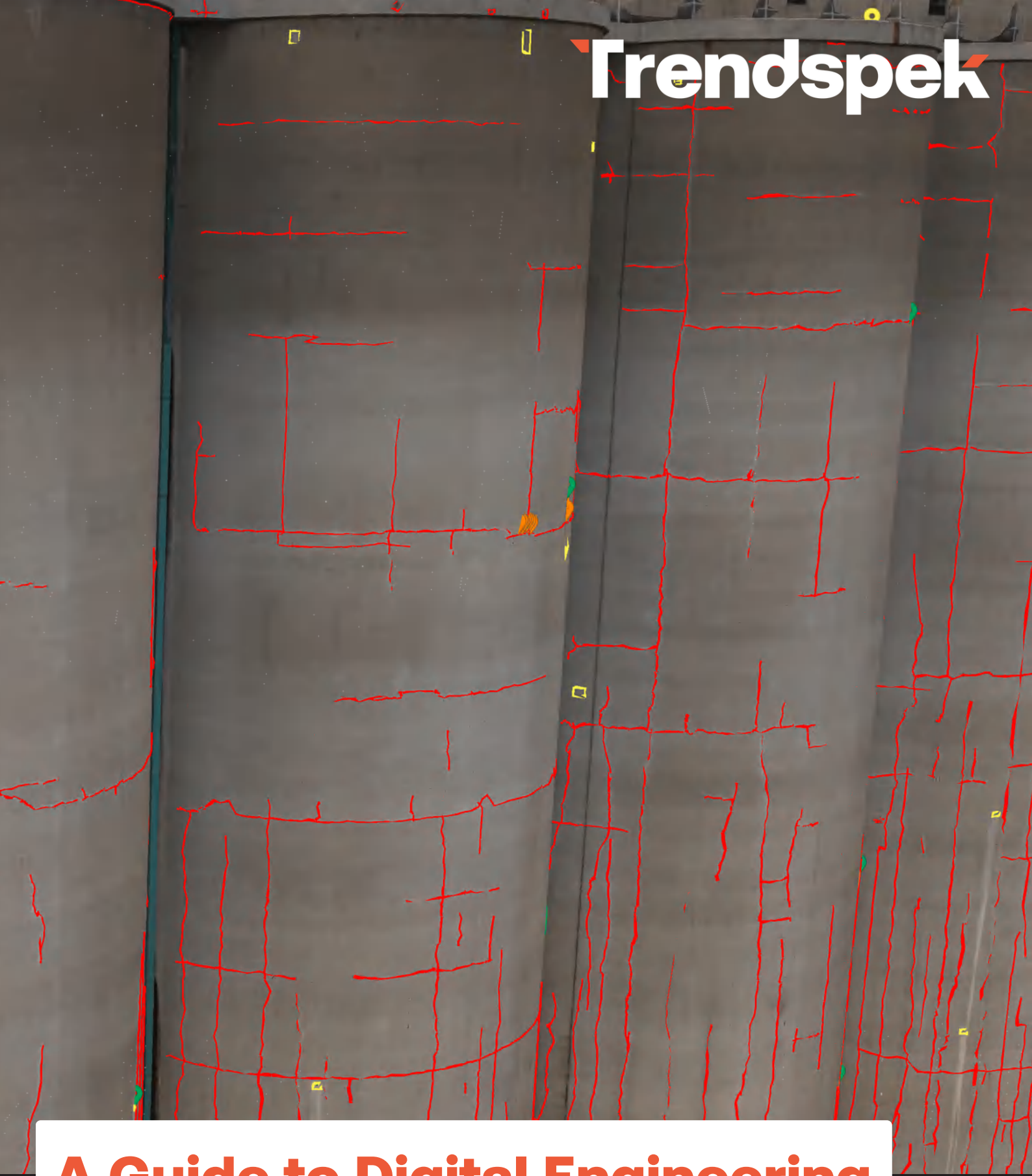


Trendspek

A Guide to Digital Engineering

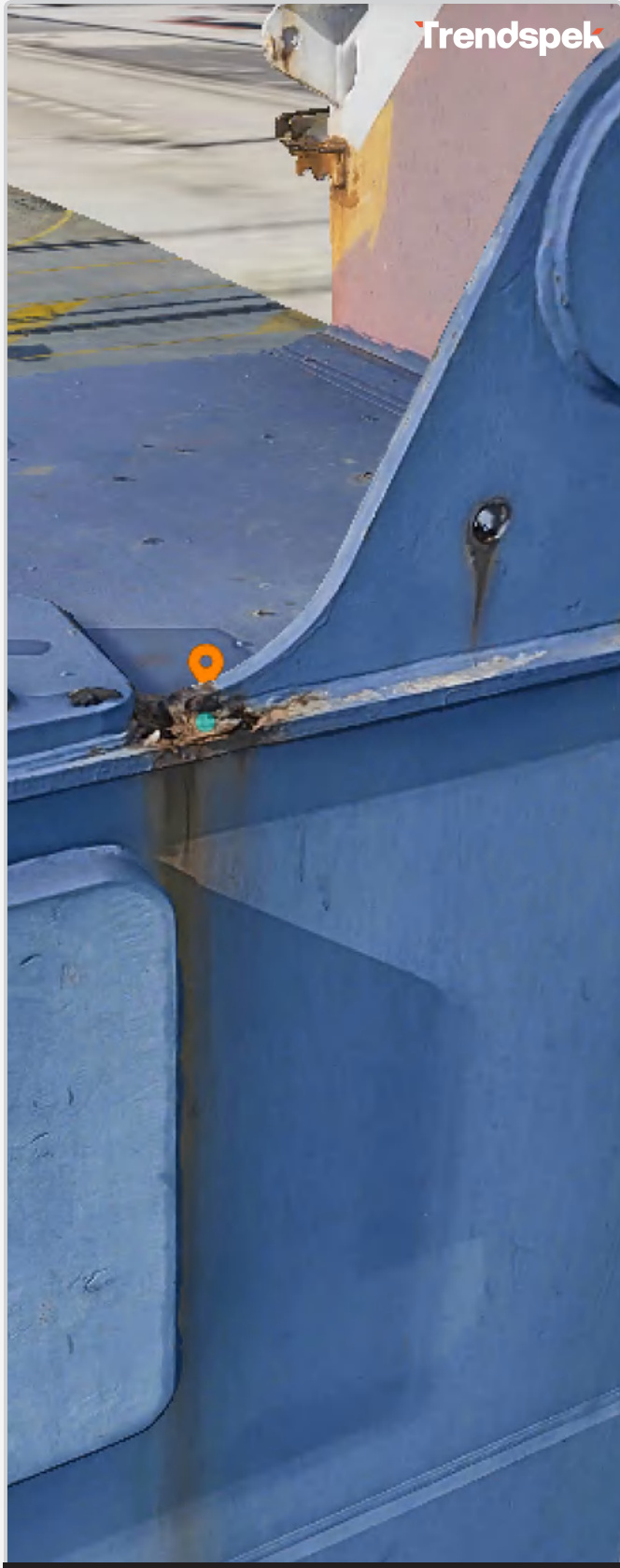
6 Benefits and how Digital Engineering can power the O&M lifecycle

Overview

Today's leading engineers are transforming their practices by adopting advanced digital technologies. These tools enhance workflows, provide more cost-effective, safer, and accurate methods to monitor high-value infrastructure, and open doors for global opportunities.

By empowering engineers with computer vision to virtually analyse structural integrity from anywhere in the world, this sets them up for real-time interactive reporting and precise record-keeping across entire portfolios, providing valuable insights for the O&M lifecycle.

This guide examines how this digital-first engineering approach not only mitigates risks, but helps secure more tenders and more value for engineers, and their clients.



DEFINITION

What is Digital Engineering?

Digital engineering is revolutionising the way we capture, create and monitor built assets by integrating vast amounts of data with cutting-edge tools, 3D softwares and holistic digital workflows.

From 3D models to computer vision, engineers are adopting these technologies to analyse and report on assets within a virtual environment — unlocking unparalleled advantages throughout the asset lifecycle.

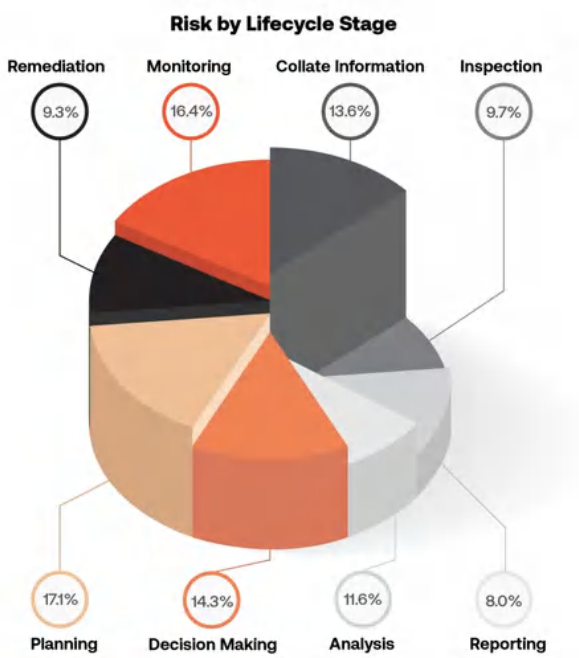
By leveraging these digital solutions, asset data becomes more than just static information.

It becomes a dynamic resource that can be readily accessed and shared with stakeholders, eliminating confusion and ensuring that all parties work from a single, highly-detailed source of truth.

What	Potential	Benefits
1. 3D Models	Visualise assets as 3D models with layers of photogrammetry, LiDAR, BIM, GIS, thermal, and geospatial data	• Full structural coverage with reduced safety risks and downtime • Interactive markup and live reporting for streamlined insights • Enhanced visibility into asset conditions
2. Procurement	Collaborate online to tap into global expertise and diversify service offerings	• Improved tendering accuracy and project comms • Optimised tender assessments for faster approvals • Ability to offer clients more valuable, scalable solutions
3. Digital Workflows	Centralised 3D models with digital markups and condition insights	• Informed, data-backed decision-making • Streamlined handover with standardised deliverables • Insightful, predictive data for maintenance planning • Improved ESG reporting and due diligence
4. Technology	Unified digital environment for data sharing and collaboration	• Efficient data processing and secure global access • Faster project setup and approvals • Seamless collaboration across remote teams
5. Talent	Access to specialised skills, tools, and real-time project monitoring	• Streamlined workflows and internal processes • On-time, cost-effective project delivery • Practical knowledge-sharing for team upskilling

WHY CHANGE AT ALL?

The challenges of manual methods



Understanding the condition of a structure is the first line of defence to optimising expenditure. However, manual inspection methods come with setbacks — both in terms of cost, and accuracy.

Manual condition assessments often involve rope abseiling or heavy machinery such cranes, with limited access and extended site shutdowns. This can be time-consuming and also prone to error, with the reporting outcomes influenced by a surveyor's subjective perspective, weather conditions, and accessibility at the time.

This variability can lead to incomplete or partial assessments, where critical defects go unnoticed and result in costly (yet preventable) corrective work.

Ian Godson, Managing Director of Infracorr, says of manual inspections: "Typically only 15-20% is covered, so there's a risk of missing crucial issues that are 30 metres up. That alone presents a significant safety concern."

These manual reports only add more uncertainty for asset owners, especially when decisions are based on representative inspections that might not reveal hidden risks. Additionally, the human hazards of manual inspections further compound the issue.

According to Australian Bureau of Statistics, work-at-height incidents resulted in over 8,000 injuries and 26 fatalities in 2021-22, making it the third-largest cause of workplace deaths in the industry.

To overcome these challenges, leading engineers like Infracorr adopted software like Trendspek to conduct safer, more accurate condition assessments.

Allowing engineers to remotely capture high-resolution data of an entire asset, this removes the need for risky manual inspections and also minimises subjective reporting.

"Unfortunately, the industry has a history of inaccurate repair estimates leading to cost and time overruns. Trendspek enables us to plan budgets more precisely and provide contractors with more reliable quotes," says Ian Godson, Managing Director of engineering consultancy Infracorr, who adopted Trendspek in 2022.

Digital engineering not only improves safety, but offers a scalable solution for managing complex infrastructure — offering real-time views to make more informed decisions and plan targeted investigations, without putting personnel at risk.

How digital solutions can address structural failures

Adding to the risks of manual inspections, the infrastructure industry is facing workforce shortages on a global scale, due to rising compliance pressures and declining investment.

Engineers Australia reports our "greatest-ever engineering skills shortage," with an estimated 50,000 engineers needed to meet growing infrastructure demands. This comes at a time when the industry is expected to not only deliver complex projects, but also meet net-zero targets.

Simultaneously — and only compounding the problem — investment for infrastructure projects is in decline around the world.

The Global Infrastructure Hub reports a sharp reduction in private capital for infrastructure in 2023, with 70% of funds now directed toward low-risk strategies.

By 2050, the net value of global infrastructure assets could fall by as much as 26.7% in the worst-case scenario.

Contributing to this are the accelerating impacts of climate change. In Australia alone, an estimated 53,000 road bridges have a replacement value of AUD $200 billion.

University of Sydney's Prof. Wije Ariyaratne, Deputy Head of Civil Engineering, warns: "The challenge for the engineers today is to develop new techniques for assessing the existing bridges for climatic change effects "

However, in the face of these challenges, engineering is evolving through technology advancements. A growing number of engineers have embraced digital approaches to efficiently, safely and cost-effectively protect and extend the lifespan of critical infrastructure.

Through detailed digital inspections, with real-time reporting and accurate spatial/thermal data, this offers unprecedented insights into condition for precise monitoring, preventive maintenance, and efficient resource allocation.

In 2024, an expert panel from the Institution of Structural engineers remarked on this new technology:

"The fact that you can use your computer to do 100 beams, when you only needed to do 10... you ought to be able to learn 10x more about the feel and quality of the outcome. We need to teach engineers today to use the digital environment as a method of exploration and interrogation."

6 benefits of Digital Engineering

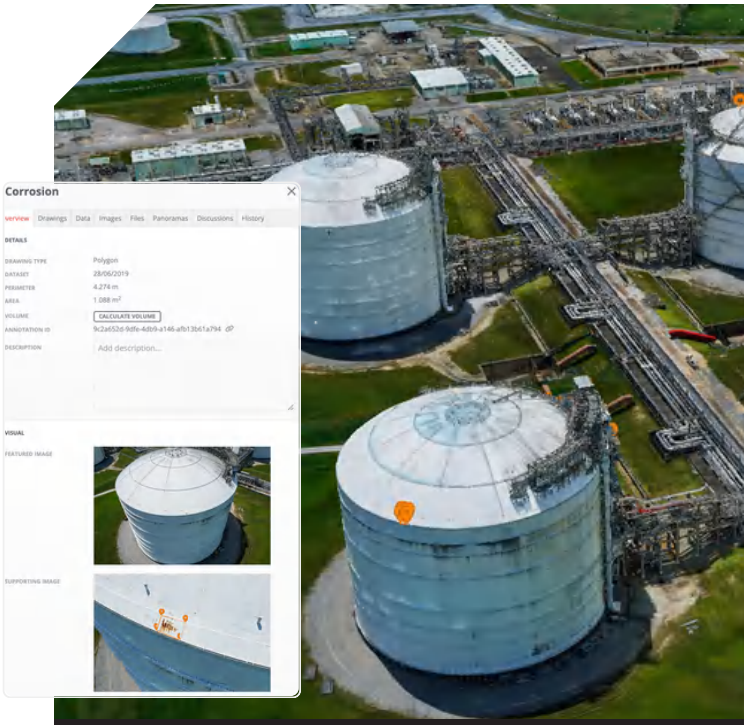
1 Full structural coverage with reduced risks

A digital environment allows engineers and asset owners to seamlessly collaborate across every stage of the asset lifecycle.

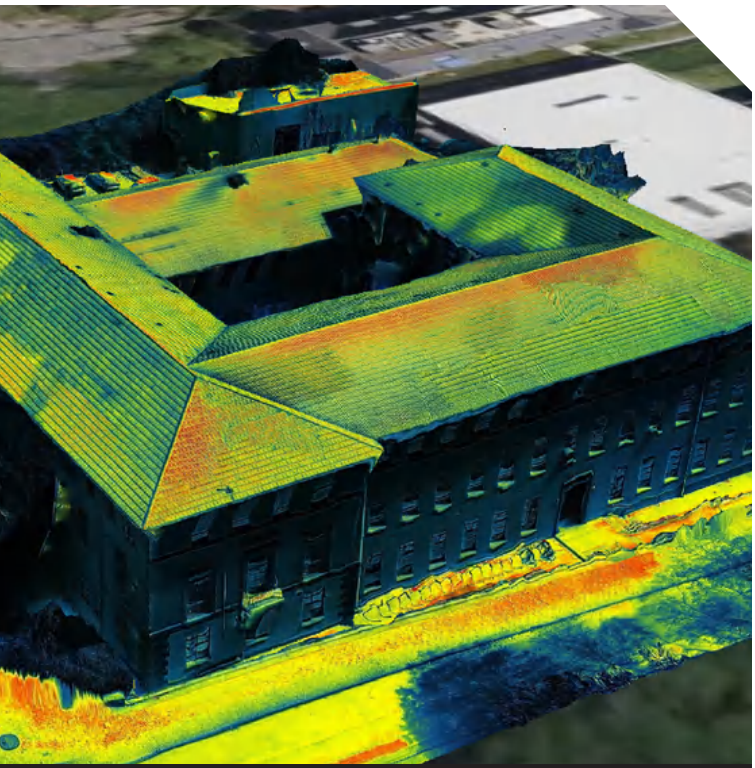
With a real-time digital record of asset condition, this reduces the need for site visits, which vastly improves personnel safety and minimises expensive site disruptions or downtimes.

This suite of data enables engineers to quantify and predict risks for preventative maintenance planning, allowing for more strategic resourcing to address critical issues while expediting decision-making with indisputable evidence.

For example, hairline cracks across a large concrete pylon can now be clearly visualised on-screen and shared with stakeholders to plan next steps, with accurate measurements and specs.



3D model in Trendspek with interactive markups, exact measurements, severity notes and materials



Layered thermal data onto 3D reality mesh to highlight roofing defects.

2 Layer data for multi-purpose reporting

Another key benefit is the ability to layer different data into one detailed report, including photos, survey findings, GIS, BIM, LiDAR, environmental, contextual, spatial and thermal data.

This creates more precise assessments that can serve multiple purposes, with various data inputs allowing for wider assessments including quality assurance and ESG. This positions engineers to win more tenders across a broader range of asset types.

Furthermore, this comprehensive repository of data can be readily shared online to involve remote resources or specialists, extending reach to win global projects.

6 benefits of Digital Engineering

Monitor conditions over time, or review remediation works once completed using side-by-side comparison tools

3 Identify trends for active monitoring

With a digital portfolio of recorded conditions, engineers can interactively analyse and monitor assets over time.

Combining comprehensive spatial data also allows for more thorough evaluations in the context of real-world constraints.

Through interactive annotations, engineers can include important notes such as cost, material specifications, access requirements and risk severity ratings, which can also be used to inform capital investment forecasting.

Over 8,000 cracks auto identified in an AI-powered detection tool, developed by Trendspek and Datature

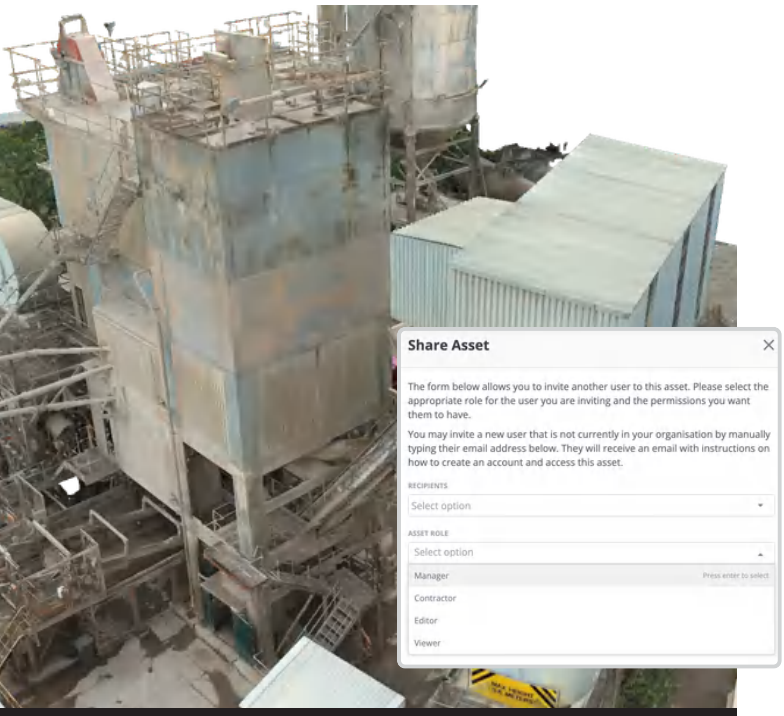
4 Use AI to anticipate structural failures

Engineers can now leverage AI algorithms to anticipate structural degradation or failure before they occur.

By training models to detect defects automatically, engineers can eliminate admin effort of painstaking assessments, and instead focus on quality checking results.

As an example, Tendspek and Datature's AI crack detection tool successfully trained a 3D model to automatically annotate over 8,000 crack defects across a large concrete silo, showcasing the potential of AI in predictive maintenance.

6 benefits of Digital Engineering



Share condition insights online with wider teams, using in-app notifications and digital reports.

5 Reduce discrepancies through digital data management

3D software centralises information across your teams, creating a single source of truth and streamlining reporting workflows.

These digital workflows are especially useful when working with a remote or large team, as each stakeholder can interrogate the same source of information and provide real-time input.

A digital environment also enables better data management. With a platform like Trendspek, you can store up-to-date condition insights across vast portfolios and easily transfer information across your organisation.

Over time, this reduces discrepancies and errors, and ensures everyone works from the same data.

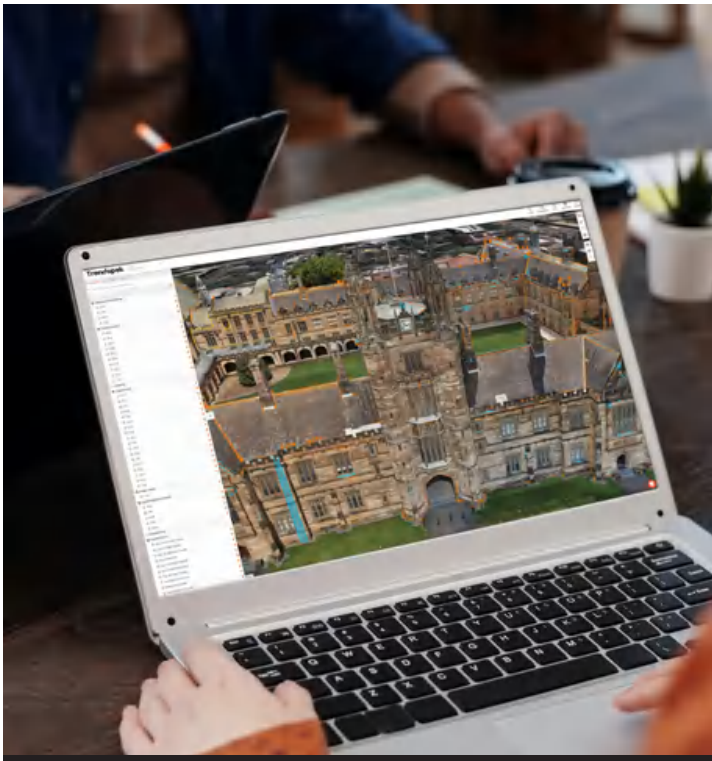
6 Build client trust through transparency

In a competitive market where time is money, the ability to visually present an asset in client meetings provides a key advantage.

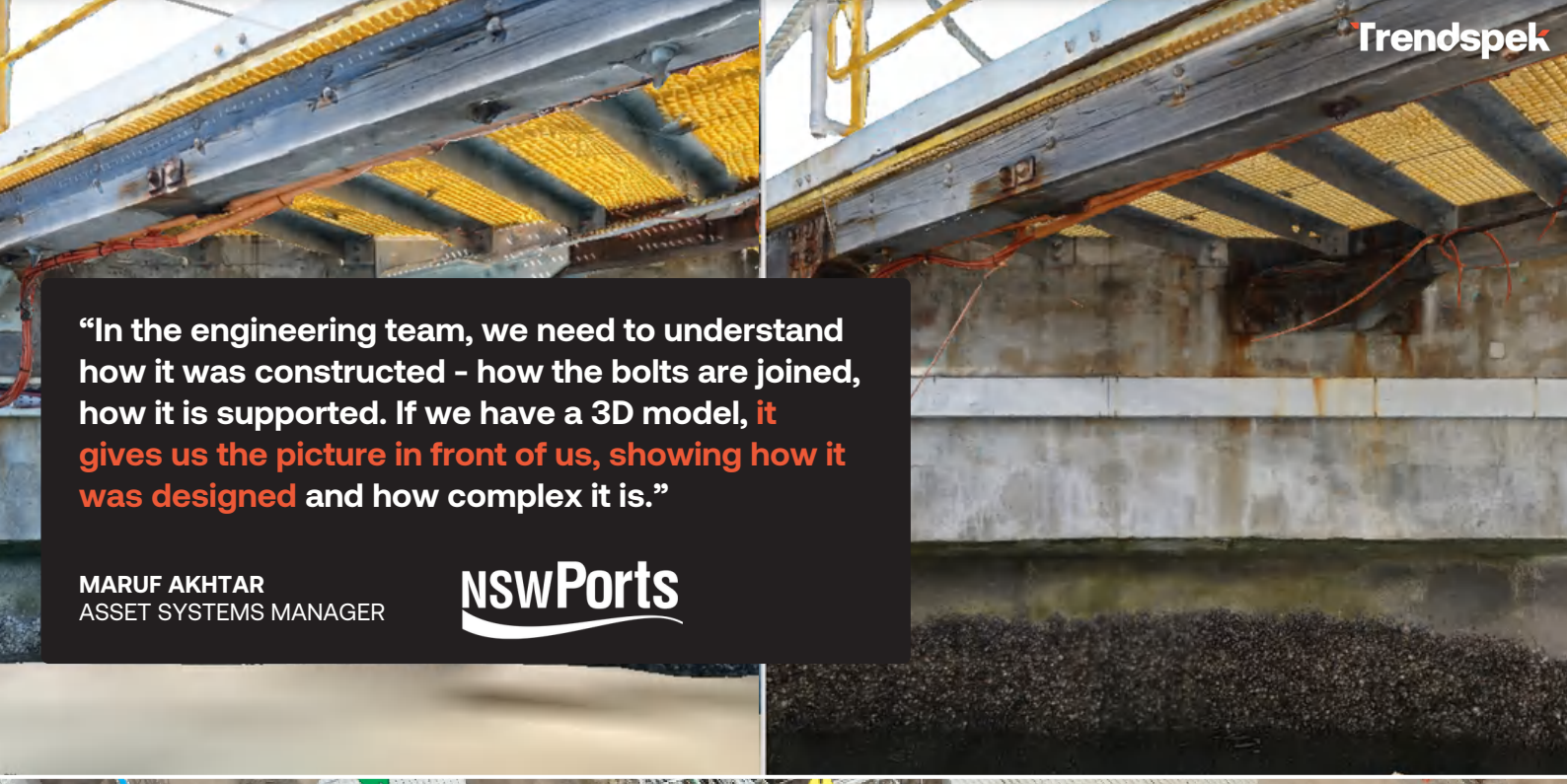
Providing real-time visualisations of infrastructure, and being able to pinpoint areas in need of maintenance in 1mm detail, not only demonstrates technical expertise but also builds trust with asset owners.

This encourages deeper client engagement and buy-in for future projects, transforming discussions about what to do next into productive, action-led conversations.

By providing visual evidence, engineers can outline clear plans and demonstrate value to align with client expectations.



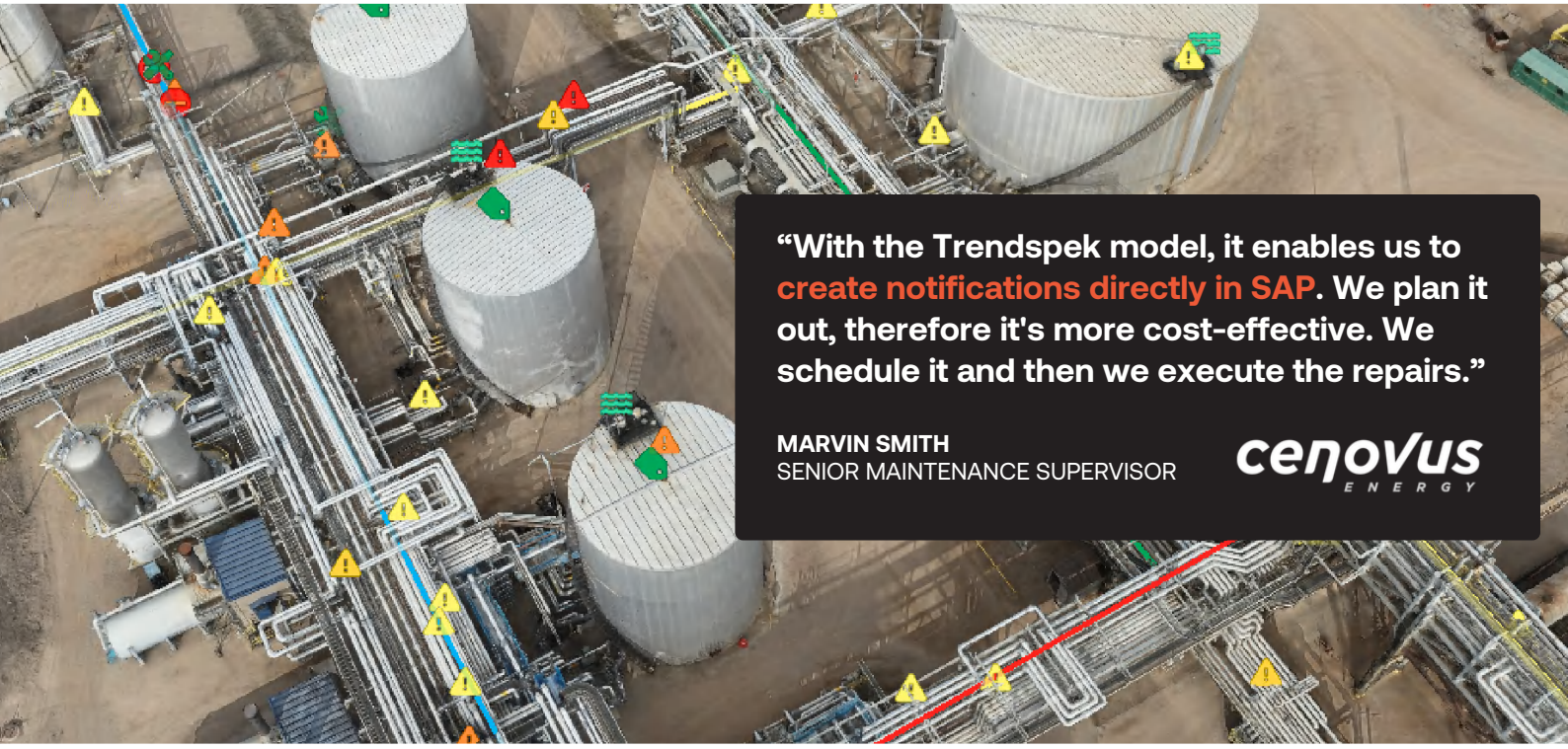
Present structural condition reports and other findings in real-time visualisations to clients



"In the engineering team, we need to understand how it was constructed - how the bolts are joined, how it is supported. If we have a 3D model, it gives us the picture in front of us, showing how it was designed and how complex it is."

MARUF AKHTAR
ASSET SYSTEMS MANAGER

NSWPorts



"With the Trendspek model, it enables us to create notifications directly in SAP. We plan it out, therefore it's more cost-effective. We schedule it and then we execute the repairs."

MARVIN SMITH
SENIOR MAINTENANCE SUPERVISOR

cenovus ENERGY

"We used Trendspek to mark up more than 100 buildings at The University of Sydney. It's difficult to even imagine doing these inspections the traditional way."

IAN GODSON
MANAGING DIRECTOR

infracorr

THE BLUEPRINT

For Digital Engineering

Those succeeding today are embracing digital transformation — and quickly.

However, for some, the speed of technological change can be daunting.

A 2020 PwC survey revealed that 73% of Australian CEOs viewed rapid technological advancements as a barrier to business growth, with concerns about implementation complexity standing out as a key deterrent.

For many industry leaders in the sector though, the message is clear: evolving processes through digital solutions is no longer optional. It's essential for mitigating risks, reducing costs, and fulfilling ESG commitments.

Here's how organisations can successfully adopt Digital Transformation to drive success.

1 Assessment

Begin with a comprehensive analysis of departmental workflows to identify where technology can enhance efficiency, address operational challenges, or increase productivity.

2 Strategic Planning

Develop a forward-looking strategy for integrating digital engineering solutions.

This should include specific goals, timelines, and the potential impact of new technologies, ensuring alignment with organisational long-term vision.

3 Investment

Commit resources to acquire the necessary digital tools and training programs that will upskill employees.

This may include investing in software platforms, hiring specialised personnel, or both.

4 Pilots and Iterative Implementation

Start small by launching pilot projects that test selected technologies in real-world scenarios.

Use the feedback from these pilots to refine your approach, troubleshoot challenges, and optimise workflows before scaling up.

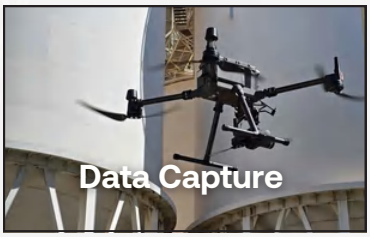
5 Communicating change

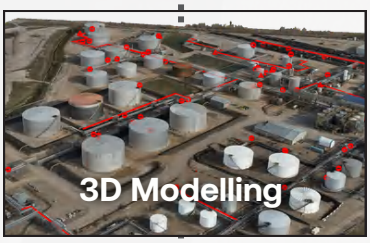
Successful digital transformation requires buy-in from all levels of the organisation. Clearly communicate the reasons behind the shift to digital solutions, providing support and ongoing communication to employees.

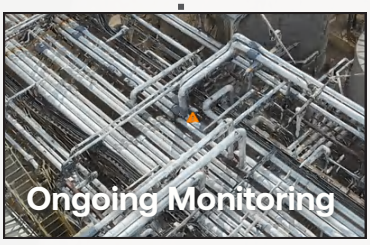
Creating feedback loops helps maintain momentum and fosters a culture of continuous improvement.

HOW TRENDSPEK WORKS

Digital Engineering can power the O&M lifecycle







Capture

Zero-touch digital capture of full site

Bring inspection data from anywhere - drones, handheld, subsea, NDT - into one place.

Inspect

Visual surveys from your desk

Subject matter experts can inspect, mark up, measure from their desktop, completing comprehensive reviews without attending site.

Analyse

Measure and monitor trends on-screen

Review exact measurements, geolocation and severity risks on-screen with full context.

Report

Comprehensive digital, PDF and .xlsx reports

Standardise inspection and reporting templates across entire sites for consistency.

Plan and prepare

Identify areas for targeted investigations

Assign resources based on auditable evidence and pre-plan consultants to improve on-site efficiencies.

Remediate

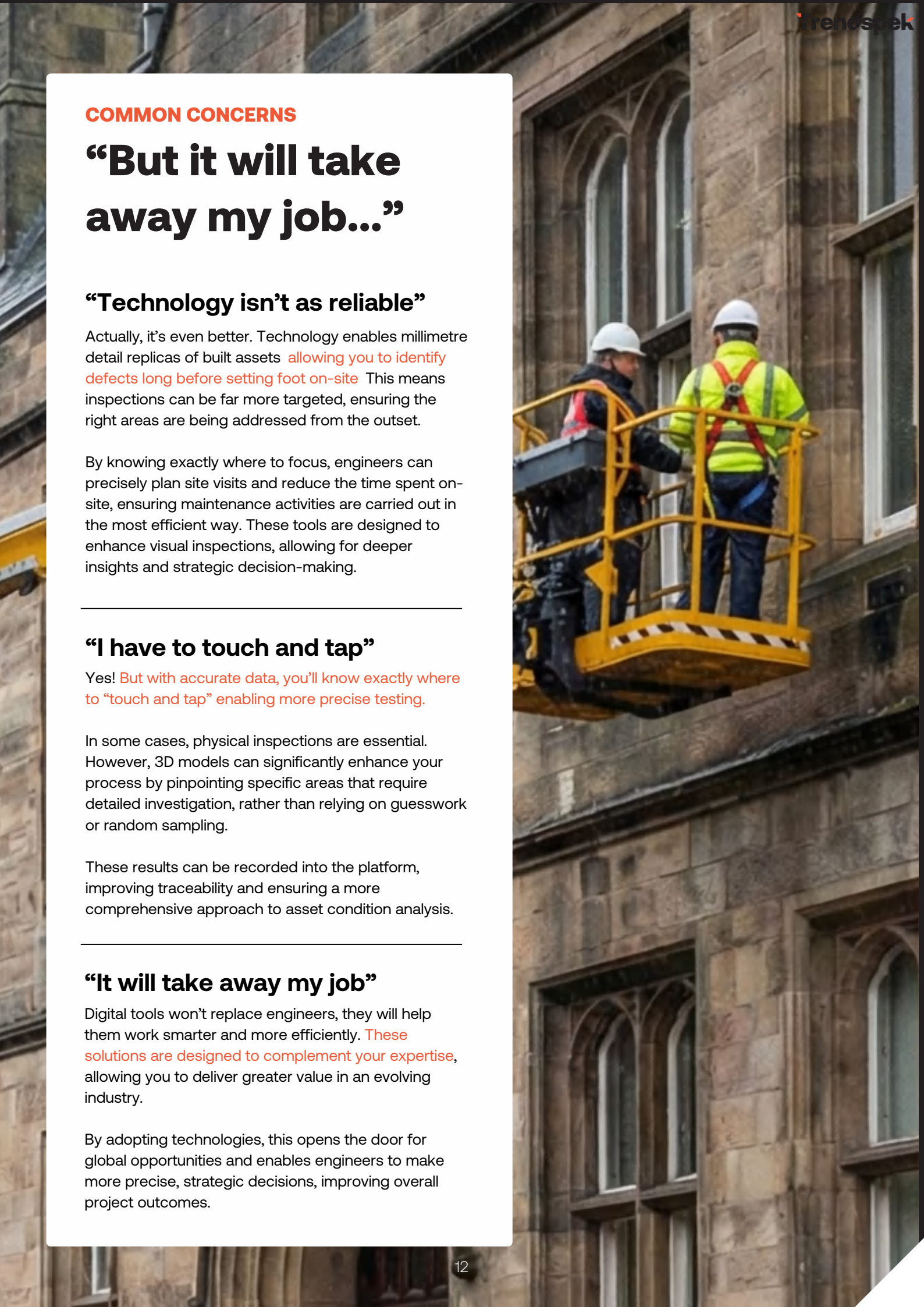
Tender scopes for remediation works

Internal and external teams access and use the same data source for accurate scoping.

Monitor and validate

Re-capture, monitor, compare

Track lifetime trends, asset condition over time and conduct quality assurance in one place.



COMMON CONCERNS

“But it will take away my job...”

“Technology isn’t as reliable”

Actually, it’s even better. Technology enables millimetre detail replicas of built assets allowing you to identify defects long before setting foot on-site This means inspections can be far more targeted, ensuring the right areas are being addressed from the outset.

By knowing exactly where to focus, engineers can precisely plan site visits and reduce the time spent on-site, ensuring maintenance activities are carried out in the most efficient way. These tools are designed to enhance visual inspections, allowing for deeper insights and strategic decision-making.

“I have to touch and tap”

Yes! But with accurate data, you’ll know exactly where to “touch and tap” enabling more precise testing.

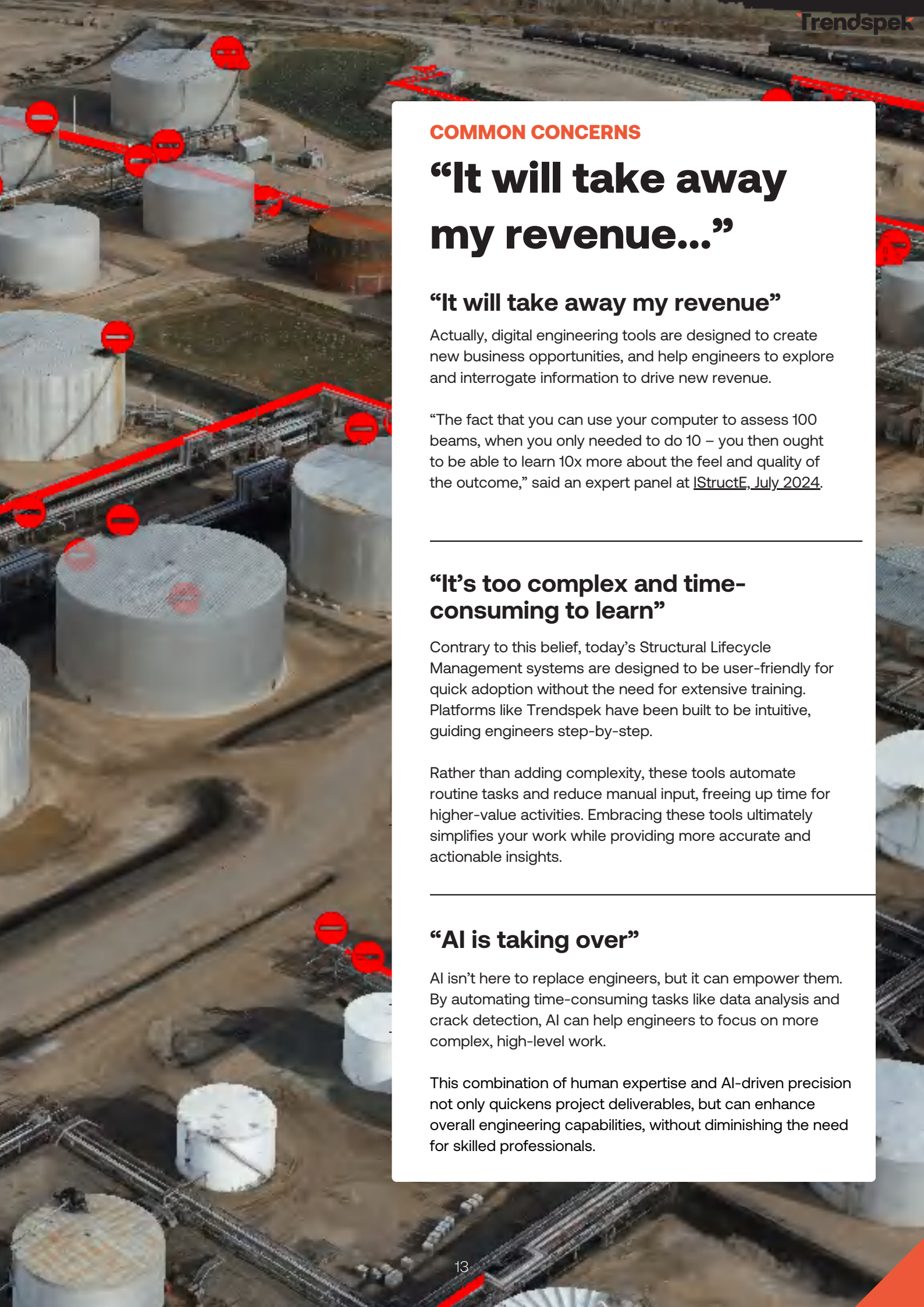
In some cases, physical inspections are essential. However, 3D models can significantly enhance your process by pinpointing specific areas that require detailed investigation, rather than relying on guesswork or random sampling.

These results can be recorded into the platform, improving traceability and ensuring a more comprehensive approach to asset condition analysis.

“It will take away my job”

Digital tools won’t replace engineers, they will help them work smarter and more efficiently. These solutions are designed to complement your expertise, allowing you to deliver greater value in an evolving industry.

By adopting technologies, this opens the door for global opportunities and enables engineers to make more precise, strategic decisions, improving overall project outcomes.



COMMON CONCERNS

“It will take away my revenue...”

“It will take away my revenue”

Actually, digital engineering tools are designed to create new business opportunities, and help engineers to explore and interrogate information to drive new revenue.

“The fact that you can use your computer to assess 100 beams, when you only needed to do 10 – you then ought to be able to learn 10x more about the feel and quality of the outcome,” said an expert panel at IStructE, July 2024.

“It’s too complex and time-consuming to learn”

Contrary to this belief, today’s Structural Lifecycle Management systems are designed to be user-friendly for quick adoption without the need for extensive training. Platforms like Trendspek have been built to be intuitive, guiding engineers step-by-step.

Rather than adding complexity, these tools automate routine tasks and reduce manual input, freeing up time for higher-value activities. Embracing these tools ultimately simplifies your work while providing more accurate and actionable insights.

“AI is taking over”

AI isn’t here to replace engineers, but it can empower them. By automating time-consuming tasks like data analysis and crack detection, AI can help engineers to focus on more complex, high-level work.

This combination of human expertise and AI-driven precision not only quickens project deliverables, but can enhance overall engineering capabilities, without diminishing the need for skilled professionals.

CONCLUSION

The benefits of Digital Engineering

Traditional approaches to asset management are fraught with challenges, from resource shortages to escalating safety risks, all of which necessitate a proactive approach.

The adoption of digital solutions presents a transformative opportunity, but overcoming resistance within the industry requires a concerted effort to communicate the benefits and alleviate concerns among stakeholders.

The benefits of digital transformation for engineers are manifold. From enhanced safety to better sustainability outcomes, the digital environment offers a holistic approach to asset management. Adopting a “turnkey” solution such as Trendspek not only streamlines work, but also improves collaboration across teams.

We’re in an evolution, and it’s time to decide if you’re part of it - or choose to stay behind.

It’s a strategic imperative that positions organisations to thrive in an era defined by technological disruption and evolving client demands.

As engineers navigate this landscape, embracing digital transformation will not only unlock value but also pave the way for a more resilient future.

> **We’re seeing Trendspek written into tenders, policies, and stakeholder maps. We’re helping protect owners and engineers against risks, empowered evidence-based decisions, and better governance. I’m excited to see the positive impact of technology across the industry.**
>
> **DEREK FEEBREY**
> CEO, TRENDSPEK

ARUP Applus SYSTRA BECA infracorr egis

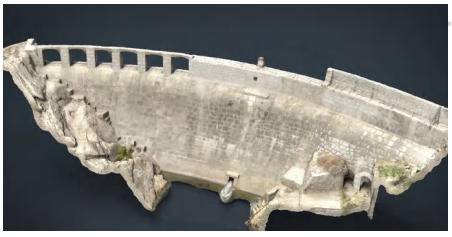
GHD AECOM KBR acciona Sterling WGA SRG GLOBAL

Glossary of terms

Digital Engineering

Using computer visualisations, tools and AI

The process of capturing, creating and monitoring built assets by integrating vast amounts of data with digital tools and software.



Digital Twin

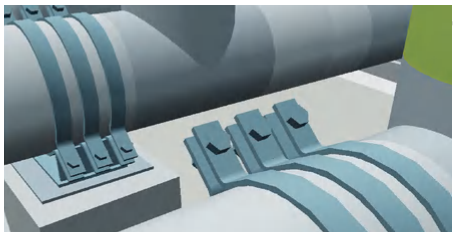
A virtual replica of a physical asset

A digital representation of a physical object, contextualised in a digital version of its environment.
Digital twins help organisations simulate real situations and their outcomes, ultimately allowing improved decision-making.

3D Reality Twin

Purpose-built digital twin for infrastructure

Detailed and interactive 3D replicas of your asset, purpose-built by Trendspek for engineering-grade infrastructure assessments.



BIM

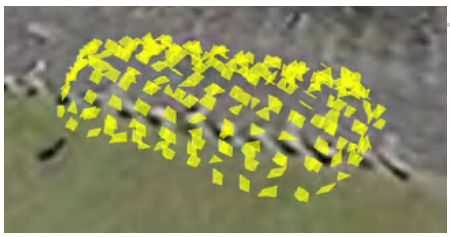
Building Information Modeling

The process that generates digital representations of the physical and functional characteristics of buildings, structures and infrastructure.

LiDAR

Light Detection and Ranging

A remote sensing method that uses light in the form of a pulsed laser to measure ranges. Used in conjunction with Trendspek PRT's to provide lattice detail of ornate structures or surfaces without any markings.



Data Point

Digital constellation of a 3D space

Photos or data are represented as numerical data points and processed into a 3D visualisation of a physical site or asset.

What is Digital Engineering?

6 Benefits and how Digital Engineering can power the O&M lifecycle

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Trendspek

trendspek.com

Australian born, global reach.

Trusted by industry leaders worldwide.

Trendspek is a leading Structural Lifecycle Management System (SLMS) that supports digital inspections, reporting, maintenance planning and condition monitoring of critical infrastructure and built assets.

2024 PROPTECH AWARDS WINNER ASSET & FACILITIES MANAGEMENT PROPTECH