How artificial intelligence can unlock a new future for infrastructure

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Building a better working world

To unlock the value of AI and truly transform the infrastructure sector, it must adopt a new mindset, skillset, and toolset.

In brief

- **The infrastructure industry has made a good start at adopting AI, but greater investment is needed to achieve significant impact.**
- **AI enables the industry to take a more holistic view and can unlock value across an asset lifecycle, moving from a linear approach to a more flexible model.**
- **To reap the benefits of AI, the sector needs to think and operate differently.**

Well-functioning infrastructure is the backbone of society, supporting how people work and live. However, the infrastructure industry faces unprecedented pressures in the coming decades, including climate change, urban expansion, economic uncertainty, labor shortages and supply chain disruptions. These challenges demand innovative solutions and significant investment. An estimated **US$139 trillion** in sustainable infrastructure investment is required globally to move towards net zero by 2050, while **US$94 trillion** must be invested by 2040 to close existing gaps and align with future economic changes.

Meeting these challenges head-on requires a new approach to delivering projects faster, more cost-effectively, and with assets that operate more sustainably to support future needs. The growth of artificial intelligence (AI) offers a transformative pathway to address this. Its transformative power has the potential to provide solutions and be a true enabler of change by breaking down barriers between stakeholders, reducing costs and expediting delivery.

While the sector has started to adopt AI in pockets, it must embrace AI industry-wide to drive urgently needed transformation. In a bid to provide direction to the industry, an EY team and the International Federation of Consulting Engineers **(FIDIC)** have collaborated on a new report that takes a deep dive into the opportunities that AI brings to the sector. The report, **How Artificial Intelligence Can Unlock a New Future for Infrastructure,** explores key trends and challenges to AI adoption and how AI-enabled technologies can optimize planning, design, construction, and asset management across an asset's lifecycle. By taking an innovative stance, the sector can truly transform how it delivers and operates infrastructure.

Report Methodology

The insights in this report have been developed from EY's thinking and input from FIDIC members:

- **A survey was sent to all FIDIC Global Leadership Forum (GLF) members, with 44 responses from senior leaders across leading global infrastructure consultant firms between March and April 2024.**
- **A workshop was held with senior leaders attending FIDIC's GLF in late April 2024.**

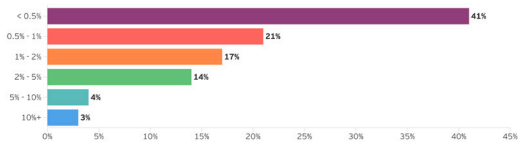
Chapter 1

Industry adoption of AI

There is an urgent need to accelerate AI technology uptake to improve infrastructure project delivery.

Despite its potential to substantially improve decision-making, increase productivity and enhance outcomes across the asset lifecycle, the current adoption of AI in the sector is still relatively slow, with mixed levels of investment by industry and technology companies. Our survey responses from the FIDIC GLF members indicate that some organizations invest conservatively, up to 2% of their revenue, while others take bolder steps, up to 10%. This is in line with other industry reports on AI investment.

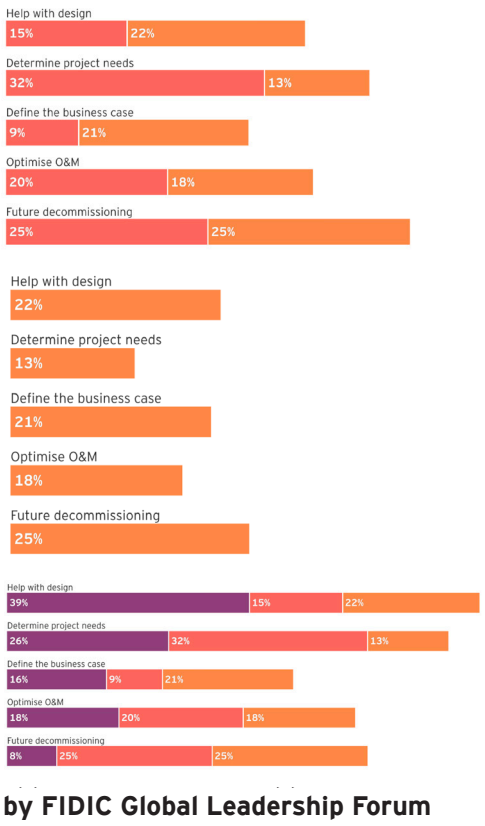
Yearly AI investment as a percentage against the turnover of associations



A bar chart that shows the percentage of turnover invested by FIDIC Global Leadership Forum members on AI projects

The growing startup and venture ecosystem has primarily driven the adoption of AI in the infrastructure industry. In 2022, start-up funding for AI-driven businesses in the built environment outpaced AI-enabled Fintech solutions in terms of deal counts. However, these investments are leading to spot solutions rather than industry-wide transformation. Our survey of FIDIC GLF members indicates that machine learning (ML), computer vision (CV) and natural language processing (NLP) are among the industry's most widely used AI technologies. And, where investment is being made, the focus is primarily on early project stages, particularly in the design phase. This is understandable, as this is where AI can significantly improve efficiency, accuracy and innovation.

Ranking of project-level challenges associations perceive could be supported by AI



by FIDIC Global Leadership Forum members.

While the steps that the industry is making are a good start, they are merely tinkering around the edges. To make meaningful change in the industry, investment in AI and AI adoption need to be far greater. To do this, the industry needs to overcome key barriers, which will only be accomplished with a distinct change in mindset.

Chapter 2

Unleashing AI

How AI can help the sector move from a linear approach to a collaborative, flexible model.

The infrastructure sector is inherently complex and interconnected across the asset lifecycle, but it is constrained to a linear approach as processes and technologies have forced the sector into silos. What if AI could unlock opportunities to work differently, more productively and efficiently across the lifecycle stages?

This is exactly the future that AI can enable. AI technologies can process vast datasets, uncover hidden patterns, predict potential issues, and optimize resources across interconnected project phases.

By breaking down barriers and bridging gaps across stakeholder groups and project phases, AI enables collaboration across the lifecycle, facilitating better decision-making, outcomes and more sustainable infrastructure.

While organic AI solutions are emerging, accelerating growth and maturity needs industry-wide strategic and targeted interventions from across the infrastructure ecosystem– from asset managers and owners to contractors and software vendors.

Each group has diverse interests, concerns and influences that are critical to balance their complex interactions and needs.

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STRATEGY CONSULTING

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(Continued from previous edition)

To support this approach, we have defined five guiding principles and ambitions that create opportunities for greater adoption of AI. The ambitions aim to facilitate further automation, reduce duplication, strengthen controls and enable evidence-based decision-making.

1. "Determine the purpose" - Increase the certainty that infrastructure will meet its intended purpose before funding commitments by taking a proactive industry approach with incentives and enablers initiated and implemented by asset owners and governments. Prioritize end-user needs and societal benefits in all planning and decision-making processes. Ensure assets are developed with resilience, responsiveness and sustainability as key priorities.

2. "Plan for end-to-end delivery" - Focus on enhancing the quality and reliability of project planning and preparation. To achieve this, develop comprehensive digital strategies that integrate AI technologies throughout the project lifecycle. Invest more time in thorough up-front planning to ensure projects are deliverable and affordable before making commitments. Implement AI-driven solutions from initial planning through operation and maintenance phases, emphasizing data continuity and interoperability.

3. "Confirm the operating model" - Set up projects and programs with governance and contract arrangements that support the ambitions of wider portfolios as a strategic priority. Integrate AI tools to create more flexibility and address data ownership and liability concerns. Continuously reassess and adapt traditional delivery and operating models to meet evolving infrastructure needs. Establish flexible contractual frameworks that encourage innovation while managing risks associated with new technologies.

4. "Integrate ways of working" - Actively ensure the right systems and teams are in place to operate more efficiently. Build capacity and capabilities for AI implementation and invest in training and upskilling programs to ensure the workforce can work alongside AI technologies. Foster partnerships between industry stakeholders and educational institutions to develop relevant curricula. Cultivate a culture of collaboration and continuous learning, emphasizing cross-disciplinary skills and AI literacy across all levels of the organization to enhance project outcomes.

5. "Operate responsive assets" - Ensure operational considerations are at the forefront of decision-making during the planning, design, delivery, handover and initial occupation of built assets. Leverage AI for optimized asset performance and maintenance by implementing AI-driven predictive maintenance systems and digital twins to enhance asset performance, reduce downtime and extend asset lifecycles. Implement data-driven solutions to analyze asset operational performance against assumptions and targets. Facilitate continuous improvement by incorporating feedback loops from operational data into future project planning and design processes.

As an example of how AI can be applied, let's consider the first guiding principle, "Determine the purpose." Here, spatial location intelligence, which utilizes ML and CV, can play a crucial role. These AI algorithms analyze remote sensing satellite imagery to help identify and classify landscape features and built infrastructure, producing digital maps of current site conditions during project planning. The outputs have additional uses during planning stages, such as serving as an early basis for optimizing site access routes to support planning approvals or logistics modeling. Find more examples of how AI can be applied across the framework in the report.

Chapter 3

Realize the potential of AI

Adopt the right mindset, skillset and toolset.

To fully leverage AI's potential, the infrastructure industry needs to adopt new business models and new ways of thinking that enable data and insights to be shared across the project lifecycle. We have identified three business models that embody the opportunities that AI brings to create whole-of-industry responses:

- Integrated platform model: Connect stakeholders through the widespread adoption and integration of various data platforms. These platforms should offer infrastructure services, data management, analytics, and other functionalities enabling seamless data sharing and joint development of AI models.
- Data monetization model: Get value from data resources and turn them into tangible business outcomes. This can be through direct revenue generation or improving operational efficiency, with key industry stakeholders aggregating and monetizing high-quality infrastructure data.
- Contract incentivization model: Encourage other stakeholders to adopt AI during project development stages. This can include adjusting tender scoring criteria to prioritize innovation and AI adoption and incorporating rewards for achieving common strategic goals in major program contracts. Benefits include cross-project collaboration, leveraging collective insights, driving efficiencies, optimizing resource allocation, and aligning stakeholder communication.

For the successful integration of these models, industry professionals need to adapt their mindset, skillset and toolset:

- Mindset: Cultivate an open and collaborative environment. This involves raising awareness, fostering discussions, and addressing legal and ethical considerations to build confidence and encourage sharing of data and insights.
- Skillset: Develop the competencies required to leverage AI in infrastructure. This includes providing training, certifications, and workshops that equip professionals with the knowledge and expertise to integrate AI technologies effectively and keep the infrastructure industry attractive to future generations.
- Toolset: Offer the right tools and frameworks for practical implementation. This involves developing standardized data collection methods, secure data-sharing protocols, and AI-specific contract provisions that support innovation and collaboration.

In collaboration with FIDIC, we have also shaped several actions that they will explore to further support the industry's efforts to adopt AI. These are listed in the report.

The bottom line

The infrastructure industry stands at a critical juncture. By embracing AI and fostering collaboration across the entire ecosystem, it can unlock AI's full potential to address the immense challenges it faces. It's time to usher in a new era of innovation and efficiency in infrastructure development and management, ensuring well-functioning infrastructure continues to be the backbone of society, supporting how people work and live in an increasingly complex world.

Summary

AI has the potential to transform the infrastructure sector but unlocking the value across an asset lifecycle requires more investment and adoption of AI, and a change in mindset.

Infrastructure advisory and consulting services

EY advises clients on financial, procurement, strategic and public-private partnership issues for large-scale infrastructure projects, providing support from project evaluation to procurement, financial close, construction and operations, and by helping governments strategically manage capital and transactions, asset sales, and divestments. We also advise on a broad range of ESG and sustainability services and solutions.

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