publishing.

Subtitled *Transforming asset dependent businesses*, the book's 11 chapters consider the history, added value, best practices and future challenges of asset management from a range of strategic corporate and academic perspectives.

Key themes include return on investment, engaging the board, culture change, benefits realisation, research priorities, digitalisation, professional development and the role asset management must play in mitigating climate change.

To order *Asset management*, visit **ICEbookshop.com/asset.aspx** or search Amazon and other leading online booksellers.

For more information about CAS, visit **CAS-UKCN.com**.

Source: Chris Lloyd

Learn by example

A new book, *Asset management insights – phases, practices, and value*, presents a series of never before seen case studies from across the breadth of the profession.

Where most existing asset management titles describe the discipline and related standards, *Asset management insights* follows the lifecycle of assets through the lens of real situations from manufacturers, infrastructure operators and public sector organisations.

The book, by Celso de Azevedo, shares these organisations' challenges in detail, including where and why they risked failure and how they adapted their practices in order to succeed.

It is organised based on the sequence of the asset lifecycle, allowing readers to follow asset-related questions throughout their lives or study specific lifecycle stages in detail.

Celso de Azevedo is the founder and CEO of ASSETSMAN, an international maintenance and asset management company. He is also the founder of the French Institute of Industrial Asset Management and Infrastructure (IFRAMI) and the Global Forum on Maintenance and Asset Management (GFMAM).

Asset management insights – phases, practices, and value is available now as a print book or ebook. To buy a copy, visit **books.industrialpress.com/asset-management-insights.html** or search Amazon for "asset management insights".

Source: Celso de Azevedo

National Grid invests in decision support tech

The investment arm of multinational utility company National Grid is investing US$10 million in Copperleaf, the Vancouver-based decision analytics firm.

Copperleaf will use the capital to fund innovation and to expand into new markets around the world.

National Grid Partners has a mandate to invest in companies developing technology that can improve the way National Grid performs its core operations, which include gas and electricity transmission, and balancing supply and demand across the UK's electricity system.

National Grid has been using Copperleaf's C55 Decision Analytics product since 2016, first for its gas distribution infrastructure in the north east USA, and more recently for its gas and electricity transmission operations in the UK.

Lisa Lambert, formerly Founder and President of National Grid Partners, now Chief Technology and Innovation Officer at National Grid, said: "We rely on Copperleaf to make the best infrastructure investment decisions given a myriad of strategic and operational constraints. At the same time, Copperleaf is perfectly aligned with National Grid Partners' mandate of investing in segment-leading companies that are disrupting the energy industry."

Source: Copperleaf

First published in Assets, the magazine for Members of the IAM. August 2019

Honour for BIM leader

Dr Anne Kemp has received the Order of the British Empire (OBE) for services to digital construction innovation.

The award recognises Dr Kemp OBE's role in helping the UK construction and infrastructure sectors to recognise that digital approaches can improve the way they design, build, operate and integrate the built environment.

Dr Kemp OBE said: "I'm so thrilled to receive this award and grateful to be working during a time when it's widely accepted that we need a golden thread of information to help us create and run a built environment that supports a better quality of living for all of us."

Dr Kemp OBE is a Technical Director and Fellow at design, engineering and project management consultancy Atkins. Early in her career with Atkins, she introduced the firm to geographic information systems (GIS), and more recently she has taken the lead on its building information modelling (BIM) strategy.

Quick CV

- Chair of the UK BIM Alliance
- Convenor of UK and international BIM standards
- Management Advisory Board member for Digital Built Britain
- Steering Group Chair for the Institution of Civil Engineers' *State of the nation 2017: digital transformation*

More accolades

- President's Award, Institution of Civil Engineers
- Geospatial Professional of the Year, GEO Business Awards

Source: Atkins

Utility withholding repairs in standoff with thieves

Eskom, the South African electricity utility, has announced it will not restore power to areas whose power supply infrastructure is overloaded by illegal connections.

Some of the areas supplied by Eskom, such as the Gauteng area, are experiencing increasing numbers of repeat equipment failures. The utility blames overloading caused by illegal connections for the failures of transformers and mini-substations. It also claims that people are exacerbating the problems by tampering with electricity meters and vandalising infrastructure.

In a statement, the company said: "Eskom will only restore supply to legal and paying customers in the areas, on condition that the community allows safe access to Eskom staff to conduct audits and remove illegal connections.

"If we do not conduct the audits, we run the risk of continued failures without dealing with the root cause … which results in repeated failures of equipment, making power restoration a wasteful exercise."

Source: ESI Africa

Road maintenance funding available

The UK Department for Transport is making £348 million available to local authorities to improve local roads.

Local authorities will be able to bid for the funds in two stages. First, a £200 million local highways maintenance challenge fund will be available in 2019-20. A £150 million local pinch point fund will then be available in 2021-23.

The challenge fund is for major maintenance projects to improve the quality of roads, make driving safer and benefit the local economy, such as by repairing potholes.

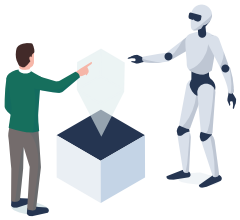
The pinch point fund will be for projects to ease congestion on the busiest roads, such as by linking main roads to housing developments, or helping buses to bypass single-lane roads.

Source: World Highways

Hack to the future

The first ever asset management hackathon produced unexpected solutions – not just to the challenge set, but to some of the profession's deeper issues.

by Richard Rayson



Good asset management requires innovation. By its nature, the discipline is always looking to the future, whether that's planning maintenance for the next 50 years or seeing how the latest technologies can benefit our profession and our assets.

It also requires the collaboration of every part of an organisation. However, the techniques we use, whilst effective, have been in use for a long time, and the discipline as a whole lacks good representation from wider business disciplines such as finance and human resources.

Change is inevitable. As we move into the era of "Industry 4.0", we must continue to look to the future and advance the profession. The problems we face will change, perhaps subtly, perhaps significantly; alongside this, new generations with new skills and life experiences will enter the workforce, adding different perspectives to the way we work and helping to create new solutions.

Attracting greater diversity of thought and perspective into asset management can only benefit the development of the profession and help

Team Echo discuss asset management's contribution to a future with autonomous vehicles during the Hackathon.

First published in Assets, the magazine for Members of the IAM. August 2019

us all improve our abilities to solve the problems of the future.

In organising the IAM NxtGen Hackathon, we wanted to attract new people to asset management: people of all backgrounds, disciplines, and ages. A hackathon is an event where people come together to solve problems. The NxtGen Hackathon spanned all of Day 2 of the IAM Annual Conference 2019, and was themed around "The Application of Digital Technology in Asset Management".

The feeling was that by bringing a range of people together in a creative environment, we could encourage new ideas and solutions to problems by combining their varied perspectives and ideas.

What we hadn't considered was how much the event could enthuse people. The day after a trial session in Manchester in May, a graduate that had attended emailed, thanking me for arranging the event and stating:

"…it definitely gave me further motivation to continue pursuing a career within asset management and also take up more volunteering opportunities…"

Feedback on the evening from another graduate had been equally glowing about their new realisation of the benefits of asset management. As a NxtGen committee member and organiser of the Hackathon, this excited me and made me wonder: "Could this be a way to attract the next generation to asset management?"

For the main event at the IAM's Annual Conference, we reached out across our networks, gaining advice from Australia and the Netherlands and short soundbite videos from experts across four continents. The interest was incredible.

Following the event, I was fascinated and amazed by the variety of perspectives and suggestions that were created and also by the enjoyment and pleasure expressed by the participants. Everyone took part from a neutral perspective, working with team members from different organisations to produce a solution. This made me wonder: "Could this be a way to reinvigorate existing members, and reach across disciplines to people outside the IAM?"

It may be that the hackathon concept can not only benefit individual organisations – by bringing people from across the business together into an open forum to solve problems – but can also benefit the profession as a whole. For the IAM's members to attend or host hackathons targeting the "big problems", with contributors from all sectors and industries, may not only produce new solutions, but also increase awareness of asset management; not only increasing the reach of the profession, but also contributing to producing solutions for the future. Look out for more Hackathons through your nearest Branch or NxtGen representative.

Tips for running a hackathon

- An output that avoids one-to-many feedback sessions can help to maximise time and create engagement from all participants.
- Short talks or videos at the start of the event can help frame the problem, pose questions or provide context. This can help participants to generate ideas and provide material that can be used in future.
- Providing useful resources on the relevant topic area can enable those present to do their own research during the event, as long as there's enough time for exploration.
- A common working environment can enable groups to share ideas and resources.
- Bring in people from different disciplines to provide fresh perspective.
- In order to engage them in the process, it may be necessary to help those from different disciplines to understand how their perspective can contribute to producing a solution.
- Short progress updates (one or two minutes) at key points during the event can enable groups to share ideas, understand what others are thinking, consider their own solutions and discuss with others.

Contributors

A big thank you to:

Dan Wilson, Electricity North West
David Verma, PwC
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Robert Gabrielczyk, AEON Engineering
Robert Kalwarowsky, Rob's Reliability Project
Suzane Greeman, Greeman Asset Management Solutions Inc.
Zahraa Kadri, Atkins

About the author

Richard Rayson is a Senior Consultant within Jacobs' Asset Management Advisory Team and also sits on the IAM's NxtGen Committee. He is passionate about promoting asset management as a career choice and leveraging the latest methods to further the discipline.

Knowledge is not power

Data and digital are fast becoming priorities for the UK's water sector. How can companies make the most of their data-related assets?

by Rob Gray

Questions to drive digital strategy

- Is the level of ambition enough to achieve the step change in performance that's needed?
- Are you being too cautious in adopting IoT, AI or machine learning?
- Are sensors being put on everything including the kitchen sink?
- Do you know whether your workforce has the right digital skills?
- Are you treating your IT systems and tools as assets that are critical to the success of your business?

UK water and sewerage companies have committed £44 billion in their business plans for 2020 to 2025. For this period, Ofwat, the water regulator, set efficiency targets intended to push the frontier of the industry – so all water companies faced a much greater efficiency challenge than for the previous period.

Digital technologies such as the Internet of Things (IoT), artificial intelligence (AI) and machine learning are opening up new opportunities for water companies to drive down costs and improve performance. KPMG's analysis of the companies' business plans has shown that the industry is part of the global trend of accelerating investment in cognitive and AI technologies (see box), highlighted in this year's Chief Information Officer report with Harvey Nash.

Notably, most companies have placed an emphasis on "digital". In doing this, they have made public commitments to invest in digital technology and to make data-driven decisions a critical part of the way that they do business. The technology will allow them to collect far more data than ever before.

But knowledge is not power. Power comes when knowledge is acted upon.

So what's needed? To take advantage of their data, companies need a digital strategy that includes selective adoption of technology, investment in digital skills and treating their IT systems and decision support tools as assets.

Be selective

Water and sewerage companies will already have an array of systems and decision support tools at their disposal. The question is when to opt for new solutions over what has been tried and tested. Both the new and incumbent technology exist to help support decision-making.

One approach, which is consistent with IAM guidance, is to consider the complexity of the decision and the impact of getting it wrong. For instance, machine learning can be used in control rooms to automate responses to alarms when the decision is relatively straightforward and consequences are minimal. Efficiency gains then occur when control room staff are able focus on what matters.

However, every company is different. This means that a clear framework should be in place to guide what solutions are most suitable based on the needs of customers. Without this, companies risk spending money on the wrong things as well as overlooking the value of good old-fashioned common sense.

Invest in digital skills

Those tasked with making decisions on data should have the skills to gather insights and challenge the data put in front of them. However, the Office of National Statistics highlighted the size of the UK's skills gap when it reported that 61 per cent of businesses had

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weaknesses in IT skill competencies in their workforce.

While water and sewerage companies were not included in the survey, it would be a fair assumption that the numbers would not be much different. Spreadsheets are still the application of choice for employees when they are dealing with data. Most employees will not be able to run queries from corporate systems or gain insights using third party data sets, such as land use or rainfall patterns. Consequently, business intelligence tools are commonly the preserve of "superusers" or a service that is outsourced. This constrains a company's ability to take full advantage of digital technology.

However, given the cost of training, it is crucial that companies take a considered approach. One possible solution, which is gaining interest, is the use of "data citizens" distributed across an organisation, whose job it is to extract insights and to then work with the business to turn them into action.

Apply asset management principles to IT systems and tools

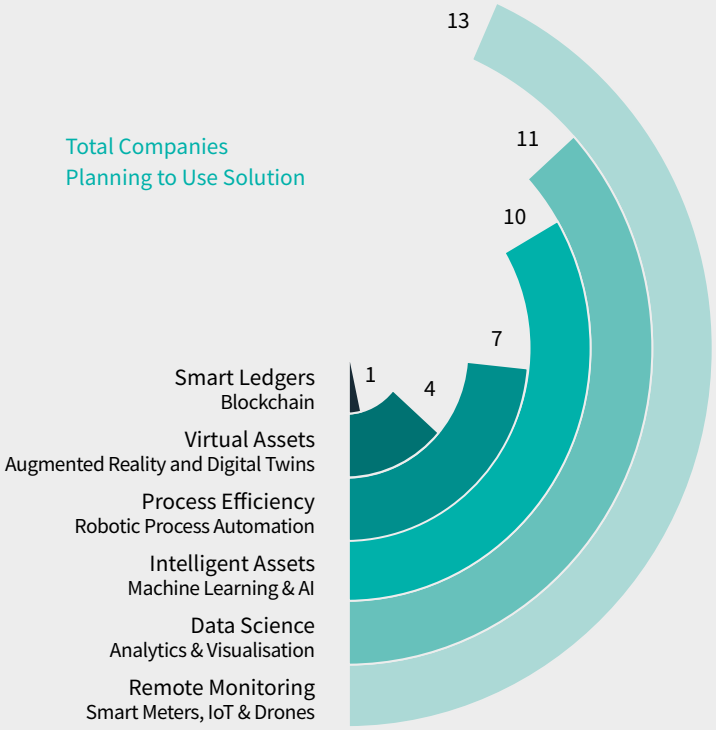
As systems become more integrated and co-dependent, water and sewerage companies' IT systems and decision support tools must be treated as critical assets.

Ultimately, this is about making sure that the basic principles of asset management are being addressed. This includes having an understanding of what you have and how it should perform, and making sure that it can be adapted to meet the changing needs of the business.

Without actively investing in IT systems and decision support tools so that they remain fit for purpose, companies risk them becoming slow, unreliable or even obsolete. Consequently, securing power from knowledge would become much harder.

Digital Ambitions in the UK Water Industry

KPMG's analysis of UK water and sewerage companies' business plans has shown that the industry is following a global trend in accelerating investment in digital technologies. Smart water meters, IoT and drones are the most popular technologies that companies are planning to invest in over the next five years. In contrast, only one company has announced its ambition to invest in blockchain.



£44bn
to be invested by UK water companies from 2020 to 2025

50%
of the companies are investing in smart meters to reduce water use and help detect leaks

1
company is investing in blockchain to enable smarter contracting and financial transactions

About the author

Rob Gray is a manager within KPMG's Asset Management Advisory practice. He has worked both as a client and a consultant, designing and implementing asset management transformation programmes across the UK's water and transport sectors.

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Global views

How can asset management professionals and organisations improve diversity and inclusion in their organisations and the profession as a whole?

CZECH REPUBLIC

Ludmila Kantova, Certified Software Asset Manager, IBM Finance and Operations

I am proud to work for a company that has equality, diversity and inclusion as part of its DNA. IBM's culture of inclusiveness goes back more than 100 years.

IBM has a large digital badge programme, where people can earn digital credentials for expanding their skills, and the Be Equal Ambassador badge was added in 2018. This badge is earned by IBMers who have demonstrated a level of volunteer effort and advocacy representation which supports IBM's diversity, inclusion, talent and business priorities. Ambassadors actively create a supportive, inclusive culture.

Our history of gender diversity dates back to 1899, when IBM hired the first woman employee, 20 years before women were given the right to vote in the USA. Last year, IBM received the 2018 Catalyst Award for its global efforts to help advance women in business – making it the first company ever to have been recognised for the fourth time.

I work from the Client Innovation Center in Brno, Czech Republic. Our organisation – both locally and globally – is more than 50 per cent female.

I strongly believe that the best way to improve diversity and inclusion is through education about unconscious bias, and by accepting equality, diversity and inclusion as an inherent part of a company's culture.

UK

Helena Henao-Fernandez, Deputy Programme Director, TEAM2100

Matt Kuhn, Programme Director, TEAM2100

Diversity is the principle that underpins creative and collaborative organisations. To be a diverse organisation, you need to be inclusive from the start to attract the very best individuals – this means being flexible with working practices that don't discourage people to apply.

In today's world, inclusion in terms of gender, ethnicity and age should be a given, not only because it is the right thing to do but also because of the proven benefits of having a wider pool of ideas. The more ideas and different angles to approach a problem, the greater the chance of developing the right solution. Leaders in asset management and large organisations need to embrace diversity and understand the benefits that it brings. Employing a clone of yourself is not the future.

However, diversity goes beyond the individual, and organisational diversity creates another level of collaboration and creative thinking. By breaking the silos between different departments of an organisation or by including different organisations in a project or programme, we can create high performing enterprises that pursue holistic outcomes. In this search for bigger objectives and the subsequent requirement of the various skills sets, we can create opportunities to attract people with different backgrounds and experiences to your own organisation.

Organisations and leaders that value all ideas and contributions are more likely to attract and retain a diverse and engaged workforce. Therefore, having a level of acceptance of "imperfection" and a culture of continuous improvement allows individuals to feel comfortable to propose bold solutions without fear.

Organisations can also increase diversity by creating a work space where individuals can be themselves in a frame of respect for each other.

In summary, creating the right working environment, valuing people's ideas, having the right leaders, and having a holistic shared sense of purpose allows diversity to effortlessly flourish.

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AUSTRALIA

Evan Hambleton, General Manager – Assets Planning and Delivery, Water Corporation

As asset managers responsible for making decisions about our precious water resources, we at Water Corporation need to take full advantage of the opportunity that diversity and inclusion in our workplace gives us. Asset management goes well beyond technical engineering solutions and we need diversity to make better decisions that represent the needs of the community.

This comes from inclusion, which means fostering a sense of belonging, where we all feel welcomed, respected and supported to fully participate.

Water Corporation is proud that we have made positive progress in attracting, developing and retaining Aboriginal and Torres Strait Islander people but we are mindful we have more work to do in this space. By employing Aboriginal and Torres Strait Islander people in regional areas, we not only provide local service delivery to these communities, but also help our employees to remain in their country and connected to important community networks.

As an organisation we have made firm commitments to a diverse workforce and a work environment that is inclusive for all and this is measured against our goals and targets. As hiring managers we are supported through the recruitment process to help us bring diversity into the workplace.

In the end though, it is down to us as individuals. We need to put aside our bias, unconscious or otherwise, and always be asking ourselves "whose voice is missing from this room?" when we are making decisions so that we truly represent the communities we serve.

UK

Dr Susan Lattanzio, Research Associate – TREND group, University of Bath

Before starting any new diversity improvement initiative, you need to take the time to understand the problem. If you don't, you are probably wasting your time and money.

At face value, gender diversity within asset management looks bad. Certainly, when I attend an IAM event I feel a bit outnumbered? But feeling that there is a problem is not evidence of a problem. The IAM membership might not be an accurate reflection of the profession.

Which probably leads us to our biggest challenge: who and what is an asset management professional? Traditionally, those identifying as asset management professionals are engineers working within utility organisations. However, the ISO55000:2014 (Asset Management) and ISO19770:2017 (IT Asset Management) standards are compelling us to reconsider the scope of the profession. For example, should a data scientist creating asset management decision support tools be considered an asset management professional? Moreover, would the organisation they work for report them as such?

That said, if we assume that we have evidence that a problem exists, what can we do to improve gender diversity? I know that you are all waiting for some actions which you can immediately implement but unfortunately it's going to need more investigation! To address a problem, you need to understand the root cause; which I'm pretty confident in this case is going to be multi-dimensional, interconnected and complex. Therefore, the solution is likely to be a programme of diverse and sustained actions, rather than a simple quick fix.

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IAM Awards 2018: individual award runner-up

Ripple effect

Victor Díez-Valencia was shortlisted for the IAM's Individual Award 2018 after significantly accelerating the adoption of asset management throughout Latin America.

Across Latin America, utilities, petroleum and metro companies, and even government bodies are realising the potential value of asset management. And this wave sweeping the region can usually be traced back to influential individuals in influential companies.

One such company is Interconexión Eléctrica SA ESP (ISA), a utility group that originated in Colombia. The company was created to interconnect three electrical networks and develop power stations to fulfil Colombia's growing demand for electricity. Over more than 50 years, it has become a major power transmission player in Latin America, with operations in Brazil, Chile, Peru, Bolivia and Central America, in energy, telecommunications and roads.

And one such individual is Victor Díez-Valencia. In 2011, Victor was tasked with exploring the potential impact of asset management for ISA. This assignment began a journey of personal and organisational development that has rippled out across ISA's subsidiaries, at the same time as similar waves were starting in other organisations across the region.

Victor's first step was a self-assessment to determine where the business was in terms of its understanding of asset management. The assessment placed both ISA and Victor himself firmly in the "development" category on the maturity scale. For example, the concept of risk management was known – in fact, it was understood and used in terms of board-level "enterprise risk".

Before he could help ISA to realise the benefits of asset management, Victor knew he needed to grow in asset management maturity himself. Networking online, in forums such as those on LinkedIn, was his first stepping stone. From there, he began networking in person at asset management conferences, and before long he was organising events of his own, bringing insights he had gained to meetings with other Latin American utilities just starting their journeys.

A significant milestone came when ISA joined the International Transmission Operations and Maintenance Study (ITOMS). ITOMS aims to discover and share best practices that result in top performance in electricity transmission companies around the world. Participants analyse their own business environments and meet every other year to share results and insights.

A benchmarking exercise among ITOMS participants gave Victor a vital piece of evidence to take to ISA. The exercise revealed a correlation between asset management maturity (in terms of compliance with PAS55, still the main standard at the time) and performance in areas such as substation and transmission line maintenance and reliability.

This correlation helped form the foundation of a business case for asset

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management at ISA. By demonstrating the tangible benefits that transmission companies in other territories had achieved, the business case gave ISA's senior management confidence in the value of asset management.

The company decided to embed asset management, based on PAS55, in its strategy for 2020. This was an important achievement, because it represented a commitment by the company to provide the resources needed to implement asset management effectively.

Communication would be a key element of the implementation. As with "risk management", the group would need to learn new definitions for many terms that were already in common usage. Without clear communication, there was potential for misunderstandings, or for the complexity of the change to intimidate people.

Victor and colleagues helped key people in each part of the organisation to see how asset management could benefit ISA. It was outside many people's comfort zone, but Victor countered the fear of change with a simple message: "Many problems and improvement opportunities in the organisation will be solved through this discipline." In this way, the company built a network of advocates to drive support and momentum for the initiative.

Many people who started out sceptical have now become defenders of the discipline. The initiative has involved more than 1,000 people across ISA and its subsidiaries, from the top managers to the multinational field technical workforce.

The company decided to recruit consultants to support the asset management journey. Victor supported an international bidding process to select a competent and experienced consultancy that could support the journey and help ISA to achieve its goals.

The rollout of asset management at ISA is now well under way, with implementation programmes running in the four largest regions of South America, representing about 75 per cent of the ISA group. The first set of five ISA subsidiaries are rapidly growing in maturity (Figure 1) and three of them are expected to achieve ISO 55001 certification in 2019–20.

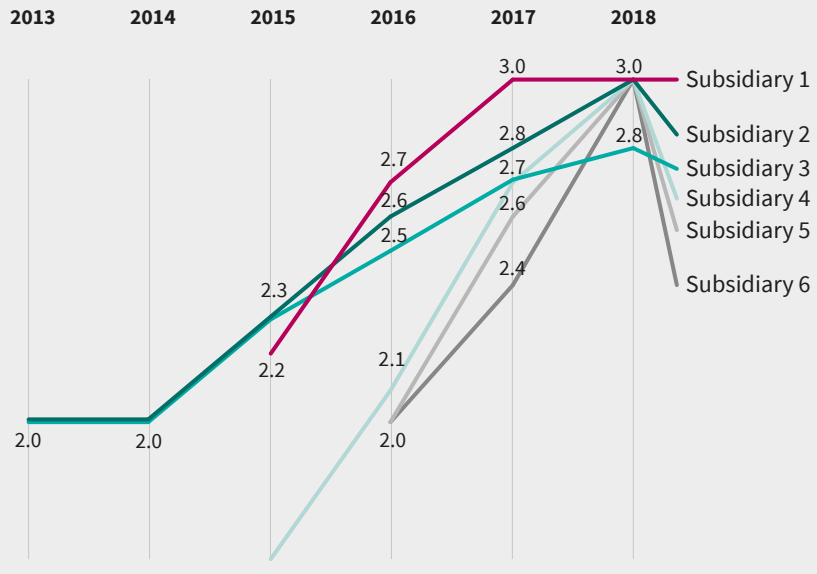


Figure 1: Maturity of ISA and selected subsidiaries

From developing awareness to achieving savings in operating costs, capital expenditure and risk, the validated benefits of the programme between 2015 and 2017 exceeded $23 million (net present value for total expenditure and income in US dollars).

As for Victor Díez-Valencia, he has continued sharing experiences from ISA's asset management implementation. This has included workshops with utilities and other companies in Latin America.

And his work also benefits asset management as a discipline. He is part of a team translating various IAM materials into Spanish, including the Big Picture and Subject Specific Guidance, to make them more accessible for Spanish speaking professionals as part of an agreement between the IAM and ISA. And he has contributed to the Cigré WC1.34 guidance on the ISO55000 series of standards, continuing to network with asset management experts in the process.

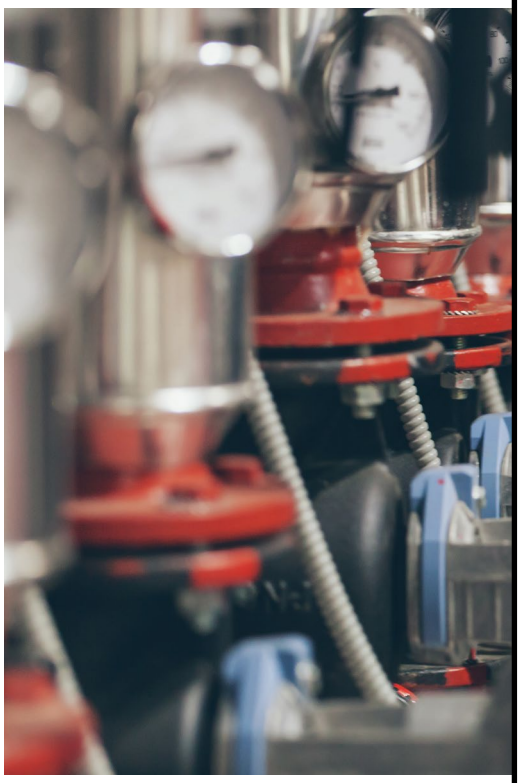
ISA is a major power transmission player in South America. Its network transports more than 250,000 gigawatt-hours a year, supplying more than 130 million people across the continent. The company builds about 5,000 kilometres of new lines every year, and has investments of more than $3 billion in US dollars. So when ISA indicates that it accepts the value of a new strategy or discipline, that strategy or discipline gains credibility.

The Colombian energy regulator has now set ISO55001 certification as a requirement for the energy distribution sector. Chile is proposing guidelines that would also require ISO55001. Asset management is always a big challenge, but key individuals and teamwork can help to begin an immense transformation.

From manual to automatic

By fully automating its reliability and integrity programme, Oman Gas Company reduced equipment failures and improved reliability performance by nine per cent.

by Sandra DiMatteo



Established in 2000, Oman Gas Company (OGC) is the principal gas transportation company in the Sultanate of Oman. The company distributes gas to 4.4 million people, as well as to the majority of the Sultanate's industrial sectors, from power and desalination plants to fertiliser, methanol, petrochemicals, refineries, and cement plants. Truly "powering the nation," OGC must ensure reliable product availability.

The company's small reliability team manages the performance and reliability of numerous plants and assets, widely distributed throughout Oman. These comprise a 2,500-kilometre, high-pressure gas transmission network spread among more than 40 facilities, including three compressor stations and 38 gas supply stations that run the length and breadth of the Sultanate, transporting more than 21 billion cubic metres of gas a year.

The engineers of the reliability team had been calculating reliability and availability performance by hand, using manually collected data stored in disparate databases. With scattered data, lack of resources, and manual processes prone to human error, OGC recognised the need to initiate an advanced reliability and integrity programme to achieve operational excellence. To eliminate human error and improve resource effectiveness, OGC sought to digitise and automate all data and processes within the programme.

The company determined that Bentley's AssetWise Asset Reliability was the most cost-efficient technology solution that also allowed the entire programme to be managed and maintained within one platform. OGC began the digitisation process in 2017, working with Advisian, a consulting firm, to implement AssetWise.

The integrity programme features risk-based inspection (RBI) workflow sequences based on API581, the asset integrity guidelines developed and published by the American Petroleum Institute. It also supports an integrity database management system, including calculation of remaining asset life.

OGC uses its enterprise asset management system, SAP, to capture full, partial, and potential failure data from the maintenance work it completes, and uses this data to update the reliability and integrity programme in AssetWise. With this closed loop process, OGC achieves a living and continuously improving programme.

The asset performance management system serves as the basis for calculating overall equipment effectiveness, identifying poor performance, performing root cause analysis (RCA), and eliminating defects. Tracking key performance metrics in AssetWise dashboards ensures adherence to processes like API581 and has helped shift the company's work culture to be more proactive and reliability-focused.

OGC can now consolidate and analyse all condition monitoring, operations and maintenance data from both manual and Internet of Things (IoT) sources, providing visibility into condition degradation trends and critical health parameters for proactive maintenance. Having centralised its system using AssetWise, OGC established digital workflows, streamlining all the processes involved in its reliability and integrity programme and accelerating accurate communication and equipment analysis. This facilitates timely maintenance to optimise asset reliability.

OGC automated several reliability and integrity processes that were previously completed manually by a reliability engineer using Excel spreadsheets. Now all reliability-related analyses, approvals, and associated recommendations – from bad-actor analysis and RCA, to reliability-centred maintenance (RCM) and RBI – are performed automatically. The system is configured to calculate weekly reliability and availability for individual assets, in series and in parallel, based on an exponential reliability model. It identifies poorly performing equipment and uses that information to perform RCA. It also triggers alerts and emails recommendations and reminders to the appropriate personnel until the corrective work is implemented.

If a due date is approaching, AssetWise automatically sends the line manager a notification, establishing accountability at every level. This approach has significantly increased equipment reliability, because implementing recommended changes is

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"The auto-alert notification in Bentley's AssetWise has been a key enabler helping us to improve our reliability at a significant rate of about 9 per cent a year."
Fahmi Reza,
Head of Reliability and Condition Monitoring,
Oman Gas Company[1]

the most important aspect of RCA. Similar automated workflows for equipment criticality analysis and reliability-centred maintenance were also integrated as part of the programme.

Having a digital, automated framework to manage asset reliability and integrity has eliminated human error, improved resource effectiveness, and facilitated a proactive approach to asset maintenance, ensuring all anomalies are identified and rectified by the appropriate personnel. The programme increased reliability performance by nine per cent, which is worth significant savings to OGC.

As part of its automation and digitisation efforts, OGC integrated handheld devices for routine operator duties to help bridge the disconnect between engineers and field operators by mapping trends, monitoring operational parameters, and providing remote technical support. Operator readings and first line maintenance are remotely recorded and automatically uploaded from the mobile devices to AssetWise to update asset health performance. Dashboards make current asset health, degradation trends, and historical performance clearly visible, making the day-to-day work of reliability and maintenance professionals much easier. Additionally, the new interoperability and connectivity established proper digital workflows and standardised processes to promote safety, quality, and accountability in the field.

Using handheld devices as part of the reliability and integrity programme ensures that operational key performance indicators are achieved, by regularly monitoring equipment compliance. If any value is out of range, as with the other automated procedures, AssetWise triggers an alert and an email notification. This means all anomalies for each asset at every facility are noticed by the appropriate operational and maintenance personnel, and potential problems are rectified through timely and planned corrective actions. Integrating handheld devices increased reliability performance, reducing the number of breakdowns and improving the execution of routine duties by operators.

The successful implementation of AssetWise as the digital solution for OGC's reliability and integrity programme has driven a cultural transformation, from a reactive to a reliability-centred approach to asset performance. With reliability-centred maintenance now at the forefront, OGC is prepared to move into Industrial 4.0 Digitisation by 2024.

Reference

1. Reza obtained his Certified Reliability Leader designation from the Association of Asset Management Professionals. He leads the transformation and stays on top of important priorities set by the company. Reza initiated operators' training and created awareness for reliability as a culture among all stakeholders in the organisation.

About the author

Sandra DiMatteo is the Director of Marketing for Asset Performance at Bentley Systems. She has more than 20 years of experience in asset performance management and reliability software solutions, asset lifecycle information management, enterprise asset management operating in a connected data environment in public infrastructure, energy and process industries. Sandra is on the Reliability Leadership Institute Board of Advisors and founded the Ontario Chapter of the Society of Maintenance and Reliability Professionals.

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In pursuit of punctuality

IAM NextGen Award 2018 winner

What makes a train late? As the team planning a major UK route upgrade will tell you, the answer is much bigger than "leaves on the line".

by Aaron Johnson

The Transpennine Route Upgrade (TRU) Programme will be the UK's biggest railway enhancement scheme to be delivered in regulatory Control Period 6 (2019-2024), providing improved connectivity and capacity between Manchester and York. The Asset Management Team on TRU is contributing to the success of the programme by ensuring that engineering design is cost-effective, safe, reliable and maintainable.

A key achievement has been building strong communication between asset management and rail engineers.

This has been accomplished by asset managers tailoring suggestions with the respective impact to cost and performance, so that engineers have all the information they need to be able to make an informed decision about the design and management of assets.

These suggestions are calculated using a technique called PRAM which stands for Performance, Reliability, Availability and Maintainability. PRAM consists of four system attributes that, when viewed collectively, form a comprehensive assessment used to inform engineering design and assist with the procurement and operational management of assets. The rail industry is increasingly using PRAM assessments as one of the key decision-making tools for improving the punctuality of train services.

Performance

Performance concerns the ability of a system to consistently achieve its required function. In railway terms, it's the ability to transport passengers and freight on time and is usually measured in delay minutes: the number of minutes between the actual arrival time and the planned arrival time. Consistent late arrival of trains causes disruption to passengers which impacts the organisation's reputation and can ultimately incur costs through lost revenue and/or compensation payments to stakeholders.

The TRU Programme has fully embedded PRAM to assist in meeting one of its core objectives: achieve a high performing railway. The objective was originally based on the Public Performance Measure (PPM): the percentage of trains that arrive at their terminating station on time.

PPM alone cannot successfully determine that the system is consistently achieving its function. A train is considered "on time" if it arrives at its terminus within five minutes of the planned arrival time for regional services, or within 10 minutes for long-distance services. The issue here is that a train could be delayed at every stop except its terminus and yet still be deemed "on time" for the purposes

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An example of the outputs from the reliability model (Figures are for demonstration purposes only and do not reflect reality)

of the PPM. Passengers could, therefore, be delayed and miss connecting transport networks all the way along the line. Therefore, an alternative measure was needed to provide a fair assessment of TRU performance.

The TRU Asset Management Team co-created a bespoke performance metric, the TRU 4-Station Metric, which observed train timings at the four key stations on the core route: Manchester Victoria, Huddersfield, Leeds and York. In total, 10 unique passenger train services were analysed, collectively completing over 500,000 journeys across a two-year period. This analysis provided the team with data to help them understand the factors causing train lateness in the TRU corridor.

Reliability

Reliability is the likelihood of a system failure. Reliability is important to examine because passengers on a dependable railway are less likely to experience delays through disruption. A reliable railway also requires less maintenance and is ultimately more cost-effective to run.

Data from the 4-Station Metric provided a line of sight from when an asset fails to its potential impact on train punctuality. This information was used to generate a suite of infrastructure reliability requirements which, when met, would achieve a higher performing railway. Throughout the system design and option selection processes, reliability models were produced that used the 4-Station Metric to provide a forecast of performance in response to proposed infrastructure enhancements. This is something that has never been done before and has helped drive decisions that will potentially save millions of pounds.

Availability

Availability is a measure of operational readiness; it concerns the relationship between reliability and maintainability. A railway that is reliable and can be maintained ready for operation when called upon. This provides the operators increased flexibility when delivering the timetable, which helps improve railway performance.

High availability is achieved by minimising railway downtime. Downtime of the railway is primarily reduced through effective maintenance. The TRU Asset Management Team analysed historic maintenance data to understand the typical time to respond, repair and maintain railway assets. This analysis was utilised by the reliability models, allowing the programme to assess the availability (and railway performance benefit) achieved through alternative maintenance regimes and implementation of innovative technology.

In addition, Failure Mode Effects and Criticality Analysis (FMECA) workshops were held with various discipline experts and route maintainers to understand frequent issues that impact maintenance and rail performance. These results provided a detailed narrative behind the trends identified from the quantitative data analysis.

Maintainability

Maintainability considers how "repairable" the system is. It is influenced by access, resource and asset complexity. Designing for maintainability ensures that inspections and repairs can be completed in an efficient manner.

Fifteen high-level maintenance principles were developed that set out a vision towards the maintenance needs of a future rail network. These maintenance principles encourage the designers to consider the use of new technology, including mechanised maintenance, remote condition monitoring and augmented reality, reducing the need for "boots on the ground" maintenance (and so negating to invest in a continuous position of safety resulting in a significant cost saving).

Outcome

To summarise, the performance degradation of a railway system can be mitigated by understanding how its assets are managed. PRAM is a gateway used to understand how an asset contributes to overall performance. This then provides a clear picture of where improvements can be made.

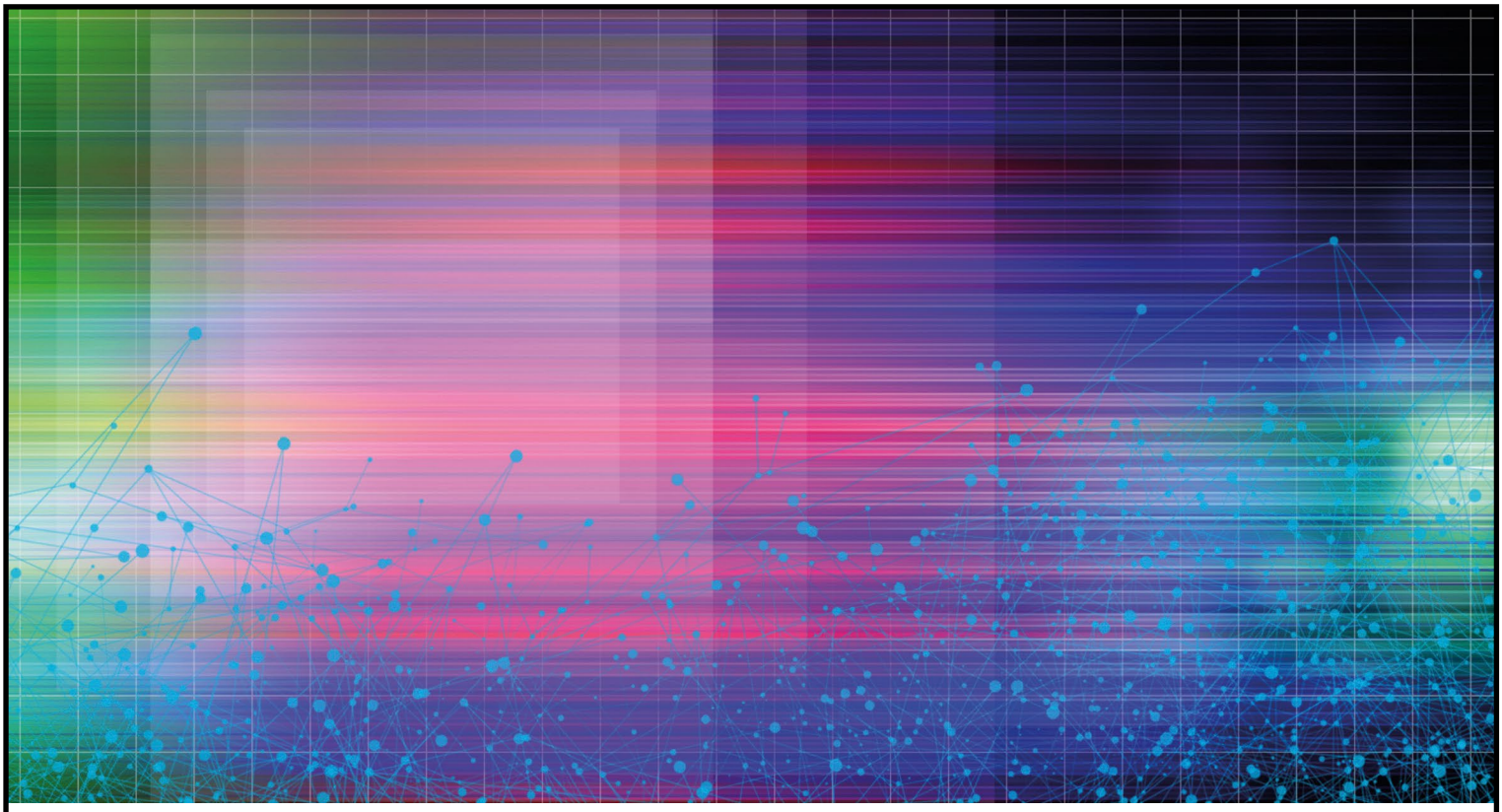
These improvements could involve anything from the installation of maintenance access to the removal or renewal of assets, or the redesign of the maintenance procedure. In any case, PRAM is a powerful tool that allows for proactive asset management that can cut costs, increase efficiency and improve customer service. Adoption of PRAM on TRU is forecasted, per year, to save over 1,500 hours of maintenance, prevent in excess of 700 failures and ensure 20,000 more passengers arrive on time at their intended destination.

About the author

Aaron Johnson is an accomplished mathematician who began his career as a healthcare data analyst. He joined Jacobs' Asset Management team in 2017 where he was seconded to support Network Rail on the Transpennine Route Upgrade Programme. As a key member of the TRU Reliability, Availability, Maintainability (RAM) Team, Aaron is responsible for the assessment in resilience of over 13,000 assets.

Acknowledgement

The author would like to thank Anthony Patman, Network Rail Route Performance Analyst, for contributions to this article.



Q&A: Pattern recognition

Advances in data and software are making modelling and decision support tools more and more sophisticated. What do these advances mean for asset management?

Q: What's driving all the advances we're seeing in asset information?

David Armstrong: The rigour we're seeing now has actually been around for a long time. But globally, technology has now caught up with the ability to do this correctly.

Anne-Marie Walters: I'm thinking about how we've gone from laser scanning to reality modelling in the industrial sector. Laser scanning speeded up surveying, and you got a model that you could use for computer-aided design and figuring out whether you had space to make a major capital change.

Now, with the explosion in the availability of cameras on everything, drones with laser scanners and high definition cameras, and the power of the cloud to process all of this data and turn all of the visual input into usable models, you've now got this ability to model in real time, which we've never really had before in the industrial sector.

Q: How is "reality modelling" different from familiar forms of modelling, like BIM?

Anne-Marie: Reality modelling is the process of turning a continuous capture of your existing assets' condition, using photography and laser scanning, into a usable, engineering-accurate 3D reality mesh.

David: If we dissect the term "reality modelling"; we all know what modelling is. The reality part is, these assets are constantly dynamically changing, so we need to continuously survey those assets. Reality modelling can interrogate the physical and virtual worlds to replicate true asset build, status, and condition.

To survey the reality continuously, using connected Internet of Things devices, you have to have the correct veracity – or quality – of data coming in. That allows us to do things like machine learning, because you have to base your machine learning capability on accurate, real events that happen at the lowest possible root cause.

Anne-Marie: Organisations take on technologies like reality modelling to capture a picture of what is actually on site

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and what it looks like – because pictures are so much easier for people to get their heads around than drawings – and use that picture to clean up their information, identify what is truly accurate, and pull sources of information together to have a more consistent, more accurate view of the truth.

Q: What's the potential of this technology?

Anne-Marie: Shell is using reality modelling at the Pennsylvania chemical site that they've got under construction right now. It's a vast site, 450 acres, and they can capture the entire site by flying a couple of drones twice weekly. It saves them a lot of time and resources.

But they're also using the reality model to manage the construction project. The site is constantly changing, but for example, they can predict where the ponding is going to be after a heavy rainstorm, and hence plan where to do construction work.

David: I see the first steps being deploying this technology into areas where it's unsafe for humans to go.

For instance, turbines are assets that tend not to fail; what tends to fail is the feeding equipment around them. That's a potentially hazardous and hot environment. Could we deploy reality modelling there and teach it what good looks like and what a potential hazard looks like? If we can understand and digitise exactly what, at the root, causes variances to happen, then we can automate those systems to ramp up or ramp down those critical machines at the right time – like before some $20 piece of low voltage wiring starts to heat, crack, and trip this multimillion dollar asset.

Q: How much of the work of asset management can potentially be modelled and automated?

David: That's something we have to ask ourselves. Can an autonomous vehicle recreate the map as it's driving down the road, and stop more safely than me, a human being? Absolutely. But am I willing to turn over control fully to that world yet? I don't think I am. The sociological impact of turning everything over to the machines would be huge. Today at least, somebody still needs to have the final say.

Anne-Marie: With reality modelling and pattern recognition software, you can get the computer to identify when something's changed from one point in time to another. A human still needs to train the computer to recognise what rust looks like, or a crack. Once it's trained, the computer can go find similar types of things, and look for the propagation of that crack or the spreading of that rust. Then the human needs to come back and identify if the problem is serious or not, and what action to take.

David: As more data comes in, we start to get more confidence. And, what reality modelling will allow us to do, in an immersive and visual manner, is extract more and more confidence. When we reach a critical level of confidence, we'll start letting the machines take over the lower-value, less critical decision making. It's going to be an iterative process over the long term, based on the level of confidence we're able to live with.

Q: What does the future hold for asset information and modelling?

Anne-Marie: There's huge potential in the integration of pattern recognition and artificial intelligence with reality modelling. We're only scratching the surface with things like automatically identifying rust and cracks. I'm not sure where the next breakthrough in technology is going to be, but I feel that's an area where there's really untapped potential.

David: To bring all the pieces together, it's going to take the larger engineering companies, with their engineering intelligence, and the leading software companies, who understand the space and how to present that information in a manner to allow real people to make timely decisions. That's the game changer that's currently in front of us. And those capabilities are commercially on the shelf right now.

ContextCapture was used to create a 3D reality mesh of the entire 22-hectare Hong Kong Science & Technology Park campus.

About the interviewees

Anne-Marie Walters is Industry Marketing Director for oil, gas, and process industries at Bentley Systems. An engineer by degree, she worked with BP and ICI before moving into software with Intergraph. As part of the Process Industries STEP Consortium, POSC Caesar and now MIMOSA, Anne-Marie has long been a spokesperson for international standards for information management in the oil and gas industries.

David Armstrong is Director of Digital Enablement at Bentley Systems. He has insight into variation and root causes from his work with Six Sigma and the Aladon Network, and was part of the G33 Committee redeveloping the North American configuration management standard.

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The power of visibility

Battery life holds the key to asset tracking success.
It has the potential to unlock huge efficiencies – and even save lives.

by Dr Mohsen Mohseninia

The Internet of Things (IoT) market is expanding at an exponential rate and is expected to grow to $520 billion by 2021.[1] Developments in connectivity and greater IoT adoption have also seen another market thrive: asset tracking.

Applying IoT to the ever-increasing number of assets tracked across the globe has meant that the asset tracking market is set to reach $32 billion by 2024, growing at a compound annual growth rate of 14.9%.[2]

In addition to this, the growth of "cold chain" supply chains means that asset tracking is increasingly needed by food manufacturers to monitor cargo conditions, including temperature, from source to destination – as well as to estimate delivery times accurately.

Similarly, asset tracking is incredibly useful in just-in-time production. Having access to information about where an item is within the production process at any given time changes the entire way the production line works. Managers can gain updates in real time, making the process more transparent; this helps ensure speed and efficiency, and ultimately improve customer service.

Moving to tracking the cargo itself

Asset tracking can be a slightly disjointed process. For example, consider a shipment of food across mainland Europe. The cargo will most likely be transported by various trains, lorries and vans. This means monitoring an asset's location requires tracking across three types of transport, which can be both costly and cumbersome. Now, many organisations have started to overcome this by attaching tracking devices to the cargo itself.

Tracking the cargo, rather than what it is being transported in, ensures that it can continue to transmit data throughout its journey regardless of how many different types of transport it takes. A carrier-agnostic SIM card inside the tracker, which can switch between mobile carriers according to signal strength, can then ensure a seamless transmission of data. This solution not only minimises the chance of a data outage, it also means that the device won't be automatically steered towards the original carrier's preferred supplier when it crosses countries: instead, it will be connected to the best connectivity option.

As well as tracking the location of cargo, manufacturers are using asset tracking devices to monitor many different variables. For example, the food manufacturing industry – which understandably has

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strict safety regulations – uses trackers to monitor conditions. This is especially important when you consider that the cargo in this instance is highly sensitive to the conditions in which it is transported. Similarly, some goods may need to be monitored for changes in light or humidity. A pharmaceutical company that is transporting medicine can use an asset tracking device to report on environmental changes, to help ensure the chemical composition of the medicine is not compromised during transit.

In the critical scenario of organ and blood transportation, accurate monitoring is vital. In addition to monitoring temperature and other environmental variables, tracking enables vital minutes to be saved. It is possible for the delivery company to "geofence" the destination hospital, enabling an automatic alert to be sent as soon as an organ arrives, or even when it is close to arrival, helping to ensure hospital staff are on hand to collect the delivery.

Overcoming the power problem

Like with any market, asset tracking comes with its own set of challenges. One of the main ones is battery power.

For a device to regularly transmit information about its location and variables, it needs sufficient battery power. This can be a critical issue, especially if that asset is travelling a long distance and regular readings need to be taken to determine its location. For example, every time a device runs a GPS location check, it puts a strain on battery life.

Extending the battery life can mean that you can track an asset more frequently and/or for longer. Similarly, if a tracker attached to cargo runs out of battery, this can cause a multitude of issues in industries and processes where constant monitoring is critical – like our earlier examples of transporting medicines or organs.

This becomes even more important when taking the entire supply chain into consideration. Suppliers need to ensure their solution enables wide scale tracking and traceability of potentially millions of assets from source to destination without exhausting battery power. By implementing a solution that uses IoT, anyone in the supply chain that has the authority to access tracking information can do so quickly and efficiently without using the same power as with a GPS tracking system. Manufacturers can bypass the need for power-draining and costly GPS location checks, through communication with cellular towers and triangulation.

Reducing the power required for a tracking device to reveal its location can extend battery life significantly. This means that a lower powered, more cost-effective battery can be used. The cost of a battery can range from £3 to £30 depending on your requirements. When you combine the fact that a battery is typically a third of the cost of the device with the sheer scale of many deployments, such a saving is not inconsequential.

The growth in assets, initiatives and laws across many industries are all driving a greater requirement for effective asset tracking, and the increasing connectedness across systems, across sectors, is further fuelling this trend. Making asset tracking devices as energy efficient as possible will enable providers to offer more for less, and take advantage of this growing sector.

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About the author

Dr Mohsen Mohseninia has more than 18 years of experience in the telecommunications sector. Before joining Aeris in 2013, he held various roles at Logica, including establishing its telecoms business in the Middle East and Africa, and developing strategy, go to market and sales in the UK. Dr Mohseninia holds a PhD in numerical computations from the University of Hertfordshire, UK.

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Turn asset data into lifecycle gold

How do companies end up with so much asset data they aren't using? And how do we move towards a more streamlined approach to asset data management?

Technical people are often linear thinkers. Linear thinking is a thought process where each step triggers the next one. If a = b, and b = c, then a = c. It's how Henry Ford's assembly line came to existence and how Kaizen, Lean and Six Sigma methodology matured.

So to execute a step, you need information: for instance, a manual for assembling a car. As we learn, we adapt and, for instance, scribble notes on that assembly manual. All is well if these scribbles only apply to you, but what happens if everybody adds personal notes to the manual over time? It creates inconsistencies and variations on the original information.

Today, instead of assembly manuals, we have complex as-built models, used by all different silos within our organisations. Each silo "scribbles" their notes on the original as-built model, again creating variations on the same dataset, but this time with far greater consequences.

Basically every phase of the Design, Build, Maintain, Operate and Demolish cycle requires us to transfer a duplicate of an asset dataset, which evolves and is isolated in that new discipline, department or even company. Asset data is never up to date, the as-built model never resembles the true current state of physical assets, the different silos are rarely up to speed with each other's activities, and asset managers are making decisions based on scattered, unvalidated and inconsistent information.

The fourth industrial revolution, the digital one, has amplified this situation by enabling data creation on a vast scale. The Internet of Things, machine learning, predictive maintenance, assets that communicate with each other, sensors that can show assets' operating parameters, 3D scans that can be transformed into 3D models with an accuracy of one millimetre – all these innovations simply create yet another unmanaged, isolated dataset.

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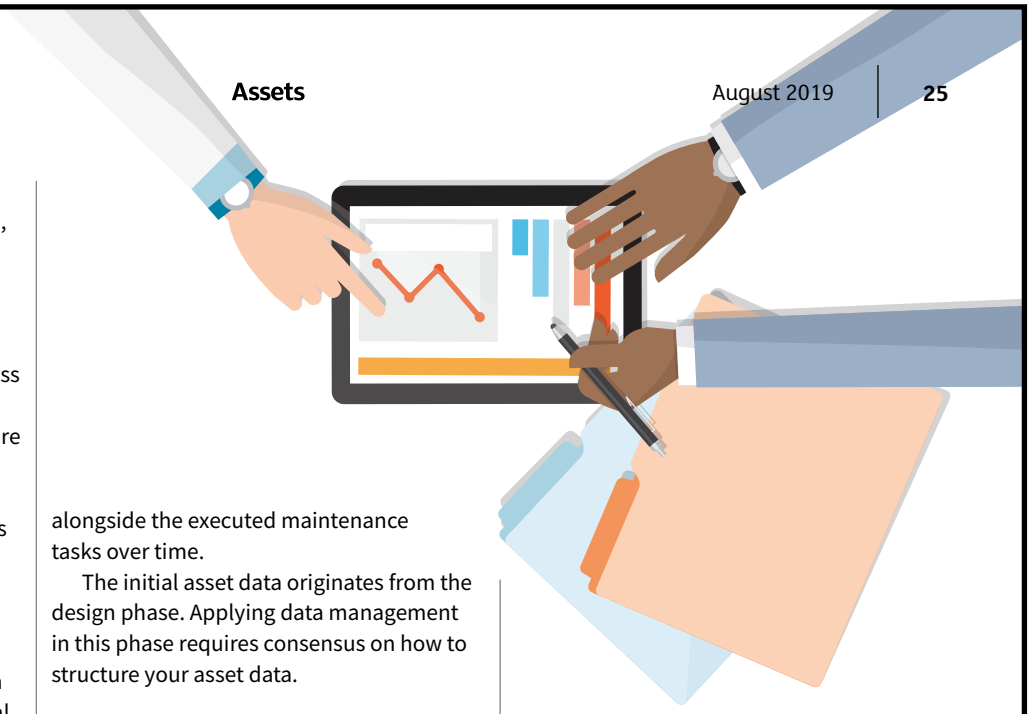

The question is how to scale up these innovations into a comprehensive solution, in a way that makes the information accessible to all and integrates it into an enriched, up-to-date as-built model. Luckily, the same digital revolution also makes it possible to manage this data across several sources.

There is already a long history of software solutions trying to manage asset data. However, the design of these software products often follows those same patterns of linear thinking. Each step triggers the next one, making the software unable to handle a diversity of activities affecting the same asset dataset simultaneously. Instead of more linear software products, a data-centric approach is therefore essential to keep data up to date and reliable for business critical decisions.

Veritas's 2015 *Databerg Report* shows that the data companies hold can be divided into three main categories:

- **useful, business-critical data** – the visible tip of the Databerg
- **redundant, outdated and/or trivial (ROT) data –** lingering just under the surface, where the company's view of it (and its quality) is distorted
- **dark data –** the invisible bulk of the Databerg, which is being generated by the company's systems and consuming resources, but has not yet been identified as ROT or business-critical, and is not currently being used in decision-making

The goal is to flip the Databerg by identifying business-critical data and isolating ROT data from among the dark data.

To handle asset data in one data-centric solution, consensus on an asset "language" is needed. By making sure you structure and align your asset data consistently and with reference to an asset location or functional location tag, it's possible to combine static asset data (activities, measurements and assessments) into a dynamic view over time – for instance, visualising concurrent inspection results for asset degradation alongside the executed maintenance tasks over time.

The initial asset data originates from the design phase. Applying data management in this phase requires consensus on how to structure your asset data.

- **2D computer-aided design (CAD) –** such as process or layout drawings – acts as the originator and narrator of asset-related activities.
- An **Asset Breakdown Structure (ABS)** acts as an index of the assets and asset data.
- **3D CAD** provides a realistic visualisation of the asset – an enriched digital twin, a single view shared between all silos.
- **Static asset data** can enhance the digital twin, turning into a dynamic 4D visualisation.

Asset-driven industries heavily rely on design drawings of processes, asset layout drawings and automation schematics. But many companies struggle to keep them up to date, let alone set out a strategy for asset data management.

When updating legacy drawings, you need to create a naming convention and a component library that will be future-proof. From the unique asset tags in the drawings, you can derive an ABS.

The next step is building standardisation, rules and guidelines into your data management. Choosing a data-centric solution based on unique asset tags or functional locations of assets will allow you to create a 2D/3D reference model for linking documents, activities and data sources together. This creates an enriched digital twin and a future-proof data model strategy.

Asset management is about combining data from different sources, coming to a complete view, and deciding on how to utilise assets optimally during their lifecycle.

It's time to focus on putting the available data to use instead of just generating it. The best way to do that is to combine data management solutions in an environment everyone understands and shares. That's how you turn asset data into lifecycle gold.

About the authors

Robin van der Mijl has spent 10 years working in the field of service, maintenance and asset management, providing the process industry with solutions to get the most out of their asset lifecycles. He holds Bachelor's and Master's degrees in Mechanical Engineering, Commercial Business, Administration for Engineers and Business Administration, and is currently Commercial Director with CEA Systems.

Ton Klinkenberg has dedicated his career to asset management. Currently working as an independent asset management specialist. Member of the HU university of Applied Science Advisory Board, master of Engineering in Maintenance & Asset Management, SUTO Research & Development board and ISSO supervisory board.

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Improved examinations

The IAM Qualifications are having an overhaul. Find out how the changes improve the experience for candidates and their employers.

by Kirsten Bodley

As the IAM celebrates its 25th anniversary throughout 2019, a critical part of its activity remains to provide asset management professionals with access to professional development, in the form of training, qualifications and events.

The IAM launched its own examinations, the IAM Certificate and IAM Diploma, back in 2013. Since then, more than 7,000 candidates have taken examinations in 28 countries, with numbers increasing significantly year on year.

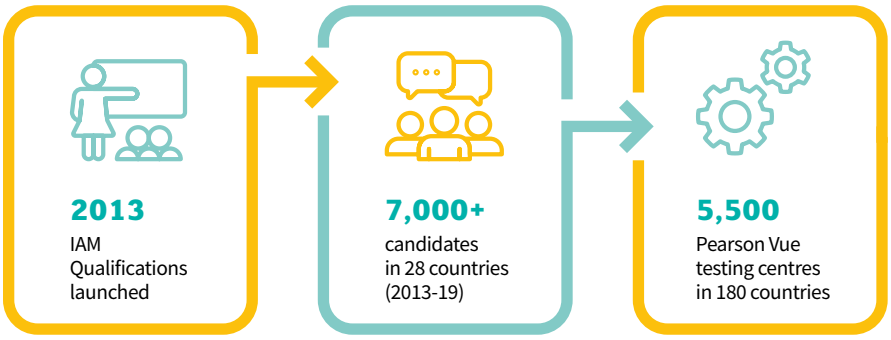
Throughout that time, the IAM has been listening to feedback from candidates about the examinations and the way they are delivered. Now, as the IAM looks forward to the next chapter in its history, it is rolling out a range of improvements to candidates' experiences – starting with a new partnership with Pearson Vue, announced during the Annual Conference in Liverpool, UK.

Pearson Vue is the world's largest computer-based testing provider, delivering 15 million exams on behalf of 450 clients in 2017.

The partnership allows the IAM to deliver examinations more efficiently in all time zones across the world. And there are many benefits for candidates.

Candidates can now book IAM examinations easily online, choose a time and location that suits them, and pay the exam fee in any of eight different currencies. There are unlimited exam time slots available, and more than 5,500 test centres to choose from in 180 different countries and territories. Candidates' exam results are now available online as soon as the examination is finished, where they can be accessed easily by both the candidate and (where appropriate) their employer.

Some existing IAM Qualification test centres may choose to become "Anywhere Proctored" venues, which allows them to host private exam sessions. IAM Endorsed Training Providers and corporate members can also choose to host Anywhere Proctored exam sessions at their own locations. However the norm for candidates from now on will be to sit the examinations at their nearest Pearson Vue test centre.



Successful candidates can now take advantage of a new digital badge, which recognises their professional development achievements. These can be used on LinkedIn and other social media profiles, as well as in email signatures, CVs and resumes. As part of the roll-out of the improved examinations, the IAM will be issuing digital badges to those who already hold one of the IAM Qualifications, so they can share their achievements too.

It's not just how candidates book and sit the examinations that's changing; the IAM Qualifications have been fully overhauled. The question papers have been redeveloped and improved by an expert panel of international authors. In addition, the IAM is in the process of achieving official recognition for the IAM Certificate and IAM Diploma from Ofqual and the UK's globally recognised Register of Regulated Qualifications.

By the end of 2019, the examinations will also be available to sit in three new languages: Dutch, Spanish and Portuguese. French and German papers will follow in 2020.

With an ever-changing asset management landscape and an increasing need to develop knowledge, skills and insight, the IAM Qualifications have an important part to play in the future success of our global discipline. These new improvements to the content and delivery of the qualifications will, without doubt, enable more people to access learning and training at every stage of their career.

For more information
Visit **theIAM.org/Quals**

About the author

Kirsten Bodley is the Chief Executive of the IAM. She has previously held Chief Executive positions with STEMNET and the Women's Engineering Society.

About the IAM

The Institute of Asset Management (IAM) is an independent learned society and not-for-profit professional membership body dedicated to furthering knowledge and understanding of asset management.

The IAM offers both Individual and Corporate Membership.

Benefits of membership include:

- access to a global network of professionals
- free **Assets** magazine
- discounts for Annual Conference, Lecture and Dinner and other events
- discounts on publications and IAM Qualifications
- online discussion boards and exclusive access to online Knowledge Centre
- eligibility to be elected or appointed to IAM posts and roles.

Visit **theIAM.org/Join** for more details

For individuals

Individual Membership allows you to engage with the profession. The grades available are:

- Fellow: must be able to demonstrate superior responsibility as an expert practitioner; entitled to use FIAM post-nominal letters
- Member: must be able to demonstrate knowledge and expertise; entitled to use MIAM post-nominal letters
- Associate: open to any interested person
- Student: must be engaged in a recognised academic course.

For organisations

Corporate Membership is available to organisations whether large or small; commercial, private or not-for-profit. Special discounts are available for local government and academic organisations. The benefits include:

- demonstrable commitment to the discipline of asset management
- access to Endorsed Assessor and Endorsed Trainer Schemes
- priority access to sponsorship opportunities and contract enquiries
- discounts on IAM Membership, events, products and services for every employee
- free company listing in online directory.

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Contact your elected representatives at **Council@theIAM.org**.
Visit **theIAM.org/Council** for more information.

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The Patrons of the IAM are an exclusive group of Corporate Members who commit to a high level of activity and engagement with the Institute. Patrons are eligible for a number of exclusive benefits and have exceptional influence on the development of the IAM and the discipline.

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The IAM's 1st North American Conference

Oct 1–3, 2019 in Chicago, IL

A forum for information exchange, problem-solving, and collaboration among asset owners, consultants, and vendors, who will share their insights and experiences for the benefit of the larger asset management community.

For additional details, and to register:
theIAM.org/Events/iam-2019-NA-annual-conference

Conference Objectives

- To link asset managers and stakeholders with leading edge practices
- To support asset management professionals and promote a community furthering the discipline of asset management
- To provide networking opportunities for business and personal relationships
- To promote collaboration, integration across sectors, functions, levels including the front line for solutions

Program Highlights

- IAM Foundation Course
- Workshops
- Keynotes & Plenaries
- Vendor Showcase
- Networking/Social Events:
  - House of Blues
  - Flight Club

Conference Tracks

- The Asset Management Journey
- ISO55000 Suite of Standards
- Innovations in Asset Management
- Assets in a Changing World
- Building an Asset Management Culture
- Inter-Agency Collaboration

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Assets

The Institute of Asset Management magazine November 2019

At the threshold

How defining a criticality threshold enabled the City of Calgary to realise the best value from limited public investment.

Global Views
How can we invigorate current and potential IAM members?

Introductions
Q&As with the new IAM President and Chair of NxtGen

Digital twins
For assets, sites, industries, and even whole nations

The Institute of Asset Management

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Letter from the CEO

This letter sees me in Chicago at the inaugural IAM North America Conference, held 1–3 October, organised by the USA and Canada Chapters with support from the Centre – real collaboration and teamwork. It has been a huge success, a monumental feat of international and interdisciplinary teamwork from our amazingly committed volunteers and the outcome was an exciting, informative and packed programme. Lots of social networking too at some iconic venues! It was a sell-out event with over 300 attendees.

Meeting delegates, including our members and volunteers, in North America has emphasised the importance of recognising the differences between countries in their relative asset management maturity as well as the business culture. The theme that came strongly through the whole conference was "people" in delivering good asset management, their line of sight and the removal of organisational silos.

The value of the IAM's Chapters has also been highlighted – they are such a key part of the IAM's strategy to extend our reach and support for the asset management discipline. Our Chapters provide opportunities to learn, share and network with like-minded asset management professionals locally and regionally.

The Institute has always recognised how important it is to be inclusive – we are cross-sector and welcome all professions. Strong feedback from the IAM North America Conference confirmed the value the IAM provides to our members through the breadth of our reach as well as knowledge sharing across borders and networks.

I have been amazed by the commitment of the volunteers in our chapters, their time and energy. As an Institute, we certainly appreciate both their contributions to the work of the IAM and the support they give to members, including through the branches. The planning for next year is underway for an even bigger joint event – roll on Denver in October 2020!

Assets guidelines and dates for contributions

The **Assets** editorial team considers all contributions from IAM members, so please send your ideas, views on the magazine and suggestions for future content to **Assets@theIAM.org**

Dates for the next issue, published Feb 2020:

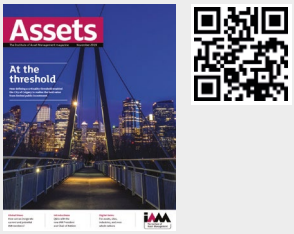
- 9 Dec 2019: deadline for suggesting articles
- 18 Dec 2019: deadline for reserving advertising space
- 3 Jan 2020: deadline for submitting approved articles
- 31 Jan 2020: deadline for advertising artwork.

Guidelines for submissions:

- The ideal Assets feature article explains implementation challenges and how they were resolved, details the benefits and gives guidance on implementing asset management in asset intensive organisations. Note that not all Assets articles are features
- The Annual Assets Best Articles competition celebrates the features that succeed the best in achieving these aims, as judged by the Assets editorial team
- The editorial team reserves the right to edit submissions for grammar, clarity, style and length. The maximum length for Assets magazine articles is 2,000 words, but we accept submissions of any length, on the understanding that the article may be cut down or split up. We will send you the revised article for approval before publication
- Please include no more than one graph, chart or diagram per 500 words
- Not all story suggestions or submissions can be included. The Assets editorial team will inform you if your suggestion will be taken up following its editorial meeting
- Contributions should not be overtly commercial in tone – but if you would like to take out a quarter-page, half-page or full-page advertisement in Assets, please email Office@theIAM.org for details and rates.

If your submission is selected to be published in Assets, you will need to provide:

- any pictures as original high-resolution TIFFs or JPEGs for printing purposes



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The Institute of Asset Management
St Brandon's House
29 Great George Street
Bristol BS1 5QT
44(0)845 456 0565
theIAM.org

Hugh Harford
Editor
Hugh.Harford@theIAM.org

Josh Ellicock
Editor
Josh.Ellicock@theIAM.org

Advertising enquiries
Office@theIAM.org

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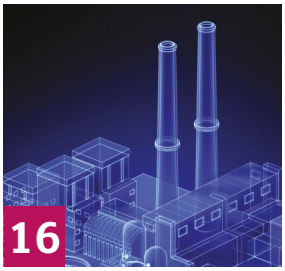

Contributors

Marie Hemingway (page 8) is a senior consultant with Copperleaf Technologies. She is passionate about helping infrastructure businesses across Europe improve their strategic investment decision making. Marie sits on the board of the Women's Infrastructure Network and is a strong advocate for female advancement.

Anna Whitmore and **Zoe Buxton** (page 16), from Mott MacDonald, work with technology to improve lifecycle asset management and performance. As a technology consultant in Digital Ventures, Anna combines wastewater and digital experience to develop new projects using the company's digital twin platform. Zoe's experience spans the whole asset management lifecycle – from risk identification and investment planning to intervention delivery, operations and optimisation – and she currently leads Mott MacDonald's Smart Asset Management offering.

Henry Fang and **Kai Li** (page 24) work for the City of Calgary, Henry in Corporate Asset Management, Kai leading the asset management programme for roads. Henry delivered the city's infrastructure risk framework, level of service framework and corporate asset management plan, while Kai has recently been focused on aligning the city's asset management practices with the ISO55000 series of standards.

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IAM NEWS

IAM Global Awards finalists announced

The judges have chosen three finalists in each of the eight categories of the IAM Global Awards 2019.

The winners will be announced at the IAM Annual Dinner and Awards ceremony on 27 November, at the Chelsea Harbour Hotel, London, UK.

Turn to page 22 to read all about this year's finalists.

To book your table at the IAM Annual Dinner and Awards Ceremony, visit www.theIAM.org/Events

A new way to gain IAM knowledge

The IAM is launching a programme of Professional Development Workshops to help professionals explore specific areas of asset management in depth.

The programme will open with workshops based on knowledge developed by the IAM. Currently, this knowledge is only available in published guidance documents, not as training. A series of pilot workshops is planned for late 2019, followed by a full launch in 2020.

The initial programme will include a workshop on developing and maintaining a Strategic Asset Management Plan (SAMP), and one on developing and implementing a management system for asset management.

It will also include a series of workshops covering the 39 subjects of The Asset Management Landscape.

— Asset management decision-making: covering subjects 6-10, this workshop provides an understanding of the three main stages of an asset's life, and how decisions made at one stage affect the next.

— Lifecycle delivery: covering subjects 11-21, this workshop explains how to integrate activities across the asset lifecycle.

— Risk and review: covering subjects 31-39, this workshop covers core risk and review activities like identifying risk and establishing effective review mechanisms, and explains how these support continuous improvement.

— Systems engineering: an in-depth look at subject 13, this workshop provides an appreciation of systems engineering techniques and how these influence asset management policies, strategies and plans.

The workshops are designed for professionals looking to explore areas of the discipline that are new to them, or where they feel a need to broaden their knowledge and understanding.

The IAM is currently seeking organisations to run pilot workshops for their staff, customers or stakeholders. Pilot workshops come with a generous 50 per cent discount off the full standard fee for an IAM workshop.

For more information about the workshops, and to discuss running a pilot workshop in your organisation for half the standard fee, please contact Andy Watts: andy.watts@theIAM.org

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New look for IAM online

The IAM website, www.theIAM.org, has been revamped with new features, an improved look and feel, and easier access to valuable content.

If you already had an account on the site, your account will transfer over to the new site – though you will need to create a new password before you can gain the benefits of logging in.

More updates and improvements will be rolled out over the coming months.

If you have any questions or comments about the new website, please let us know at theIAM.org/contact-us

Sustainability in the spotlight

Emma Howard Boyd, UK Commissioner to the Global Commission on Adaptation, will deliver the IAM Annual Lecture 2019.

The Annual Lecture takes place on 27 November, the first evening of the IAM Asset Management Conference, at the Chelsea Harbour Hotel, London, UK.

Emma Howard Boyd is also the Chair of the Environment Agency and an ex officio board member of the Department for Environment, Food and Rural Affairs in the UK. She serves on a number of boards and advisory committees, including ShareAction, Menhaden PLC, The Prince's Accounting for Sustainability Project and the Green Finance Institute.

She has worked in financial services for more than 25 years. As Director of Stewardship at Jupiter Fund Management, she was instrumental in developing the firm's expertise in corporate governance and sustainability.

The IAM Annual Lecture is free to attend, and attendance is not restricted to those attending the IAM Asset Management Conference. Registration is required, however, and places are limited.

Register to attend the IAM Annual Lecture, delivered by Emma Howard Boyd: theIAM.org/events

INDUSTRY NEWS

Sustainability driving innovation

A commitment to sustainability by the City of Calgary, Canada, led to unprecedented techniques being used in the construction of the new 12 Street Southeast Bridge.

The city's commitment meant that the design team, led by consultancy Jacobs, needed to take all possible precautions to avoid a concrete spillage into the river spanned by the bridge. The traditional technique of casting the bridge in place was not an option.

Instead, the team developed a design built from 60 pre-cast concrete panels, connected together by Ultra High-Performance Concrete (UHPC). Each panel measured more than 14 metres wide and was manufactured off-site from UHPC and stainless steel reinforcement.

This is the first time this technique has been used in Canada's Alberta province in a multi-span, continuous vehicular bridge. As such, monitoring and measurement are built into the design, with wireless strain gauges in several of the panels and joints. Data from these sensors will be used to assess the success of the innovative construction techniques.

The 12 Street Southeast Bridge measures 170 metres across the Bow River, between the Calgary Zoo and the historic community of Inglewood. Now complete and open to traffic, it replaces the 108-year old St George's Island Bridge.

Source: Jacobs

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INDUSTRY NEWS

The Year In Infrastructure

Digital twins were the key theme of the latest Year In Infrastructure conference, held at the prestigious Marina Bay Sands in Singapore on 21-24 October.

The annual conference, hosted by Bentley Systems, attracts more than 1,500 delegates from around the globe. Its aim is to showcase the work of Bentley's customers and partners, and to share company news from Bentley itself (see box).

The theme of this year's event was "Advancing BIM through digital twins", with multiple workstreams running in parallel throughout the four days. Presentations demonstrated real-world applications of various software systems across all main infrastructure sectors, and provided platforms for thought leadership and physical demonstrations.

Keynote speakers on the Wednesday and Thursday included Keith Clarke, CBE, chair of Forum for the Future, and Dr Ayesha Khanna, co-founder and chief executive of ADDO AI, an enterprise artificial intelligence solutions firm headquartered in Singapore.

The Year In Infrastructure awards were announced at the conference. Highlights included the Shanghai Investigation, Design & Research Institute picking up two of the 18 awards on offer: one in the Mining and Offshore Engineering category for using innovative design to reduce emissions from an offshore wind farm in Liaoning, China; and one in the Digital Cities category for applying digitalisation in the Jiujiang Smart Water Management Platform.

Source: Assets

Bentley Systems key announcements

New product/service:
iTwin Cloud Services for Infrastructure Engineering Digital Twins

New acquisitions:
Orbit Geospatial Technologies, Citilabs

New joint venture:
Digital Constructions Works, with Topcon Positioning Systems. This new joint venture company aims to advance and optimise the constructioneering processes for improved design-build project

For more about the application of digital twin technology, turn to page 16.

New global guidance

A new companion document to ISO55000 – the international standard for asset management – has been released.

ISO Technical Specification (TS) 55010:2019 – Guidance on the alignment of financial and non-financial functions in asset management aims to help financial and operational leaders understand how and why alignment between their functions helps realise value from their assets.

Unlike the ISO55000 series of standards, ISO/TS55010 does not set out requirements for organisations to meet. It is a guidance document, with advice about goal setting, measurement, teamwork, and developing a common language and understanding between financial and asset management functions.

ISO/TS55010 was developed by the same technical committee as ISO55000, ISO/TC251, in response to demand from asset owning organisations worldwide. Over four years, ISO/TC251 heard from the Institute of Financial Accountants, Institute of Mathematics and its Applications, the International Accounting Standards Board and other financial experts.

Source: International Organization for Standardization Technical Committee for Asset Management Systems (ISO/TC251)

To buy your copy of ISO55010:2019, visit ISO.org/store.html

Power up

When General Electric (GE) applied a series of equipment upgrades at a Nigerian gas power station, it expected to see power output improve by six per cent. In fact it improved by 15 per cent: more than twice the expected improvement.

GE's 6B Performance Improvement Package, designed to upgrade and extend the lifecycle of mature power generation assets, involves replacing materials, coatings, sealing and aerodynamics.

The company applied the package to two of the six 6B gas turbines at the Indorama Eleme Petrochemical plant in Nigeria. GE says that each turbine's output has increased by five megawatts (MW), twice what was predicted.

As well as increasing output while the turbines are operating, the upgrade is also helping to extend the interval between inspections. This is expected to help Indorama avoid 21 combustion inspections and four hot gas path inspections, reducing maintenance costs and increasing the assets' availability by up to 3,960 hours over the next 16 years.

A senior management official from the Indorama group of companies said: "Due to growing power demand in Nigeria, our objective is to expand our production. GE's technology will help us mitigate costs while ensuring there is enough power to support increased production at a lower cost."

Source: ESI Africa

Spend in the pipeline

On 25 October, Scottish Water invited potential contractors to discuss its plans to commission £5.2 billion of repair and maintenance work over the next eight years.

At the time of writing, Scottish Water – Scotland's state water supply company – was planning to split the spend across four lots as follows:

Lot 1: Repair and maintenance for water infrastructure (£650-900 million)

Lot 2: Capital investment for infrastructure and civils (£1.2-1.6 billion)

Lot 3: Repair and maintenance for mechanical and electrical (£400-700 million)

Lot 4: Capital investment for mechanical and electrical (£1.8-2.0 billion)

Scottish Water's current contractors include a joint venture between Atkins and RPS, and one between Mott MacDonald and MWH, both providing technical consultancy; and two more joint ventures, one between Morrison Utility Services and Aecom, one between Black & Veatch and Byzak, providing construction work. These organisations will carry on providing their services until the proposed start of the new framework in 2021.

Work with the new contractors will then run from 2021 to 2027, with the option to extend until 2033.

Source: Construction Enquirer

The future of construction?

The Graphene Engineering Innovation Centre (GEIC) at the University of Manchester, UK, is working with industry partners to find new uses for graphene in construction and infrastructure.

Graphene can be formed into a film that is just one atom thick, but boasts a tensile strength 200 times greater than steel. It also conducts electricity.

The University of Exeter has incorporated graphene into concrete production, resulting in a composite material twice as strong as traditional concrete and four times more water resistant.

And Highways England is exploring the potential of graphene's electricity conducting properties in a new digital road network.

The GEIC has appointed a consultant, Arcadis, to work with the construction supply chain to find more ways graphene could enhance assets in the sector.

Source: Construction Enquirer

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Join the Network

The Women's Infrastructure Network is facilitating connections and networking, exchanging ideas, and helping to share the infrastructure agenda – and your business could be part of it.

by Marie Hemingway

women's infrastructure network

Since launching in the UK in 2011, the Women's Infrastructure Network (WIN) has been growing the visibility of women in the infrastructure sector. It provides a networking and support group for women, and currently has over 1,300 active members.

In partnership with the infrastructure industry, WIN hosts events, advocates for greater representation of women in the sector, and provides opportunities and tools for women (and men) to connect with each other. Our events are usually free to attend, open to all, and range from keynote speeches and panels to career events, site visits and informal networking meetups.

WIN offers a unique forum for professionals and their organisations, with the power to promote and facilitate engagement across multiple infrastructure sectors. Individuals can tap into the diversity of thought from across the network, share best practice and successfully integrate innovative ideas back into their respective businesses with the support of network connections. Host organisations can take the opportunity to promote their people, products and services to a diverse, wide-ranging audience, stimulating future business and attracting industry talent from outside conventional pipelines.

We are proud to facilitate a network of members working at all levels across the UK infrastructure sector. Participants represent a diverse group from across the spectrum of the infrastructure industry and include members of public agencies, equity sponsors, infrastructure and pension funds, commercial and investment banks, law firms, financial, technical and insurance advisory firms, engineering and construction firms, operations and maintenance providers.

Expanding influence

The Northern UK branch of WIN was founded in 2018 in response to the increasing demand for events and networking opportunities outside London.

The Northern branch was formally launched on 24 January 2019 in South Yorkshire. The launch event was delivered in partnership with the Nuclear Advanced Manufacturing Research Centre (NAMRC), part of the national High Value Manufacturing Catapult, and sponsored by Copperleaf and Walker Morris. The event was attended by about 50 men and women from across the infrastructure sectors, predominantly working in the North of England.

Attendees said the opportunity to share experiences, network, and listen to inspirational speakers were the highlights of attending the event. One attendee noted that the "mix of people attending the event in different industries made it a more interesting and valuable learning experience". Additionally, attendees exchanged ideas in a workshop, "How to increase gender diversity within your organisation?", a summary of which is available to supporting businesses looking to attract and retain female talent within their organisations.

After the success of the Northern branch launch event, WIN is looking for more businesses working in the infrastructure sector to host engaging events such as technical talks, workshops, networking events or site visits throughout the UK. If you're interested in what the Women's Infrastructure Network can offer, please get in touch to discuss how we might work together. We look forward to hearing from you!

Upcoming events

Q4 2019 – National Grid, Warwick, UK

Q1 2020 – Thales, Cheadle, UK

Q2 2020 – Highways England, Darlington, UK

Interested in getting involved?

— To read more about the network and UK events, visit www.womens-infra-uk.org

— To become a member, join us on LinkedIn – search for "Women's Infrastructure Network UK"

— To discuss how your company can host a future WIN event, contact mhemingway@copperleaf.com

About the author

Marie Hemingway is a senior consultant with Copperleaf Technologies. She is passionate about helping infrastructure businesses across Europe improve their strategic investment decision making. Marie sits on the board of the Women's Infrastructure Network and is a strong advocate for female advancement.

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Doing the right things differently

Introducing a new way of thinking about asset management objectives – to get the right focus, at the right level, to achieve the right results.

by Dr Paul Gibbons

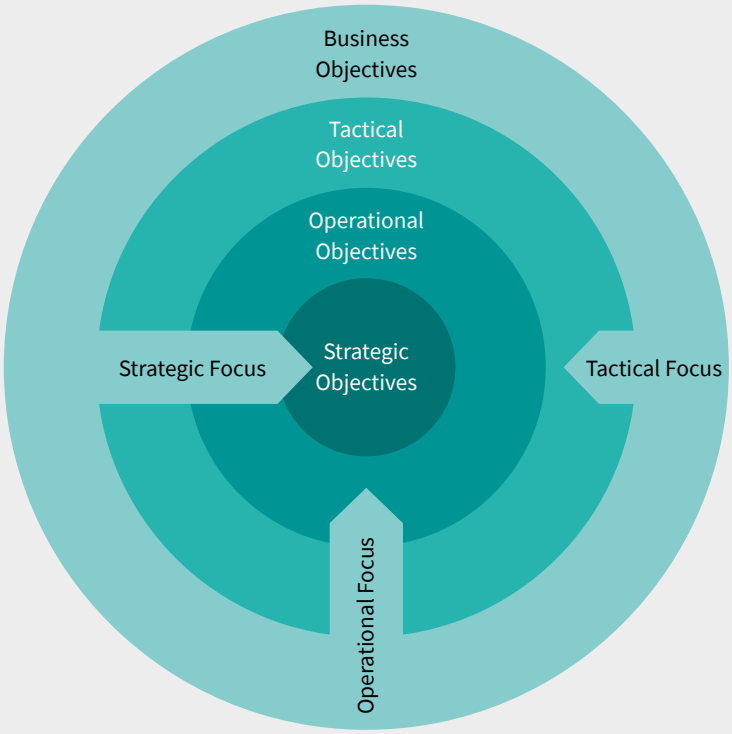

Figure 1: Strategic, operational and tactical level

The purpose of asset management is to help businesses achieve their objectives through the coordinated activities they use to realise value from their assets. Although it seems quite straightforward, it is not actually that easy to translate business objectives into meaningful asset management objectives for different teams working at different levels across the business.

Without these meaningful objectives, teams can be working very hard but not necessarily achieving what is needed. As Dr W Edwards Deming once said: "It is not enough to do your best; you must know what to do, and then do your best."

When a business has clear overall objectives, it should be easy to link these to the different functions in the organisation, as they each focus their local objectives on doing the right things. These could be either enablers for others to achieve their objectives, or specifically linked to achieving a business objective.

But what about asset management objectives?

ISO55000 (section 3.1.12) provides some very useful guidance on what an objective is (in general and in the context of asset management). The standard defines an objective as a "result to be achieved" and explains that these objectives can be at

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multiple levels in the business – strategic, tactical or operational (Figure 1). The majority of staff will be engaged in tactical level activities, with fewer involved in operational level activities and fewer still involved at a strategic level.

In terms of asset management objectives, there could also be levels of service that need to be achieved. ISO55000 also defines an objective as an "intended outcome", or uses words with similar meanings to "objective", such as "aim, goal or target".

So how do we bring these different types of objective to life in the organisation to give the right focus? To develop the right asset management objectives, we need to:

— align the different types of objectives with the right roles within the organisation

— operationalise them through specific asset management processes.

Figure 2 shows a way this can be achieved.

For each of the three types of asset management objectives (strategic, tactical and operational), there will be different individuals or teams focused on delivering different things. It is therefore important for those individuals and teams to derive their own specific personal objectives to give themselves the required focus and ownership. Having specific asset management objectives makes it easier to align specific personal objectives properly to what the individuals or teams are focused on. This is a key success factor in achieving true line of sight.

All individuals working in asset management should have specific objectives. These can be tactical, operational or strategic, depending on what role they play in the organisation. Before these personal objectives can be set, it is important to establish asset management objectives that are derived from the business objectives.

See also
People as assets in our May 2019 issue
Changing the frame in our August 2018 issue

Business level

Specific business objectives are typically created by the executive team and have supporting key performance indicators to track progress as part of the organisational plan. There may also be other requirements the organisation needs to achieve, that are either captured in the objectives or stand alone, such as a regulatory or licence requirement.

These objectives are outside the scope of the *asset management system,* but they provide the focus for asset management; all asset management activities should link up and be derived from these higher level objectives. In asset management terms, this is the top level of the line of sight.

Strategic level

Linking directly with the *specific business objectives*, **strategic asset management objectives** focus on developing and implementing better ways to do asset management within the organisation.

For a business that is immature in asset management, their initial strategic asset management objectives could be to develop an asset management organisation and to implement a framework as an enabler for the business to do good asset management. Other strategic asset management objectives could be to implement a new asset information system or create an asset information strategy.

The strategic asset management objectives are linked to the *management review process.* They should also form part of the *strategic level governance and improvement* of asset management within the business. This approach demonstrates the senior leadership's commitment to asset management, meeting the key requirement for top down buy-in for doing asset management in the organisation.

Tactical level

Local asset management objectives link directly to the *specific business objectives,* and describe the specific targets and requirements for every asset in the organisation. This is to provide the necessary focus to understand how the assets add value to the organisation, and what needs to be measured to know whether that performance requirement is being achieved.

The local asset management objectives can be established using a simple *asset performance requirements process.* From the specific performance requirements, asset performance dashboards can then be derived. This provides the necessary focus and enables the business to understand how the assets are supporting the *specific business objectives*, rather than having a generic asset performance dashboard.

With the local asset management objectives created along with performance dashboards, the *asset manager review process* can then be followed to establish the necessary focus on *tactical level governance and improvement*, working from the bottom up.

Operational level

Providing a focus on asset management maturity for a specific portfolio of assets, **asset steward review improvement objectives** are derived from known gaps in the implementation of asset management processes. In simple terms, if an asset management process has not been fully implemented, then an improvement objective should be agreed and assigned to the relevant individual or team.

The *asset steward review process* itself is an asset management process linked to the *management review process*, where the whole organisation's asset management maturity can be reviewed. Asset management maturity scorecards, created as part of the

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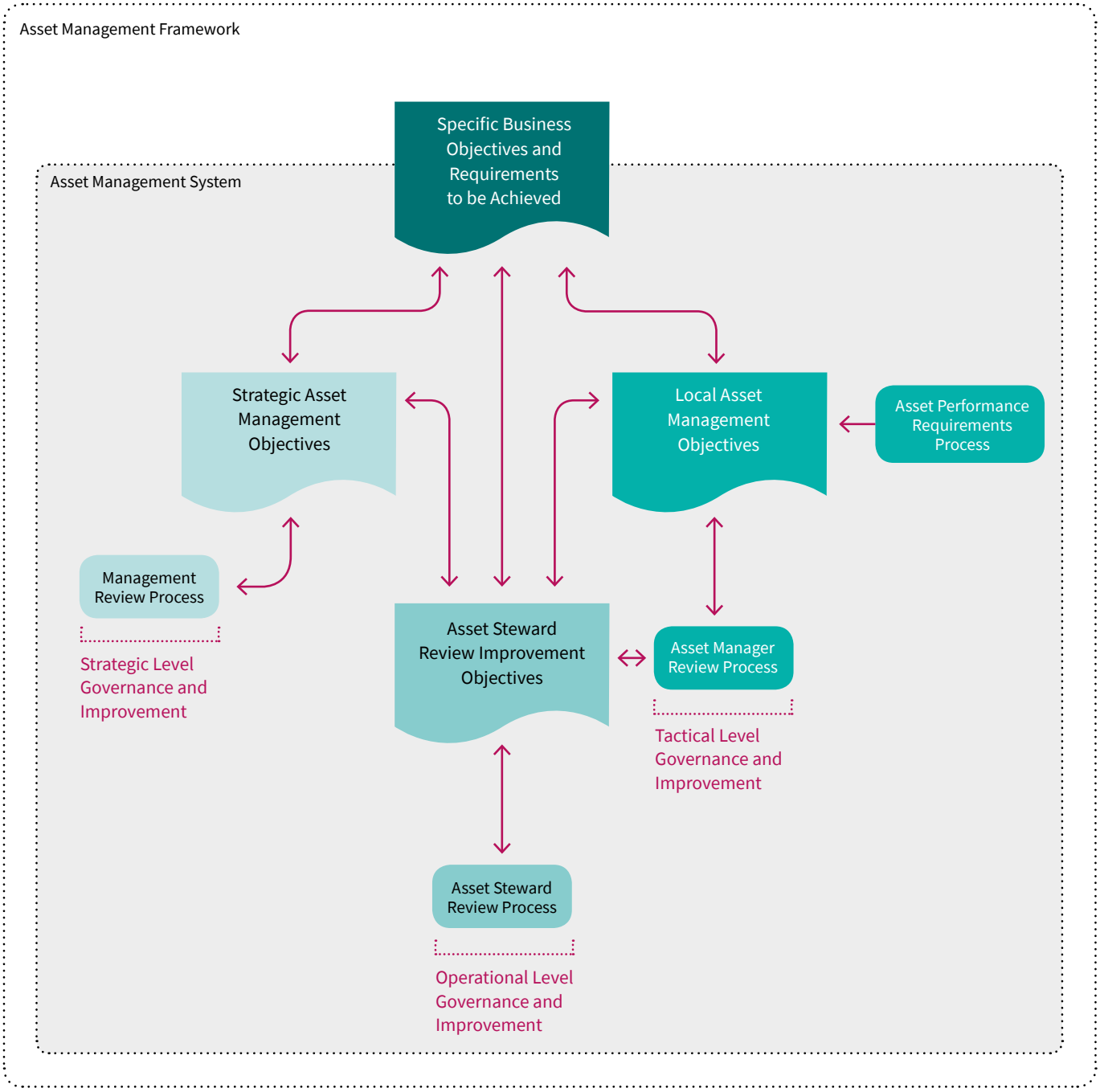

Figure 2: Asset management objective alignment

asset steward review process, can be compiled to identify any areas for improvement at a business level and inform future *strategic asset management objectives.*

The *asset steward review process* is a critical step in establishing asset management within the business, because it shows the accountable person the levels of asset management governance that are used to drive improvements. Governance reviews on their own are not enough to do good asset management.

About the author

Dr Paul Gibbons is a technical director with Jacobs. He is an apprentice-trained machinist with an engineering doctorate and more than 35 years of industry experience in asset management.

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Global views

How can we reinvigorate existing IAM members and reach across disciplines to people outside the IAM?

UAE

Dr Ali Alian, Asset Performance Development Manager, Dubai Roads and Transport Authority

Interest in asset management accelerated dramatically between 2008 and 2015, when it reached many disciplines and industries and showed them a concrete methodology to manage and enhance the lifecycle of assets. Moreover, it enabled organisations to establish a strong framework and end-to-end processes to manage each stage in asset management.

However, the majority of asset managers are still struggling to convert the benefits of asset management implementation into a monetary figure. Benefit realisation methodologies are still immature in the IAM community, which has affected the momentum of asset managers and lowered their rhythm in asset management communities.

Being able to convince senior management of the importance of an asset management strategy is a good thing, but the ability to prove the effect of implementing the asset management strategy is even more important, to both reinvigorate existing IAM members and to influence non-members to join the community and share their knowledge and experience.

On the other hand, achievers cannot enjoy their achievements unless they compare their selves with others. Systematic and secure benchmarking channels, either within or across disciplines, do not yet exist in the IAM community, which again lowers the momentum of the achievers and does not encourage people outside the IAM community to join the competition and enjoy this privilege.

UK

Mick Saltzer, Senior Principal Consultant – Asset Performance Management

To continue to grow, engage and excite members, the IAM needs to consider current members' experience – as well as opportunities to innovate.

This could mean leveraging smart technologies to connect members with a personalised experience, whilst changing the current business model and creating a broader ecosystem of members and external partners.

For example, the IAM could revamp their pricing model. A Netflix-style pricing model with Basic, Standard and Premium service levels could allow members to choose the level of service required.

Introducing a more personalised online experience for members, with more content on the website, could provide a means for members to directly collaborate and network, stream relevant content, and share ideas or concerns.

Push notifications for events or areas of interest could provide a greater level of interaction and engagement among members.

Communication could be enhanced with an IAM app to provide up to date information on-the-go. It could be open to non-Members looking to find out more and reach out to members, to create an active online community.

By leveraging analytics and machine learning, the IAM could better understand and predict members' behaviour and desires, and classify them according to defined criteria.

Developing a people finder could significantly enhance opportunities to meet those with similar challenges or those who need to find an expert.

A chatbot could allow members looking for information about events or products to ask questions in a chat window instead of navigating a website.

However, in progressing any of these ideas, the overall mission of the IAM must not be lost.

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EMEA

Chidi Umeano, Principal Consultant, Codub Consulting Ltd

The IAM currently has over 2,700 members and a network of over 30,000 people globally. Keeping such a huge network of professionals connected and engaged can be challenging.

A sure way to reinvigorate and engage members is to articulate the value of the IAM by:

- **Holding regular events.** The value of physical meetings cannot be overemphasised when building engagement amongst members. Events present good opportunities for invitees from other disciplines to experience the community first-hand. Webinars are also great where geographic constraints exist. It is also worth considering setting up a Chapter with Branches in Africa.
- **Communicating regularly to stay relevant.** A common mistake is to make this a one-way thing. Engagement comes from hearing and being heard. It is important to keep channels open for assistance, contributions or just for members to say thanks. Leverage technology here, particularly Instagram and Twitter.
- **Personalising content.** Sending out regular emails on general content is good, but it is better to leverage personalised content, based on the demographics and interests of members. It shows thoughtfulness and drives engagement and loyalty.
- **Promoting gender balance.** Establish a strong network for women professionals in asset management.
- **Nurturing student membership.** We need to strengthen students' membership, to encourage mentoring among the young people who will take over the mantle of leadership. NxtGen is a good example.

In summary, the IAM should focus on delivering value, connecting authentically with members and building a strong community.

AUSTRALIA

Ernst Krauss, Principal Consultant, Wood plc

The foundations for asset management systems have been laid by very experienced people working in the asset management field. Operational experience has been gained by current adopters of the ISO standard, and that experience is slowly being harvested by organisations like the IAM, the Asset Management Council (AMC) and more localised kindred societies, and made available to a wider public.

The difficulty in invigorating enthusiasm for asset management and asset management systems, in my opinion, can be addressed by more accessible achievements and tangible outcomes from implementing and sustaining an asset management system.

Another point is that, in my view, it is difficult for universities to teach asset management under current rules. The future is with the next generations of engineers, managers, economists and others that contribute to the development, management and disposal of assets. The opportunity is there for asset management system steward organisations to provide better information, making use of new communications technology to reach these next generations, offering internships and work experience, to help educate students about asset management systems.

Flexibility of language and understanding of terms is another hurdle that often is perceived to exist in various industries. Strategic Asset Management Plans (SAMPs) and Asset Management Plans (AMPs) are often called different names in different industries and, on close examination, provide the same information that SAMPs and AMPs should provide. Interest in the whole asset management system is quickly lost and, therefore, the opportunity to achieve better outcomes is lost.

Asset management societies could also engage in global benchmarking or maturity assessment programmes, comparing industry achievements and derived benefits.

Want to represent your region in Global Views? We're always keen to hear from new voices. To register your interest in contributing, email **assets@theIAM.org**

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Q&A: 2020 vision

After more than 20 years' involvement with the Institute, Ursula Bryan, who is Head of Engineering and Asset Management at National Grid Electricity Transmission, became IAM President in June. Here, she shares her three commitments to developing the IAM and the discipline.

Q: How has your work with the IAM prepared you for this role?

A: I became involved in asset management in the early 1990s, when National Grid created its first asset management organisation, so it's been part of my thinking for three decades. In terms of the IAM itself, I've been on the Board since 2009, so I am very used to discussing the wide range of issues that affect the Institute and our members. Taking over from Chris Newsome, however, means I have some big shoes to fill.

I first became involved with the Institute because National Grid Electricity Transmission is a Patron and I often went to Patron meetings and played a part in the Institute's activities through the Patrons. In the early 2000s I was involved in the work towards creating the first PAS55. That involvement continued with contributing to the development of the 2008 version of PAS55 and, later, to the development of ISO55000.

I was also involved in contributing to the first version of the assessment methodology and the Subject Specific Guidance documents, and I only stood down as a judge for the asset management awards when I took on the presidency. I'm still very keen to recognise great asset management, of course, and to promote excellence in asset management.

Prior to becoming the President, I chaired the Faculty meeting for a number of years. That was an important role as the technical work of the Institute is co-ordinated through that group. It certainly gave me a great breadth of understanding.

Q: What are the key changes you've seen during your time with the IAM?

A: Importantly, the major changes in the Institute reflect the changes going on in the world of asset management more generally. Probably the biggest difference is the sheer number and range of people and organisations now active in the discipline.

In the early days, it was really only the large infrastructure-owning organisations who were involved in asset management. Over the years, the range of organisations adopting asset management has expanded into areas such as facilities management, manufacturing and municipal organisations.

The second area where there has been enormous change is in the international dimension. From being originally UK-focused, the IAM now has members across the globe. By creating Chapters, we've been able to support people around the world in a way that fits their own geographies. In October, the US and Canadian Chapters came together for a conference in

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Chicago and the month before, both the Germany and Netherlands Chapters held conferences.

It's testament to how much asset management has evolved and how many people are engaged in the field.

Q: What do you see as the most important part of your work in the next year?

A: One of the areas that Chris Newsome was driving forward – and Richard Edwards before him – was the professionalisation of asset management. We're now at the point where we'll be launching a register of professionals next year.

A massive amount of work has gone into what's a huge and exciting step for the Institute and for asset management professionals. As a Board member, I was heavily involved in attracting sponsorship to help us on this journey, and my first commitment as President is ensuring we continue professionalising the discipline and launch the register.

There is still a great deal of work to do to get the register up and running, to make sure we have the criteria, the application process and the link to continuing professional development so that people can maintain their status.

I strongly believe this will bring important benefits, not just for individuals, but for organisations who are keen to see their people professionally registered.

Q: How do you see the professional register and chartership fitting together?

A: When we set out to professionalise the discipline, we always knew we were going to create a register of professionals. In parallel, we also decided that we would seek permission to petition the Privy Council to become a Chartered Institute.

Chartered status is recognised clearly in the UK and in Commonwealth countries but less well known in some countries. The professional register will be valuable in every country, providing portable recognition for capable individuals.

Q: You've mentioned inclusion as one of your three commitments. Can you explain what that means to you?

A: I want everyone to feel they're welcome in our asset management community. The best way to enable that is to create an environment where everyone can bring their whole self to getting involved in the asset management discipline.

It's an amazing coincidence that Kirsten Bodley is now Chief Executive of the Institute and I'm President. It certainly wasn't engineered, and my commitment is about the benefit of bringing everyone's experiences together and creating the space for people to make their contribution.

I'm delighted that Derrick Dunkley is going to lead a small group of people who are committed to inclusion in asset management, and I'm excited to see what actions come out of their discussions.

Q: How do you see the role of asset management in our ever changing world?

A: There are so many challenges facing us as a society across the world, and my third commitment is to explore how asset management can help our community as we grapple with these challenges and help us take up opportunities our ever changing world presents.

Climate change is, of course, the most obvious challenge and asset management has a role to play. Resilience is also a critical area where I believe asset management can help. Digitisation presents us with a massive opportunity.

To take these areas forward, we are setting up some small groups that can discuss how the Institute can get involved and support members as they grapple with these challenges and understand these opportunities.

Q: Are you excited about the future of asset management?

A: Definitely. It's a huge privilege to take on the role of President as we enter a new era of professionalisation and involvement in the wider world. The fact that we can make a difference is thanks to those volunteers and members who work tirelessly and creatively. I'd like to say an immense thank you to them all.

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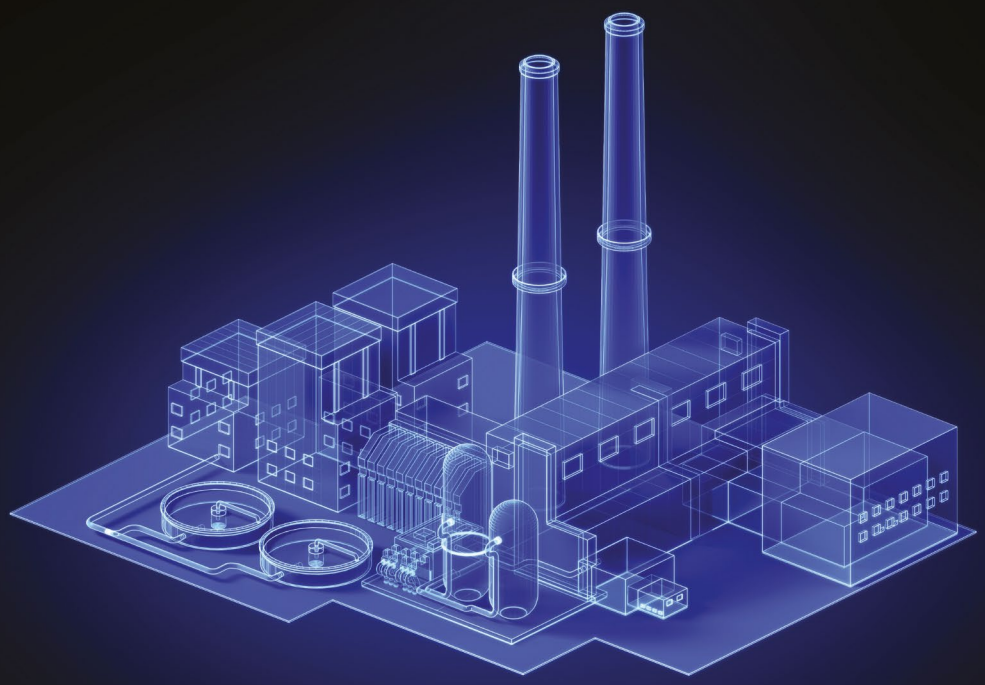
Transforming commissioning with digital twins

A digital twin provided valuable insight to guide a complex commissioning process, where monitoring and quick action were essential to avoid significant costs.

by Anna Whitmore and Zoe Buxton



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The Centre for Digital Built Britain (CDBB) defines a digital twin as "a realistic digital representation of assets, processes or systems in the built or natural environment". It can sometimes be difficult to link this definition to the tangible benefits of a digital twin. The practical application of digital twins to improve asset commissioning helps to demonstrate the value of the concept, by creating new insights into asset performance to support improved decision-making.

Traditional asset commissioning can be a time-consuming, labour-intensive process, particularly when the asset in question is complex and highly variable. Mott MacDonald Bentley was responsible for the design, build and commissioning of a £37 million sludge treatment plant at Five Fords near Wrexham, Wales. The plant uses a complex process called Anammox to treat the sludge liquors before returning them to the main wastewater treatment works for further treatment. This process requires complex conditions and control to operate successfully.

Bacteria are the key enabler for the process, and if they are lost because of an adverse change in conditions, they can only be recovered through reseeding, which carries a significant cost. When getting the plant up and running at the beginning of its operational life, there is a significant risk of increased costs.

Mott MacDonald Bentley (MMB) and Dŵr Cymru Welsh Water wanted more certainty during this commissioning stage, to mitigate risk and to reduce the lengthy commissioning programme. To achieve this, MMB and Welsh Water recognised an opportunity to apply the digital twin concept to Five Fords and worked with Mott MacDonald's Smart Infrastructure team to develop a solution.

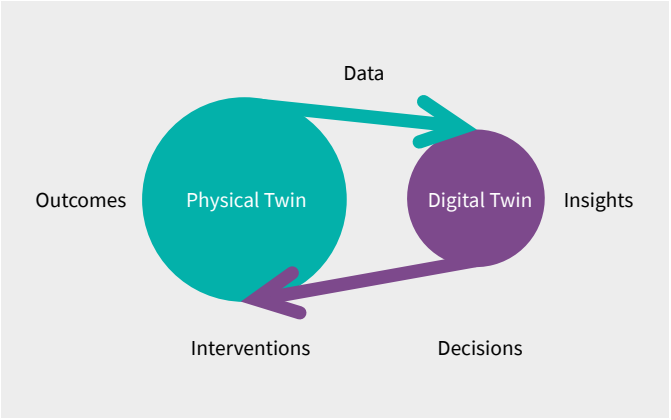
Although digital abundance is beginning to transform aspects of the infrastructure value chain, the challenge of harnessing digital capabilities to improve asset management lifecycle activities is still ongoing. Digital twins are emerging as part of the solution, improving the way asset owners manage, maintain and operate their assets.

"The Five Fords digital twin has allowed the team to move from reactive to proactive decision-making. It is creating a real step change in how we manage our assets."
Dan Buxton,
Design Manager, MMB

What makes a digital twin "a realistic digital representation" is the dynamic data connecting the physical and digital assets (Figure 2). This link creates insights into the physical asset, leading to improved decision-making and better, faster and cheaper interventions.

Recently, the CDBB has been leading the

Figure 1: Digital twin of Five Fords treatment plant in Moata
Figure 2: Digital twin topology



development of a national digital twin: "a family of connected twins that can all speak to and understand each other".[1]

In this vision, following the CDBB's Gemini Principles[2] (Table 1), the twin of a wastewater treatment plant can be imagined as one piece of a larger digital twin of the entire water sector. This sector twin would then feed into a wider ecosystem of sector digital twins – for example highways, airports and energy – increasing in scale, complexity and value added. This would enable greater data sharing, which has the potential to unlock an additional £7 billion in benefits across the UK infrastructure sector through improved efficiencies, increased competition and enhanced network resilience.[3]

Demonstrating the value

The national digital twin may seem removed from everyday asset management, but the use of a twin at Five Fords demonstrates how the concept can drive value through practical use on a more local scale.

Development of the twin was driven by two key questions:

— What if we knew how the plant was going to perform in the future?

— What if we could simulate operating conditions virtually before making decisions?

The answers to these questions defined the inputs and analytics required to make the digital twin functional. Combining deep engineering and operational knowledge of the asset with digital skills meant that the functionality of the digital twin would provide new insight into asset operation, allowing the commissioning team to make proactive decisions to help ease the overall commissioning process.

To deliver the digital twin, two components were required: a platform to capture, process and visualise the data, and a calibrated, real-time model to provide analytics.

Mott MacDonald's digital twin platform Moata processes billions of data points daily and can integrate with multiple software packages and machine learning modules, making it a powerful digital twin platform built for scale.

To dynamically model the complex biological process, the industry-leading wastewater simulation software Biowin was used. Biowin (developed by EnviroSim) was integrated with Moata to provide real-time insight into plant operation.

Mott MacDonald's approach of creating a platform which can integrate external software and modules ensures the right people are delivering each component of the solution. Moata builds on existing intellectual property to provide users with a new layer of functionality that enables them to predict, simulate and implement operational changes via a user-friendly interface (Figure 3).

While the digital twin has delivered a new level of insight into asset performance, it does not prevent engineering issues occurring on site. Commissioning this treatment plant has been a particularly complex process. The team has had to manage challenges such as low winter temperatures affecting the vital Annamox process, unpredictable inflow characteristics and communication between a wide range of suppliers. While the digital twin cannot control these external factors, it has helped the team to act with conviction when deciding how to move forward.

For example, the reactor temperature was low because of a cold winter, which was causing problems with the bacteria. While the digital twin cannot physically heat the reactor and fix the problems, it can predict the effect of low temperatures on plant performance, empowering the team to decide on a course

""This looks like a great step towards creating an ecosystem of connected twins in the UK water sector. Pulling together towards this common vision for our industry will help to deliver a built environment in which people can really flourish."
Mark Enzer,
Chief Technology Officer,
Mott MacDonald

Figure 3: Headline report of plant operation vs simulation

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PURPOSE: **Must have clear purpose**	**Public good** Must be used to deliver genuine public benefit in perpetuity	**Value creation** Must enable value creation and performance improvement	**Insight** Must provide determinable insight into the built environment
TRUST: **Must be trustworthy**	**Security** Must enable security and be secure itself	**Openness** Must be as open as possible	**Quality** Must be built on data of an appropriate quality
FUNCTION: **Must function effectively**	**Federation** Must be based on a standard connected environment	**Curation** Must have clear ownership, governance and regulation	**Evolution** Must be able to adapt as technology and society evolve

Table 1: The Gemini Principles, published by the Centre for Digital Built Britain

of action – in this case, increasing the volume of heated dilution water.

The Gemini Principles

There were technical challenges to overcome during the development of the digital twin itself, ranging from perceived data security to data quality. The Gemini Principles, although created for the development of a national digital twin, were also well aligned with the granular application of a single-asset digital twin.

In terms of data security, the Gemini Principles state that holistic security principles should be embedded from the outset to ensure data sharing is managed effectively. While data security at Five Fords is not a matter of national security, as it would be with a national digital twin, it was still a key consideration and will likely be a concern for all asset owners.

The Five Fords digital twin is hosted on a secure data platform with robust access protocols, but sending telemetry to a third-party platform was still perceived as a risk. This perception resulted in ongoing barriers to data transfer that affected the automation of the digital twin. It is only by understanding and managing these risks that we can move towards open data policies, which allow appropriate data to be shared, ultimately opening the door for suppliers to create more innovative solutions.

Data quality is another common challenge faced when building a digital twin. Issues on site with the physical asset had negative impacts on the quality of data being received, and so on the modelling results. Although this was undesirable, it also had unexpected positive benefits. Visualising and interrogating data through the digital twin alerted operators to equipment failures and incorrect data. It highlighted the importance of having timely, appropriate data, in line with the Gemini Principles.

Mott MacDonald's Smart Infrastructure team sees unlimited potential for the application of this concept. Transitioning using the Five Fords model from asset commissioning to business-as-usual operation is the first step, helping to optimise performance, reduce energy use and cut chemical consumption.

This is one small part of creating a wider digital twin for all water and wastewater assets, building an ecosystem of supply, distribution and treatment assets and integrating catchment-wide aspects of the water cycle such as rainfall predictions. This will only come about through collaboration and strategic partnerships, ensuring we are using the best expertise on a global level.

The potential to add functionality by integrating corporate business systems has clear positive benefits for asset management, particularly around long-term planning and complex scheme solutions. As these layers of complexity are developed, greater insights mean better decisions about how to manage the physical infrastructure, leading to better, faster and cheaper interventions, unlocking value from existing assets using digital technology.

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About the authors

Anna Whitmore is a technology consultant at Mott MacDonald Digital Ventures. Focused on improving asset performance and the integration of new technology, Anna combines wastewater and digital expertise to develop new projects using Mott MacDonald's digital twin platform, Moata. Anna has a degree in chemical engineering and started her career in New Zealand as a wastewater process engineer.

Zoe Buxton leads Mott MacDonald's Smart Asset Management offering, working with clients to digitally enhance lifecycle asset management and decision-making processes. She has experience working across the whole asset management lifecycle, from risk identification and investment planning to intervention delivery, operations and optimisation.

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Q&A: Fresh thinking

Get to know Will Slater, recently appointed Chair of NxtGen, the IAM's committee for professionals new to asset management.

Q: What does being Chair of NxtGen involve?

A: Just like any of the other voluntary groups supporting the IAM, my role as Chair is focused on setting a vision for NxtGen, making sure that it's aligned to the IAM's overall vision, and then developing tactics and initiatives to keep us stepping towards that vision.

We have a good vision for NxtGen already: To be recognised as the leading group for those in the early stages of their asset management careers. So I see my role as being focused on developing that set of tactics, and enabling us as a committee to deliver these and achieve our vision.

To do that, we need a committee with people who are motivated and can bring energy, ideas and ways of thinking that I don't necessarily have. Enabling them to use these skills effectively – that's also a major part of my role.

Q: What does NxtGen's vision mean for its members?

A: The job of NxtGen is really clear. It's to support those in the early stages of their asset management career, helping them to gain knowledge and experience much quicker than if we weren't there, allowing them to progress and supporting their development into full members. That is really the core of being NxtGen.

There are lots of benefits that come with that. You're making friends for life, and you're part of a network that you can grow with. But our core reason for being is to provide that knowledge and experience to allow them to continue their career, at a pace that's right for them.

Q: What are your goals for your time as Chair?

A: Broadly, we're looking to cover four things: create a really good learning environment; engage our members; champion their views; and promote full membership of the IAM.

Championing members' views is quite a new objective, and it's a key outcome for us, which Kirsten [Bodley, CEO of the IAM] shares. What it means is, we're aiming to get a NxtGen member on every committee and council within the IAM, and also on the ISO55000 mirror committee.

They're all really keen to have a NxtGen member involved. A number have said, "We look around the room and we recognise we're all one type of people." They want fresh thinking as part of their committees and we believe that NxtGen can go some way to supporting that.

Q: What are your immediate priorities?

A: The biggest one is to continue to organise great events, whilst we review the overall NxtGen strategy. One upcoming event will likely be an introduction to asset management webinar. We haven't done a webinar before, but US NxtGen has – quite successfully, because geographically they're very spread out, so it's hard to get members in one location. For lots of reasons, we've ended up in a similar situation in the UK, so we want to use the learning from them to run a webinar here.

We also need to engage and develop our membership base. In my previous role on the committee, one of my biggest objectives was to connect with the IAM's Patrons. I delivered a presentation to the Patrons on what NxtGen is and asked them to

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identify someone in their organisation that could be an Advocate for NxtGen. We now have a number of NxtGen Advocates – we will be sharing information about NxtGen with them, and asking them to share details of events with those who may benefit from our offering.

As a committee, we have a number of other priorities, including filling some much needed committee roles, running at least three events before the end of March next year, reviewing the type of events we hold and finally, holding a great Christmas social!

Q: How has your career so far prepared you for this role?

It's led me to be really passionate about NxtGen and the potential it has.

I studied mechanical engineering at university. It was a four-year course including a year in industry. I remember interviewing for that year in industry, meeting my manager-to-be at Northern Gas Networks in Leeds, and being asked where I wanted to be placed in this large organisation.

I knew from the first three years of the course that I didn't just want to be an engineer. I didn't just want to be involved in the technical detail, because I've always had a mind with a financial and broader business element to it. I wanted both.

So I explained that was where my thinking was at, and my manager introduced asset management to me, and said, "This might be what's right for you." In that, I found the perfect combination of both technical knowledge and understanding, and the financial side of things.

It all fitted together for me really quickly because, by chance, I'd spoken to someone that was involved in asset management and could introduce me to it.

So I understand that people who are in a similar position to me, coming through their engineering or finance degree but wanting some of the opposite in their career as well, don't necessarily know about asset management. I also recognise that this may be a similar story for those already working in asset-intensive organisations, but who want to develop their asset management careers. This experience has helped me most to prepare for my role as NxtGen Chair, to get the word out about asset management and find the next generation for our discipline.

A note of thanks

I'd like to thank John Green for his commitment and tireless support for NxtGen. He has been involved with the section for eight years, the last four as Chair. Throughout this time, he has provided many newcomers with an introduction to the world of asset management in the UK and other Chapters. I am very pleased he will remain actively engaged with the Institute, including as a member of the Awards Committee. Thank you for your continued contributions, John!

I'd also like to welcome Will as Chair. His drive and enthusiasm will be an excellent driver to reinvigorate NxtGen to encourage and support more newcomers to the IAM and the discipline. I look forward to working with him.

Kirsten Bodley, CEO of the IAM

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The world's best

Announcing the finalists in the running for the IAM Global Awards 2019.

Each year, the IAM Global Awards celebrate outstanding achievements across the whole scope of the asset management discipline.

There are eight awards categories this year, each with three outstanding finalists. Two of the awards – the Risk and Resilience Award and the Information Management Award – are being awarded for the first time this year.

The winners in each category will be announced at the IAM Annual Dinner and Awards Ceremony. The event takes place on 27 November, the first evening of the IAM Asset Management Conference, at the Chelsea Harbour Hotel, London, UK.

The finalists

Project Achievement Award

Awarded for a project which has achieved a good or notable outcome.

Leon Francis, Sellafield Ltd

Gradually removing a 122-metre redundant ventilation stack, and with it one of the highest non-nuclear risks at the site, using an innovative climbing platform and a highly skilled team.

Abdulrahman Ghamni, Yanbu refinery, Saudi Aramco

Establishing and implementing an accelerated transformation roadmap to establish and implement a comprehensive asset integrity management system.

Matt Needham, Acis Group

Refurbishing out-of-date properties while upskilling the future generation of tradespeople.

Individual Achievement Award

Awarded to an individual, typically with more than five years' asset management experience, who has made a personal contribution to their organisation or to the asset management knowledge base.

Jamie Marsnik, IBM

Advancing the software asset management (SAM) discipline and delivering successfully a SAM service to numerous clients, generating more than $100 million in savings.

Wajdi Mereb, Dubai Roads and Transport Authority

Leading Dubai Roads and Transport Authority to become a fully data driven asset owner – digitising its assets, fulfilling BIM level 2 and beyond, and successfully implementing BIM for the whole lifecycle.

Nader Milibari, Saudi Aramco

Working within Saudi Aramco and the Gulf region to promote an asset performance management culture and leverage related knowledge through training and certification, systems, processes and procedures.

Team Achievement Award

Awarded to an operational team or department who have made a significant contribution to their organisation or the asset management knowledge base.

Almothanna Alserhani, Safaniya onshore producing department, Saudi Aramco

Handling the department's asset management programme, aligned with ISO55001.

Abdulrahman Ghamni, Yanbu refinery, Saudi Aramco

Establishing and implementing an accelerated transformation roadmap to establish and implement a comprehensive asset integrity management system.

Christopher Power, Mott MacDonald

Developing asset management processes for the earthworks of Network Rail.

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NxtGen Award

Awarded to an individual new to asset management (with five or fewer years' experience) who has made an outstanding contribution to the implementation and development of asset management and demonstrates great potential in the field.

Vidit Aneja, Town of Caledon

Leading change by establishing and implementing the town's first asset management programme and ensuring its compliance with the Ontario Regulations for 2019, 2021 and 2023.

James Carne, Transport for London

An outstanding contribution to asset management within Transport for London – including one project that delivered £1 million in value – and involvement in NxtGen, presenting to engineering institutes and inspiring new asset managers.

Declan Creamer, Atkins

Supporting clients in their asset management approaches, to ensure they are at the forefront of the discipline.

Information Management Award

New for 2019

Awarded to an individual or team whose information management activity has enabled teams and stakeholders to use their time, resources and expertise effectively to make asset management decisions and fulfil their roles.

Jim Barlow, Environment Agency

Breaking new ground by applying BIM methods in an operational environment.

Ludmila Kantova, IBM

Using automation and innovative thinking while implementing a solution for critical data management, making data validation more productive, data management more efficient, and data analytics faster.

Colin Richardson, Northumbrian Water

A step change in information management, covering creation through BIM, legacy asset data cleansing, storage and access, and continuous improvement.

Innovation Award

Awarded to an individual or team whose innovation in asset management has delivered financial, performance and risk reduction benefits.

Gregory Lindsell, Spiralweld

A novel approach to through-life management of engineering assets, supporting many industries.

Fatema Walji, Atkins

Analysing aerial survey data to provide answers to some of the biggest challenges Network Rail faces.

Arnold Yuan, Ryerson University

Developing condition indices and deterioration models – the first of their kind in evidence based, risk-informed sidewalk asset management.

Customer Service Award

Awarded to an individual or team whose approach has benefited the asset management system in respect of meeting customer requirements and/or improving customer satisfaction and advocacy. Customers can include internal customers within the organisation, external customers who receive products and services from the organisation, or stakeholders who influence the success of the organisation.

Jamine Dickinson, National Grid

Developing a mitigation scheme to reduce noise from a high voltage electricity transmission substation, resulting in positive feedback from the numerous local residents affected.

Abdulrahman Ghamni, Saudi Aramco: Yanbu refinery

Establishing and implementing an accelerated transformation roadmap to establish and implement a comprehensive asset integrity management system.

Dave Roberts, Transport for Buckinghamshire

Focusing and engaging elected members and executive management on asset management principles, resulting in a far better customer journey and genuine improvements in the organisation's highways asset.

Risk and Resilience Award

New for 2019

Awarded to an individual or team with an excellent or noteworthy approach to managing risk (identifying, evaluating and prioritising risks followed by coordinated and economical application of resources to minimise, monitor and control those risks) and/or ensuring resilience (an asset management system's ability to return to a steady state after an intervention).

Mousa AL Qaisi, Dubai Roads and Transport Authority

Harmonisation between the asset management team and the safety and risk regulation team, leading to intensive analysis of the current best practices in managing asset-related risks.

Andy Bichan, Amey Consulting

Developing a bespoke obsolescence management tool for Heathrow Rail, providing visibility of, and contingency for, critical assets at the end of their lifecycles – allowing for more exact budget allocation earlier in the development phases, and improved operational safety and availability.

John Devall, Severn Trent Water

A refreshed asset management framework, building on solid foundations to better assess risk, support prioritised decision-making, and enable the organisation to deliver for customers.

To book your table at the IAM Annual Dinner and Awards Ceremony, visit www.theIAM.org/Events

What's most critical?

Asset management isn't about keeping everything in perfect condition – it's about maximising value. So when investment is low, it's useful to know which assets can be allowed to deteriorate a certain amount, without risk to the whole system. The City of Calgary developed an assessment to do just that.

by Henry Fang and Kai Li

Traditionally, Calgary Roads manages risk very well at the business level. Risk is a repeat agenda item at senior management meetings. However, when it comes to managing risk at the asset level, Calgary Roads has faced a number of challenges.

First, asset criticality is a subjective concept, and often a situational one, depending on recent risk events. There was no systematic approach to quantify the criticality of roadway assets. Asset criticality also changes with media attention, political agendas, or management focus. For example, potholes on roadways in spring often draw more public attention to the pavement assets.

Second, it is hard to define infrastructure risk without defining asset criticality. Not every deteriorated asset necessarily represents high infrastructure risk. An example is the aged benches and bike racks in older communities. On the other hand, some asset classes, such as bridges, have very low risk tolerance. The consequences of these assets failing are severe.

The City of Calgary's 2017 Corporate Asset Management Plan (CAMP) applies a simple risk evaluation across the corporate asset portfolio, drawing on a broad understanding of asset criticality and condition status as outlined in its Infrastructure Status Report. The condition of the asset classes represents the likelihood of those assets failing, while the criticality represents the consequences of failure. In combination, the risk score provides an asset health index for the asset class.

Generally speaking, critical asset classes need to be maintained in better conditions, while less critical asset classes may be allowed to deteriorate to a lower condition grade without increasing infrastructure risk. This concept has been used to develop a criticality-to-condition relationship and threshold (Figure 1). This process also provides a risk score (criticality × condition), used to assess whether the average condition of an asset class is within the tolerable standard.

Because of tight timelines, the risk diagram presented in the 2017 CAMP was developed from a quick assessment by

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the corporate asset management team. To validate the risk profile of its roadway assets, especially in terms of criticality, Calgary Roads decided to proceed with a formal asset risk criticality assessment for all roadway assets.

The first step was to develop criteria for assessing asset risk criticality. Two approaches that governments often take include questionnaires and workshops. These approaches can produce comprehensive criteria and weights when the stakeholders come from various backgrounds. However, the stakeholders involved in this project were mostly transportation engineers, so criteria developed using these approaches might not have been diverse enough.

Since the intention is to use the asset criticality information to support budget allocation decisions in the future, the project team adopted multi-criteria analysis – an existing technique for prioritising transportation infrastructure projects – and customised the criteria to fit the needs of the assessment.

There are four sections in the criteria: economic, social, environmental and smart growth. Since Calgary Roads' criticality assessment focuses on existing roadway assets, and the smart growth criteria focused on supporting future demand, the weighting of the smart growth criteria were reduced to zero. The weightings for the other three criteria remain the same, since they are based on policies in the Calgary Transportation Plan and Municipal Development Plan (Table 1).

A literature review discovered risk consequence matrices developed by other municipalities in Canada. Calgary Roads' final risk consequence matrix incorporates many good practices from these other municipalities. It describes consequences of failure using quantifiable measures as much as possible. When quantifiable measures are not available, it uses qualitative descriptions to define approximate impact. There are five scales for each criterion and the descriptions of the criteria are modified to meet the needs of this assessment.

After developing the asset criticality assessment criteria, Calgary Roads conducted a test workshop with asset managers who were familiar with the risk concepts. The participating asset managers were able to use the criteria to give fair and unbiased assessments of each asset class.

The results of the test workshop were compared with the initial asset criticality scores from the 2017 CAMP. The relative relationship of asset criticality between the asset classes was the same in both assessments. But the absolute criticality scores were lower in the test workshop than in the 2017 CAMP.

Four more workshops were then conducted, one with each division of Calgary Roads. Participants focused on assessing the asset classes managed by their division. Individual assessments were then aggregated to generate the final scores of the roadway asset criticality assessment.

While most participants understood the rationale behind the criticality assessment and approved the methodology, the project was not without its challenges. For example:

— Asset managers tend to rank their own assets at a higher criticality level, and a few of them rank their own assets the highest among all roadway assets.

Figure 1: Risk diagram for roadway assets

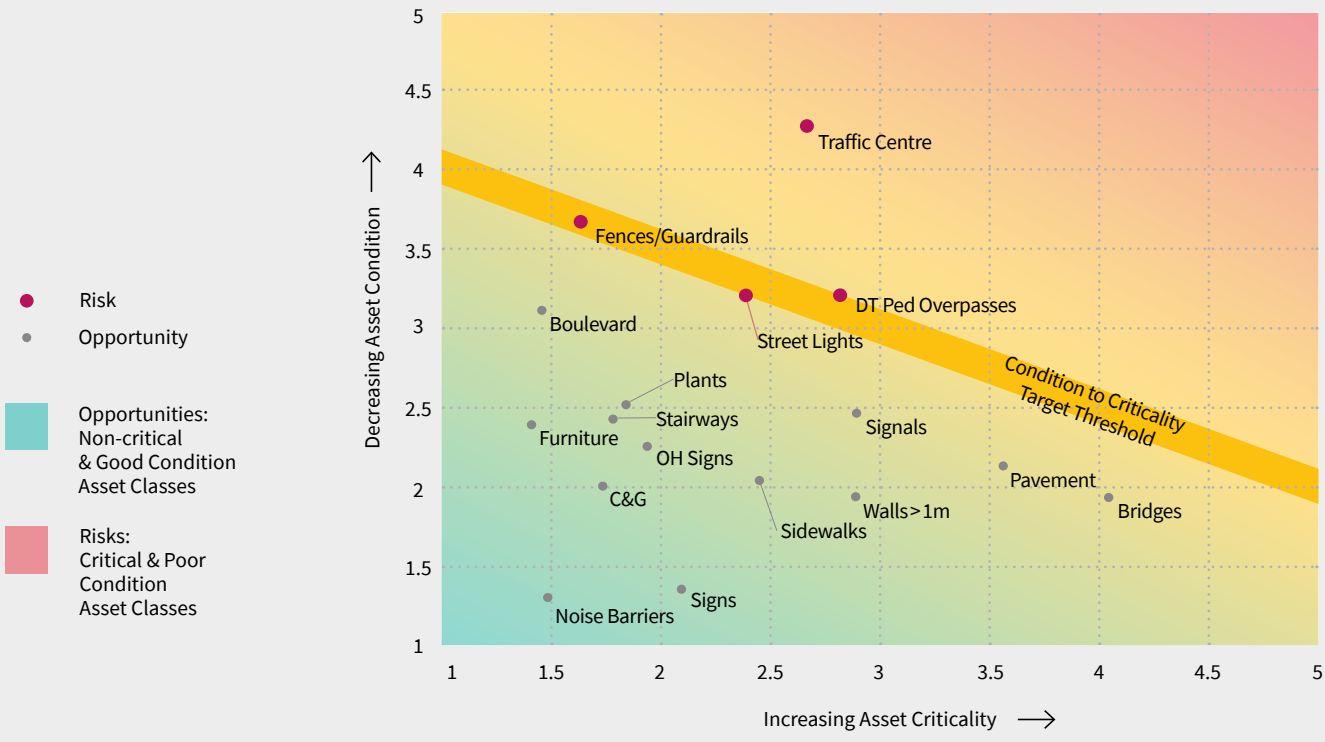

Table 1: Multi-criteria analysis transportation project prioritisation criteria

Multi-criteria analysis sections	Calgary Transportation Plan/Municipal Development Plan policies	Asset criticality assessment criteria (failure of the asset will result in…)
Economic	A prosperous economy	impact on ongoing business investment and expansion
		difficulty attracting and retaining a diverse workforce
		less reliable goods movement
		increased annual operating and maintenance cost impacts
Social	Connecting the city	decreased mobility choices for Calgarians
		reduced accessibility
	Urban design	reduced safety level
		reduced compliance with Livable Street criteria
Environmental	Greening the city	higher electricity use
		more greenhouse gas emissions
		reduced capacity for climate change adaptation
Smart Growth	Shaping a more compact form	lower strategic intensification of developed areas
		lower utilisation on capacity and lifecycle of existing infrastructure and services
		less development of the primary transit network

— Participants typically rank the asset classes based on the most critical assets in the class – for example, most participants assess the pavement asset class based on arterial roads and collectors.
— Most asset managers do not see the immediate benefits of this assessment in their day to day work, unless investment decisions are truly based on the assessment results.

The project team applied various strategies to overcome some of the challenges:
— Pilot the assessment before rolling it out to the whole organisation. The project team learned how to explain the process and guide people to think about the big picture rather than focusing on day to day operations.
— Use the median values rather than mean. This approach takes out some outliers where asset managers score extreme values for their own assets.
— Adapt to the concept of relative criticality rather than absolute scores. For example, bridge assets are relatively higher in criticality than pavement assets. When the criticality assessment is rolled out to the whole city, the project team will also need to find a method to normalise the scores between different business units.

The final asset criticality scores were plotted in the risk diagram along with the 2017 asset condition ratings. The asset classes with the highest criticality scores are:
1. Bridges
2. Pavement
3. Retaining walls more than one metre high
4. Signals
5. Pedestrian overpasses in downtown districts

Condition to criticality target thresholds (the shaded line in Figure 1) were tentatively defined based on a common understanding from the participants. The common understanding is that higher criticality assets should be maintained at a better condition level. Further asset criticality analysis, drilling down to the asset sub-class level, is required to determine the technical level of service for each asset class.

The risk diagram has now been used to create an annual Infrastructure Risk Report to monitor roadway infrastructure risk. The report is intended to be used by Calgary Roads' senior management to communicate about infrastructure risk with the City Council and all levels of government.

The City of Calgary is facing a long economic downturn and infrastructure investment has been significantly reduced for the current four-year business cycle. In order to monitor the impact of reduced investment on infrastructure risk, the roadway asset criticality scores will be kept constant during this business cycle.

Asset managers have seen the potential of applying asset criticality to help optimise their annual lifecycle budgets. Most stakeholders welcome a data driven approach, building on the current methodology, to help with lifecycle project prioritisation.

The asset criticality assessment result was presented to and approved by Calgary Roads management in early 2019. The next update is expected to be in 2021, to align with the updated Calgary Transportation Plan and Transportation Infrastructure Investment Plan.

Calgary Roads is continuing with the project on asset sub-class criticality analysis and moving it towards a more data driven approach. Once asset criticality is defined at asset sub-class level, asset risk will be applied when defining levels of service and lifecycle project prioritisation.

About the authors

Henry Fang has worked with the City of Calgary for 13 years, with the most recent seven years in Corporate Asset Management. Henry has managed many asset management projects and delivered the infrastructure risk framework, the level of service framework and the corporate asset management plan.

Kai Li is leading the asset management program in the City of Calgary, Roads. She has 15 years of experience in asset management, including data analytics and lifecycle management planning. Her recent focus is to align Calgary Roads' asset management practices with ISO55000/1/2.

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About the IAM

The Institute of Asset Management (IAM) is an independent learned society and not-for-profit professional membership body dedicated to furthering knowledge and understanding of asset management.

The IAM offers both Individual and Corporate Membership.

Benefits of membership include:

- access to a global network of professionals
- free Assets magazine
- discounts for Annual Conference, Lecture and Dinner and other events
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For organisations

Corporate Membership is available to organisations whether large or small; commercial, private or not-for-profit. Special discounts are available for local government and academic organisations. The benefits include:

- demonstrable commitment to the discipline of asset management
- access to Endorsed Assessor and Endorsed Trainer Schemes
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- Ferrovial
- Highways England
- IFM Investors (UK)
- Jacobs
- KPMG
- Massachussetts Bay Transportation Authority
- Metropolitan Transportation Authority
- MTR Corporation
- National Grid
- Network Rail
- Northern PowerGrid
- Northumbrian Water
- Rolls-Royce
- Scottish Power
- Scottish Water
- Severn Trent Water
- Sweco
- Transport for London
- UK Power Networks
- WSP

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Annual Conference **2020**

22 – 24 June 2020 Hilton Brighton Metropole

The IAM Annual Conference is the Institute of Asset Management's flagship global event, providing the worldwide asset management community the chance to engage with each other.

Delegates will have the chance to attend a diverse range of presentations, workshops, formal learning and networking opportunities. There will also be an interactive exhibition area offering the chance to find out the best and most innovative services and tools to help with your asset management needs. With over 400 worldwide delegates and the leading asset management companies in attendance, this is a key conference for the asset management community.

Bookings open early December – theIAM.org/events

Added benefits

- Speakers from a wide range of professional backgrounds and industries
- Multiple topic streams
- Unique networking opportunities (including evening socials)
- Leading asset management service and tool providers exhibition
- FREE IAM Qualifications exam sessions for delegates
- Conference presentations made available to delegates post event
- Fully catered during event time

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