AI and the New Era of Engineering Innovation

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Contents

Foreword

AI will not replace engineers; it will empower them to reimagine what is possible.

The UK's consultancy and engineering sector stands at an historic inflection point. From tackling climate change to creating resilient communities, our work underpins national prosperity and global progress.

Artificial Intelligence (AI) is now reshaping that mission. It is redefining how engineers think, design, and deliver, turning once-manual processes into intelligent, collaborative systems.

With the right frameworks, leadership, and skills, AI can make the UK the world leader in safe, ethical, efficient, and innovative engineering. ACE's role is to ensure that this transformation enhances the human expertise that defines our profession – delivering for communities and the planet.

Kate Jennings, Chief Executive Officer, ACE
Dr Sarah Prichard, Chair, ACE
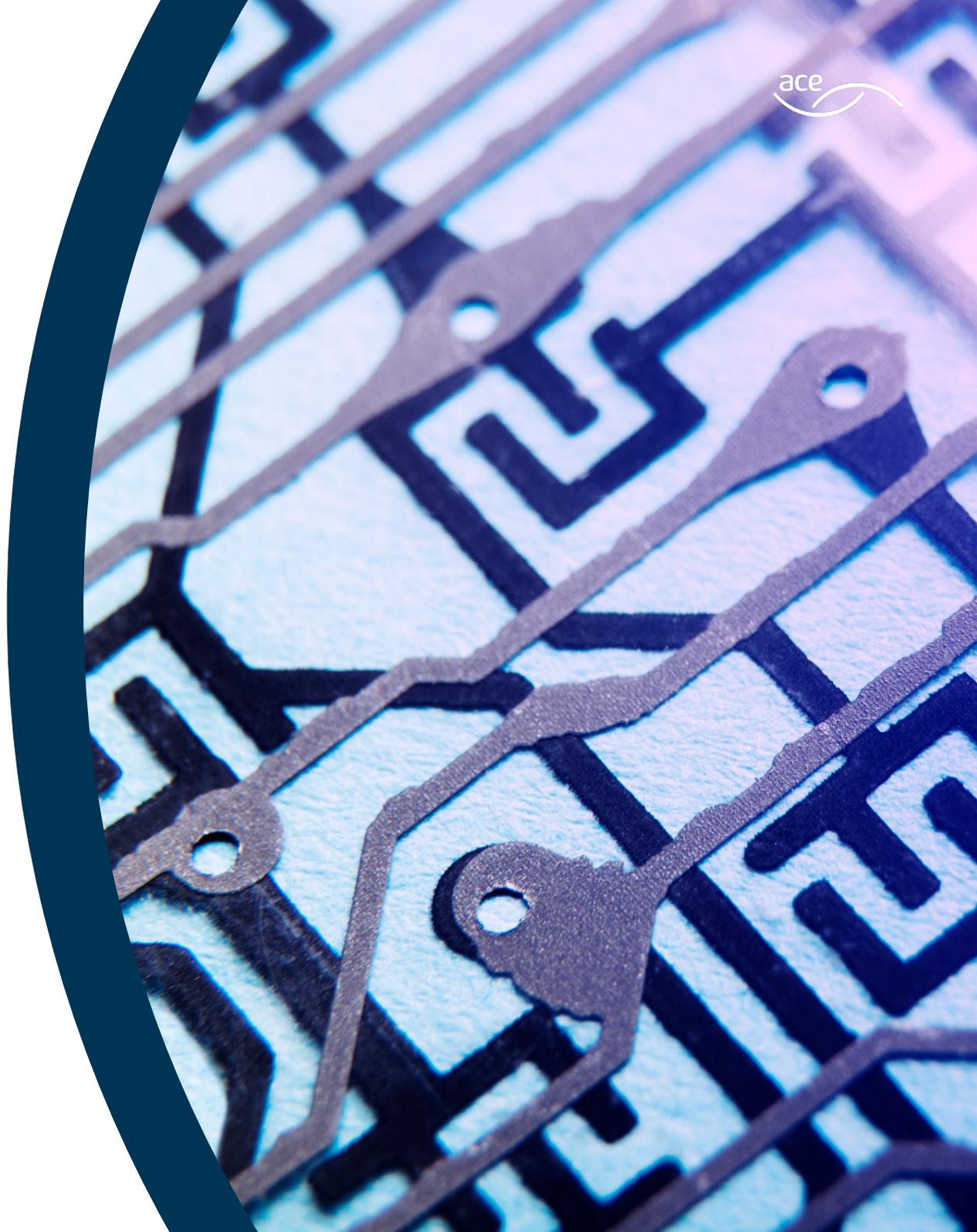
Executive summary

AI is transforming the UK's consultancy and engineering sector, reshaping how projects are conceived, delivered, and managed. This paper explores how AI is driving productivity, evolving workforce skills, and opening new commercial markets, while outlining the policy actions needed to ensure responsible and inclusive adoption.

Key insights

Technology investment in the UK is higher than the global average. 68% of UK business leaders are increasing investment in technology to deliver improved project outcomes. (State of Design & Make 2025, Autodesk (2025)

AI is a productivity multiplier: Generative design, predictive maintenance, and AI-assisted proposal tools are reducing project timelines and improving quality (McKinsey, 2024).

Workforce evolution: Engineers are shifting from manual modelling to strategic oversight, demanding new skills in data interpretation, ethics, and governance (WEF, 2025).

Policy need: National coordination, open data, data quality standards, and reskilling are essential to unlock AI's full potential.

Recommendations at a glance

Recommendations for industry

1. Establish AI leadership and governance structures that can stimulate ethical AI uptake across industry.

2. Create agile pathways for AI tool adoption and experimentation.

3. Invest in workforce training and internal AI champions.

Recommendations for government

1. Develop a National AI in Engineering Strategy in partnership with industry.

2. Reform procurement to enable faster decision making, reward innovation and speed up AI uptake.

3. Embed and expand AI-specific apprenticeships and make engineering a designated profession.

The case for AI in engineering

AI has moved from experimentation to integration across the built environment. Engineering consultancies are now embedding intelligent systems into design, delivery, and decision-making. Common uses now include generative design, predictive maintenance and inspection, AI-assisted proposal development, and knowledge retrieval and project analytics. Standardised and generative design complements and unlocks the benefits from modular construction.

AI is augmenting, not replacing, human expertise. Junior engineers accelerate routine tasks while senior engineers focus on creativity and leadership. The result is a profession that is more productive, strategic and globally relevant.

The Government's *AI Opportunities Action Plan* and *UK Compute Roadmap* highlights funding for applied R&D and demonstrator projects that should be applied to design engineering sector. The action plan seeks to accelerate AI adoption to boost productivity, competitiveness and innovation.

The industry can capitalise on this and collaborate with research partners to develop projects that apply AI to

ACE Affiliate Member spotlight: Beale & Co and Griffiths & Armour

Insurance and legal professionals are considering the risks and opportunities of AI uptake in the industry. AI use in the construction sector is increasing, and government, clients and insurers are now building AI related requirements into tenders, contracts and renewal processes. (Beale & Co 2025; Griffiths & Armour 2025)

design, simulation and optimisation, supporting national goals for growth, resilience and technological leadership.

Businesses are expected to disclose how AI is used, comply with new contractual controls and manage risks linked to confidentiality, data protection, intellectual property, liability and the growing use of agentic AI. Strong human oversight, clear governance and reliable audit trails are essential. A concise, organisation wide AI policy and careful review of client terms are now critical to ensure compliant and safe deployment of AI tools.

AI is not just transforming engineering workflows; it is redefining engineering's purpose and elevating its value to society.

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Productivity transformation: AI in design and delivery

AI is redefining the anatomy of engineering work. Competitive advantage no longer depends on larger teams but on empowering each engineer through intelligent tools.

ACE member spotlight: Arup

36% of architects, engineers, and city planners now use AI daily, while over 80% use it at least weekly - not just for simple chatbot tasks, but for advanced design-work like large-scale simulations, evolutionary algorithms and science-based AI. (Arup global survey 2025)

Fédération Internationale des Ingénieurs-Conseils (FIDIC) and EY recently published a report exploring how AI can transform infrastructure by optimising planning, design, construction and long-term asset management. While engineering firms currently invest between 2% and 10% of their revenue in AI, the report highlights the need for a systems-thinking approach, stronger cross-stakeholder collaboration, and a greater willingness to invest if the infrastructure sector is to fully realise AI's potential.

Consultants and engineers who once iterated models manually are now employing AI-assisted generative systems capable of producing hundreds of validated options within minutes. Test and validation engineers use predictive simulation models to detect design flaws before prototypes exist.

ACE members are utilising AI across many projects to drive efficiency and maximise those productivity gains.

AI-driven process automation can boost productivity by 20–40%, reduce project overruns by up to 25%, and halve product development cycles. (McKinsey 2024)

Case study:

AECOM AI flood image analysis

Service: Data Science & Analytics
Market: Water

Overview

AECOM developed AI solutions to extract data from previously unusable flood imagery, enhancing historic flood models and supporting future environmental management. These award-winning projects were recognised by The Times and won the NCE Techfest 2022 Award for Best Use of Technology: Artificial Intelligence.

Solutions

Two AI proof-of-concepts automated the geolocation of flood images without GPS data and detected flood boundaries from oblique aerial photos. Using modular AI techniques—including object detection, OCR, NLP, clustering, Bayesian optimization, and geocoding—the system successfully located 15% of images directly and narrowed the search area by 90% for others.

Impact

− Reduced manual analysis by up to 90%
− Accelerated flood mapping and response
− Demonstrated scalable, cost-effective use of AI on existing datasets

This initiative showcases how targeted AI integration can unlock new environmental insights and operational efficiencies without costly new infrastructure.

Case study:
Mott MacDonald

Service: Water
Market: Wastewater

Overview

Yorkshire Water and Mott MacDonald Bentley (MMB) delivered a 44,000m² integrated constructed wetland at Dearne Reach, UK, to improve water quality in the River Dearne. Using artificial intelligence (AI) and intelligent plant technology, the team enhanced safety, accuracy, and efficiency while reducing costs and emissions.

Solutions

AI optimised the earthworks by analysing design data, calculating optimal cut and fill operations, and simulating machine performance. Intelligent plant guided by GPS executed the work precisely, eliminating manual setting out. Collaboration with MDiG and Earthbrain enabled real-time progress monitoring and soil balance management, ensuring no material was imported or exported.

Impact

− Improved 4km of river water quality
− Completed 3 weeks ahead of schedule
− £350,000 cost saving
− Zero material waste and enhanced site safety
− Over 350,000 plants across 13 wetland cells remove ammonia and nutrients naturally

This AI-driven, nature-based solution sets a benchmark for sustainable water management and digital delivery in future infrastructure projects.

Market expansion and global competitiveness

AI is opening new market opportunities, from clean energy and advanced materials to climate-resilient infrastructure. Predictive analytics are extending consultancy value into long-term asset management and lifecycle optimisation.

Cloud-based AI platforms are democratising expertise, enabling SMEs to compete. However, for start-ups and new entrants – particularly in public procurement – progress can still take months or years, acting as a barrier to accelerated uptake up of AI systems.

For larger engineering consultants, they are using AI to refine specialised offerings and deliver deeper insights to clients. For example, ACE member Stantec, developed Wildlife ML which leverages AI-driven image detection to efficiently identify wildlife species and enhance project analysis. This solution significantly boosts efficiency in environmental monitoring. Tasks that once took experts days or weeks can now happen in hours; the AI handles multiple photos per second instead of one every 15 seconds in the old process. They are using utilising AI tools to deepen their offer to clients on asset management and infrastructure resilience.

Case study:

Stantec soil risk map AI/ML enhancements

Service: Digital
Market: Environmental Services

Overview

In the Netherlands, excavation projects must document soil contamination levels before work begins. To simplify this, Stantec created the **Soil Risk Map**, an online GIS tool that instantly generates contamination reports by integrating data from external sources via APIs.

However, when data is incomplete, the system can't produce a definitive report, requiring manual follow-up by soil consultants. To meet growing client demand for faster, more automated results, Stantec saw an opportunity to use **AI and machine learning** to predict soil safety classifications even with limited data—reducing manual effort and improving scalability.

Solutions

Stantec developed a **machine learning model** to predict soil safety classes in data-scarce areas. The team cleaned and prepared geospatial data, rasterised polygons, extracted pixel-level values, and trained the model using advanced optimisation techniques. Validation on an unseen municipality tested real-world accuracy, assessed through precision, recall, and F1-score, with expert review ensuring reliability.

The proof of concept focused on simple cases, laying the groundwork for future expansion and deeper collaboration between Stantec's data scientists and local developers.

Impact

The AI-driven system is projected to deliver **tens of thousands of dollars in net returns** in its first year, cut **turnaround times by 95%**, and boost gross margins. Clients gain faster, more consistent results, while Stantec strengthens its competitive edge and fosters a culture of innovation. The project sets the stage for further innovation and expansion into related services.

Workforce evolution: the AI-enabled engineer

AI is shifting engineering from manual execution to strategic orchestration. Routine coordination work is automated, and interdisciplinary, data-driven roles are expanding.

According to the World Economic Forum (2025), automation may displace 92 million roles globally by 2030 but create 170 million new ones. Within engineering, success will depend on the AI-enabled engineer, fluent in interpreting AI outputs, validating results, and ensuring compliance.

As AI takes on more routine functions, such as drafting, modelling, and documentation, the nature of engineering work is evolving, particularly for technicians and early-career engineers. Rather than replacing people, AI is reshaping the skills that make them essential.

Today's engineering roles demand more than technical competence; they require digital agility. Professionals who can navigate advanced software, interpret complex data, and collaborate with intelligent systems are increasingly in demand. Employers are looking for talent that combines technological fluency with critical engineering judgment - people who can question, verify and enhance AI-generated outputs. Safety remains critical and the engineer's expertise more important than ever. We therefore recommend government considers making engineering a designated profession.

Affiliate member spotlight: Autodesk

76% of companies plan to invest more in digital skills training in the next three years, recognising the urgency of upskilling. In the meantime, organisations are also placing greater emphasis on AI fluency, with 53% of leaders identifying it as the most important skills when hiring over the next few years – up from 43% last year. (Autodesk (2025). State of Design & Make 2025)

ACE member spotlight: Rider Levell Bucknall (RLB)

Rider Levett Bucknall (RLB) has partnered with Multiverse to launch a Data & AI Transformation Academy across the UK and Europe, aimed at upskilling its workforce through continuous, on-the-job learning. The programme includes a 13-month "AI for Business Value" course and a Level 4 apprenticeship "Data Fellowship," drawing participants from cost management, sustainability, project management, and built asset consultancy.

This marks a pivotal shift in the profession: from executing tasks to orchestrating intelligent processes, where human insight and machine precision work together to deliver more innovative, efficient, and resilient engineering solutions.

Reskilling and professional standards

To respond to this skill challenge, ACE proposes a National AI Professional Certification Framework to ensure competence and public trust.

Key features could include tiered certification (AI Literacy → Application → Governance), integration with existing professional bodies, and micro-credentials delivered via accredited providers.

Such certification would formalise skills, support safe adoption, and strengthen the UK's international reputation. We recommend government also considers making engineering expertise a designated profession.

Next-generation apprenticeships

Government-supported and industry recognised AI-specialised apprenticeships and graduate schemes should develop early-career engineers skilled in generative design, predictive analytics, and digital project management. Innovate UK, via BridgeAI, has started funding some AI apprenticeship courses, but there is an opportunity for them to be expanded, specialise in infrastructure and have greater uptake within industry.

A certified, AI-literate workforce is the foundation of transformational innovation.

Apprenticeship pathway

Learn → **Apply** → **Certify** → **Lead**

Case study:
Early career professionals and AI

Microsoft Excel is central to the Architecture, Engineering and Construction (AEC) industry, supporting everything from project tracking to complex calculations. Yet many of us spend too much time managing endless cells and repetitive tasks. To deliver efficiently and meet deadlines, we need smarter ways to work.

Much of my work involves Excel inputs, outputs or tracking, so proficiency is vital. However, with so much functionality, mastering it all is nearly impossible. This is where Artificial Intelligence (AI) adds real value.

AI can instantly create Visual Basic for Applications (VBA) scripts to automate complex or repetitive tasks. Simply describe your data and desired outcome, and generative AI will produce a ready-to-use script with clear instructions.

Reviewing and adapting these scripts deepens understanding, builds confidence and helps drive digital transformation across teams. Remember to always keep information security in mind and never share confidential data with public AI tools.

At Ramboll, our secure AI platform, RamGPT, manages data safely within company servers. If using Microsoft Copilot or similar tools, ensure you understand how they handle and store information.

By adopting secure, intelligent automation, we can boost productivity, minimise repetitive work and help lead the digital transformation of the AEC sector.

James Moore, Assistant BIM Coordinator, Ramboll, ACE EP Network Digital Lead

Recommendations: enabling frameworks through industry and government collaboration

1. Governance and leadership

Recommendations for industry: Appoint AI Champions or Chief AI Officers, create ethics-based AI governance frameworks, and join ACE's cross-industry AI and Innovation Working Group*.

Recommendations for government actions: Develop a National AI in Engineering and Built Environment Strategy; form a cross-sector steering group and establish a national open data and interoperability standards, empowering NISTA to manage and curate infrastructure datasets and strengthen open data policies to support innovation across SMEs, researchers and industry partners.

2. Innovation and productivity

Recommendations for industry: Introduce agile procurement and safe sandbox testing for AI tools and adopt standardised risk and compliance checklists.

Recommendations for government: Reform public procurement to speed up decision making, reward AI-driven innovation and sustainability and create Innovation Partnership Frameworks for testing AI in live projects.

3. Workforce and skills

Recommendations for industry: Invest in internal AI training and mentorship programmes and develop designated AI innovation leads.

Recommendations for government: Fund national upskilling, remove Level 7 apprenticeship age caps, and incentivise employers to develop in-house AI capability and career pathways.

Consider making engineering a designated profession and ensure that school, technical college and university curricula include AI vocational capability development.

*To learn more and join the AI and Innovation Working Group please email: **bbrittain@acenet.co.uk**

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The Association for Consultancy and Engineering (ACE) is the business association for the UK's professional consultancy and engineering companies operating in the social and economic infrastructure sectors.

We represent around 400 member companies, large and small. As the leading voice for the sector, we foster collaboration to propel the industry to fulfil its ambitions.

The sector is highly skilled, productive, and forward-looking - employing over 470,000 people and contributing more than £39 billion to the UK economy. It competes on a global stage, exporting over £11 billion, providing solutions to the world's pressing issues and holds the key to a brighter future.

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