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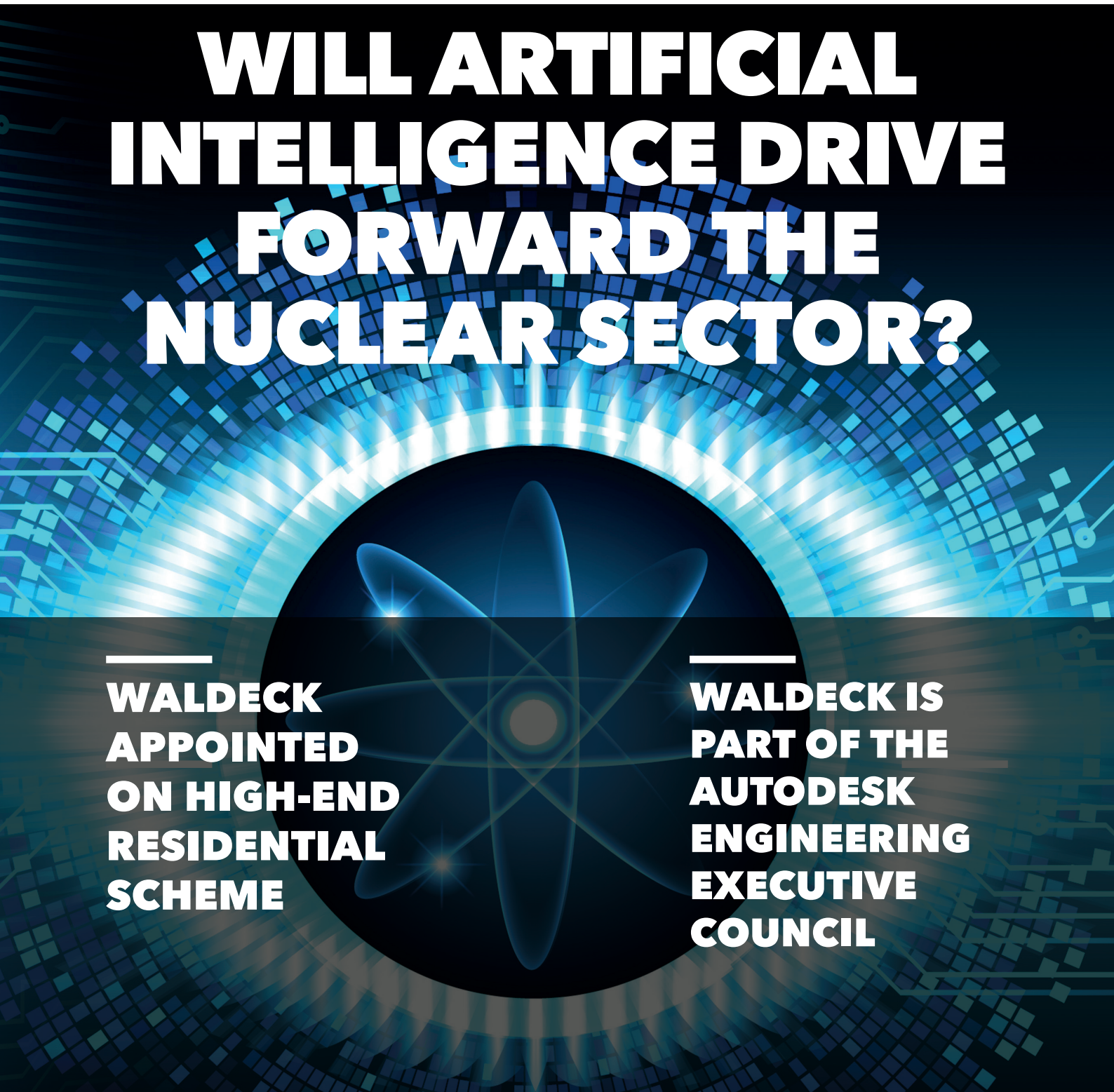
Waldeck
Digital Strategy Consultancy Solutions

INSIGHT

WILL ARTIFICIAL INTELLIGENCE DRIVE FORWARD THE NUCLEAR SECTOR?



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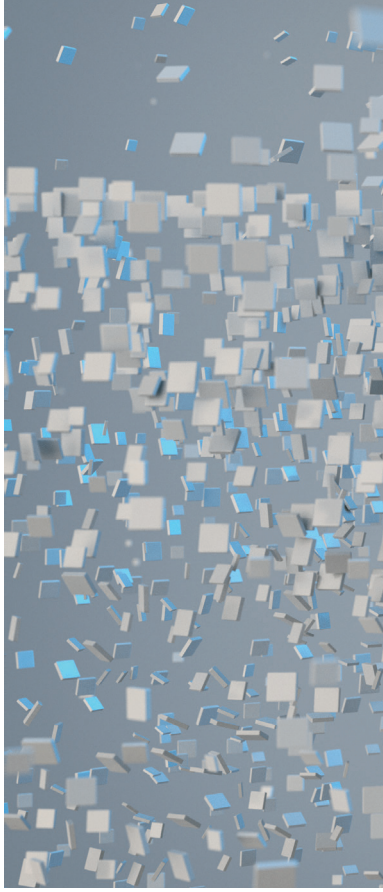


Mark Greatrix, Associate Director and Head of Research and Development at Waldeck, discusses the opportunities that developing technological advances such as Artificial Intelligence offer the nuclear industry.

Artificial intelligence (AI) has been widely recognised as one of the most influential and disruptive technology-based game-changers of our time, with its ability to create simulated intelligence in machines that have the capability to teach themselves and predict outcomes.

These 'machines' have been programmed to mimic human action and rational thought, which is transforming the way we go about our everyday life and even how we do business across the globe.

As Andrew Ng, former chief scientist at Chinese multinational technology company, Baidu, observed: "I have a hard time thinking of an industry we cannot transform with AI."

Year on year, we're also witnessing the evolution and integration of digital technology into domestic and industrial life through the Internet of Things (IoT) – which refers to everyday objects, enabled by the internet to send and receive data. IoT has and continues to disrupt all aspects of life. This includes on a domestic level, with more homes featuring internetenabled objects, through to the industrial level where machine learning and AI advancements see operational assets now communicating their servicing requirements, transmitting operational data for efficiency-based analysis and, in some use cases, automatously navigating their environment.

READIED FOR DISRUPTION

AI has been more defined as a form of non-human intelligence which is then measured on its ability to replicate human mental skills. These skills comprise of understanding natural language, pattern recognition, strategising, case-based and rule-based reasoning, as well as being able to adaptively learn from its own experiences.

As technology progresses, we're starting to see a number of sectors ready for the disruption and transformation to create more efficiency, certainty, reduced cost, improved quality and time in getting assets into operational performance. We believe the nuclear sector represents a stand-out opportunity for a positive digital disruption.

Within our nuclear sector projects and wider construction industry projects alike, we are already seeing the influence that AI and digital technology can have at the very front lines of project delivery to create greater certainty of outcomes through predictive digital tools.

Working in these sectors, Waldeck now leverages machine learning and AI to automate rule-based design and coordination routines, 3D-4D intergrated tool, object and defect recognition as well as pre-planning and automating the flights for our Unmanned Aerial Vehicles (UAV) as they undertake detailed surveying and surveillance tasks.

We now see that incorporating cutting-edge AI technologies is key to supporting the competitiveness of many professions and sectors that are facing a paradigm shift in AI-supported means of working including nuclear, transport, logistics, manufacturing, aerospace, defence and security.

LEVERAGING UAV BENEFITS

Regularly deploying UAVs, Waldeck has leveraged key project benefits, supporting accuracy, efficiency and health and safety improvements. The increased autonomy of UAVs and blended ground-based technologies has provided a step change and has been hugely influential in their utilisation on an industrial scale, and as such are certain to be key enablers to future progressions.

Reducing or better still eliminating human presence in high risk nuclear environments and any area of conflict will be the driver for future unmanned systems deployed within these sectors. These devices will rely heavily on machine learning and AI to strengthen their current operational and data utilisation limitations.

The range of AI solutions which can potentially benefit the nuclear and other heavy sectors are vast, however the latest thinking deploys 'neural networks' which are inspired by the way the biological nervous system in the human brain processes information do stand out as providing almost limitless potential. Neural networks have the ability to extract meaning from imprecise and complex data sources, detecting patterns and trends which go undetected by other computer-based solutions and humans alike, enabling them to simulate projections and determine 'what if' scenarios providing a step change in how AI can be leveraged to support the future of these sectors.

CYBERSECURITY CHALLENGE

The IoT has inevitably presented itself as somewhat of a double-edged sword which has enabled huge innovation based progression, whilst also presenting cybersecurity-based minefields for all those that adopt and integrate IoT technologies, by its very nature allowing more potential for cyber and digital data-based attacks.

With cybersecurity posing huge implications for nuclear and other sensitive and regulated projects, the nuclear energy industry has had a cybersecurity program running since 2002, protecting digital assets and the sensitive information they contain.

Currently, and more importantly moving forward to support IoT adoption, machine learning and AI will be leveraged to supplement the nuclear and those other heavy sector security in both the physical and cyber-based environments whereby this technology will be a key enabler for operational performance and an intuitive analysis tool.

As a business working on nuclear and other heavy projects, we see first-hand the importance of handling and securing digital data, and with the current boom of digital data and the physical world's predicted progression curve for data production, its associated storage and transmission requirements, the markets will leverage AI technology in its native environment, cyberspace to tackle the increasingly sophisticated cyber-attacks which are becoming commonplace in the modern era, facing the ongoing threats of keeping data secure.

UNTAPPED POTENTIAL

Both private and public organisations are certain to be impacted dramatically with revolutionary changes certain to take place over the coming years.

While AI will be more and more commonly leveraged to automate repetitive tasks, simplify tedious manual processes and streamline stressful and expensive tasks, all of which will improve productivity and efficiency across the professions and indeed, inmuerable walks of life.

For the nuclear industry, both at CAPEX and OPEX, there still remains huge untapped potential whereby AI can be utilised to lessen and mitigate risks humans would have traditionally been exposed to, this by far has to be one of the biggest advantages AI can present.

DRONE TECHNOLOGY FOR ROOF AND CLADDING ENVELOPE SURVEYS AND BIM OUTPUTS

When using traditional surveying methods, building and roof inspections can be a difficult, dangerous and expensive task.

There is no longer a need to use expensive scaffolding or hire cherry pickers, Waldeck has the skills and experience to fly our drones over buildings to capture the same information but at a higher accuracy and higher quality.

By replacing traditional methods of surveying with the new, digital solutions, we make roof and cladding inspections faster, safer and much more efficient.

We can also use the data to monitor defects, provide BIM modelas and CAD drawings and automatically generate quantities for costing purposes.

The implementation of drone technology for roof and cladding inspections enables Waldeck to mitigate risk and improve health and safety for our clients, improve operational efficiencies, reduce costs and save time.

THE BENEFITS

Health & Safety Improvement

- Civil Aviation Authority (CAA) approved
- Need for working at height is eliminated
- Our drones include fail-safe systems
- We use flight stabilisation technology management systems

Speed of Capture

- Large areas covered in a fraction of the time
- Quick turnaround of data captured and processed
- Reduced time on site minimising operation downtime

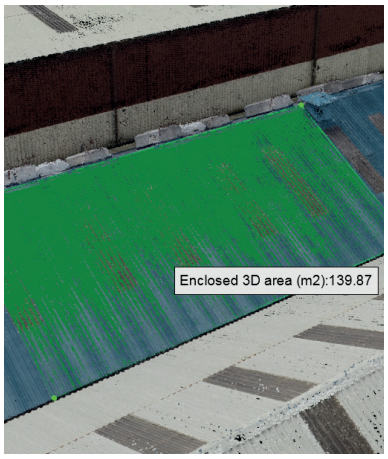
Cost savings of up to 63%

Time savings of up to 68%

SERVICES

REVIEW AND INSPECT

Waldeck's remote drones provide our clients with a cost-effective, high quality solution for aerial surveys. They are equipped with high definition cameras which can capture picture perfect images of roof defects, allowing us to prepare bespoke reporting maintenance schedules.



ESTIMATE AND MEASURE

Waldeck's drones capture high quality images which are then processed and interrogated to measure distances, to find the lengths and heights of cladding, roofing defects, as well as measuring the area of a building to provide an accurate estimate on materials needed.

DATA CAPTURE TO MODEL

Waldeck's drones gather data which is far richer and much more detailed than traditional methods. Utilising our in-house expertise to enable the quick translation of the data captured into detailed 3D models and 2D CAD drawings, if desired for use on anything from; analysis of existing structures, predictive maintenance, re-clads to project monitoring and complaince verification.

WALDECK MAKES THE FINALS OF BRISTOL POST BUSINESS AWARDS

Waldeck was shortlisted for the Innovator of the Year category in the Bristol Post Business Awards.

To gain this nomination, we have demonstrated our commitment to innovation and technology in our business and industry.

Andy Powell, Bristol Business Unit Director, said: "With digital as a key driver in our business, it is an honour to have been selected for the Innovator of the Year category.

"The shortlist is testament to our reputation and importantly, our commitment to research and development in order to continually enhance our offering to clients.

"The Bristol Post Business Awards reflect the hard work and great examples of businesses locally and we are proud to be named among them."

The awards offer an unrivalled opportunity for the business community in Bristol to come together to celebrate the city's best and mores innovative companies.

Winners were announced at the awards dinner on Thursday 21st June at Ashton Gate Stadium in Bristol.

WALDECK IS PART OF THE AUTODESK ENGINEERING EXECUTIVE COUNCIL

Waldeck has joined the Autodesk Mid Markets Engineering Executive Council, which met for the first time in June, as part of the Autodesk University event in London.

The Council, set up by Autodesk, is for senior leaders and executives in multi discipline, structural, MEP engineering and design and build contracting companies, which aims to work together to innovate around the next generation of business challenges, innovations and trends that are impacting our industry.

Mark Greatrix, Associate Director, said: "It's great to have been given this invaluable opportunity, to not only share our knowledge and best practice with other recognised industry experts and specialists but also learn from Autodesk and its strategic direction in shaping the future of digital technology."

The Council will meet twice a year and will work collaboratively to solve common business challenges that hinder advancement of the AEC industry.

On behalf of Waldeck, Mark Greatrix has joined the invitation-only Leadership Forum, organised by Autodesk.

THE FUTURE OF MAKING THINGS HAPPEN

The annual Autodesk University Conference celebrates 'The Future of Making Things Happen'.

Each year, the event offers a chance to connect with the best in the business, share technical knowledge, solve unique business challenges, and gain a deeper understanding of cross-industry opportunities, and we did just that.

We heard from Autodesk CEO, Andrew Anagnost, who discussed how the convergence of manufacturing, construction and production industries with automation technologies like AI and robotics is redefining the future of making things.

Here's what else we learnt:

Automation is key

We saw a positive picture of the automation's coming impact on the construction industry, and we need to adapt and evolve with these new ways of working.

Once again, automation isn't and shouldn't be about taking the jobs away, it is creating and will continue to create new jobs and new types of jobs.

There is going to be 10 billion people by 2050, that is 2 billion more than there is today and our infrastructure is already struggling.

It's simple, without automation there just isn't enough capacity to keep up with requirements, so we need to embrace automation to overcome the current and future challenges we will face.

Future requirements for infrastructure to suit demand means that 'More is Inevitable'.

With the shortage in current capacity, we need to develop solutions to do 'More, Better and For Less'.

Understanding the gap

During the leadership forum David Coulthard, ex F1 Racing driver, delivered a keynote speech on how the world of Formula One has had to strive and deliver efficiencies to compete at the very pinnacle of racing. David went on to deliver a very concrete discussion on how the construction industry needs to become more innovative, focussing heavily on collaboration and building outstanding teams of people.

Understanding how to exploit the knowledge, skills and capability gaps will be key to succeeding in what will become an extremely competitive market where everyone will be required to do 'More, Better and For Less'.

Have an open mind

As we look to re-imagine our industry, this isn't something we can do by drawing upon experience, we need to tackle this with an open mind and an open house approach, working collaboratively with different experts to force the shift from a traditional industry a much more digitally focussed one.

DIGITAL IS THE FUTURE!

CASE STUDY: DIGITAL CAPTURE SURVEY

Project Overview

Waldeck's Digital Capture team were commissioned to carry out an aerial survey and from this produce a surface model of the terrain to create a topographical survey.

Services provided by Waldeck

To provide a true representation of the target areas on site, our Digital Capture team used a DJI Phantom 4 Pro Unmanned Aerial Vehicle (UAV), alongside the Leica Viva GS08 plus Global Navigation System (GNSS) to ensure a comprehensive capture. By combining the aerial survey data and the GNSS data to produce a coordinated point cloud, we were able to establish the fundamental geometry of the site.

Challenges

The biggest challenge faced on this project was the site itself as the output we were looking to achieve was a topographical survey on the ground. However, due to the nature of the site being used for the storage of new cars and vans, a large majority of the ground was occluded. The high quality data captured and our excellent knowledge of the software enabled all cars and vans to be eliminated from the point cloud leaving the relevant points, which were of high importance to us, in order to produce the required output.

Another challenge encountered was within one of the flights we were carrying out to capture the data. The site is located close to the coastline, where winds were a lot stronger causing the UAV to fly against the elements. However, even though the winds were strong they were within our operational limits and the UAV successfully captured high quality data that was able to be used from flights at a height of 50m.

Innovations

Once the GNSS data and aerial data had all been processed to form a point cloud and the vehicles removed to leave just the natural geography of the site, the Digital Capture team used the 3D data to create an accurate and geo-coordinated surface using Autodesk Civil 3D. The surface created was intelligent and enabled us to extract information such as contour levels and also spot elevation levels directly from the surface itself. As well as extracting this information, we were also able to outline the key features on the site in order to give the client a more accurate interpretation of where the data relates to within their site.

Using aerial data and GNSS data capture methodology has allowed the Digital Capture team to capture the entire site as required by the client. Utilising the UAV on this project provided a fast and efficient capture of the entire site, completing the flights area, 323,550m2 in 1 hour 27 minutes.

Automotive Client
Third Floor Administration Refurb

Waldeck has been appointed by their long-standing automotive client to support them with the third floor administration building office refurbishment.

Our scope of services includes; technical support throughout the tender period relating to the internal fit-out work and MEP design to successful appointment of the main Contractor. The works will be phased with Waldeck remaining client side to carry out detailed snagging inspections ahead of key project handovers.

Buckingham Group
Hornsey Depot Extension

Waldeck has been appointed by Buckingham Group to provide structural engineering and architectural design services for a large extension on the existing building at Hornsey Depot.

The project involves the extension of the existing building using a new structural steel framed single bay extension with reinforced concrete pit to house new wheel drop equipment.

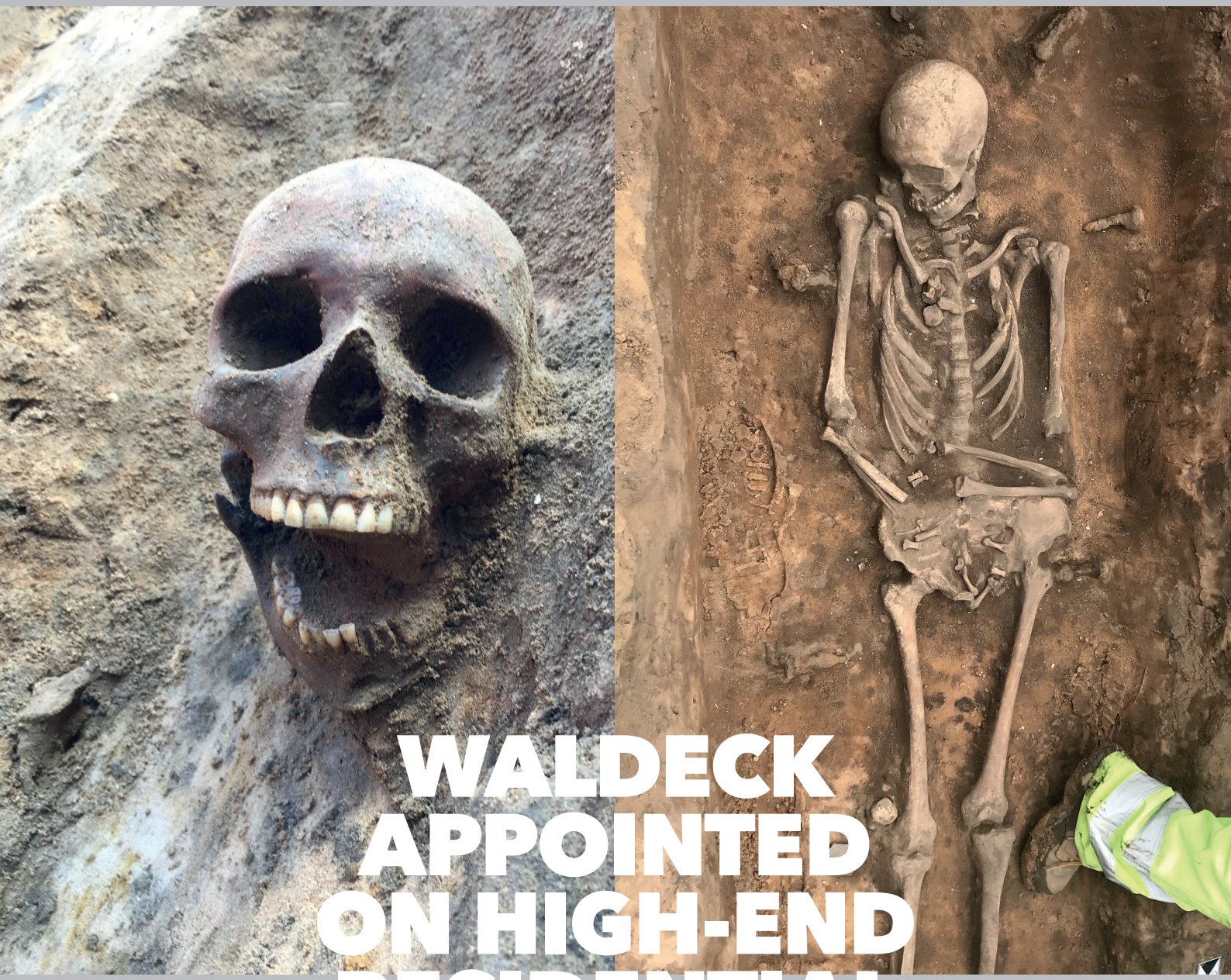
The extension will be clad and roofed to match with the existing external train doors reused in new openings at the end of the new extension with a new bi-folding door to maintenance entrance.

The existing maintenance access gantries will be adapted and extended to enable servicing to the train carriage roofs.

Cross Keys Homes
Mechanical and Electrical Projects

Waldeck has been appointed on two Cross Keys Homes projects delivering mechanical and electrical services, across two sites in Peterborough.

The first project is to conduct a mechanical and electrical condition survey of their head office and a planned refurbishment schedule. With the second project consisting of an options appraisal for replacement heating systems.



WALDECK APPOINTED ON HIGH-END RESIDENTIAL SCHEME

Waldeck has been appointed by Jackson and Jackson Developments Ltd to provide Structural Advisory Services on the 'Viking House' redevelopment project in Lincoln.

Given the green light by the City of Lincoln Council, the plans are to introduce a further 272 student bedrooms as part of the development. The developer aims to meet some of the demand generated by the University of Lincoln's ambitious expansion plans, which is anticipated to see the population of the University's Brayford Campus increase by more than 3,300 students in the next seven years.

Left: Some interesting finds found during the archaelogy works on site at Viking House

Below: Artists impression of the residential scheme

The University of Lincoln has fully supported the proposal of the development, which aims to make a significant improvement to the entrance of the city.

As we see the site developing, some interesting finds were discovered through the archaeology works, the team on site managed to avoid significant delay through open communications with the Councils and use of Archaeologists with a 'can-do' attitude.

The build programme, which is being delivered by local construction company LGG Projects, is expected to reach completion by September 2019.

"The team on site avoided significant delay through open communications with the Councils and use of Archaeologists with a can-do attitude."

SHEFFIELD BASED ENGINEER RECEIVES LIGHTMONGERS AWARD

Rachel Shaw, Senior Electrical and Lighting Design Engineer at Waldeck, has been awarded 'The Lightmongers Award' by The Worshipful Company of Lightmongers.

The award is for Rachel's outstanding achievement on the University College London (UCL) Masters in Light and Lighting course.

Interviewed by four members of the Lightmongers Education Committee, Rachel presented her dissertation findings on; 'Are current daylight recommendations, based upon Climate Based Daylight Modelling, providing the users' daylight needs for teaching and learning spaces in new schools', whilst also delivering a business case for further industry research.

Delighted to win the award, Rachel said: "I completed my Masters' degree last year, gaining an overall distinction, but I never thought I'd be up for 'best individual student', let alone win it.

"I am so grateful that Waldeck value individual development and have given me the opportunity to further my knowledge and expertise in lighting design."

Andy Inkson, Sheffield Business Unit Director, said: "Rachel is an extremely valuable member of the Mechanical and Electrical team in Sheffield and this award is testament to the hard work and dedication she puts into her personal development, which overall enhances the service we offer to our clients."

Rachel was presented with the award at the Lightmongers Court Dinner in London on 9th May.

UNIVERSITY OF LINCOLN

WALDECK JOIN UNIVERSITY OF LINCOLN INDUSTRIAL DIGITALISATION STEERING GROUP

Mark Greatrix, Associate Director at Waldeck has joined the steering group of an 'Industrial Digitalisation Project', which aims to identify and close skills gaps in digital literacy across a variety of employment sectors.

Mark, who spoke at the launch event in May, has joined the steering group led by the University of Lincoln, to share our expert domain knowledge in the field of digital in the face of a significant skills gap in our industry and across other industries.

Kicking off the project was the first steering group meeting held on 7th June, which comprised of industry leaders from a variety of companies, including; Siemens, Anglian Water, United Lincolnshire Hospitals, Teledyne e2v and Micrometric

Mark Greatrix, Associate Director and Head of Research and Development, said: "It's so important to plan for the future and with digital and technology at the forefront, we need to align this across all industries.

"Through this project, we aim to equip engineers and workers with the cutting-edge digital skills that can drive forward a digital and technology-enhanced workforce and it's great to see so many leaders across a variety of sectors come together to help and support the University of Lincoln achieve this."

The next steering group will take place in July.

BRISTOL TEAM TAKE ON COLLIERS INTERNATIONAL TRYATHLON

Staff from our Bristol office took part in the Colliers International TRYathlon on Friday 1st June.

Relaying their way around the route as a team were Andy Powell, Bristol Business Unit Director, Andy Konkol, BIM Coordinator and Nicol Georgoupolou, Graduate Engineer.

Will Cartwright, Senior Structural Engineer and Ed Wells, Senior Engineering BIM Technician took part in the swim, cycle and run individually, both coming out in the top 10 overall.

Charlotte Watson, member of the Employee Engagement committee, said: "As a business, we show strong commitment to our Corporate Social Responsibility, not only through events like this, but also through the engagement with local schools, colleges and universities, investing in our people and environmental impact."

The team were joined by over 200 other professionals from a variety of companies and industries.

For 2018, TRYathlon partenerd with The Gurkha Welfare Trust. GWT's mission is to ensure Gurkha veterans in Nepal are able to live their lives with dignity, by providing financial, medical and community aid.

Often the question 'what is sustanability?' is asked. There is general confusion of what constitutes sustainable design; is it an environmental necessity or a tick box exercise when using BREEAM?

As a result, people will feel it is either:

- **Too theoretical**
- **Very costly**
- **'A dark art'**
- **An add and subtraction equation rather than integrated design**

As stated by Patrick Cescau, CEO of Unilever: "The agenda of sustainability and corporate responsibility is not only central to business strategy but will increasingly become a critical driver of business growth."

Commenting on this, Mark Allen, Principal Architect at Waldeck, discusses sustainability and sustainable design and the future trends that we will see drive the industry forward.

What is sustainability?

In 1988, sustainability was defined as:
"Development which meets the present without compromising the ability of future generations to meet their own needs"

If we simplify this statement, we see that it actually defines the people, the planet and the profit, which is much easily translated into most business acumens.

For instance; how do we protect people and improve our daily environments, whilst protecting the planet and maximising profitability? After all profit is the driver of a successful business, it's what is needed to enable businesses to reinvest, and invest in the future of the world we live in.

Why is it paramount we look at sustainability?

The sustainability agenda has been developing since the 1990's and involves a broad range of issues that affect the way a business operates — from pollution and climate change to education, poverty, health and human rights.

We see businesses who are operating sustainably, recognise that social, environmental, economic and ethical factors affecting the core business strategies, whilst also understanding that meeting the agenda requires working collaboratively with all stakeholders — from suppliers and clients to employees, shareholders and government bodies.

With this said, any value in sustainability and corporate responsibility is key to showing thought leadership in the industry.

Sustainability in Design: How do we add value to our clients?

How do we add value to our clients? - A question that all businesses ask themselves.

We appreciate that no 'one size fits all' when looking at the bigger picture, but our clients are the same, although they each have different views, requirements and will also be at different points on their journey of sustainability.

It's not a case of being in front or behind the curve, trend setting or trend following. That said there are a number of key sustainable developments we need to address to provide future value.

a. Energy Performance

In the era of a climate change, energy performance is crucial to defining a buildings success.

THINK PIECE: SUSTAINABILITY AND HOW DO WE DEFINE IT?

According to the United Nations Environment Programme, buildings account for nearly half of the world's energy expenditures, 40% of greenhouse gas emissions, 25% of the earth's potable water, and, in developed countries, over 20% of all solid waste generated (including food waste, yard waste and unrecycled materials). Current studies by the RIBA have shown energy usage can be up to 300% over original predicted design energy. It is therefore paramount our designs are close to an accurate prediction.

b. Specialist in Renovation

The main challenge currently facing the construction industry is what to do with the current building stock; 80% of the current building stock will be in existence in another 100 years and only 1% of existing buildings are demolished each year.

We see the Energy Performance Building Directive (EPBD) due to be revised yet again, given its 3 year rolling program, mandating renovation and refurbishment, setting out the need to become specialists in renovation, which comes with its own skill set from building survey, moisture analysis through WUFI.

c. Health and Wellbeing

Whilst we should never claim our buildings improve health, because of limited experimental data, this is becoming more and more pronounced with the WELL standard, multi-comfort standard and alignment with BREEAM.

As an example, in the UK we spend 90% of our time in a vehicle or buildings and according to the World Health Organisation, we have the highest asthma cases in any developed world country, therefore suggesting an ever growing need to assess the metrics we use for buildings environments and basic building regulation compliance, to improve health across the industry.

Conclusion

Whilst designers have focussed heavily on the external realm to buildings relationship as part of the architectural course studies, the impact of building fabric design on end users has been overlooked. Distinct reliance on merely complying with building regulations has become the cost effective solution in the industry without meeting end user benefits.

There are studies to show the impact sustainable design has on buildings in a real life environment:

- **Optimised classrooms design can provide increased pupil accomplishment**
- **Hospitals with larger windows and views out have enables bed turn around to be quicker on the basis of improved recoverability of the patients**
- **Optimised office buildings have shown to improve productivity of employees as noted by Deloitte and JLL**

When we, the designers, consider the holistic impacts of a building, it becomes clear that sustainable architecture and design is of the utmost importance. Green buildings benefit everyone – not just those that live or work within the building, but also the community, the economy, the planet, and can benefit business to reinvest in better environments.

Consequently, it is crucial to keep ahead of the game, making it important to continually think about the next 'big idea' and how it can be integrated into our clients' current business models.

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