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ASSET MANAGEMENT COUNCIL

INNOVATION IN ASSET MANAGEMENT

Innovation & ISO5500x –
Friend or Foe?

New Technology to
Improve Asset Identification
and Tracking

Current & Future Systems
for Monitoring Remote
Fixed & Mobile Assets

Managing Disruption:
Designing a Capability
Infrastructure Program

AM in the Changing SA
Power Supply Industry





2017 GLOBAL ASSET MANAGEMENT FOCUS IN BRISBANE



ASSET MANAGEMENT COUNCIL

Asset management leaders from across the globe are coming to Brisbane in March and April 2017 for a powerful meeting of minds.

The Asset Management Council's annual conference **AMPEAK17**, which is on from 2-5 April, will be at the centre of these activities. We recommend you don't miss the opportunity to be involved and connect with global minds and thought leaders in asset management at **AMPEAK17**.

The Asset Management Council is pleased to welcome to Brisbane the ISO/TC 251 delegates, the Global Forum on Maintenance and Asset Management, the International Union of Railways and the CASG Defence Asset Management Community of Practice. These global specialists and decision makers will be participating in a series of conferences and meetings – and it's an excellent chance for you to participate.

Join us at **AMPEAK** where you can hear about the latest research and technology, and network with professionals across all industries. **AMPEAK** is on from **2-5 April** at the Brisbane Exhibition and Convention Centre. Early bird prices are available until 17 February. To register or for more details visit www.ampeak.com.au

The Asset Management Council can also host a workshop or meeting for your asset management network in Brisbane. Contact us on **(03) 9819 2515** or email info@amcouncil.com.au for more details.

INTERNATIONAL ASSET MANAGEMENT COMMUNITY MEETINGS IN BRISBANE

27-31 MARCH: ISO/TC 251 committee meeting of over 80 delegates from 29 countries at Energex. **Details:** <https://committee.iso.org/tc251>

2-5 APRIL: AMPEAK17 conference with more than 60 presentations from Australian and international asset management professionals. **Details:** www.ampeak.com.au

2-7 APRIL: Global Forum on Maintenance and Asset Management meeting. **Details:** www.gfmam.org

1 APRIL: World Partners in Asset Management meeting. **Details:** www.wpiam.com

6-7 APRIL: International Union of Railways – UIC Railway Asset Management Conference. **Details:** www.uic.org

6-7 APRIL: Asset Management Council workshops and technical tours. **Details:** www.ampeak.com.au

Get involved!

For details on how you can participate in this rare convergence of international asset management leadership, please visit www.ampeak.com.au



ERNST KRAUSS

EDITOR IN CHIEF

I trust your start of the New Year has been filled with prospects to further expand your Asset Management activities. We observe a renewed interest in finding out how the buzz words of "Internet of Things," "Industry 4.0," "Big Data," "Analytics" and more will influence Asset Management. At the recent Australian Oil and Gas Exhibition (AOG), the Chairman of NERA (National Energy Resources Australia) Ken Fitzpatrick, outlined the need for Australia to become better skilled, focus on new and better Business models and increase efficiency in Operations in the Energy Sector. This call could not come at a better time, as we move into year three of the existence of the Asset Management System Standard, which is an enabler of all these elements. Early adopters found guidance provided by the Standard useful and we can expect further improvements to the Standard when its first review is completed. The interest in the impact of innovation and new technologies is rising, as we also see in the articles in this edition. There are certainly many hours spent in thinking about data structures, data gathering for analytics and value creation for managing Assets in Europe.

A great interest is noted about the application of sensors, data analytics and information creation through the implementation of sensors for all aspects of Asset Management and daily life, including measuring the emotional impact on individuals of ever present sensors, visual and discrete. This month's technical articles deal with aspects of the new technology on our doorstep and shows in some examples how it benefits the users in Asset Management.

We look forward to the forthcoming AMPEAK Conference in April and hope that you can again participate in the premier forum for Asset Management. The program the Technical Team has developed is certainly inspiring and is enhanced by the participation in the Conference of members of the Global Forum for Maintenance and Asset Management (GFMAM). Presentations by the Delegates at AMPEAK also make sure we stay connected with international developments in Asset Management and its value to Businesses.

The Asset Management Council team looks forward welcoming you at AMPEAK 2017 in Brisbane and as always welcome your contributions to "The Asset", your feedback and comments.

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FROM THE CHIEF EXECUTIVE OFFICER

**CEO,
DR ANNE GIBBS**

With the rapid rate of change in the global environment asset managers need to keep pace with the latest developments and learn from colleagues in related sectors.

Disruption to the accepted way of working has been brought about by such things as digital transformation, internet of things, changes to technical standards and regulatory environments to name but a few. Many innovative and creative solutions have been designed in response to these changes or disruption providing stakeholders with an improved experience.

- The Introduction of new technologies or disruptive technologies are changing the way physical assets are being managed. Digital technology brings with it the ability to apply predictive maintenance into aspects of asset management and decision making.
- Increased information availability enables stakeholders to make more personalized decisions about assets, which in turn requires the ability of asset managers to innovate to respond to their stakeholders' changing priorities. For example, more details available about energy consumption from a householder enables decisions to be made about the householders use of energy which may alter the stakeholders' behaviour. The asset owner would therefore need to determine how to regulate the change in the consumers' energy usage patterns, which may not be achieved through use of traditional assets or the way these assets were used in the past.
- Increasing population pressures in established cities and lack of available funds for maintenance

of existing infrastructure is a catalyst for innovation. Innovation has been found in funding methods for new and old infrastructure and in new technologies for improving infrastructure maintenance.

- Innovation has been sparked by examination of operational processes in a business and finding a better way to do things. Using an asset management framework such as ISO55001 may provide a new approach to businesses, assisting in finding value for stakeholders.
- Natural disasters such as flood and fire can also be a catalyst for innovation with collaboration between asset managers, academics, government investors, consumers and other stakeholders

Asset managers will need to innovate in the future. This requires an organizational culture that nurtures the necessary creativity to encourage innovation where experimentation and a willingness to learn are valued highly as well as permitting a tolerance of failure. Asset managers should also look outside their own organization for new ways of thinking. Increasingly, innovation is a result of looking to other industries to see how they have solved similar problems.

An opportunity for asset managers to look outside their own industry sectors to see how others solve similar problems is provided with AMPEAK17 to be held in Brisbane 2nd to 5th April 2017. AMPEAK17 is a special opportunity to mix with the global asset management community and discover what innovation we can bring back to implement within our own organisations.

Hope to meet you in Brisbane.

FROM MY DESK: CHAIRMAN'S LETTER

**CHAIRMAN,
GLENN INGRAM**



It has been said that 2016 was a landmark year for Asset Management in Australia. Two incidences where Asset Management was used as a defence in court may signal the “coming of age” of asset management in February 2016 AusGrid vs the Australian Competition tribunal and in June 2016 Endeavour Energy vs the Supreme Court. AMPEAK16 hosted by the AMCouncil Adelaide Chapter in April was a highlight for the year with the theme “Asset Management as a Catalyst for Change.” The numbers in attendance and feedback exceeded expectations. Congratulations to the Conference Chair and organising committee for providing this exceptional professional development opportunity.

The monthly lunchtime asset management webinar series were popular in 2016 and provide a way for geographically remote members to keep abreast of their professional development in asset management without the need to take time out of their daily schedule to travel. In all there were some 40 Technical Events held by the AMCouncil Chapters across Australia in 2016 providing an opportunity for over 1,000 delegates to attend. The Chapters are run by volunteers and are commended for their time and energy in putting these excellent technical events together. Alliances have been formed and collaboration on technical events held with Australian Rail Association and Australian Corrosion Association. The Board has appointed an Executive Commissioner, Liaison, to assist with stakeholder relationships.

The AMCouncil flagship training course, Asset Management Fundamentals one day Course and associated seminars and executive briefings were rolled out to nearly 500 delegates across all industries in 2016, more than a 40% increase in reach from 2015. Competency in asset management is highly sort after in industry. Industry is looking towards the AMCouncil asset management competency sets and Certification

scheme as a standard to specify requirements for asset managers within organisations. The increase in those provided with individual asset management certification in 2016 increased more than 5 times that of 2015. The influence of the AMCouncil continues to grow with AMCouncil being asked to speak in many forums and in the EA thought leader series. The AMCouncil has provided representation at TC251 Committee meetings, represented at the GFMAM and WPIAM. AMCouncil has also increased their presence on line with more interactions on linkedin, twitter, facebook , blog posts and online newsletters and electronic journals and videos available to members.

The AMBoK team have been very busy working to add to the asset management body of knowledge and are in the final stages of developing an on-line asset management maturity model which will provide a useful assessment tool. Our industry partners continue to add significant value to the organisation. IFM was heavily involved in assisting in refining the Asset Management Maturity Model through testing the model throughout its various businesses during 2016. Broadspectrum is the principal sponsor of AMPEAK and Broadspectrum's assistance with the graphic design of The Asset Journal is invaluable. SAP has a team of experts from Europe, America and Australia who are currently working on several projects with the AMBoK team.

Thankyou to all my fellow Board members, our partners, our large team of volunteers, CEO and staff and all members for your support and assistance in implementing the successful change and rebuilding of the organisation that occurred in 2016 and over my term as National Chair of the Asset Management Council.

Glenn Ingram

National Chair, Asset Management Council



ARTICLE 1 – INNOVATION & ISO 5500X: FRIENDS OR FOES?

Steve Doran – Director, Infrastream (CAMA)

IS LAND AN ASSET? THE CONFUSION ABOUT ASSET SALES IN QUEENSLAND

Aln reading this title you may have decided to read on from one of two angles of curiosity. The first may be that you have held a concern about this, and are seeking an informed view to help you form or refine your own opinion. The second may be that you are wondering why the question is even being asked.

For either case, let's first set the scene by clarifying definitions of innovation and standards and comparing the nature of innovation and the nature of standards in general.

"INNOVATION" & "STANDARDS" DEFINED

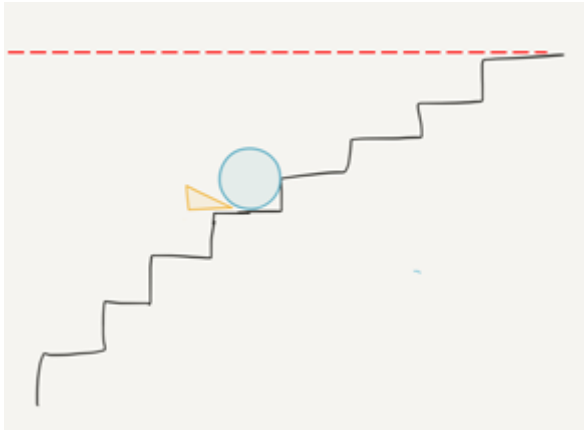
The word innovation comes from "in" and "nova" which are the Latin words for, respectively, "into" and "new". Based on this, innovation is about a whole change rather than an adaptive or "continuous" improvement of something that is already in place. We can think of innovation as moving into something new or 'changing the game' rather than working on some prevailing means to an end from the outside to improve it or 'playing the game more skillfully'.

It is important that this distinction between innovation and continuous improvement is made

because to discover, develop and implement an innovative change is to break the status quo, and that invariably calls for highly deliberate action. Efforts to innovate, rather than just continuously improve, by looking outward into the unknown is the necessary precursor to:

1. improvement opportunities beyond expectation being discovered and developed and;
2. survival, (otherwise known as achieving a balance between performance, cost and risk) more and more in our rapidly changing context.

The ball and wedge model of continuous improvement to a required standard



Innovation!

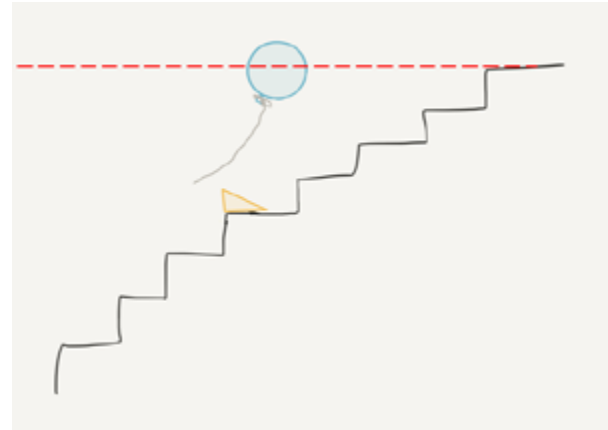


Figure 1. Another way of contrasting continuous improvement and innovation

Standards Australia describes standards as “documents setting out specifications, procedures and guidelines” that “are designed to ensure that products, services and systems are safe, reliable and consistent.” Wikipedia simply defines a standard as a: “Norm, convention or requirement.” To develop this further, compare attributes of innovation with corresponding characteristics of typical standards:

REF. #	ATTRIBUTES OF INNOVATION	ATTRIBUTES OF TYPICAL STANDARDS
1	Potentially infinite sources of inspiration	Single, set source of direction
2	Varied angles and approaches are encouraged	Prescriptive
3	Risk taking is typically necessary and opportunity is an equally relevant uncertainty	Risk minimising
4	Poses questions such as “what if....?” and “how else might we.....?”	Uses words such as “shall” and “must”
5	Circumvents the norms	Drives toward conformity and norms
6	Seizes advantage from fast changes and speed	Slow to change and cautionary
7	Looks out not only for “known unknowns” but “unknown unknowns”	Assumes a predictable environment
8	Empowers practitioners	Instructs practitioners
9	Focus is on ultimate goals	Focus is on the subject at hand
10	About achieving outcomes beyond expectations	About meeting the required level of compliance

Table 1. Comparison of the attributes of innovation with those of typical standards caught between powerful enemies?

In asset management, we presently have the global ISO 5500x standards gaining strong inertia in importance as certification is being made mandatory and an integral part of contractual arrangements. This is being driven by regulators, governments, public utilities and clients.

At the same time, innovation is emerging as a necessity to meet increasing stakeholders' performance expectations amid tightening cost and risk constraints for organisations with responsibility for major asset portfolios. There is an imperative for us as asset managers to embrace innovation and in fact, we have little choice with the rapid emergence of technological shifts alone via the internet of things, nanomaterials, big data, driverless vehicles and drones, etc.

As asset managers we may appear to be in a position analogous to the famous 19th century French-Canadian strongman Louis Cyr shown in the picture below, poised to restrain two powerful draught horses (representing the need

to innovate and the need to adhere to the ISO 55001 requirements) moving in opposite directions. By attempting to both combine innovation and standards to achieve successful management of the assets of our customers, are we heading for failure?

To answer this and to act effectively in this role, it is vital that we understand the relationship between ISO 5500x and innovation before setting down our strategies and action plans.

ISO 5500X ON INNOVATION

While as a suite of standards, ISO 5500x by definition must be somewhat linear and directive to be of value, its position regarding innovation can nevertheless be assessed by examining its content with reference to the innovation attributes listed earlier. The results are as follows:



Figure 2. 19th century strongman Louis Cyr preparing to restrain two draught horses

REF. #	ATTRIBUTES OF INNOVATION	RELEVANT ISO 5500X CONTENT EXAMPLES	COMPARISON WITH ATTRIBUTES OF TYPICAL STANDARDS
1	Potentially infinite sources of inspiration	(0) 1. "This International Standard can be applied to all types of assets and by all types of organizations."; (0) 2.3 "An asset is an item, thing or entity that has potential or actual value to an organisation";	Sets an open field scene rather than pointing to a single, set source of direction
2	Varied angles and approaches are encouraged	(0) 2.5.2 a) ".creating an asset management system brings new perspectives to the organization and new ideas on value creation...[and] can also stimulate improvements in other organisational functions, such as purchasing, finance, human resources and information technology."; (0) 2.5.3.5 "The asset management system will require collaboration among many parts of the organisation."	Encourages the drawing of direction from various sources rather than being prescriptive
3	Risk taking is typically necessary and opportunity is an equally relevant uncertainty	(0) 2.4.1 "to exploit opportunities and reduce risks"; (1) 6.1 "determine the risks and opportunities."; See also 6.2.2 k); (2) 6.1 "In this International standard it is assumed that "risk" also includes	Promotes attention to opportunity as well as risk (even though it does not directly reference the need to take risks at appropriate times)
4	Poses questions such as "what if....?" and "how else might we.....?"	(1) 4.1 "The organisation shall determine external and internal issues that are relevant to its purpose..."	The terms "shall" is used (> 70 times), but it tends to be used at a high level and allows a broad scope
5	Circumvents the norms	(2) 6.2.2.1 "There is no set formula for what should be included [in the asset management plan] or how it should be structured"	Allows the organisation to shape the outputs as it sees fit rather than driving toward conformity and norms
6	Seizes advantage from fast changes and speed	(2) 6.2.2.1 "There can be benefits to developing the first asset management plan as an interim plan as quickly as possible"	Recognises the value of moving quickly when appropriate and is flexible enough to accommodate change as needed rather than being slow to change and cautionary

7	Looks out not only for “known unknowns” but also for “unknown unknowns”	(0) 2.1 “The factors which influence...how the assets are managed, include...- its operating context; - its financial constraints and operating requirements; - the needs and expectations of the organisation and its stakeholders.” (1) 6.2.2 “The organisation shall ..take into account relevant requirements coming from outside the asset management system.”; (2) 6.2.2.4 “The organisation should consider the risks that can change with time and how these could impact the asset management plan in the future”;	Acknowledges that assets need to be managed in an unpredictable environment and that this environment should be explored and taken into account
8	Empowers practitioners	(0) 2.4.2 “ensuring that employees are aware, competent and empowered”; (2) 9.2.3 “[Self assessment]...should encourage participants to identify opportunities.... Active participation, understanding and support of the organisation’s employees are important in conducting a self-assessment review.”; (2) 10.3.2 “[Continual improvement] processes may include:g) stimulating employees to come forward with suggestions”; (2) 10.3.3 “The organisation should actively seek and acquire knowledge about new asset management-related technology and practices...” Examples are then provided	Promotes the empowerment of internal practitioners in gaining knowledge about new methods and technologies and in challenging the way work is carried out, rather than exclusively instructing them on how things must be done
9	Ultimate goal focussed	(0) 2.4.2 “Value: Assets exist to provide value to the organisation and its stakeholders. Asset management does not focus on the asset itself, but on the value...(which can be tangible or intangible, financial or non-financial).. determined by the organisation and its	Is clear that ISO 5500x is not ultimately about the asset or the asset management system but the value provided
10	About achieving outcomes beyond expectations	(2) 4.4 “Compliance with all the requirements of ISO 55001 should be considered as achieving only the minimum starting point for an effective asset management system and should not be	States that compliance is not the destination but the start of the journey

Table 2. Analysis of ISO 5500x relative to the attributes of innovation and those of typical standards

The standards exist for a purpose, which does not include promoting or enhancing innovation but to help organisations align with “the requirements for the establishment, implementation, maintenance and improvement of a management system for asset management” (ISO 55001 Introduction).

Accordingly, there are many elements of ISO 5500x which align less with innovation and more with what would be expected from a standard. This analysis is based solely on focussing on its innovation-positive aspects. The validity of the assessment can be supported from two different perspectives:

1. Considering the rigour involved in the development of ISO 5500x standards, and their global level of acceptance, it may be concluded that the standards would not be self-contradictory or inconsistent in its key messages. That is, it can be understood that other clauses would not be innovation-restricting or be too closely aligned with the presented attributes of typical standards, without needing to capture all ISO 5500x clauses in the analysis.
2. ISO 5500x is a high level suite of standards for asset management as reflected by the fact that the requirements standard ISO 55001 is just 32 pages long and the nature of the core section subjects (namely: Context of the Organisation, Leadership, Planning, Support, Operation, Performance Evaluation and, Improvement). With the scope

being defined as applying to “..all types of assets and by all types of organizations”, it seems impossible for the standard to tightly display the restrictive traits of typical standards. Further, throughout ISO 5500x, the power is placed firmly with the organisation to make the decisions on application of the standards or how the requirements will be met.

CONCLUSION

While this analysis cannot confirm ISO 5500x and innovation to be “friends” it is clear that the spirit of the ISO 5500x suite of standards is not in opposition to innovation as a “foe”. Given that they neither directly boost each other or impede each other but can operate in concert in the same asset management environment, acquaintances would be a suitable term.

So, as asset managers we are free to steer our asset vehicles into alignment with the ISO 5500x standards and press the innovation accelerator pedal at the same time. It is up to us and how well we interact with the key stakeholders around us that will determine our level of success in delivering maximum value from the assets we manage in new ways. If we feel that ISO 5500x is restricting efforts to innovate in any way, we could then identify and check the local interpretations of the standard instead of the standard itself. In doing this, we may find that the limitations are based more on our preconceptions than the standard itself. Once these preconceptions are overcome, perhaps using assessments such as those made in this article, we can advance with the innovation activity that ISO 5500x supports us to do.





ARTICLE 2 – NEW TECHNOLOGY TO IMPROVE ASSET IDENTIFICATION AND TRACKING

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& Built Environment Queensland University of Technology

The link between a physical asset and the digital world is becoming more and more important for asset tracking. Barcodes, RFID's and QR codes lead the current market as future solutions.

A hidden factor often forgotten by construction companies is asset theft. A recent report from Construction Executive revealed that as many as 83% of construction companies have been victims of fixed asset theft... This costs general contractors and other building corporations a combined annual loss of \$1 billion, a figure that is steadily increasing

by as much as 20% every year. [1] This contributes to "one third of all bankruptcies being a result of theft." [2] This demonstrates there is a major need for asset identification and tracking.

Speaking with a Thiess plant engineer, they believe that QR codes are the way of the future [as] it would be really handy to scan a QR code and it bring up all the critical data on any piece of equipment. [3]

Further interviews with engineering professionals confirmed that maintaining an assets life-cycle

remotely and on site was a major problem the sector faces. As well as this, “the tracking, recognition of all plant equipment, especially hired assets, would be helpful and make a project more efficient.” [4]

Quick Response (QR) codes are a lot like the Universal Product Code (UPC) barcodes that are found on every item in the grocery store. “... The difference between UPC barcodes and QR codes is that QR codes hold information in both the vertical and horizontal directions, while UPC barcodes only hold information only in the horizontal direction. This means that QR codes can hold a lot more information, approximately 350 times more information.” [5] They also utilize a mathematical error correction method called Reed Solomon, which can correct up to 30% error on a code. This shows that they are sustainable to wear and tear which is essential to heavy fixed or mobile machinery found in the construction industry.



Figure 2 – UPC vs QR Code

QR Stuff’ describes QR codes “In its simplest sense think ‘print based hypertext link’ - simply encode a URL into the QR Code and then point a mobile phone or other camera-enabled device at the code. If the device has had QR Code decoding software installed on it, it will proceed to the browser and go to that Uniform Resource Locator (URL).” [6] This shows a credible link between real world and digital world. Through direct hardware access to a devices camera and Global Positioning System (GPS), the QR code will be scanned by an operator, workshop or site manager linking information stored in the cloud to the piece of equipment.

QR codes and Radio Frequency Identification (RFID) are leading the way in data transfer and are an ideal, easy and efficient way of recognizing and tracking assets. RFIDs are used for identifying and tracking assets data using electromagnetic radio-frequency fields between an RFID sensor and the electronically

stored information attached to the asset. Both are used in the construction industry and can be used for asset tracking, but both have very different features.

QR codes are highly visible, distinct and can be easily spotted on the outside of a vehicle or inside a cab. The size of the QR code can be proportional to the size of the asset. RFIDs are not as easy to find because of their small size and can be damaged if hit, thus increasing cost. “QR codes are web oriented which [can be used through a mobile or smart phone device to relocate the user to a website] and whatever information is not stored in the code itself is often provided via web links. This makes QR codes a lot more flexible and practical than RFID [which is ideal for the groups system].” [7]

One of the biggest advantages is that QR codes are virtually free.

Other advantages are the large amounts of data storage available and smart phone readability. QR codes are unique because they contain large amounts of information and can be tracked for free in the construction industry. They are easy to understand and simple to teach and learn.

If fixed assets are scanned once a week by a smartphone, the inbuilt GPS can send a ‘ping’ and save the costs of regular GPS pings sent out. The costs for sending regular GPS pings from fixed asset locations, such as a generator, are expensive and unnecessary. Scanning an asset notifies cloud technology of which assets information is being requested. Hence, this will be used to determine the location of fixed assets. Around 79% of Australians have smart phones, and it is most likely that this number will be higher for site managers, making it a very viable option for the future [8].

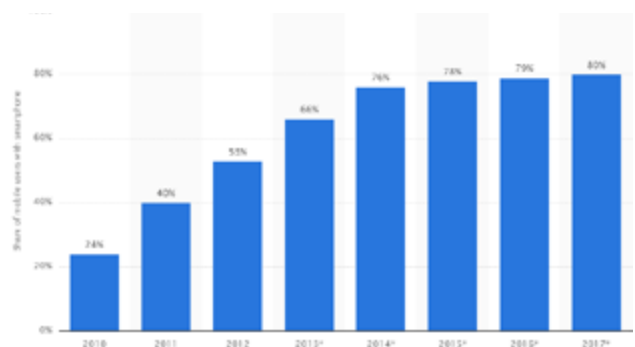


Table 1 – Mobile & Cloud Based Technology Acceptance [19]

ArcSSet have stated, “The implementation of QR codes into ... asset management and mapping system makes it now possible to drastically decrease the cost of asset tracking.” [9] In independent field tests, over 50% of lost items were effectively returned using QR codes. [10] Therefore, the integration of this new technology to improve asset management methodology has already been successfully industry tested.

HOW CLOUD BASED TECHNOLOGY IMPROVES ASSET MANAGEMENT

The age of mobile cloud computing opens up new ways to enhance and optimize the asset management process. In the construction industry, computer technology is relatively new and rapidly growing, however it is lagging behind other industries and as can be seen in table, is not reaching its potential. Although the data was obtained in 2012, it still demonstrates the industries lack of adaptation to Cloud based technologies.

Sector / Industry	Percent acceptance of Mobile & Cloud Based Technologies
Manufacturing	31%
Trade and Commerce	23%
Information and Communications	16%
Financial Services	9%
Construction	1%
Other	30%

Cloud computing is such a thriving and prosperous industry, to back it up “the worldwide cloud computing market will increase at a 36 percent compound annual growth rate through 2016, hitting \$19.5 billion.” [20]

Total interlinking systems for mobile smart devices is the future of asset management as well as the expectation. Email or server network documents that are worked on by multiple users at any given time can have the potential to cause catastrophic business consequences by corrupting and/or conflicting file content.

The more employees collaborate on asset profiles, spreadsheets and documents, the greater the need for impermeable asset management control software. As assets grow, their information expands, by which maintenance history and usage metrics begin to spread the amount of information. “With cloud technology, all files are stored centrally [resulting in] greater visibility [and] improved collaboration, which ultimately means better work and a healthier bottom line.” [21]

For many companies, their current asset management statuses are similar to the picture on the left in figure 12. Documents and assets are not in a central location, the cloud. The picture on the right represents an ideal world where asset information is located on any mobile digital platform.

“According to a 2014 CEB TowerGroup report, more than 71 percent of firms confirmed their intent to adopt cloud computing or increase its usage by 2017. This will happen when firms feel more comfortable with software as a service-based solution and the right products are available for adoption through the cloud.” [22]

Cloud software gives a visual representation of an array of assets with information and metrics surrounding them resulting in easier decision making.

The arrival of smart phones, QR codes and asset tracking systems are ideal solutions and soon to be essential to bridging the gap between the physical and digital worlds.

Asset management must be flexible and open to adapt in sync with these changes. Asset management continuously pushes towards better financial, environmental and social costs, risk, and quality of service. Highlighted throughout this paper are a number of new and current technologies that can be applied to asset management systems to improve their effectiveness and value added.

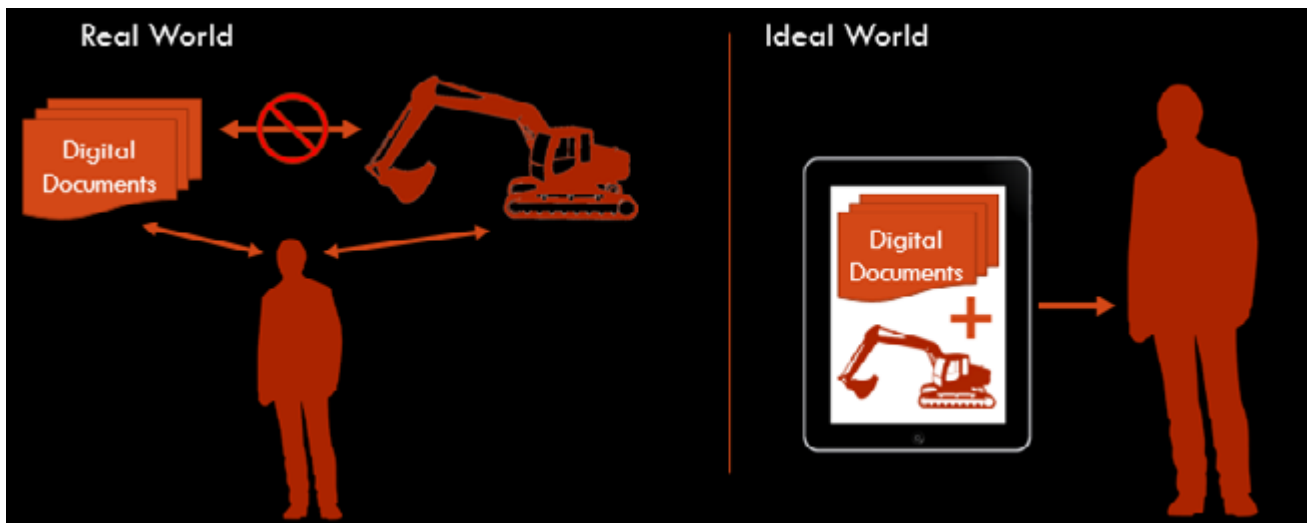


Figure 12 - Real vs Ideal World of Cloud Asset Management

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ARTICLE 3 – CURRENT AND FUTURE SYSTEMS FOR MONITORING REMOTE FIXED AND MOBILE ASSETS

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Supervisor: Dr Madhav P. Nepal, School of Civil Engineering
& Built Environment Queensland University of Technology

How do you track what you can't see? As industry pushes towards driverless machinery, reliable tracking of remote and rural mobile assets becomes more and more essential. Fixed assets such as piping buried underground or underwater, which are not feasible or easily accessible, need monitoring for protection. This is a major industry hurdle as "30% of all organisations do not know what they own, where their assets are located or who is using them." This combined with the fact that "65% of fixed asset data is incomplete, inaccurate or

missing altogether," results in significant losses of money, clients and control. [1] Supervisory Control and Data Acquisition (SCADA) systems that monitor and control asset works are critical for remote sites. SCADA systems are used to perform 4 key functions (DPS Telecom):

1. Data acquisition
2. Networked data communication
3. Data presentation
4. Control

Sensor Installation for pressure, temperature and/or strain measurements

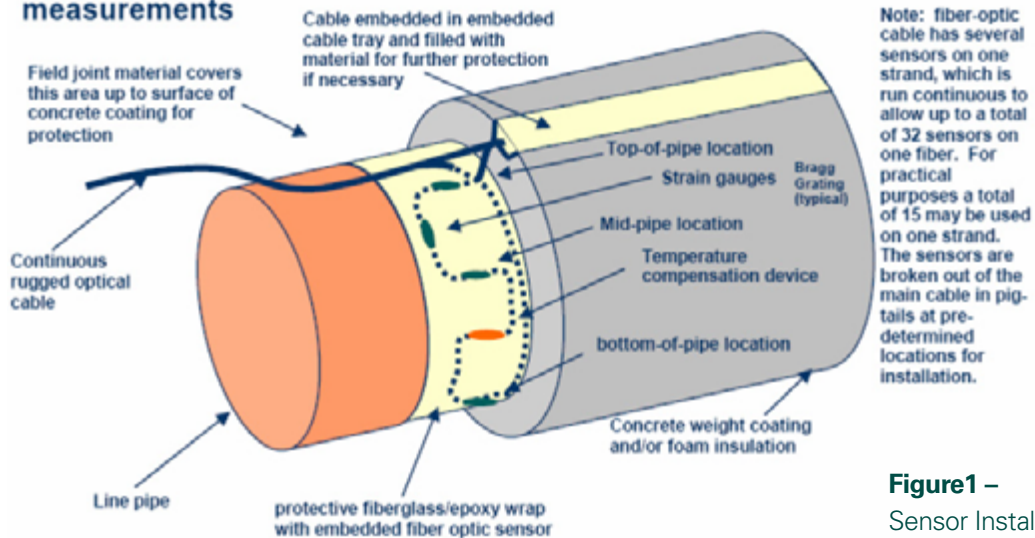


Figure1 –
Sensor Installation [2]

To integrate with this, sensors and GPS technologies send pings to a database via satellite with an exact location of the asset, extending the link between real and digital worlds. The sensors pick up measurable data and relay it back to the user through fibre networks and routers. Figure 1 shows where and how the fibre optic sensor is inserted into a pipe. For a pipeline; flow rate, pressure, temperature and strain are all critical variables that are closely monitored. [2]

Sensors involved measuring and recording a variety of data from an asset is conducted through a programmable logic controller (PLC) or a remote terminal unit (RTU). Finally, the information is sent through a network and is received and displayed on a computer or smart device. [3]

A diagram to depict this is shown in figure 2. This human to asset interaction establishes a link for accurate live data to be supplied to a user interface and is an affordable and accessible control.

A controlled and monitored SCADA pipeline is shown below in figure 5:

Three dimensional (3D) SCADA systems that track and monitor fixed assets allows a solution for remote or buried assets. With regard to the future evolution of systems and processes, here are a number of unique technological advancements that could change the asset management process for the better.

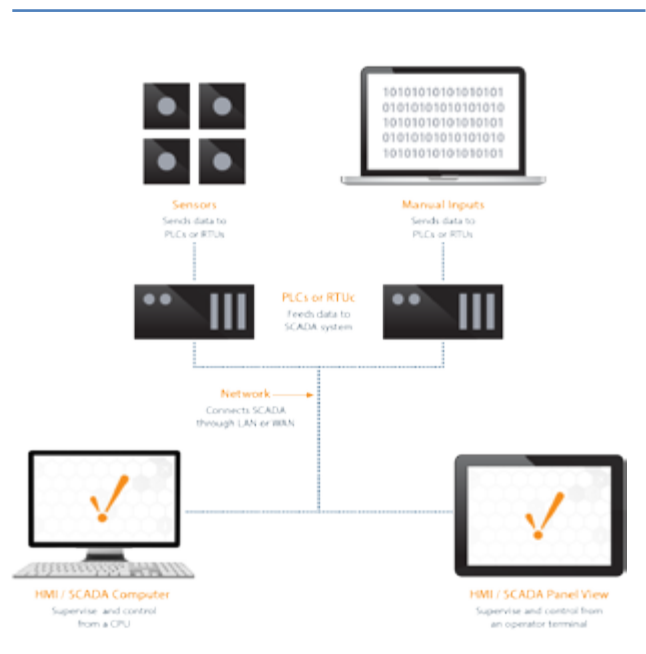


Figure 2 – Basic SCADA Skeleton



Figure 3 – SCADA System

HOLOGRAMS

The future holds for asset management, 3D, or even 4D, holograms are a viable direction for the industry to take as seen in figure 4. A site plan with all asset metrics belonging within the plan could unlock the next major door of the asset management industry and provide innovative solutions for hard-to-see or buried fixed assets.



Figure 4 – Representation of asset management through 3D holograms

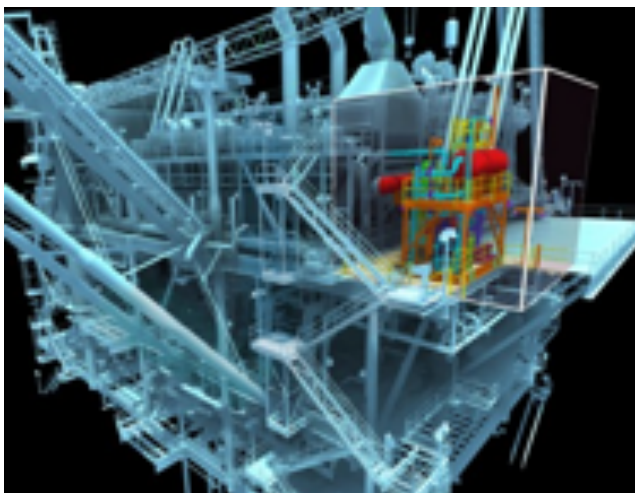


Figure 5 – Hologram of a site

3D HOLOGRAMS

Holograms provide “Instant visual understanding can be communicated regardless of language or level of technical understanding. [Companies can] illuminate the hologram with a simple halogen or LED light source; no special viewing equipment or computers are required.”[4] Ideally, 3D hologram output drawings would replace 2D drawings and would result in fixed asset being easier to maintain.

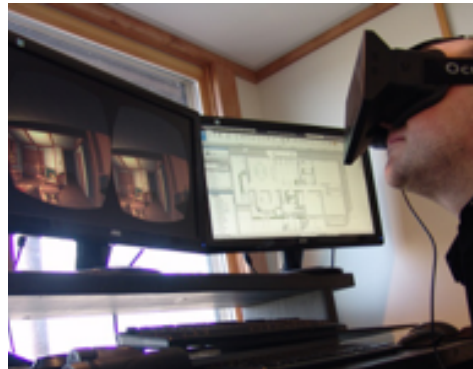
OCULUS RIFT

The Oculus Rift featured in figure 8a are virtual reality goggles traditionally built for gaming, but can also be used for working in computer-generated environments. The 3D experience offers motion tracking capabilities with the ability to move around 3D models and look around corners far more than using a mouse and keyboard, similar to that shown in figure 8b.

“...BIM software allows teams to create the 3D environments necessary for virtual reality applications. The software works well for converting 2D construction drawings into 3D models, 3D point cloud images into 3D models, and utilizing the models into other products.” [5]

Multi-disciplinary sites all over the world can be accessed through virtual reality by anyone, anywhere who connects to a cloud server to which it belongs. Physically walking through a virtual world, connecting real with digital, provides a better representation of the current site status. It is a cheap, time efficient and unique experience compared to the cost and time of flying someone to visit a site. Cases such as Chernobyl or Fukushima, where it is impossible to walk around the radiation disaster zone, can be made possible through virtual technology and to analyse of faulty assets. The benefit is that it provides on and offsite managers with the ability to see the status and live data of particular assets as well as maintenance statuses of all assets in a new fresh and more intuitive manner.

Holograms and virtual reality integrated with a SCADA system push the boundaries of real and virtual connection, display and interaction. Sites with fixed or mobile assets integrated via soft allow for a futuristic, unique and optimal remote approach to asset management. Until these concepts are further developed, user input and smart software dominate the industry. By leveraging more intelligent software integration, a smarter, more versatile and proactive asset management system will deliver better organisational decisions. The arrival of smart solutions are soon to be essential to bridging the gap between the physical and digital worlds. Asset management must be flexible and open to adapt in sync with these changes. Asset management continuously pushes towards better financial, environmental and social costs, risk, and quality of service.



Pictured right
Figure 8a –
Oculus Rift into
virtual reality

Pictured eft
Figure 6b – Potential
of the Oculus Rift in
Asset management
and construction



Figure 7 – Virtual reality in construction

Highlighted throughout this paper are a number of new and current technologies that can be applied to asset management systems to improve their effectiveness and value added. The industry will need to monitor the latest technological developments in data management, 3D visualization and connectivity to ensure that their systems are delivering the best possible value to the business/customer.

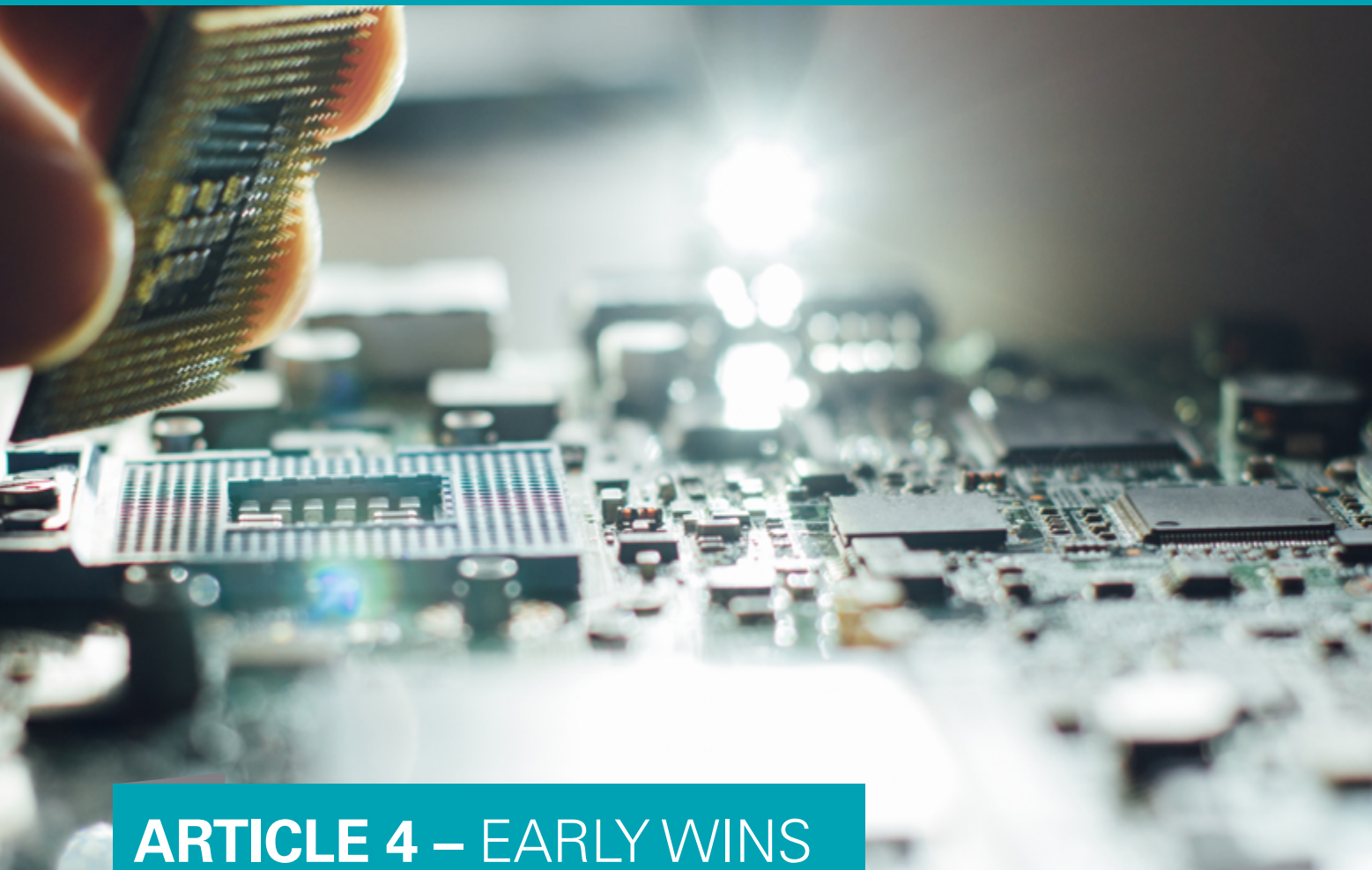
Ideas and opinions mentioned in this article provide an insight into the future for asset management. Replacing working processes is unnecessary, but optimising them is critical.

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ARTICLE 4 – EARLY WINS WITH DATA YOU ALREADY HAVE

Authors: Yodit Stanton (CEO of Sensors) and Theresa Stanton

Using existing data can help you gain early wins with your team. This article outlines two kinds of approaches for quick wins: better visualization and analysis of existing data or deploying an IoT sensor network to collect more relevant information.

BETTER ASSET UTILIZATION

Asset utilization and management will continue to gain traction and save companies significant money:

- Improve asset performance to reduce downtime
- Extends asset life to avoid new capital purchases
- Tracks equipment according to regulatory guidelines
- Schedule preventive maintenance to prevent problems
- Optimize and plan for new asset developments
- Data is reshaping our companies. We can now instantly access, and share data. Using data for strategic decision making can
 - Help you systematically improve reliability and reduce costs
 - Get alignment from your team
- Focus on the right things
- Develop traction by continuous improvement
- Decrease response time, may be to customer complaints, or design issues
- Data visualization drives change

Today most data is in an Excel sheet as a time series. And it is very limited in what it tells you. Data doesn't mean much unless you can do something with the data. Data visualization

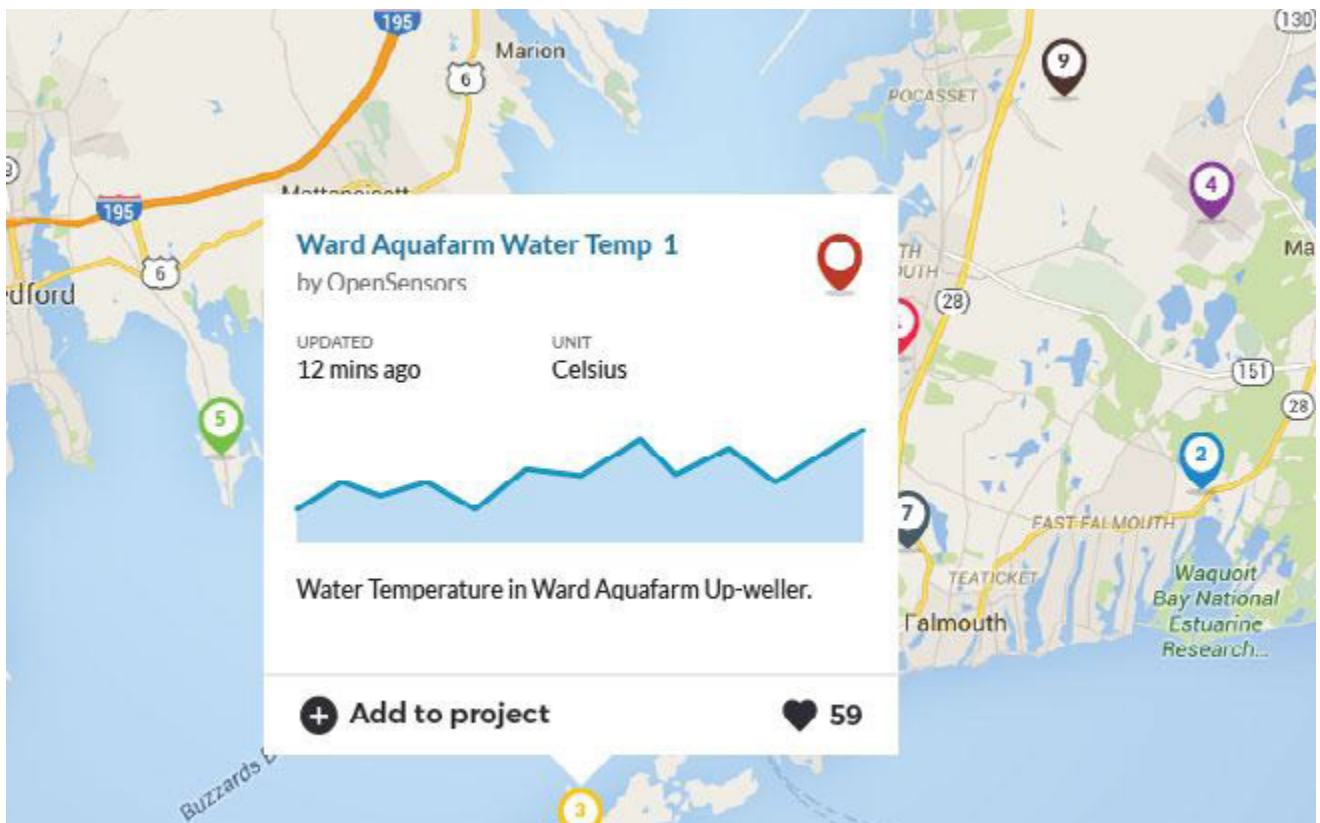
dashboards enable the team to identify inefficiencies and test solutions. They require no technical background, enabling quick and intuitive access.

Most machine data generated by asset tracking can be visualized in 3 ways

1. Real time information and alerts give maintenance staff the ability to identify anomalies and react promptly to problems.
2. Historical trends analysis enables managers to understand daily/weekly/monthly performance patterns such as peaks and averages. In turn, that helps them make better strategic decisions on how to manage capacity and improve operational efficiency.
3. Predictive Analytics: with enough historical data, businesses can predict future capacity and schedule planned maintenance of their assets.

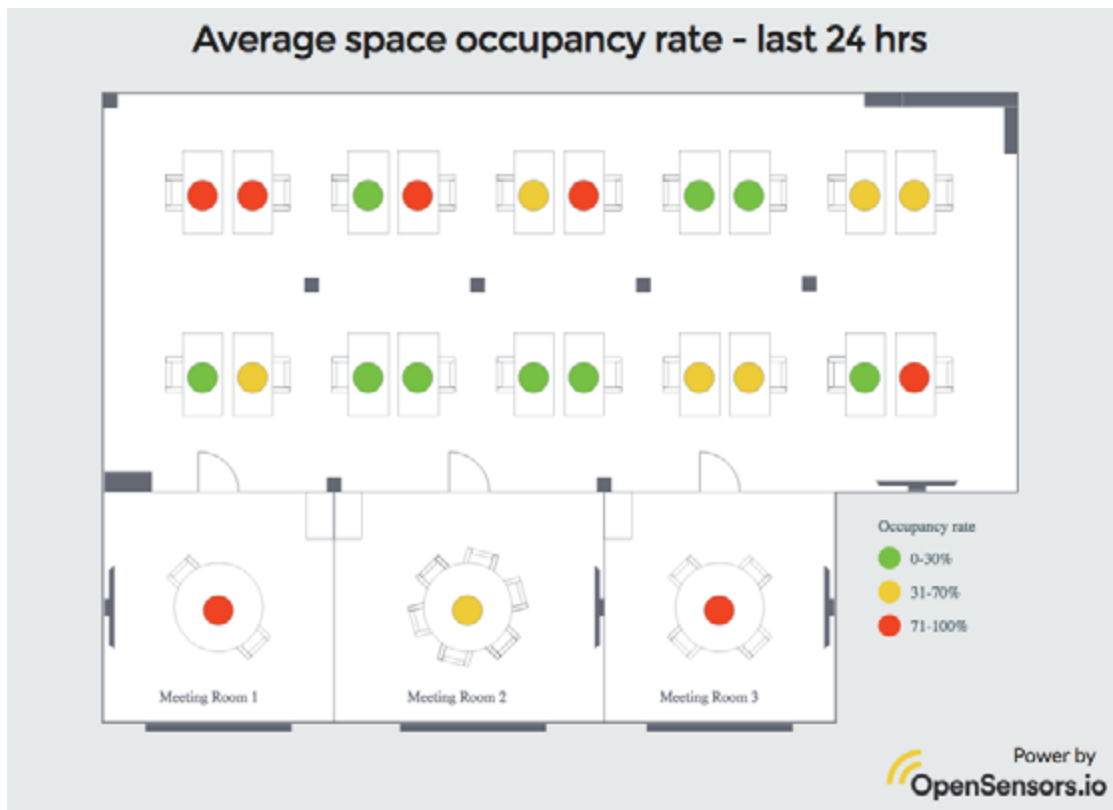
For e.g. knowing the patterns that leads to failures enables them to identify problems early on and have a plan on how to handle that.

OpenSensors provides a number of analytics dashboards that enable businesses to manage their sensor networks and also get insights from the data: Here are some examples of data visualizations that provide greater information density than Excel.



Map

Map to show relevant information on each asset



Heat map

Office occupancy heatmap overlaid on an office plan

500 Devices Total	94 To install	14 Errors	Set up device
All devices		Errors	No activity
Device id	Tags	Installed by	Status
030483823	Floor 1, Room 132, Desk 13	Tommy Johnston	● Last reading 4 days ago
130482850	Floor 1, Room 106, Desk 24	Alicia Roberts	● Duplicate-id Published-auth
530483822	Floor 2, Room 229	Cash Emerson	● Last reading 27 mins ago

Operational dashboard

Monitors the health and the installation process of the network.

Ward Aquafarm Water Temp 1



Alerts

Receive notifications when data you are interested in gets outside of normal thresholds.

GETTING STARTED

Start simple and build towards a more sophisticated system. Focus on what are you trying to do:

- What information do you have?
- What can you bring into your organization that'll help make you better?
- What assets do you want to manage better?
- What data could be combined with public data to make it more valuable?

EXISTING DATA CAN HELP YOU GAIN EARLY WINS

The first step is identifying what you want to monitor. IoT isn't new as such but what is new is the ability to surface and aggregate data from machinery you already have. A lot of industrial

devices already log data, IoT is simply an evolution where access is easier. For example, one client, a company that makes industrial machinery wanted to monitor the daily usage around it's assets in many locations. Currently when something goes wrong an engineer from the company has to go onsite and download the data using the serial port. Using an add-on serial to WiFi unit we were able to access and capture the crane's data log of 50-60 daily events. Moving them up into the cloud for processing allowed us to build some alerts and dashboards to track the machine's usage and maintenance without having to make onsite visits.. Their customers are also able to access data about the particular machines they have purchased. Local data stores that you currently monitor but have to visit to collect the data are a good place to look for adding a layer of data analysis. From the initial usage alerts we later added more sophisticated data analysis by combining it with weather data to understand how environmental factors affect their assets.

This level of access to an aggregate view of performance data enables companies like this to focus on performance improvements and iterate on their products much faster than possible.

Another common source of historical data is Excel spreadsheets or paper-based records. Often these sources may have data integrity issues that need to be cleaned up before they are useful. For the most part we recommend processing these in multiple passes. Doing a deep pass with a limited set of critical numbers, this allows you get some simple useful pictures of what is going on. The rest of the detail can be added on a second or third pass. The more quickly you can get to a state that provides some benefit while perhaps not the goal, you can start seeing some traction and build on it for even more improvement.

Public data—both current and historical—can often provide a useful context for the private data that you are collecting. Consider how public or licensable sources of information on factors that may affect your operation or asset utilization like weather, air quality, road traffic and cargo freight activity can be used to complement internal sensor data.

CASE STUDY OF DATA ANALYSIS

One recent project where we used sophisticated data analysis was an urban parking space monitoring and management system where we discovered that we could reduce the number of sensors by 40% and still get better than 90% accuracy on actual utilization.

PHASED APPROACH TO ADD SENSORS

OpenSensors recommends a phased approach, from proof of concept to full-scale deployment, to ensure a successful installation of an IoT network in a business environment. Our aim is to reduce the time to go live and minimize risk.

PHASE 1 EVALUATE SENSORS:

Evaluate different sensors for quality, signal-to-noise ratio, power consumption and ease of setup by trying them out on a very small scale in a lab.

Phase 2 Proof of concept:

Do a full end-to-end test to verify that the queries and analytics were feasible. Connect 5 to 10 sensors to a cloud infrastructure. At this stage you can start with crude visualization for data exploration to narrow questions and see patterns in the data. As you develop the visualization it can become quite sophisticated.

Phase 3 Pilot phase:

Move out of the lab into your actual environment. Typically, this requires somewhere between 30 to 100 sensors. We suggest a one to two-month test to ensure that the sensors work at scale and the gateway can handle the load, similar to production usage.

Phase 4 Plan and implement full-scale deployment:

After the pilot phase, there should be enough data to verify network performance and your choices for sensors and connectivity, after which, full deployment can be planned in detail and implemented.

ABOUT OPENSENSORS

OpenSensors works with businesses to understand the opportunities their sensor data are going to enable. We constantly discover business cases and applications for our clients as we dig into their data and business problems. And while we manage the data part, we also work with hardware manufacturers and managed services providers who install and maintain the sensors. Contact us if you would like assistance on sensor selection, network design, or planning a proof of concept deployment.



ARTICLE 5 – MANAGING DISRUPTION: DESIGNING A CAPABILITY INFRASTRUCTURE PROGRAM (PMIP)

Article by: Article Writers.

A journalists reflection from the presentation entitled “Planning and Designing a “capability infrastructure” delivered by Elizabeth Ann, RMS – Director Point to Point Reform Program at the AMCouncil NSW Chapter National Symposium “Future Directions for Infrastructure” held November 2017

Technical Article 4

Disruption and innovation often go hand in hand, but there is an important difference between the two. For example, the use of smartphones to connect online with business services was an innovation. But when Uber began using smartphones to facilitate ride-sharing, the result was a disruption that literally had people fighting in the streets.

Uber's impact on point to point transport services – where customers choose their destinations rather than fixed stations or stops – was such that the NSW Government appointed a task force to implement regulatory change.

As a result, the Point to Point Transport (Taxis and Hire Vehicles) Act 2016 was passed by the NSW Parliament in June 2016, establishing the NSW Point to Point Transport Commission.

Elizabeth Ann is executive director of the new commission, and says it is possible to develop a capability infrastructure for dealing with disruption that will help organisations avoid being “Ubered.”

INVENTIVENESS, INNOVATION AND TECHNOLOGY

Ann says it's important for managers to understand disruption and innovation, and how they differ.

“There's a disruption guru from Harvard Business School, Clayton Christensen, who says disruption displaces the existing market, industry or technology, and produces something new, better, more efficient and more

worthwhile,” she says.

“Innovation can occur without disruption, or it can be the cause of disruption.”

‘Innovation’ and ‘technology’ are also used interchangeably by many people, Ann says, and it would be wrong to minimise the impact of innovation or technology and the disruption it can cause.

“Innovation can be ‘inventiveness’, as Steve Wozniak told us at a transport training forum, or it can just be a different viewpoint,” she says.

“To me, innovation is fundamentally changing how we view the world, how we respond and how we have openness and resilience to view problems from different perspectives.”

DISRUPTION – THE UNEXPECTED RESULT

Most managers are taught the standard strategic tools of risk planning, perhaps even scenario or futures planning.

“We probably think we plan for the known future pretty well,” Ann says.

“But strategic planning is a little bit like crossing the road. You know where you want to go, you know the risks. If you look left and right, you've mitigated your risks and you get a good outcome pretty much every day.

“Disruption is when you go to cross that road thinking you'll get to the other side and you get hit by a plane. It's the unexpected result.”

Innovation and disruption are both what Ann calls “makers of the future.”

“But disruption literally uproots and changes how we think. It breaks down our preconceptions, opens us up to new possibilities; it is at once destructive and creative.”

BUILDING UNDERLYING CAPABILITY

So how do we build an infrastructure in ourselves and our organisations that allows us to respond with agility and resilience when that airplane comes? Ann says the answer is to first identify the scope of the disruption by:

- Listening to stakeholders without judgement about how the disruption has affected them, and how they want to do business with you and others.
- Asking customers what they want, what are their pain points, how do they want to live their lives.
- Looking at the environment broadly; don't make assumptions about the causes or solutions.
- Getting diverse views – asking other people who may not have any background on the issue at hand.
- Looking at the trends and statistics for hard facts.

Ann believes political and social disruptions can be driven by human expectations of the society they live in to be responsive and empowering.

Governments are still unsure how to respond to this citizen-driven disruption.

“We’ve seen a form of political disruption in recent elections where the dominant players in our Westminster system have been forced to negotiate slim majorities and work more closely with Independents and minor parties,” Ann says, adding that the disruption of the traditional taxi industry taught the NSW Government a lesson on dealing with disruption.

Uber and point to point service disruption

Today’s empowered customer is increasingly sophisticated, no longer accepting solutions imposed on them by businesses or governments. Customers want to control pathways for themselves, and point to point transport services are a prime example.

Point to point services differ from mass transport such as trains and buses, which leave from designated locations, such as a train station or bus stop, Ann explains.

Point to point services fit into the future transport road map, because they’re personalised services tailored to individual preferences.

“They use digital platforms and data sharing so businesses and customers decide together what best meets their needs. The disruption caused by Uber’s entrance into the market was technological and social,” Ann says.

“Uber’s obvious change was using technological disruption through smartphones. It was clear to us that a major disruption was being caused to the existing taxi market and the future sustainability of the market was being called into doubt. Conflict was erupting on the streets between customers, taxi drivers and Uber drivers.

“Customers were saying that the government was not thinking about how they wanted to live their lives. The government wasn’t thinking about the transport solutions that suited people. They chose essentially to exercise civil disobedience to get what they wanted.”

THE GOVERNMENT RESPONDS

To deal with the disruption, Transport for NSW needed to:

- Understand how users and non-users perceive Uber X – in an absolute sense and relative to taxis.
- Explore how Uber X may be impacting the P2P market.
- Understand consumer expectations in relation to the government’s role in regulation and consumer protections.

On July 1 2015, the NSW Minister for Transport and Infrastructure announced an independent taskforce to examine the future sustainability of the industry. It consisted of a regulatory expert, Professor Gary Sturgess, assisted by Dr Tom Parry. They met with over 140 organisations across NSW and released a discussion paper.

The government was told that:

- The legislative framework did not support a new, more flexible model.
- Skills and expertise were not aligned with the regulatory capabilities required to educate industry or regulate the recommended model that places primary responsibilities on industry. IT systems were not flexible or adaptive enough to adequately support new capabilities.
- Processes were inflexible and largely non-value adding, driven by policy and legislative requirements, and there was a lack of adequate systems.
- Human resource capabilities were not aligned to the preferred response.

INSTALLING CAPABILITY INFRASTRUCTURE

NSW has now introduced sweeping changes to the regulatory framework for point to point services, including the establishment of the Point to Point Transport Commission.

“We have the humility to admit we weren’t ready to respond swiftly to this disruption,” Ann says.

“It’s taken three years for us to respond. We can’t take three years to respond to disruption and innovation again. We need to build that capability to be ahead of the game.”

Building the required capability infrastructure meant the government had to devise a new regulatory model, which makes point to point service providers responsible for safety outcomes and requires them to identify, eliminate or mitigate risks to health and safety.

Minimum standards will be provided, meeting the customer expectation that the government will ensure safety. Removal of prescriptive rules means there is greater flexibility in how risks may be managed.

A NEW POINT TO POINT MODEL

“The model enables business to adapt to disruption, and be innovative in the use of technology in a changing environment,” Ann says.

“It allows business to decide how best to serve their customers and change their model as customer preferences change, making them more resilient to future disruption. Pricing restriction removal will allow more competition.”

Ann believes that the way forward is to work through the fear and concern disruption can

evoke – and listen to a diversity of voices when it comes to solution seeking. It’s a matter of being open to feedback internally and externally.

“We need to build organisations that have diversity, collaboration and respect for the little voice that has the great idea,” she says.

“You need to show people that having multiple viewpoints makes you and them stronger and more resilient. Make it okay for people to have a go – try, learn, fail and find better ways.”



The background of the slide features a low-angle shot of solar panels under a bright sun, with green leaves from a tree in the foreground on the left side.

ARTICLE 6 – ASSET MANAGEMENT IN THE CHANGING SA POWER SUPPLY INDUSTRY

A summary taken from Doug Schmidt, General Manager Networks SA Power Networks key note presentation to AMPEAK16 Conference held in Adelaide April 2016.

INTRODUCTION

Twenty years ago, the internet took a century-old telephone network and turned it into an information superhighway. Today, something similar is happening in the power supply industry. The power grid has already become an 'internet for electricity' where suppliers and consumers trade and regulate commodities in a two-way relationship.

Doug Schmidt is General Manager Networks at SA Power Networks, the 70-year-old electricity distributor that services virtually all residential and commercial customers in South Australia. He calls his part of the power supply chain "the poles and wires."

Privatised in 2000, 80% of SA Power Networks' value lies in the poles, power lines and substations it maintains, assets totalling \$4 billion.

After 70 years, the company performs well on quality and reliability. But like every other player in the industry, it's facing disruption fuelled by wind power, solar, and electric vehicles.

SA Power Networks is modifying its existing asset management (AM) framework in response. This case study outlines how the problem is being assessed, the challenges, and the solutions for a new AM approach. It's an ongoing process in an era of unprecedented rapid change.

A WAKE-UP CALL FOR TRADITIONAL GRID ASSET MANAGEMENT

Most of SA Power Networks' assets were installed between

the 1950s and 1980s, with a current average age of about 40 years. Its focus has been on the continuous supply of electricity – repairing fallen lines, monitoring poles and maintaining substations.

This paradigm could have continued indefinitely, except for recent consumer-led changes. The electricity industry must now accept that the grid is a two-way street. A model where one generator supplied power to all homes is now obsolete, due to a number of industry disruptions.

WIND POWER BLOWS EVERYONE AWAY

According to the Australian Energy Council, South Australia is second only to the US state of Iowa in its per capita use of wind power, a phenomenon that caught the industry napping.

"When they connected the first one we thought, 'these things will never take off,'" Doug Schmidt says.

"But they did. In 2014, there was 1,200 megawatts (MW) of installed capacity in SA, and wind supplies about 40% of the state's energy across the year. On some parts of some days, wind supplies 100% of the state's energy. That directly impacts the operations of coal-powered power stations."

Schmidt says that in the 1980s, no one would have expected wind power to develop in such a short period.

"It's a classical disruption cycle – you never expect something's going to happen, then all of a sudden, bang!"

However, he says there are serious problems with power stability when the wind drops, and some unintended consequences of this disruption that need to be managed.

SOLAR POWER AND ELECTRIC CARS

With homes taking up solar power and feeding surplus energy back into the grid, solar is the game-changer when it comes to definitions of 'supplier' and 'consumer'.

"One-in-four of our residential customers have solar on their roofs," Schmidt says. "During the day, houses feed power back into the substation, so there are reverse flows on the network. Five years ago if you'd said we would have that situation, we would have said you're crazy."

The uptake of electric vehicles also disrupts the traditional view of asset management. Future electricity use will put further strain on the grid when consumers charge their cars at night during peak power consumption.

A FIRST RESPONSE TO THE DISRUPTION

In 2011, SA Power Networks started thinking about what the organisation was going to look like in future. It produced a document and a story that stakeholders could buy into.

"We tried to predict what a future customer would look like," Schmidt explains. "How we'd service them and what our roles would look like in our internal processes."

Future Option 1 saw customers going off-grid completely. But problems of high capacity and poor reliability made this untenable.

In Option 2, customers remain on the grid, but buy and sell their own generated solar electricity as it suits them. "I think that's where we're heading," Schmidt confirms.

FUTURE ASSET MANAGEMENT STRATEGIES

SA Power Networks then looked at how to change its decades-old AM model.

"Every industry, no matter how successful, is experiencing some form of disruption," Schmidt says.

"We need to be agile in designing and embedding new processes and procedures into the AM system. Ongoing engagement with customers and key stakeholders is critical to ensure services meet future needs and expectations."

The company is on a two-year cycle for updating its AM model, but it's still not keeping pace with industry changes. "I think it might need to get even quicker," Schmidt admits.

Strategies being developed include:

1. Battery installation (grid and customer sides) to avoid costly infrastructure upgrades and replacement.
2. Micro-grids to avoid building new powerlines to service new residential developments.

3. Using localised generation to supply a new customer development.
4. Replacing aged infrastructure with shorter design life equipment.
5. Automating the network through digital technologies.

NEW OPPORTUNITIES FOR AN AM MODEL

AM strategies must include new technologies – video drones to identify where power lines are affected by trees and phone apps that show real-time progress on line repair jobs.

In a forecast of technology take-up published on Reneweconomy, it's predicted 40% of customers will have batteries at home within the next 20 years.

"So now we have a two-way network, where customers connect to and use our network how it suits them," Schmidt observes. "Customers can buy and sell electricity as it suits them."

But he says that doesn't go far enough.

"We have other disruptors, working in what we call 'behind the meter'. They provide batteries, solar, in-home energy systems, all sorts of things behind the meter to provide better services to customers. That's the positioning for new markets."

SA Power Networks is getting in on the installation of solar panels and batteries behind the meter. "We're doing things we wouldn't have thought about doing five

years ago, like home energy management systems.

That's how quickly the industry's moving."

KEY POINTS FOR AM IN A COMPETITIVE INDUSTRY

"Just about every industry's undergoing disruption," Schmidt says. "No matter how successful you are or how long you've been around, there's somebody nipping at your heels trying to get a slice of your action."

A case in point is battery use at home to store solar generated electricity. By 2020, Australia is expected to have installed more than 800 MW of battery storage, worth more than \$2.5 billion.

"You need to revisit your external environment, your customers and stakeholders, and update your strategy regularly," Schmidt advises.

"Having done that, you need to be agile in implementing those new procedures and systems within your asset management system, so you can determine what product and service you're going to provide.

"And you need to keep customers and stakeholders engaged on the journey. You can't lose track of that and get stuck in your theory or your excellence in engineering. It's all about delivering improved outcomes to customers and stakeholders."

Myth 10 – That the best/only mechanism I have to manage

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INTRODUCTION

When resolving system and equipment failures, the first port of call is often an organisation's engineering group and in particular a sub group called the reliability engineers. Those organisations that have not invested adequately in root cause analysis capability will have provided their engineering function with limited analytical tools to resolve failure mode issues in a holistic manner. As the saying goes "if your only tool is a hammer then everything is a nail" and for many engineering graduates their only knowledge (hammer) is technical design which can answer the question - have I got the right equipment? Opportunities to manage issues

at the task delivery level (did I do the task correctly?) or in the support analysis function (did I do the right task?) are not generally considered or, less likely, applied. This holistic solution option is enunciated in the AM Council's Capability Delivery Model within the component covering Continuous Improvement noting that IEC 192-03-17 defines a 'failure mode' as the "manner in which failure occur".

This paper addresses the oft stated belief that the only solution to a "failure mode" is an engineering solution of redesign so that the failure mode is removed completely not just "managed". Other opportunities for a cost-effective control are often missed for a variety of reasons that are explored here. Additionally, complex equipment redesign may be beyond both the capacity and authority of the engineer tasked with resolving a failure mode. In such cases their only recourse is the Design Authority which they generally believe to be the Original Equipment Manufacturer (OEM, however, that may not be so.

Implications

Resolving asset related risk requires a holistic approach that understands root cause and seeks the most cost effective solution from a variety of options applied across the life of that asset. Such interventions must of course be technically feasible and cost effective in managing the consequences of identified failure modes such as:

- Injury to people or damage to the environment or the loss of some level of protection from these events;
- Commercial or other loss through non-delivery of product or service, where defective products or materials result or a service is not provided in either a timely manner or at all;
- Increased cost and down time due to secondary damage to the equipment itself and associated systems either functionally or geographically related;
- Increased cost of continued failure mode management actions that have not been eliminated by design;
- Increased logistics costs associated with failures that will likely occur at inconvenient times and caused increased unavailability due to the effort required to assemble resources and undertake the work often in unusual circumstances with what is available at the time.

SCENARIO 1 – NEW DESIGN

Let us first explore the value of Failure Mode knowledge being the "manner in which a failure occurs" and the means by which potential equipment integrity is assessed during design through the process of Failure mode effects and criticality analysis (FMECA). Each identified failure mode provides a header for a set of data that represents the reliability characteristics of the particular piece of equipment.

Managing any given failure mode is a redesign by the OEM!

These characteristics are shown at figure 1 where the sum of the failure modes represents the reliability performance of the equipment as a whole since failure modes are mutually exclusive and may be totaled through simple aggregation (338B). Additional information,

required to determine the potential responses to any revealed failure modes that pose a potential risk, is the part that causes the failure (parts fail - entire equipment or system do not). Each part that fails also has a technical cause which assists the engineer to determine the type of

risk response that might be most cost effective.

As noted on the far right had side, there are only three possible risk response for the analyst to select a cost-effective solution to an identified failure mode being:

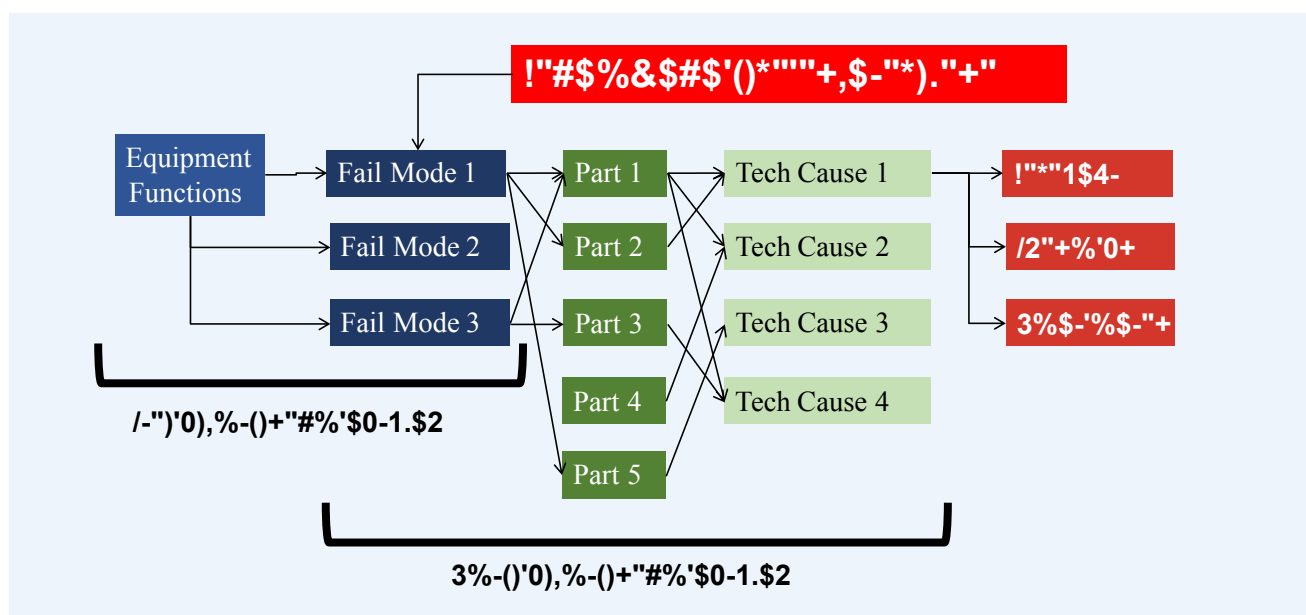


Figure 1: Equipment Failure Mode Characteristics

1. Redesign
2. Operator response
3. Maintainer response being either a preventive or corrective task.

During the initial design effort, quite clearly the opportunities for eliminating a failure mode completely can be identified using the FMECA process.

Design changes during this development period can be very cost effective and may in fact be the best approach to eliminating a risk exposure. However, as the list of failure modes are reduced

in priority based on assessed criticality, eventually a design change ceases to be a cost-effective solution, other actions are now necessary.

After all design change options have been exhausted the remaining failure modes must now be managed with either an operator or maintainer action. The failure characteristics information is now applied within a process titled Reliability Centered Maintenance to determine the content of the Preventive Maintenance program and Task Analysis to determine the detail content of preventive or

corrective tasks for all identified failure modes. The competencies required now move beyond the normal design engineer into the realm of the integrated support analysis known to the military where it originated as Logistic Support Analysis.

As the design process must be conducted by an authorized design authority, the OEM issue in the design phase is nugatory. However, the issue of OEM and the role of design authority becomes more important when managing failure modes in existing equipment.

Myth 10 continued....

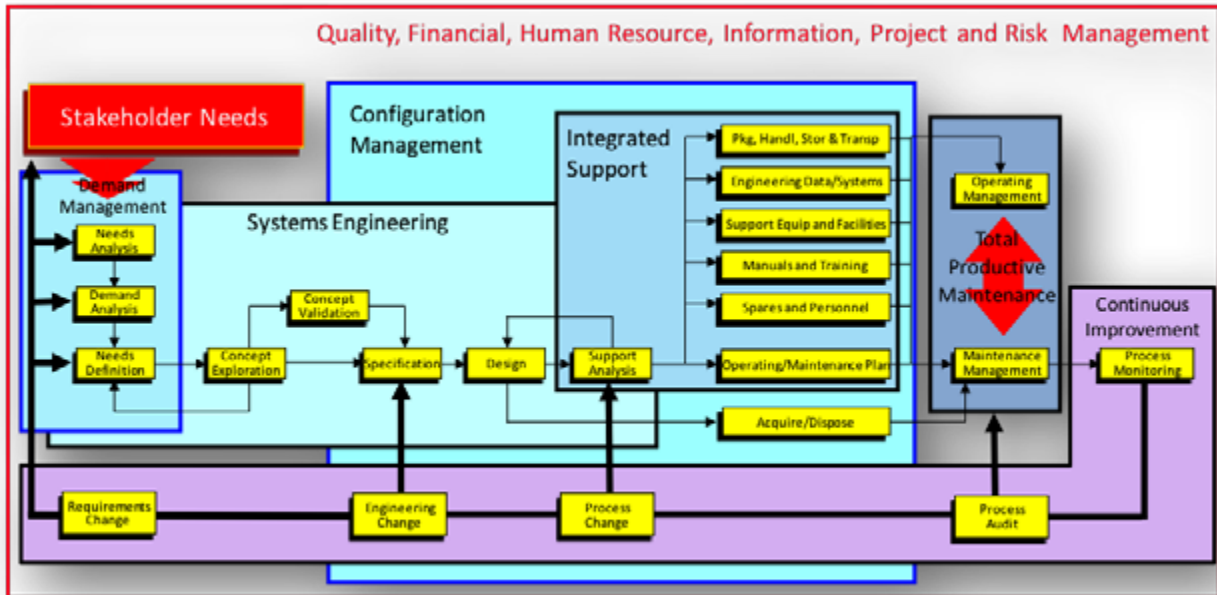


Figure 3: Capability Delivery Model

SCENARIO 2 – EXISTING EQUIPMENT

Failure modes discovered in existing equipment provide much raw material for continuous improvement opportunities. However, unlike the top down analysis approach of new designs, existing equipment reverses the order and undertakes a bottom up approach. This approach is characterized by the Asset Management Council's Capability Delivery Model shown in an earlier, but for these purposes, simpler form.

Failure mode data is captured as part of Process Monitoring at the start of the Continuous Improvement process on the far-right hand side and the root cause analysis process proceeds to ask three primary questions representing the next three continuous improvement loops in succession from left to right:

1. Process Audit – “Am I doing what I said I would do in the Plan”. Are the operating and maintenance staff using the integrated support resources that were provided. When this answer reaches an agreed level of performance (say 99.9%) the system is now delivering what the support

solution, developed during design, can achieve. There will be many opportunities in this space to deal with a failure mode that may be caused by root causes in any of the nine elements of integrated support.

2. Process Change – “Is the plan correct for the discovered data during delivery”. With all integrated support being fully applied we know our Process Monitoring data represents our support solution. Initial estimates and assumptions can now be replaced with hard data and we can improve our support analysis to better reflect the reality of the design and support solutions.

3. Engineering Change – “Do I have the right engineering design solution”. A revised and accurate support plan allows us to determine the inherent characteristics of the design. Only now does design change become a potential solution to an identified failure mode having exhausted other options relating to support delivery and accuracy of the content of that support.

ORIGINAL EQUIPMENT MANUFACTURERS

Asset Management Myth Number 4 explored the issues of Original Equipment Manufacturers. The issue here is more complex than appears on the surface. In particular, just because an organization manufactures a design does not mean that they are the design authority. The design may have been completed by a design house and the manufacturers expertise is just that, manufacturing and not design.

When seeking a design solution to a failure mode issue that involves existing and often obsolescent equipment, there are significant statutory accountabilities associated with the conduct of that design effort.

The OEM may not always be a guaranteed way of cost effectively resolving issues with the design and avoiding any potential conflicts of interest that may prove costly.

SUMMARY

Resolving identified failure modes with an engineering solution from the OEM is not always the best solution in particular for existing equipment where performance is effected by the quality of support. In these cases, the last consideration should be for a design correction and then only from the designated design authority who may not be the OEM.

CONCLUSION

As noted, there are clearly many ways in which the adverse impact of equipment failure modes may be managed. The “best” way is not always total elimination through redesign, other potentially cost effective options described in the AM Council’s Capability Delivery Model are available. Should redesign be the considered solution then understanding who has design authority for that equipment is essential from both a due diligence and technical success perspective. The design authority may not be the OEM but an external design house.

Hence the belief “That the best/only mechanism I have to manage any given failure mode is a redesign by the OEM!” is confirmed as a myth.



Tutorial 9

Capability Delivery Model – Overview

9.1 INTRODUCTION

In order to implement an asset management system, an organisation itself must choose appropriate

- Technical, financial, enterprise and agreement processes,
- Organisational roles, structure and competencies
- Technical, financial and operating plans; and
- Risk-based decision-making plans

The Capability Delivery Model schematically presents processes that may be used in part or entirely to deliver the stated outputs of the organisation.

The processes are shown in six main disciplines:

1. Demand Management
2. Systems Engineering
3. Configuration Management
4. Acquisitions
5. Operations and Maintenance
6. Continuous Improvement

These disciplines are associated with a number of national and international Standards, such as ISO/IEC 15288 Systems engineering.

Each of these disciplines have a number of enabling competency elements and sub-elements, which in turn may have any number of competency sets and support units of competency. The disciplines and enabling competency elements are discussed in further details in section 9.3



9.2 PURPOSE OF THE CAPABILITY DELIVERY MODEL

The primary purpose of the Capability Delivery Model is to document a typical set of processes that can be use to:

- Provide guidance for the application of an asset management system
- Develop and implement an asset management system capability, and
- Develop and implement an asset capability (solutions) for an organisation
- Other purposes of the Capability Delivery Model include identifying and documenting
- The typical engineering and financial disciplines involved in those processes
- The enabling principles used in the management of assets

- How to create and define organisational functions within an asset management organisation, and
- The relevant ISO and international engineering and financial management standards relevant to the processes associated with the management of assets (see bibliography for Standard names)

9.2.1 INDUSTRY SPECIFIC INFORMATION

The IEC TC 56 Dependability committee is currently in the process of developing a Technical Specification that documents the relationship between ISO55000 and ISO 50001 to the IEC Dependability Standards and the International Financial Reporting Standards. That document is expected to be available publicly.

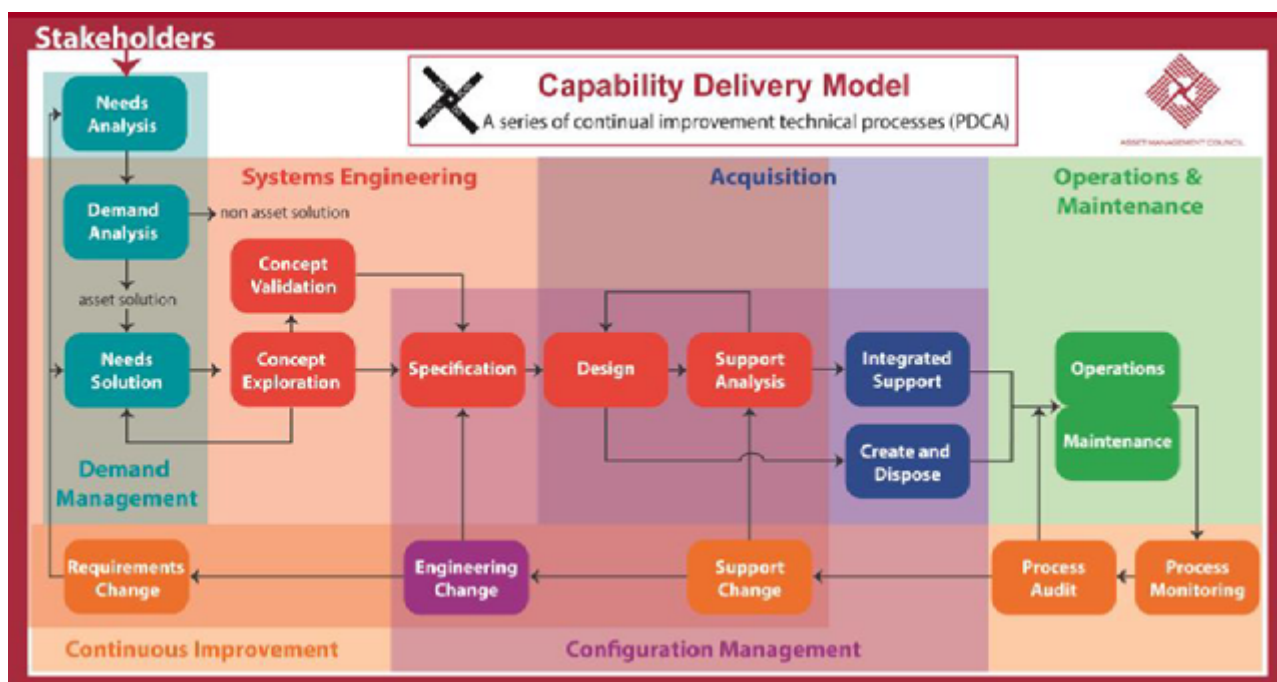
A number of Asset Management Council members are participating the development of that specification.

The technical specification is intended to provide

- A brief introduction to both asset management and the requirements for an asset management system
- The benefits from the use of an established and common set of asset management system processes and procedures, tools and techniques to manage assets and
- A description of the relationships between the Asset Management System to the tools and techniques, processes and procedures of
- Existing IEC Dependability standards

- Relevant International Financial Reporting Standards (such as IAS 16 Property Plant and Equipment and the IFRS Taxonomy Guide) and
- Through the use of the ISO/IEC 15288 Systems Engineering as a technical process management standard

The specification will enable industry specific guidelines to be developed using a common structure and common technical and financial terminologies



UP COMING EVENTS

EVENT	DATE	LOCATION
April 2017		
AMPEAK 2017	2/04/2017	Brisbane
Technical Presentation - Gippsland	5/04/2017	Gippsland
Asset Management Fundamentals	6/04/2017	Brisbane
How to develop a strategic asset management plan seminar	7/04/2017	Brisbane
Asset Management Fundamentals - In-House	12/04/2017	Melbourne
Asset Management Fundamentals	28/04/2017	Adelaide
May 2017		
Asset Management Fundamentals	5/05/2017	Melbourne
Melbourne Chapter Event - Infrastructure Boo	11/05/2017	Melbourne
Brisbane Seminar	17/05/2017	Brisbane
Asset Management Fundamentals	17/05/2017	Hobart
How to develop a strategic asset management plan seminar	18/05/2017	Hobart
Technical Meeting	18/05/2017	Sydney
How to develop an asset management plan seminar	19/05/2017	Hobart
Asset Management Fundamentals	24/05/2017	Sydney
How to develop a strategic asset management plan seminar	25/05/2017	Sydney
Canberra Chapter Event	25/05/2017	Canberra
How to develop an asset management plan seminar	26/05/2017	Sydney
June 2017		
Asset Management Fundamentals - In-House	6/06/2017	Sydney
Asset Management Fundamentals - In-House	7/06/2017	Sydney
Asset Management Fundamentals	19/06/2017	Perth
Technical Meeting	21/06/2017	Sydney
CAMA EXAM (WPIAM) – Register through www.wpiam.com		
Australia	6/04/2017	Brisbane
Australia	21/04/2017	Melbourne
Australia	29/05/2017	Melbourne
Australia	29/05/2017	Perth
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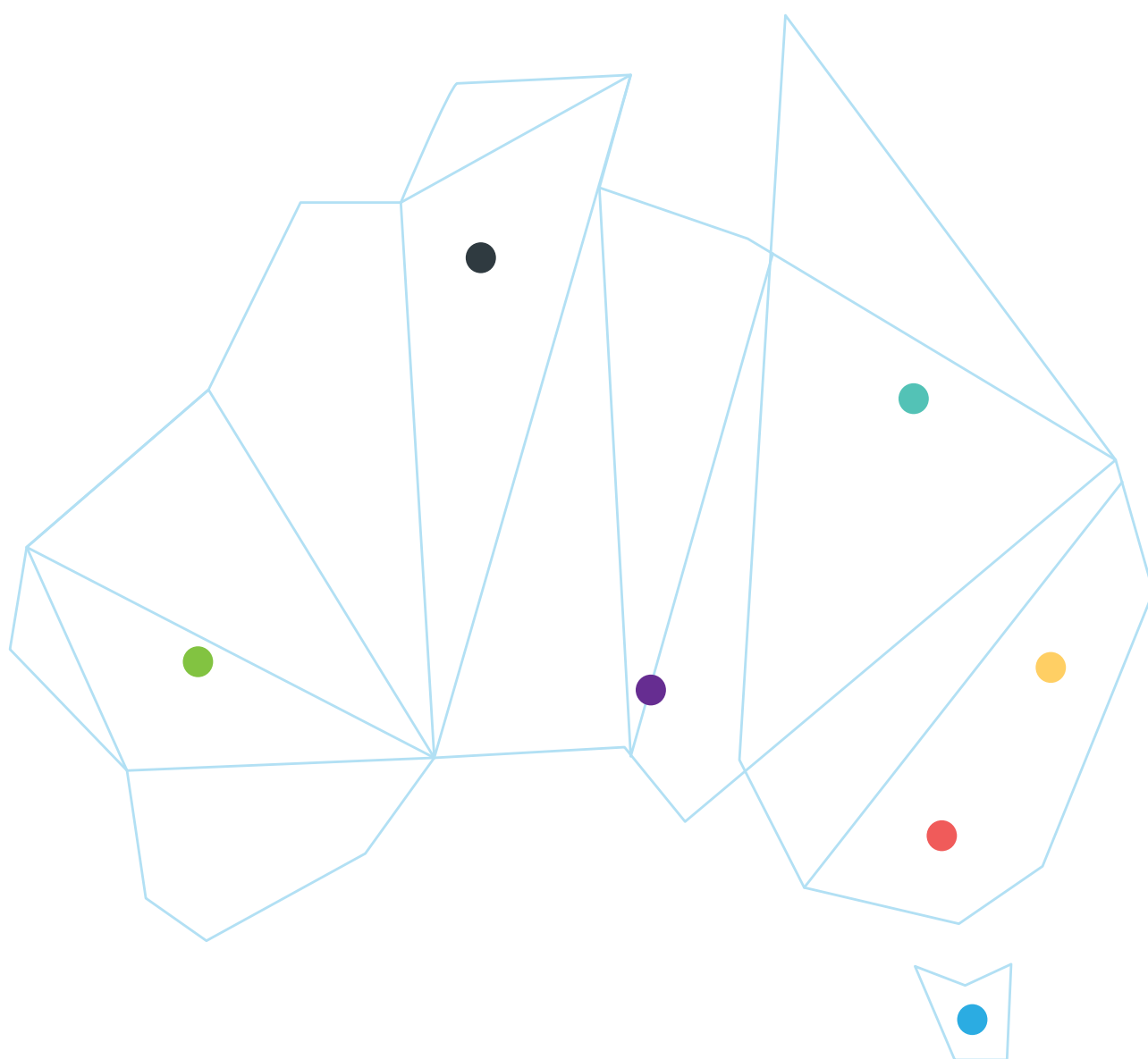
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