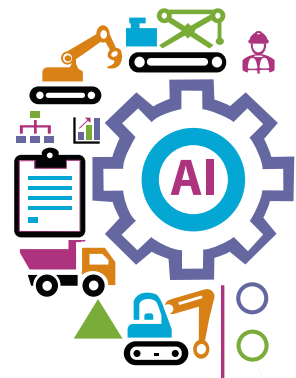




Artificial Intelligence in UK Construction

A Civil Engineering Contractors Association report

May 2025



Executive Summary

- Artificial Intelligence has the potential to set UK construction on its next major leap in terms of performance, automating and streamlining aspects of project development.
- This revolution is already happening, with AI tools starting to make their way into use in businesses - wittingly or unwittingly - across the sector.
- Key benefits that may arise from the use of AI include optimisation of design, identification of errors, faster and better decision-making, and improved commercial management. AI can also unlock better health and safety performance.
- This implementation can drive benefits, but consideration must also be given to how this might create new risks for construction companies. These risks include reduced privacy, overdependence on AI tools, cyber security concerns, ethical issues and the loss of intellectual property.
- The UK does not currently have direct legislation specific to AI, but existing legislation must be considered by businesses using AI.

Recommendations

CECA has made the following recommendations in relation to the use of AI by UK construction:

MANAGING RISK

- Recommendation 1** – Promote the use of existing standards for the adoption of AI.
- Recommendation 2** – Consider the development of a specific review of risks associated with the use of AI in construction.
- Recommendation 3** – Consider opportunities to develop confidential reporting system for AI risk in construction.

CROSS-INDUSTRY COLLABORATION

- Recommendation 4** – Support existing sector activities relating to AI.
- Recommendation 5** – Support or develop a construction sector AI community.
- Recommendation 6** – Develop construction AI implementation plan.

TRAINING

- Recommendation 7** – Signpost existing training.
- Recommendation 8** – Development of role-specific training.
- Recommendation 9** – AI security and ethics training.
- Recommendation 10** – Inclusion in professional development.



Introduction

The history of the construction industry is starred with moments when technology allowed the sector to take great leaps forward.

From the first use of concrete by the ancient Greeks, to the development of Computer Aided Design in the 20th century, new technology has unlocked new ways of delivering buildings and structures that are cheaper, faster to build and more resilient.

Today the industry may be limbering up for its next leap. Already wider society is flirting with the use of artificial intelligence, whether knowingly through Large Language Models such as ChatGPT, or with less awareness as AI's unseen hand guides software and business processes across the economy.

Construction businesses face the same permeation of AI into their activities. Leading technology and software companies serving the sector already promote the ways in which AI and machine learning are helping them to provide better services to their customers. Along with counterparts around the globe, the UK Government is supporting and promoting the use of AI for construction, trying to push the country to the front of this new industrial revolution.

CECA members are using AI to deliver outstanding results for their customers. Sites are monitored with AI poring over camera images to recognise and track plant and material movements in real time. Elsewhere, bots are crunching through social media on the lookout for comments to get a better

understanding of how roadworks are affecting users via their posts. Meanwhile algorithms are being wielded to grasp complex GIS data, informing better design before projects even get to site.

But do we know what we are jumping into? The obvious benefits that AI might bring must be weighed against concerns about what lurks as we head into the unknown. Will AI respect long-held intellectual property rights? Might it force large numbers of our valued workforce out of a job? And can we trust decisions on how to build vital infrastructure to a machine, particularly if we don't fully understand how those decisions are being made?

This report seeks to understand the potential role that AI can play for our industry. We examine the ways that it may change the jobs of those working in the sector, for good or ill. We will highlight and use cases from across a wide range of roles in the sector. And we will draw this together to make recommendations about how industry can best harness AI to secure better outcomes for customers, and a better future for the sector.

To do so we will explore AI in the context of six role categories:

- **Project planning & design**
- **Management**
- **Commercial**
- **Delivery**
- **Support services**



2. Benefits of AI in Construction

In this section we outline some of the benefits that might arise where AI is incorporated into the activities of the key role categories in the industry.

Project planning & design

» Design optimisation

Access to large datasets from existing assets and their performance opens the potential to allow generative AI to produce thousands of design options for a new structure, and to carry out an assessment of which is the best solution, and proposing further options to further improve it.

» Automation

Projects are rarely fixed throughout their development lifecycle. Where customer or regulatory requirements change during the design period, AI can be used to rapidly update the digital model, adjusting it to meet new demands while ensuring that any new solution still meets the wider brief.

» Error detection

Like any business process, there is a risk that errors are introduced to designs, whether by a human or digital hand. Through access to standards, codes, and information about errors on previous projects, AI can review designs and identify errors and/or areas where errors are more likely to arise.

» Community engagement

Securing support and consent from communities is an increasingly important element of the process for new construction projects. AI can help review and summarise large datasets of community feedback, while also sampling social media for sentiment about a project.

» Simulation & visualisation

AI tools can be used to rapidly develop 4D visualisations of proposed projects, allowing customers and stakeholders to explore structures while they are still on the drawing board, while also allowing site teams to understand what they will build and how the scheme will progress. While such visualisation is already available, AI will open up options to make amendments in real time, helping to bed any decisions on changes in reality.

Management

» Decision making

Leaders of construction businesses will be asked on a near day-to-day basis to make decisions that will have significant and long-term implications for the company. While the ultimate responsibility for these decisions will always rest with the leader in question, AI can support this process by analysing and processing complex information on the issue, helping to guide the leader towards a better understanding through which to make this decision.

» Business process improvement

There is a significant opportunity to drive more efficient processes in businesses through AI. Process automation can review data from a company's existing operations to both optimise workflows and automate some back office tasks.

» Project planning & scheduling

AI can analyse and assess all of the complex inputs, constraints and resource requirements for a project and use this data, along with historic data from previous projects, to develop an optimised schedule



for delivery. Such schedules can also understand and flag up any likely risk hotspots within the programme

» **Health, safety and environment**

AI can support health, safety and environmental compliance by aggregating and assessing data from all of the company's operations, reporting on risks and non-compliances to allow prompt action to remedy any concerns. This can further be supported by live camera data from fixed and drone camera platforms.

Commercial

» **Cost forecasting**

AI-enabled software is already unlocking better cost management and forecasting for UK construction companies. These providers can draw from large historic cost datasets, and incoming data from new projects, to accurately model current and forecast costs in real time. Dashboards can provide commercial teams with readily understandable insights into cost performance.

» **Estimating**

At tender stage, the same cost estimation capability can be used to build accurate estimates for inclusion as part of tenders for new work. AI can analyse designs to prepare breakdowns of inputs, while also identifying drivers of potential cost variance.

» **Contract management**

Construction contracts are often complex, with clients and suppliers typically amending standard forms to meet their own requirements. AI can be used to read these contracts and provide insight to companies about potential risks, as well as guiding on how the contract can be managed through the

life of the project, using actual data from site to automatically notify of an event that is relevant to the contract.

» **Supply chain management**

A typical construction project may have hundreds or even thousands of suppliers working on it. AI can help construction companies to understand this often complex ecosystem, crunching large amounts of data and highlighting relationships between suppliers to ensure that the company has access to the right supplier capacity and competence at the right price when it is needed.

» **Automation**

We are seeing rapid progress on efforts to bring greater automation to the fleet of plant and equipment used by the UK construction sector. In the future, AI will be able to review project designs and create delivery schedules that can be built using automated plant.

» **Safety monitoring**

Through site-based cameras and wearable technology, it will be possible to monitor the workforce across even very large construction sites. AI can capture and analyse this data, intelligently flagging up poor health and safety behaviours, while also highlighting potential risks to workers.

» **Telematics diagnosis**

Much of the construction plant in use by the construction sector already includes telematics to provide insight on the way that each piece of kit is performing. Adding AI into the mix will allow identification of issues that will allow predictive maintenance before a problem arises, as well as optimisation of plant movements to reduce fuel use.



» **Work simulation**

As noted previously, AI-enabled visualisation tools will allow workers to build a structure in the virtual world first, helping to better understand the construction process and iron out any potential barriers to delivery before a foot has been set on site.

Support services

» **Compliance**

All businesses have a legal obligation to follow relevant legislation and regulation. They may also have made contractual commitments to clients and signed up to standards set by accreditation bodies. Ensuring compliance with the requirements that flow from these commitments can be a significant task. AI offers the opportunity to hand over some of the responsibility for monitoring and reporting to automated systems.

» **Market analysis**

As part of construction companies' business development and work-winning activity, it is essential to have a clear understanding of future opportunities, customer drivers, and the nature of the market that you are competing in. AI can analyse public and private market data sources to identify emerging markets, potential risks to avoid, predict future demand, and suggest areas for expansion or investment.

» **Customer relationship management**

Most UK construction businesses of any significant size will already use forms of Customer Relationship Management software to help them keep tabs on the businesses that they work for, as well as key stakeholders. But AI provides the opportunity to accelerate this, digging deep into the data to offer insights about each organisation, as well as tailored personalisation for engagement with individuals.

» **Bid preparation**

The preparation of bids for new work can be a labour-intensive activity for many companies. As such, one area where we are already seeing adoption of AI tools in construction is in support of bid writing. While concerns are already emerging about the ethics of such use, we anticipate that this use will only grow, with systems that analyse customers bid documents

and wider policies to craft optimised bid submissions. By inputting the bidders own company information, standard forms will be completed at the click of a finger, allowing bid writers to focus on adding value to the final submission.

» **Recruitment**

AI will be used as a tool by recruitment teams at companies to interrogate huge volumes of potential employee data to identify potential talent in ways that are more intelligent than current candidate-screening approaches. By taking the human out of some of these processes, there is also an opportunity to limit the risk of unconscious bias in recruitment. AI may even be engaged in early interviews to pre-screen promising candidates down to a shortlist for face-to-face interview.

» **Staff development**

The role of AI for the workforce doesn't stop at recruitment. AI can also play an important role in learning and development for employees, both keeping track of their personal development and qualifications, while also designing training plans that are tailored to the individual's career needs.

In March 2025, 85.6% of UK construction businesses reported they did not currently use AI, compared to almost 75% of businesses in other sectors. However, adoption is increasing: 90.1% of construction businesses reported they did not use AI twelve months previously.¹

1. Office for National Statistics, <https://www.ons.gov.uk/economy/economicoutputandproductivity/output/datasets/businessinsightsandimpactontheeconomy>.

3. Risks & Challenges of Implementing AI

» Individual privacy

AI systems rely upon access to large data sets, that could include structural blueprints, cost models, contract documents, or workforce information. Where such data is being pored over by a machine, there is a risk that personal or sensitive information may be included as part of the dataset. While a human operator might recognise the sensitivity of such content, AI will only do so if it has been specifically programmed as such. This creates a risk that the outputs from the AI may disclose information that should remain confidential.

Privacy-enhancing technologies can help to strip out such information, as can front-end efforts to remove private data before use.

There are also concerns around how consent for the use of data in AI models is achieved. The power dynamic between employers and employees means that staff members may not feel that they can decline permission for their data to be used in an AI model.

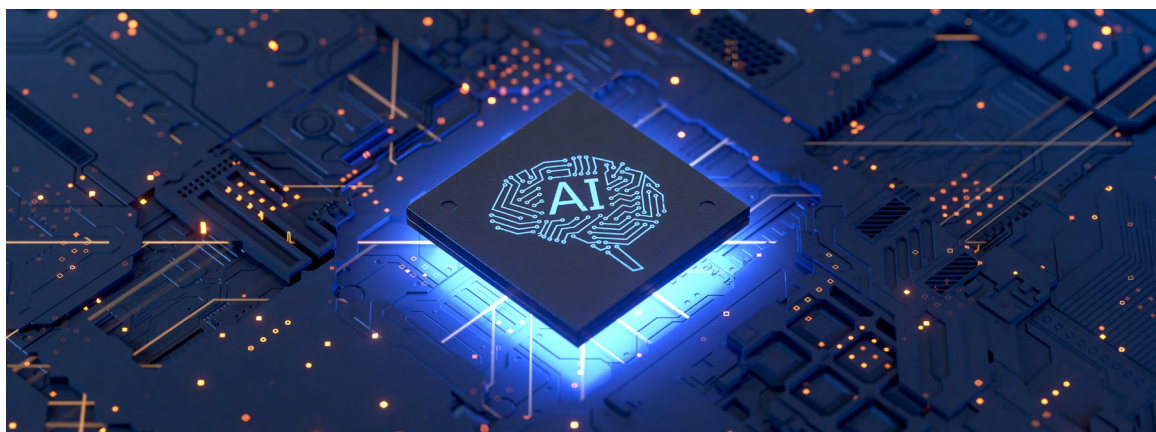
Where personal data is used, employers should make extra efforts to help their workforce to understand how it will be used and protected, and offer genuine 'no blame' opt-outs

» Cybersecurity

Businesses should have existing strategies to address risks of bad actors undermining the security of digital tools that they use, such as viruses and phishing attacks.

However AI potentially extends these risks into new areas. On top of typical cyber risks, businesses should be aware of the potential for:

- Data poisoning, whereby datasets used to train AI models are infiltrated and changed to drive negative outcomes. Data poisoning can be mitigated by full encryption and validation of any data that is used to avoid external amendments. Close control should also be applied to the data being used, with only a small number of trusted users allowed to access the dataset. While open source data can be an important tool for AI models, such information is susceptible to poisoning, and should therefore be treated with appropriate caution.
- This is a severe risk where AI is being used for safety-critical activities such as structural design, and health & safety monitoring. Data poisoning of models in such cases could lead to fatal risks for your workforce or end-users.
- Prompt injection sees an AI model receive an unauthorised prompt from a third party attacker that causes it to follow the attacker's (potentially malicious) instructions.
- Model inversion attacks are another cyber threat. Here the attacker creates its own AI model that seeks to predict the data that a model was trained on, based on the outcomes it produces. If confidential information was used to feed your AI model, this presents a threat that such information might be uncovered through this approach.
- Internet of Things (IoT) vulnerabilities arise where the sensors that are used to gather data to feed an AI model are compromised. This is a particular risk as each individual sensor may be hard to protect, given the need for them to be widely distributed across a structure or building.



» **Dependence on Technology**

Prior to the ready availability of AI and machine learning, the construction industry's activities and processes were underpinned by the knowledge and experience of individuals. While not infallible, such human involvement ensured that decision-making was based on real-world understanding of standards, codes and policies.

The use of AI to automate some of these processes potentially removes the human from decision-making.

This breeds a risk of over-reliance on AI. This is challenging both because it potentially leads to a gradual undermining of the industry's knowledge of its own processes, and also because it potentially removes the vital safeguards that are provided where human insight understands the system being used and therefore can recognise where it is at risk of failure. We are already seeing examples of so-called 'hallucination' by AI models whereby failings in their training mean that they prepare false outputs that are presented as fact

As such, validation is an essential element of any use of AI. This reinstates the human into the process, confirming that the outputs of any AI model are accurate, trustworthy and robust.

» **Workforce Displacement**

Perhaps the most frequently cited general concern for the public about the growing use of AI is the idea that AI will outcompete workers for jobs, leading to rising unemployment in the sector. As construction employs around 2 million people in the UK, this presents a challenge not only to each individual affected, but also to the economy as a whole.

For employers, this risk should be part of their thinking wherever AI is adopted within their business. Effort should be made to understand whether the technology will support workers, augmenting their capabilities to deliver more productively, or if it will replace human effort.

Employees should be informed and consulted about the use of AI, and where necessary provided with support to transition to new roles where existing activities are automated.

» **Cost**

While there are a huge range of new AI-powered tools that are emerging to support the construction and built environment sector, few if any of these are being developed on the basis of altruism. There will be a cost associated with implementing AI platforms in most cases, and ultimately this will be borne by users.

This also creates a potential issue of a two-speed construction industry, with small and medium-sized businesses less able to afford access to some AI tools.

» **Data quality**

The old maxim rubbish in, rubbish out can easily be applied to the use of AI tools. Incomplete, biased, wrong or unstructured data can guide AI towards inappropriate outcomes. This will undermine performance and increase distrust of any products of the tools. This issue will increasingly come to the fore, particularly where models start to be built that are founded on data that has itself been generated by other AI models.



» Ethics

The issues relating to the ethical use of AI are wide-ranging and touch upon some of the topics that have already been covered above. It is an area that those leading the development of some of the leading AI models have been keen to highlight, to ensure that the growing adoption of AI is done in a way that is ethical.

The overriding theme is that anyone adopting AI should be considering the ethics of such use. As with any other part of their business, construction companies should live up to their mission and values in the way that they use AI, establishing policies to guide ethical use.

Consideration should be given to whether AI use is ethical, fair, non-discriminatory, trustworthy and justifiable.

» Standardisation

As an emerging technology, the development of AI tools has largely be driven by market forces, with individual organisations creating new products. However this means that there is limited standardisation across the market, meaning that different users may engage with different models, requiring differing approaches and processes.

This potential proliferation of opportunities may driven better outcomes through market forces that identify the best solutions. But it may also create fragmentation in the market with a lack of consistency that undermines the ability of the sector as a whole to harness the benefits of AI.

» Market concentration

The flip side of concerns about a lack of standardisation and resulting fragmentation is the risk that a small number of organisations develop market-leading capabilities in AI that means that the supply of services is concentrated too tightly. This leads to risks of monopoly-type behaviours and an inability of users to benefit from competition between providers. This risk is potentially exacerbated by the high costs of entry to develop AI models for the construction and built environment sector.

» Skills for AI

As an emerging technology, there is very limited knowledge of AI in the UK construction industry workforce, with few industry-specific training opportunities available to address this.

With this knowledge deficit, this is likely to act as a drag on the adoption of AI tools for most businesses, unless they recruit from the limited pool of experts that are available. As with cost, this potentially creates the risk of a haves and have-nots for the sector in terms of grasping the benefits arising from AI.

» Intellectual property

AI tools are reliant on data to train their underlying models. This data can be sourced from many datasets, both public and private. There is concern that the intellectual property of the originators of any data used may be compromised, with the model producing outputs that lean heavily on previous IP without recognising the source.

» Health, safety and wellbeing

UK construction has worked hard to improve the environment for those working in our industry. Yet it remains a sector where the levels of deaths and injuries to workers remain higher than the rest of the UK economy.

In this context, AI offers some opportunities to mitigate this risk. However employers need to be careful that the use of AI does not import new, and potentially unnoticed, risks into the workplace. As regulator, the Health & Safety Executive has started to consider these risks and how they can be mitigated.²

“Validation is an essential element of any use of AI. This reinstates the human into the process, confirming that the outputs of any AI model are accurate, trustworthy and robust.”

2. <https://www.hse.gov.uk/news/hse-ai.htm>

4. Regulation of AI

The UK Government has been broadly supportive of the adoption of artificial intelligence by business and society. In January 2025, it set out its *AI Opportunities Action Plan* that called for the UK to play a leading role in the development of AI.

In particular, the plan called for the UK to push hard on cross-economy adoption of AI, as a developer of AI technology rather than solely importing capabilities from other economies such as the US or China.

It intends to use its soon-to-be-published Industrial Strategy to actively promote AI across the economy, and will appoint sector champions in areas where AI can have the greatest impact. Yet construction is not noted in the Plan, so it seems unlikely that our industry will be the focus of such support.

Currently there is no specific regulation or legislation covering AI. Instead it is regulated via existing legal frameworks.

Key regulations that may impact on construction businesses using AI include:

1. UK General Data Protection Regulation (UK GDPR) & Data Protection Act

These existing acts protect individuals from the unfair use of their personal data, requiring companies using AI to ensure that they have permission to process personal data, with additional requirements in relation to impact assessments for higher risk usage, as well as a requirement to implement safeguards where decision-making is automated.

2. Equality Act 2010

This Act seeks to ensure fairness and the prevention of discrimination, based on protected characteristics. The same protections that it demands for traditional business activities also apply to the use of AI. As such, users of AI tools must ensure that they are not introducing unanticipated bias into their activities. Given the fact that AI tools have already been shown to be susceptible to bias, this must be an important consideration ahead of use. This should involve both assessment of the data used to train the model, and also a human check on any outcomes.

3. Health and Safety at Work Act 1974 (HSWA) & Construction (Design and Management) Regulations 2015 (CDM 2015)

Under the Health and Safety at Work Act an employer must take all reasonably practicable measures to eliminate or mitigate risks associated

with their work activities. This applies to the use of AI tools.

As such, ahead of implementing AI tools, companies should consider what the potential safety ramifications might be. Risks could include an overreliance on AI tools that are supposed to be monitoring safety risks.

We have already see this with some wearable technologies that give a false sense of comfort to users, meaning that they might undertake risky activities on the assumption that the AI has not warned them not to. We also anticipate that, while automated plant and tools may secure significant safety improvements as they remove people from potentially dangerous environments, there is also a risk that – lacking human control – they may move in ways that is unexpected by those nearby.

Under CDM 2015, principal designers and contractors take responsibility for planning, managing and monitoring the health and safety of construction. While AI tools may automate elements of the design and delivery of projects, it does not remove this legal obligation. As such, a human must retain this responsibility and ensure that all aspects of CDM are complied with.

The Health & Safety Executive outlines its approach to AI [here](#).³



3. <https://www.hse.gov.uk/news/hse-ai.htm>

4. UK Copyright, Designs and Patents Act 1988

As noted in previous sections of this report, the protection of intellectual property is recognised as a key risk associated with the use of AI. The UK Copyright, Designs and Patents Act 1988 is the main legal instrument that protects IP, along with the Intellectual Property Act 2014.

Typically AI systems are trained on huge volumes of historic data. Where this data belongs to third parties, a concern arises that the subsequent reuse of this data represents the theft of the original IP. This could either lead to a claim that the subsequent design infringes copyright, or that the initial use of copyright data for training the model was not authorised.

Previous governments began the process of developing a more comprehensive regulatory framework for AI and favoured a context, principle-based approach overseen by individual regulators rather than creating a single regulatory function, and standard legislative rules governing AI.

The new Labour Government is likely to take a different approach. The Labour Party's 2024 manifesto pledged to "ensure the safe development and use of AI models by introducing binding regulation on the handful of companies developing the most powerful AI models". Later in the first King's Speech of the Government, Labour said that it would "establish the appropriate legislation to place requirements on those working to develop the most powerful artificial intelligence models".

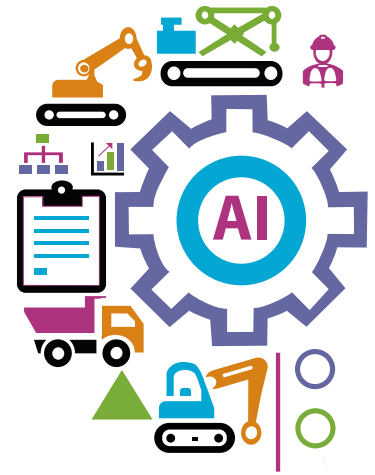
UK activity in the AI space is also governed to some extent by the EU AI Act, which came into force in August 2024, with many of the provisions applying by August 2026.

This act has been described as "the world's first comprehensive AI law" and it takes a risk-based approach to regulating AI. It applies to all AI systems placed on the market or used in the EU, regardless of where the provider, or the AI system, is based. It also covers AI systems outside of the EU (including the UK) where the output produced by the AI system is used in the EU.

In May 2024, the Council of Europe (of which the UK is a member) also adopted the "first-ever international legally binding treaty aimed at ensuring the respect of human rights, the rule of law and democracy legal standards in the use of artificial intelligence (AI) systems." It is principle based and technology neutral.

"AI does not replace the need for human involvement in decision-making and should not lead to the development of over-confidence about the safety that systems provide for workers, leading to a lowering of standards."





5. CECA Recommendations

Having considered the current state of use of AI, we have a number of recommendations that we are seeking industry feedback on. Our recommendations cover three areas – managing risks; cross-industry collaboration; and training.

Managing risk

Recommendation 1 – Promote the use of existing standards for the adoption of AI

Significant work is already underway through the AI Standards Hub, BSi and ISO to develop recognised standards for the use of AI by businesses. Industry should seek to understand and adopt these standards where appropriate.

Recommendation 2 – Consider the development of a specific review of risks associated with the use of AI in construction

Alongside the above universal standards, industry should consider the specific risks associated with the use of AI. This will then support the development of protocols to manage this risk at an industry level.

Recommendation 3 – Consider opportunities to develop confidential reporting system for AI risk in construction

For other risks that have the potential for significant impact, industry has historically collaborated to create confidential reporting systems, allowing those with concerns to highlight them privately. Industry may wish to consider the options for such an approach for AI risks.

Cross-industry collaboration

Recommendation 4 – Support existing sector activities relating to AI

UK construction already has a range of organisations and initiatives that are supporting the rollout of AI technologies, such as Innovate UK’s BridgeAI programme, C Tech Club, and Nima. Industry should promote and support these existing initiatives.

Recommendation 5 – Support or develop a construction sector AI Community

There is appetite to develop a community that focuses on construction companies that are looking to adopt AI technologies. This group can then act as a networking and reference body to support the adoption of AI and provide feedback on issues as they emerge.

Recommendation 6 – Develop construction AI implementation plan

There will be increasing opportunities for industry to collaborate around AI opportunities. As such, it is proposed that industry should develop an AI implementation plan, helping to understand how best to take advantage of this opportunity.

Training

Recommendation 7 – Signposting of existing training

There is a range of training already available to industry including the Hartree Centre’s Discover Digital Transformation programme. Industry should signpost the availability of this more widely.

Recommendation 8 – Development of role-specific training

Currently there is limited industry-specific training that is available in relation to the use of AI in construction. As such, industry should work with training bodies to develop readily accessible industry specific training packages.

Recommendation 9 – AI security and ethics training

Given the risks outlined above, industry should also seek to develop specific training about the risks of the use of AI and how this can be managed.

Recommendation 10 – Inclusion in professional development.

As an emerging technology area, AI should increasingly be considered as part of professional development for industry, and should be included in engineering institutions as part of ongoing development of registered professionals in the sector.

