Dear GLF members,

We are looking forward to welcoming you to the Think Tank artificial intelligence (AI) session ("AI session") of Global Leadership Forum (GLF) Summit 2024 focused on the potential of AI in enabling a new future for infrastructure.

Interim report pre-read material

As part of the pre-summit preparations, we are issuing this pre-read version of the interim AI report that will be published later this year. It is important to note that this pre-read is not the final report, but serves as a starting point for our collective exploration next week in Geneva.

The primary objective of the AI session is to explore the members' ambitions for AI in infrastructure, the barriers to adoption, the enablers needed for adoption and, ultimately, the recommendations that the GLF collectively makes for the benefits of AI to be realised.

We are looking forward to lively interaction with you to help FIDIC derive meaningful conclusions regarding the enablers needed.

What happens after the AI session

Following the AI session, your insights and perspectives will be incorporated into the report, as well as the findings from the survey and detailed case studies/interviews (where currently there are placeholders).

The final report target publication date is September 2024.

We sincerely appreciate your participation and enthusiasm in this important endeavour. Your engagement and active involvement during the forum summit will play a vital role in shaping the outcome and driving meaningful change.

Thank you, and we look forward to your valuable contributions at the AI session.

Can AI enable a new future for infrastructure?

April 2024

Foreword

Graham Pontin
Director of Policy External Affairs & Communications, FIDIC

One of the greatest constants in the world is change. Sometimes change is incremental but at other times it can be monumental, instrumental or even disruptive. The world is grappling with a number of truly global challenges, such as meeting net zero, achieving more for less and improving societal outcomes. The infrastructure sector is vital for driving such changes and improvements forward.

At the first Global Leadership Forum (GLF) summit much of the focus was on net zero and this challenge remains, however, another reoccurring theme continued to emerge. This was how we can use technology and AI to supercharge progress, reduce waste and improve the delivery of projects. This also inevitably led to global leaders also asking how such technologies were not only going to affect the wider sector, but also their own operations.

FIDIC's collaboration with EY remains strong and this report continues to show the GLF's commitment to tackling the most significant challenges the infrastructure industry faces. Undoubtably artificial intelligence (AI) is here to stay and that our sector will not be immune to this change. It is, however, also important to note that there is no single version of AI and that there is a common misconception of the different models and tools that are being developed.

Only recently, the Financial Times[1], reported that the next versions of Large Language Models such as ChatGPT and others will be capable of reasoning and individuals such as Elon Musk in 2024 suggested we'll have AI that is smarter than any one human, probably around the end of next year and that within the next five years, the capabilities of AI will probably exceed that of all humans[2].

This report demonstrates how transformative AI could be for the infrastructure sector, how the various sector players will need to interact in future and how business models may need to change. It also shows there are the grass roots and examples of AI utilisation occurring but that traditional siloed thinking amongst other things is holding us back.

The implementation of AI in the infrastructure sector is fragmented and as such the challenges we are trying to solve cannot benefit from the potential benefits such technologies offer. AI technologies offer potential when there is a global shortage of engineers, to improve productivity, improve value add and to drive better environmental and societal solutions. I look forward to discussing the solutions and challenges at the GLF summit with fellow global leaders.

Finally, I would also like to thank EY, GLF members and the FIDIC team for their continued support and commitment to driving progress across the sector for a better future.

Chris Lewis
EY Global Infrastructure Leader

Steve Lewis
Partner, Head of Infrastructure and
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It is a great pleasure for EY to have been a strategic advisor to FIDIC in the development of this report on the adoption of Artificial Intelligence (AI) in infrastructure. In recent years, AI has emerged as a transformative force, revolutionising various industries and sectors. Now, we stand at the precipice of a profound shift in how we design, build, and manage our infrastructure.

AI offers immense potential to enhance the efficiency, safety, and sustainability of our built environment. This report delves into the key trends, challenges, and opportunities surrounding AI adoption in infrastructure. It explores how AI-powered technologies can optimise planning, design, construction and asset management, and enable smart decision-making. It also looks into the enablers needed from various stakeholders in the industry to generate a wider and faster adoption of AI, along with the new business models needed to make that adoption a reality.

As we navigate an increasingly interconnected world, harnessing the power of AI to overcome complex infrastructure challenges is crucial. However, it is equally important to address ethical considerations, data privacy, and cybersecurity concerns along this transformative journey.

The consideration of how AI can be adopted to help solve the macro challenges faced by society and, in turn, by infrastructure is at the heart of how we at EY think – we endeavour to build a better working world, and we believe AI will have a role in that. We hope this report goes some way to demystifying AI and its potential for us all in infrastructure and that is serves as a guiding light, empowering policymakers, industry leaders, and innovators to embrace the potential of AI and shape a future where our infrastructure is smarter, safer, and more sustainable. AI gives the construction and engineering industry the opportunity to embrace technology to drive productivity and innovation. Building Information Modelling has been seen as too complex for many infrastructure organisations. Now AI offers the potential for universal adoption, expanded benefit realisation and the driving of leading practices across the industry.

We extend our gratitude to everyone at FIDIC and the Global Leadership Forum who contributed, challenged, and encouraged the development of this report, and we are especially grateful to those who took the time to complete the survey, as their valuable input has helped us draw meaningful conclusions and insights for this report. Particular thanks must be extended to Jim Johnson of Arup, Fidel Saenz de Ormijana Valdes of Ferrovial, Mike Haigh, Graham Pontin and Sara Lipscombe of FIDIC and Nelson Ogunshakin whose passionate leadership, commitment and joviality were continuous enablement for the compilation of this report and wider industry transformation. In addition, to the multinational team at EY who worked tirelessly, thank you

Contents

01 Executive Summary

The infrastructure industry faces immense societal challenges over the coming decades, including climate change, urban expansion, economic uncertainty, labour shortages, and supply chain disruptions. Meeting these accelerating challenges requires a new approach to delivering projects faster, more cost-effectively, and with assets operating more sustainably to support future needs. Advanced solutions like artificial intelligence (AI) must be embraced industry-wide to drive this urgently needed transformation.

To better understand the industry's perspective on the barriers related to AI use in infrastructure delivery and operation, the enablers needed for wider adoption and the potential benefits, a survey of the FIDIC Global Leadership Forum members was undertaken. This survey provided valuable insight current state and the ambitions for AI use in infrastructure, with the findings detailed throughout this report.

The survey results, along with industry observations, demonstrate that, as expected, AI adoption in infrastructure significantly lags other major sectors despite its potential to substantially improve decision-making, build resilience, increase productivity, and enhance outcomes across the asset lifecycle. Lagging technological advancements are characteristic of an industry deeply rooted in traditional practices, risk aversion, workforce skillset constraints, and a culture historically suspicious of new technologies.

Currently, AI deployment remains fragmented across discrete use cases and technology verticals like computer vision, machine learning, natural language processing and automated planning/scheduling. Infrastructure stakeholders exhibit an inconsistent understanding of AI's definition and capabilities. Investment has been primarily driven by startups testing point solutions, with major enterprise software vendors just beginning to offer integrated AI-enabled products. Minimal cross-industry guidance around data governance, integration standards and implementation best practices inhibits systematic scaling.

The immense volume of data generated through infrastructure planning, construction and operations represents an underutilised resource. Lack of open data sharing stemming from cybersecurity concerns, murky data ownership protocols and technical barriers perpetuate stakeholder silos that will erode AI's effectiveness. Further adoption barriers include unclear AI ROI forecasts, traditional delivery models disincentivising collaboration, and workforce reskilling needs.

Realising AI's full transformative potential requires transcending traditional linear, cost-centric business models. A paradigm shift towards enterprise-wide, service-oriented perspectives is critical – viewing AI as an enabler that fosters connectivity across the complex, interdependent systems comprising society's infrastructure needs.

Three innovative models provide blueprints:

1. **Integrated data/AI platforms** enabling centralised visibility, shared processes and cross-stakeholder connectivity.
2. **Data-as-a-Service** allowing stakeholders to access and monetise proprietary data.
3. **Contract incentives** and disincentives enforcing AI adoption and innovation investment.

Mapping AI's transformative use cases against infrastructure's five guiding lifecycle principles illuminates its potential:

1. **Determine purpose** – AI enhances asset planning/selection certainty.
2. **Plan end-to-end delivery** – AI enables richer insights for robust business cases.
3. **Confirm operating model** – Data-centric digital twins streamline AI adoption.
4. **Integrate ways of working** – AI strengthens controls and performance oversight.
5. **Operate responsive assets** – AI optimises operations and sustainability.

Achieving systematic change requires targeted cross-stakeholder collaboration. Seven key groups – asset owners, operators, consultants, contractors, government, academia and technology providers – must align on shared 'ambitions' for AI-driven infrastructure enhancement. Groups must also implement corresponding 'enablers' like incentive models, data sharing mandates, interoperability standards, R&D programmes and workforce upskilling to overcome change inertia.

Critically, stakeholders must embrace an enterprise mindset centred on shared mission outcomes versus individual agendas. Working towards common data environments accessible to trusted AI technologies is a prerequisite. Failing to break down silos and engrained scepticism risks perpetuating the industry's chronic underperformance.

Ultimately, infrastructure's ability to confront defining generational challenges hinges on expediting AI adoption at scale. Doing so demands commitment from stakeholders to prioritise proven models that industry leaders in other sectors have embraced – clear AI vision/strategy, robust data/analytics capabilities, collaborative ecosystems and continuous innovation. This realignment will enable infrastructure to emerge as a sustainable engine for economic opportunity, environmental stewardship and societal progress.

02

What are the societal challenges AI could help infrastructure address?

In recent decades, the global shift to urban living has led to over half of the world's population now living in cities and The World Bank expects this figure to double to 8 billion by 2050[3]. Alongside urban expansion, other challenges such as the aging population, climate change, and economic uncertainty are also putting increased pressure on our infrastructure, and the sector needs to adopt new approaches to deliver infrastructure that meets the demands of an evolving society. In addition, the escalating costs of building infrastructure require the industry to select, plan, and deliver projects faster and more cost-effectively and then operate built assets more efficiently to ensure we have infrastructure that supports a sustainable future.

With the rise in advanced technologies that can respond to and reduce the impact of these challenges, stakeholders across the infrastructure industry should explore and embrace the opportunities they bring.

Artificial intelligence (AI) is one technology that can't be ignored but do we truly understand how AI can help us address the macro challenges facing infrastructure delivery and operation and, in turn, society at large? And are we adopting it fast enough in the infrastructure sector?

The answer is, generally, no. To change this, we must continuously monitor the most urgent macro challenges facing both the industry and the societies that infrastructure serves so that we can focus and prioritise the areas that AI can support.

Major macro challenges require a redefinition of infrastructure strategy

Infrastructure development is guided by the need to meet today's needs while sustainably planning for the future. Today's societies face significant macro challenges that demand immediate and specific actions from the infrastructure industry. These challenges, outlined below, are also accelerating and need far greater investment to alleviate them – as well as different industry responses:

1. **Climate change** is causing significant financial loss to global economies due to climate-related disasters, driven in large part by infrastructure which contributes up to 79% of total global greenhouse gas emissions annually[4].
   a. **Investment needed to mitigate:** An estimated $US139 trillion in sustainable infrastructure investment is required globally to move towards net-zero by 2050[5].
   b. **Industry response:** Adopt innovative measures that curb carbon in new infrastructure, increase the resilience of existing assets, and enhance carbon-centric planning and decision-making.

2. **Urbanisation and population growth** exert immense pressure on infrastructure as cities grow rapidly.
   a. **Investment needed to mitigate:** An estimated US$47 trillion in infrastructure investment is required by 2050[6] to support urban expansion and deliver sustainable cities.
   b. **Industry response:** Continuously find new ways to manage assets more efficiently and develop infrastructure faster and based on design and planning decisions that lead to more resource-efficient assets.

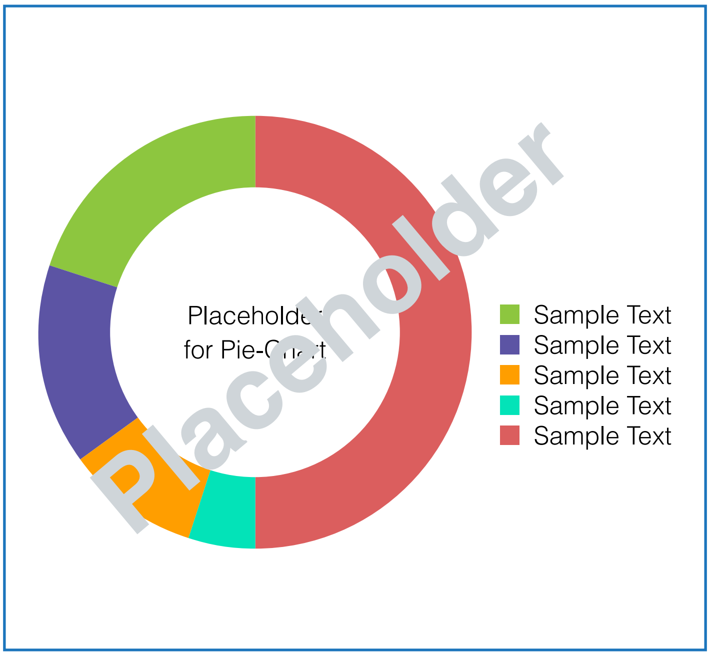
3. **Economic uncertainty** and recent significant increases in the cost of living, energy prices, and the cost of capital have impacted infrastructure delivery and operations and pose challenges for developing essential infrastructure in developing countries .
   a. **Investment needed to mitigate:** Infrastructure investment must reach US$94 trillion by 2040 to close existing gaps and align with future economic changes[7].
   b. **Industry response:** Invest in solutions that boost productivity and reduce construction costs.

4. **Availability of skilled labour** is a pressing concern in the infrastructure industry due to labour shortages and an aging workforce.
   a. **Investment needed to mitigate:** To meet planned demand, Europe alone is estimated to need over two million more workers in the construction sector by 2030[8].
   b. **Industry response:** Find ways to reduce reliance on manual labour and increase output per worker by developing and adopting innovative technologies that maximise productivity and reduce reliance on human labour.

5. **Supply chain challenges and geopolitical events** in recent years have impeded infrastructure investment and development and had a substantial impact on business case assumptions and profit margins. An increase in construction cost, risk profiles and claims has led to high levels of contractor insolvencies, with the UK construction market experiencing the highest number of insolvencies across all industries in the 12 months ending Q3 2023 and the highest levels experienced in the sector in over 10 years[9].
   a. **Industry response:** Deploy technologies that enhance cost intelligence and build resilience to navigate these uncertainties.

Technology has a significant role to play in supporting the industry as it seeks to address these macro challenges. AI, in particular, provides discrete solutions that can help address each of them, yet the industry's understanding of AI is currently inadequate. Furthermore, the industry is also significantly behind the curve in implementing AI solutions. To tackle these challenges and drive change, industry stakeholders must improve their understanding of AI, allocate the resources required to build the necessary capabilities and increase its application across the infrastructure lifecycle.

Survey Q5: ranking of these macro challenges in priority order that organisations perceived AI could address



Traditional infrastructure methods are losing relevance: an industry shift and refocus is needed

Infrastructure projects and the assets delivered are increasingly complex, often suffering from continued scope change as they are procured. This leads to many failing to deliver on time, within budget, or with their intended benefits. This creates an unacceptable amount of wasted resources in recovering these projects or undelivered societal impact.

This means that traditional infrastructure delivery methods are losing relevance, and project owners and stakeholders need to shift their focus to consider the full project ecosystem that integrates physical and digital assets, citizens, and end users within the wider external macro environment.

The compelling argument for AI-driven transformation in infrastructure

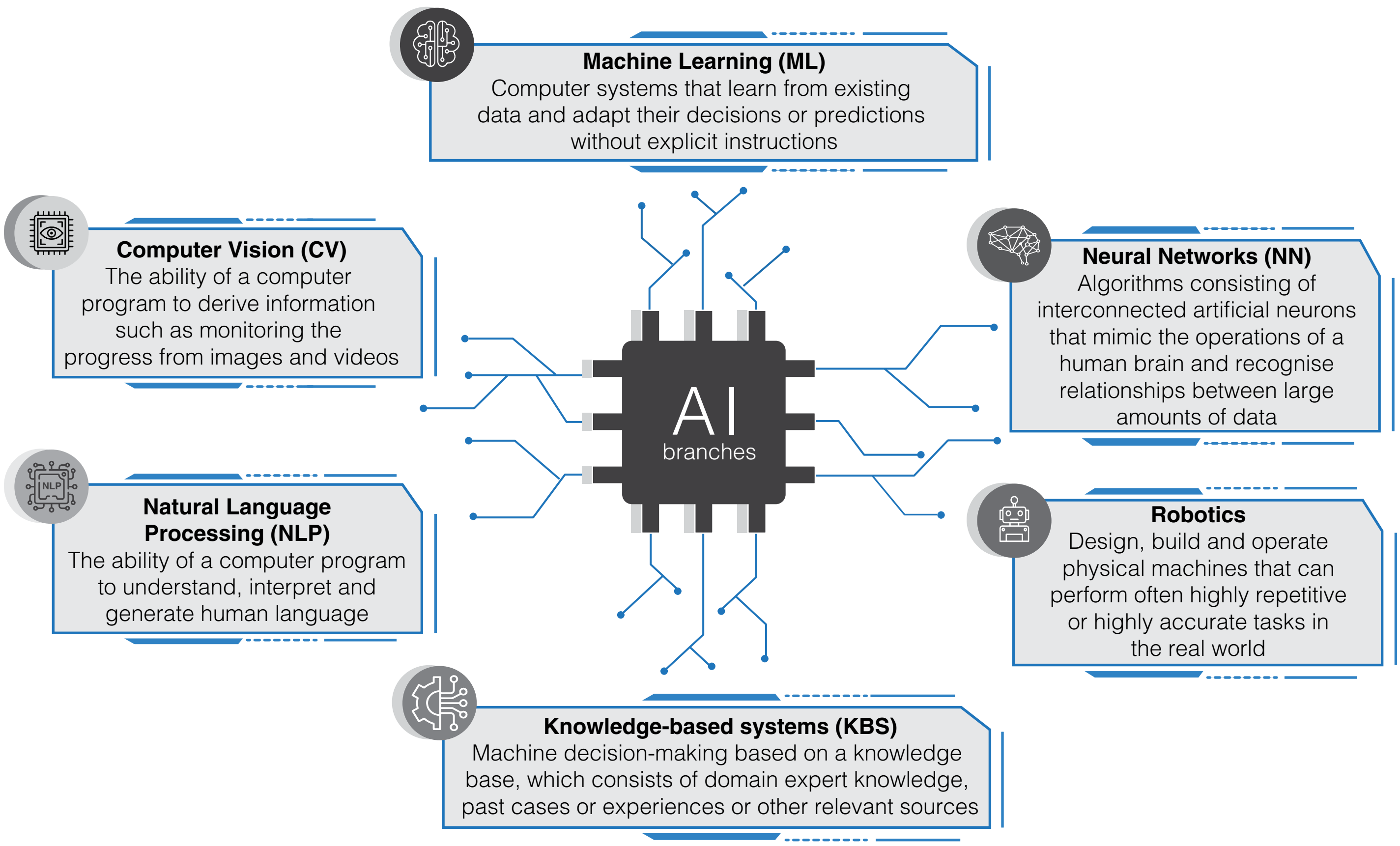
The infrastructure industry must evolve its traditional methods and technologies to improve project outcomes in the face of complexity and interconnectivity challenges. Stakeholders can no longer view AI as a tool that is relevant only to other sectors. Neighbouring industries like transportation and manufacturing are already breaking down silos and operating as interconnected ecosystems. As industries converge, solutions and tools once considered industry-specific are likely to find broader application. The infrastructure sector must embrace this rapid cross-sector disruption.

AI has already proven its ability to significantly enhance decision-making, resilience, productivity, and the industry's capacity to address major challenges at both macro and micro levels. However, the infrastructure industry, historically slow to adopt new technologies, needs to accelerate and expand its adoption of AI.

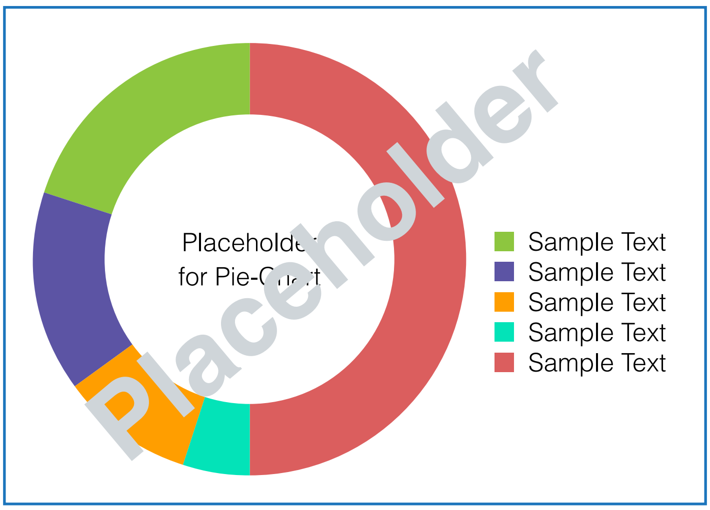
03 What is the current state of AI adoption and maturity in the infrastructure industry?

AI technologies have been available, in some form, since the 1950s. However, the recent explosion in its use started following the November 2022 launch of ChatGPT, a widely used, open AI large language model (LLM). Despite the recent adoption in many sectors, AI is still new to many in the infrastructure industry, and there remains an inconsistent understanding of what it means and what it can do. It is often misunderstood and even feared: is it a single solution or a collection of technologies? Is it a threat or an opportunity? It is important to define AI clearly and explain how it can be used. Figure 1 illustrates the six discrete branches of AI.

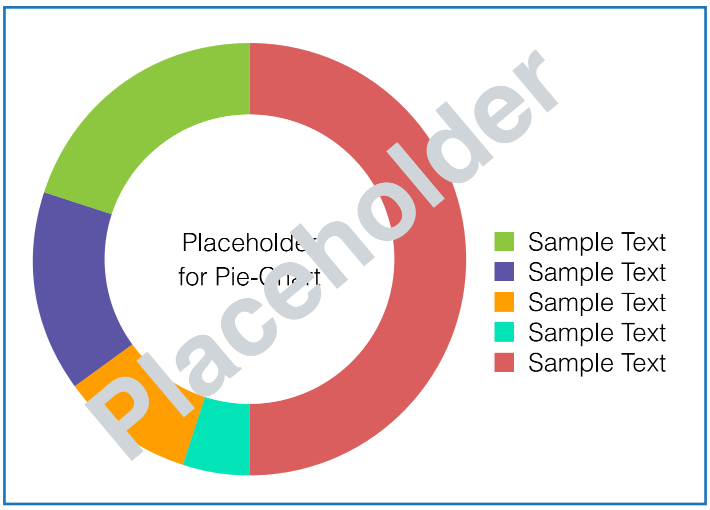
Figure 1. The six common discrete branches of AI in infrastructure



Survey Q7: Is your organisation currently investing in AI capabilities?



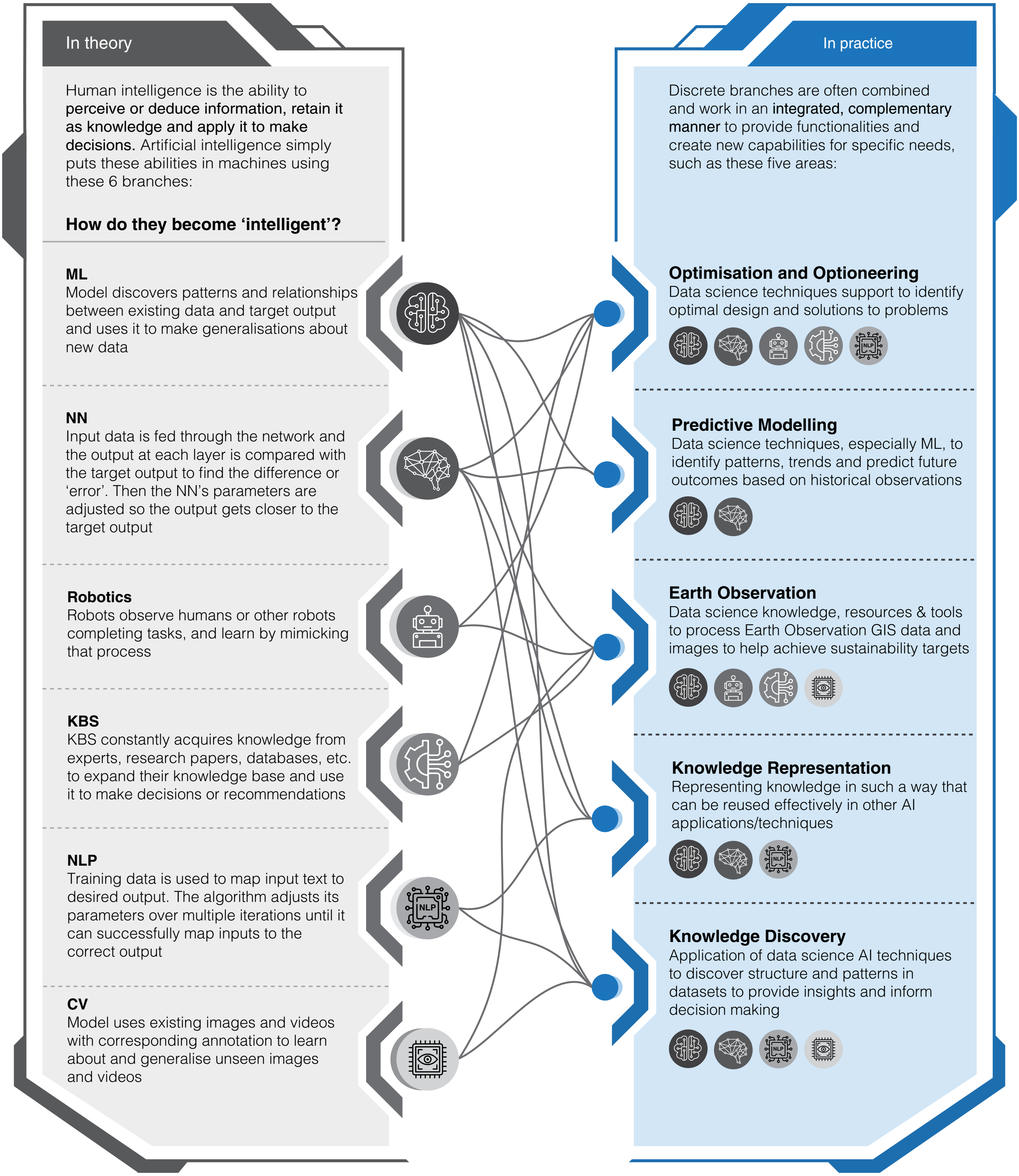
Survey Q12: Please select the AI Technologies your organisation is employing?



In practice, AI is applied in an integrated way in infrastructure through five key areas of adoption

While AI can be broken down into six discrete branches, in industry practice, it will be adopted in a more integrated way. Figure 2 illustrates the difference between the branches and the five key areas of AI adoption currently in use within infrastructure, where they work together in an integrated and complementary manner.

Figure 2. Key areas of AI adoption in the infrastructure sector



Startups have led AI investment in infrastructure, but adoption remains limited

The growing startup and venture ecosystem has primarily driven AI application in the infrastructure industry, leading to more organisations testing various AI solutions to address business and industry challenges. There has been a notable increase in AI-based startups specialising in Internet of Things (IoT)-enabled urban infrastructure, smart mobility, intelligent waste management, and digital twin technologies[10]. For example, OpenSpace provides AI-driven building information modelling (BIM) technology for construction projects[11]. Another startup, nPlan, has achieved significant industry uptake by enabling project and portfolio managers with unbiased schedule assurance insights. Their AI Deep Learning-powered forecasting engine utilises past project schedules to demonstrate project deliverability before key decision points[12].

More established software vendors are starting to expand their offerings to include AI capabilities. Procore Technologies, a well-known cloud-based construction management software application, recently developed an AI-driven construction project management platform. This platform uses machine learning algorithms to simplify and automate workflows and repetitive tasks. It also provides insights that help project managers anticipate and address issues before they arise[13].

Infrastructure-focused technology businesses have attracted substantial funding, securing US$12.3 billion between 2020 and 2023[14]. This investment level and the solutions being developed demonstrate that AI is creating pockets of value across the infrastructure industry. However, significantly more investment is needed in the development and integration of the technology to drive widespread adoption.

AI solutions in the infrastructure market are largely discrete point solutions, with AI integration remaining fragmented and limited. Key regulations, standards, and guidance to support best practices and interoperability are still in early development. Our research indicates that the industry's maturity in embracing AI across the five key areas is generally low, suggesting that AI's full potential to significantly improve performance and outcomes is far from being realised. Figure 3 illustrates the adoption spectrum and provides examples of the relatively simple and more complex use cases of AI branches, demonstrating that most areas are in the early maturity stage.

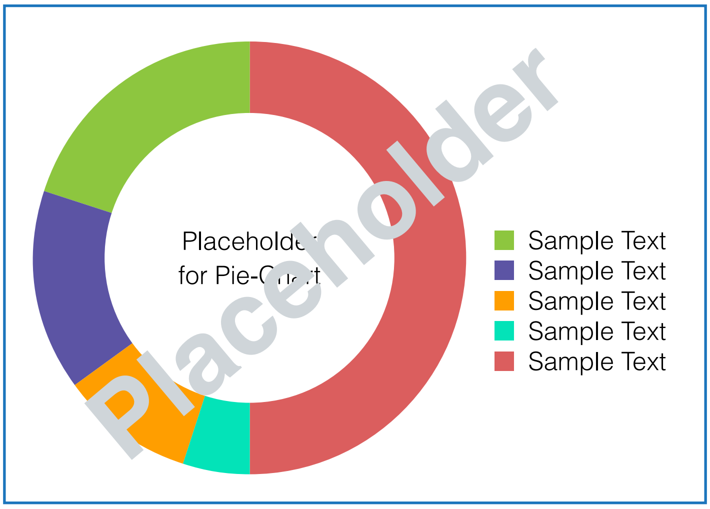
Figure 3. AI adoption maturity level, with simple and complex use cases in the respective identified areas

Areas and maturity level of adoption	Simple use case	Complex use case
Optimisation & Optioneering	Supply chain optimisation leverages machine learning algorithms to analyse data and optimize the management and logistics of materials and equipment	Using sensors in an automated building management platform to detect occupancy, temperature and air quality and to optimise either the use of energy in the building or the quality of the environment against preset criteria
Predictive Modelling	ML algorithms analyse project goals, historical data, and environmental data to identify the potential risks of a project using data patterns. These risks can include high carbon emissions, environmental impacts, worker safety issues, and cost risks	Agent based modelling to predict user behaviour in multi modal transport systems
Earth Observation	Platform uses computer vision to visualise and analyse spatial data of potential project locations to assess the feasibility and impact of the project	Automated identification from satellite imagery of locations for catchment interventions for natural flood risk management or for blue-green infrastructure interventions in a city
Knowledge Representation	AI-assisted vendor and subcontractor management use ML, NLP, and data analytics to analyse vendor and subcontractor data, evaluate performance, and automate contract management processes	Using Generative AI to create marketing and business development collateral – but human intelligence is still needed to calibrate for over-selling
Knowledge Discovery	ML algorithms can learn the usage data of a lighting system based on time of day, day of the week etc. and adjust the brightness or switch it off to maximize energy savings	Using computer vision and AI/ML to record and analyse images of remote and difficult to access locations such as tunnels and to identify structural anomalies so that targeted maintenance can be implemented

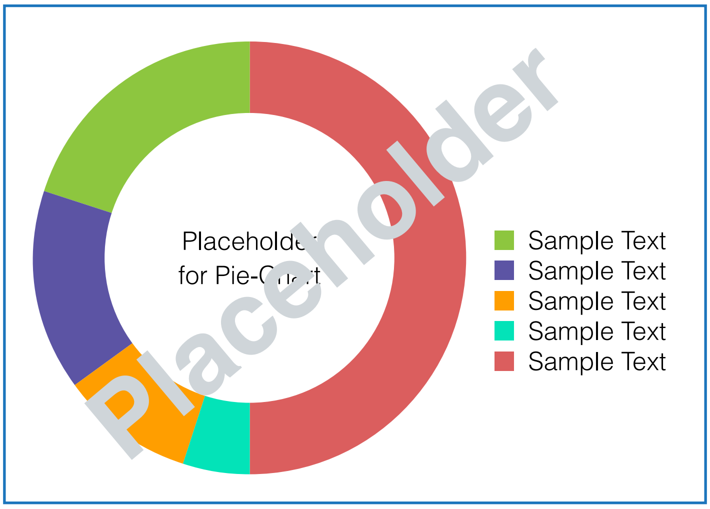
Maturity level of AI adoption

Limited use cases | Emerging adoption | Widespread adoption

Survey Q8: Is your organisation currently investing in AI capabilities?



Survey Q9: Please select the AI Technologies your organisation is employing?



Growing AI adoption enables better support for systems thinking across infrastructure data and processes

The increasing adoption of, and investment in, AI in infrastructure presents an opportunity to bridge the connection between infrastructure planning, project delivery, asset operation and the dynamic complexities of the societies in which they exist. As a result, it is crucial to take a more integrated, holistic approach to delivering and operating infrastructure assets through systems thinking. When applying and adopting AI in the industry, a systemic mindset can help to visualise the interactions between system elements and gain clarity and perspective by viewing the wider interrelationships between these elements. This mindset will support the identification of the right stakeholders at the right time and expand the range of AI choices and solutions available by broadening collective industry thinking that will accelerate the delivery and transformation of infrastructure to meet the macro-level challenges society faces.

04 What is the broader impact of AI on infrastructure and society?

Infrastructure planning, delivery and operation often occur in isolated, linear environments, limiting the potential of AI

Infrastructure development is typically undertaken independently in silos using a linear end-to-end lifecycle with bespoke processes, delivery models and technologies that are adapted each time for each project. However, complex ecosystems are established when infrastructure projects and delivery organisations are set up, requiring communication, collaboration, interdependence, innovation, and transparency to achieve successful outcomes. Stakeholders must recognise the need for these characteristics, the complex context of project system dynamics, and the necessity for technological advancements to be closely aligned with investments in people and mindset adaptation.

This traditional view of infrastructure development can lead to a disconnect from the broader business case and societal drivers over its lifecycle, resulting in an inability to adapt to dynamic change and subsequent sub-optimal outcomes. A systems thinking approach to infrastructure would foster the realisation of the benefits of advanced technologies like AI by supporting a more interconnected view of infrastructure. This approach would help break down barriers between industry stakeholders that often emerge through disjointed and linear projects, creating lasting value from the options selection to delivery into service and throughout the asset operational lifespan.

The infrastructure asset lifecycle and society are heavily integrated and increasingly dynamic, with human behaviours, mobility, technology and economics all creating significant, ongoing influences

Societal systems thinking is typically undertaken by governments and planners. However, it is increasingly important for all industry stakeholders to consider the societal system to adequately address evolving risks and opportunities that occur over an asset's lifecycle. As such, traditional infrastructure delivery methods must evolve to consider the full ecosystem that integrates assets and their end users within the external environment in which they operate.

Incorporating a systems thinking mindset into AI adoption in infrastructure is useful to demonstrate where it can benefit infrastructure delivery and operations and the wider social system in which they coexist. There are two systems, the 'capital project system' and the 'societal system' which will be explained in the following page.

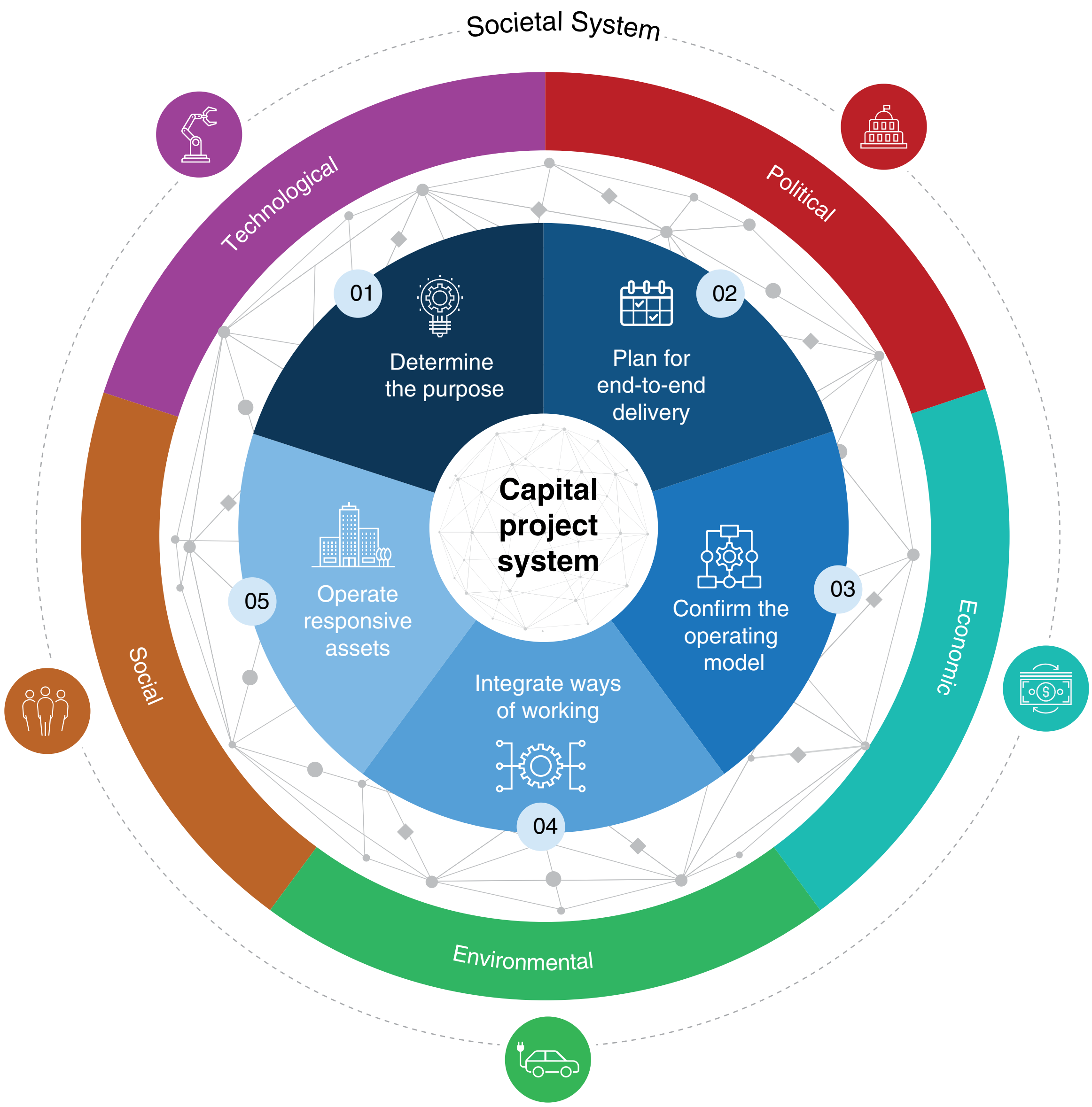
Placeholder: case study or interview

The 'capital project system' – infrastructure projects that operate as ecosystems within and across the societal system. These are structured around five guiding principles that are pertinent through an asset lifecycle.

The 'societal system' – the political, economic, social, technological, and environmental influences that impact all of society, drive infrastructure decisions and end user needs.

The interconnected nature of the systems environment is illustrated in Figure 4

Figure 4. The interconnected infrastructure systems environment



Technological
- Technological capacity, innovation and integration
- Data requirements, availability and management

Economic
- Financial viability and lifecycle cost-benefit
- Economic growth, job creation and productivity enhancement
- Trade facilitation

Political
- Development priorities
- Land allocation and policy formulation
- Governance frameworks and regulations

Social
- Community engagement, needs and equity
- Skill set and labour diversity
- Cultural heritage, traditions and community identity

Environmental
- Sustainability in terms of its impacts on biodiversity, natural resources and climate
- Climate resilience

AI can help the industry shift to a "systems outcome-focused mindset" by addressing each of the five guiding principles that define the capital project system

Five guiding principles that frame the traditional asset lifecycle have been defined to support the implementation of a systems thinking mindset in infrastructure development and enable the adoption of AI. As illustrated in Figure 4, these principles outline the framework of the system within which infrastructure is delivered and operated. By enhancing the ability of infrastructure industry stakeholders to more effectively consider and build the interconnectedness of various factors across all five guiding principles, better decision-making and outcomes can be achieved. Adopting AI-driven solutions that foster collaboration and cut through the complexity of the interdependencies across the capital project system would significantly increase the likelihood of projects achieving their intended outcomes.

These five guiding principles provide opportunities to create value at every stage of the asset lifecycle and form the basis upon which AI technologies can unlock benefits for society.

1. **Determine the purpose:** Meeting end-user needs should be the primary focus of planning and decision-making. Assets must be developed to benefit society, with resilience and responsiveness as key priorities. As we transition to a circular and net-zero economy, designers, contractors, and operators can no longer work in silos. All stakeholders have critical experience and knowledge of how an asset can meet its targeted outcomes and benefits, which evolve through the planning and delivery stages. This expertise must be harnessed to achieve better outcomes.

2. **Plan for end-to-end delivery:** Establishing a robust digital and data strategy during the infrastructure business case development process is critical for success. The industry must invest more time in thorough up-front planning to ensure projects are deliverable and affordable before making commitments. AI can significantly improve planning, design and preparation for project execution if sufficient investment is made early on. In the early stages, the highest degree of influence is achievable at the lowest cost, meaning that early investment will be repaid many times over during delivery.

3. **Confirm the operating model:** Traditional delivery and operating models are no longer sufficient for delivering major infrastructure. Setting up projects and programmes with governance and contracting arrangements that support the ambitions of wider portfolios is a strategic priority. Opportunities for unlocking value through adopting technologies that improve collaboration and efficiency exist across all operating models, from traditional transactional models to highly collaborative enterprise models.

4. **Integrate ways of working:** As infrastructure assets and the external environment are becoming more complex, the capabilities required to successfully deliver and operate them have never been more challenging. Asset owners must actively participate from the outset to ensure they have systems and teams with the right capabilities to act as intelligent clients. Meanwhile, supply chain providers must continuously develop their businesses to deliver high-quality outcomes. These resources must be developed and deployed not only to satisfy current project requirements but also with a forward-looking focus on developing and filling future skills and talent needs in areas such as digital, automation, and sustainability.

5. **Operate responsive assets:** Operational considerations must be kept at the forefront of decision-making during the planning, design, delivery, handover, and initial use or occupation of built assets. This requires collaboration between designers, contractors, operators, and end users, as well as data-driven solutions that analyse asset operational performance against assumptions and targets. By prioritising better outcomes for built assets, greater value can be delivered throughout the operational lifecycle of assets.

Placeholder: case study or interview

AI use cases in infrastructure and how they support the five guiding principles

Guiding principle 1: Determine the purpose

AI use case (1a): Spatial location intelligence

AI branch: Machine Leaning (ML) and Computer Vision (CV)

Function: ML and CV algorithms analyse remote sensing satellite imagery to help identify and classify landscape features and built infrastructure, producing digital maps of current site conditions during the project planning stage. This technology creates digital maps faster and at a significantly lower cost than traditional methods, enabling better site investigation and due diligence for planned developments. This enhances the capability of decision-making to select the most appropriate locations for new developments.

Example in practice: ML algorithms process remote sensing satellite imagery to visualise and analyse spatial data of potential project locations[15], measure biodiversity baselines and trends[16] , and provide feasibility insights based on the potential impact on the site and surrounding geography. The outputs have additional uses during planning stages, such as serving as an early basis for optimising site access routes to support planning approvals or logistics modelling in construction to support planning approvals at an early stage.

AI use case (1b): Automated Environmental Impact Assessment (EIA)

AI branch: Machine Leaning (ML)

Function: ML algorithms conduct automated AI-enabled Environmental Impact Assessments (EIAs) by assessing and monitoring a project's potential impact on the surrounding environment. These algorithms identify patterns and relationships between key environmental factors such as water, air, noise quality, and climate impact. This functionality expedites the EIA process and improves the output quality by providing data-driven trends and insights while minimising human guesswork.

Example in practice: ML algorithms are deployed to identify environmental risk factors on proposed infrastructure sites that can adversely affect biodiversity, including flora and fauna. These algorithms model pollutant levels and habitat invasion due to the construction process and provide recommendations for effective mitigation strategies to address and alleviate the identified negative impacts.

Guiding principle 2: Plan for end-to-end delivery

AI use case (2a): Generative concept design

AI branch: Machine Leaning (ML) and Computer Vision (CV)

Function: ML solutions undertake generative design using existing data to generate new design ideas, while CV solutions analyse industry design codes and standards, user preferences, and performance requirements to generate multiple concept design alternatives, optimise design processes and enhance design outcomes. Utilising AI can automate repetitive tasks, reducing time spent on these activities and enabling designers to focus on more value-added activities such as complex engineering challenges and stakeholder management.

Example in practice: Designers deploy ML and CV AI techniques to integrate mechanical and empirical knowledge and automate concept design processes, such as analysing complex structural drawings, combining requirement texts, and performing pattern recognition and topology optimisation[17]. This functionality can significantly increase the speed of optioneering, identifying potential issues and risks with design options, and improve design outcomes in the concept design stages when the value opportunity is greatest.

AI use case (2b): Intelligent risk and contingency quantification design

AI branch: Machine Leaning (ML) and Natural Language Processing (NLP)

Function: ML and NLP-enabled solutions automate the analysis of industry trends and historical project performance benchmarks, including changes, claims and risk exposure throughout project phases. These solutions assess the realism of project cost estimates, schedules and contingency allowances. The insights enable project owners and delivery teams to mitigate optimism bias, derive more evidenced-based risk and contingency allowances, and identify emerging risks earlier to develop more effective risk management strategies.

Example in practice: LLM solutions leverage large historical schedule datasets collected from infrastructure projects to produce unbiased forecasts and deliverability assessments, providing investment case assurance to project owners. This AI-driven approach removes human bias and provides project owners with more realistic schedule assessments, enabling them to collaborate with contractors to control key risks, evaluate competing bids and take a proactive approach to delivering entire project portfolios.

Guiding principle 3: Confirm the operating model

Use Case (3a): AI-ready digital twins

Function: AI adoption throughout the asset lifecycle requires quality data for algorithms to provide value. This data necessitates a strategy spanning design, construction and operation phases, where data from multiple stakeholders is shared and integrated. By specifying digital twins as a project requirement, project owners enhance collaboration between stakeholders via a shared virtual platform. This fosters better communication and coordination and provides a strong foundation for obtaining AI-ready asset data, a fundamental requirement for deploying AI solutions across the entire infrastructure development lifecycle.

Example in practice: Combining BIM models with asset information to form mature digital twins provides a platform for integrating AI with Internet of Things (IoT) sensors to support digital asset management, predictive maintenance and real-time monitoring. This drives improved asset performance and improved operational efficiency during the operation phase.

Guiding principle 4: Integrate ways of working

AI use case (4a): AI-powered Project Management Office (PMO)

AI branch: Machine Leaning (ML) and Natural Language Processing (NLP)

Function: ML, and NLP-enabled intelligent solutions streamline the project management office (PMO) by automating project management functions and tasks including scheduling, resource allocation, document management and progress monitoring. This boosts control, insights and productivity, producing higher quality, real-time project and portfolio performance information. Enhanced capabilities allow project managers to identify early signs of project failure and make actionable recommendations.

Example in practice: ML and NLP based solutions automate the analysis of historical and current portfolio performance data, current market conditions and various external factors to provide data-driven predictions on potential project delays, budget overruns and resource shortages. This approach enhances the PMOs forecasting accuracy and provides real-time insights to inform risk management and mitigation, reducing project delays and cost overruns while ensuring financial efficiency across portfolios.

AI use case (4b): Autonomous construction solutions

AI branch: Machine Leaning (ML) and Computer Vision (CV)

Function: ML and CV-enabled smart construction robots autonomously perform site operations, such as detailed scans of structural components for quality assurance, aerial drone surveys to create digital twins, as-built surveys, and basic tasks traditionally performed by workers, like lifting and moving objects, transporting materials and monitoring sites for safety issues. These AI-driven autonomous construction solutions collectively increase productivity, reduce risk in a high-hazard industry, and tackle issues related to skilled labour and housing shortages.

Example in practice: ML and CV-powered semi-autonomous swarm robots deployed to undertake underground construction via an innovative method that eliminates traditional tunnelling. The AI powered robots perform horizontal directional drilling, boring a series of small openings that form tunnel outlines. They deploy cartridges of construction chemicals through the bores to 3D print the tunnel's structural shell, upon which a continuous concrete layer is sprayed to complete it. This technique is faster, safer and more environmentally friendly than current tunnel construction methods, reducing costs and enabling the industry to satisfy the growing demand for tunnels more sustainably.

Guiding principle 5: Operate responsive assets

AI use case (5a): Predictive rail maintenance

AI branch: Machine Leaning (ML)

Function: ML-powered predictive analytics enable rail operators to proactively anticipate potential failures, optimise maintenance schedules, and ensure uninterrupted train operations, enhancing overall asset operational efficiency. By providing rail operators with the ability to detect failures through an early warning system, the risk of accidents and derailments can be significantly reduced, safeguarding passengers and crews.

Example in practice: An ML solution performs predictive models that automate railways wheel and track condition monitoring based on real-time data from sensors, swiftly identifying wear and tear patterns and allowing for the proactive prediction of maintenance needs, preventing hazardous situations. This solution enhances safety and minimises downtime, improves passenger experience and optimises rail operations by minimising unnecessary maintenance expenses, leading to long-term cost savings.

AI use case (5b): Smart building energy management

AI branch: Machine Leaning (ML)

Function: ML-based solutions provide AI-driven smart energy management systems on new and existing built assets through advanced data analytics and optimisation algorithms. These smart energy systems support the optimisation of energy consumption and efficiency to achieve operation expense savings, enhance the asset's environmental performance and provide a better end-user experience.

Example in practice: An ML system combines analysed data obtained from a building's existing energy management system with other data sources (e.g., weather data) to optimise the building's energy use in real-time. The system predicts the building's energy use 24 hours in advance based on learning from past experience. It is also connected to the electricity meter and wider network, allowing for price monitoring and electricity generation mix analysis. This enables the system to make decisions on when to increase or decrease the building's electricity load based on the cost or carbon intensity of electricity at any given time..

By mapping AI use cases within the interconnected decision-making and stakeholder networks established in infrastructure planning, delivery and operation, its place throughout the foundational elements of the systems can be visualised and better understood by the key industry players crucial for its uptake. Figure 5 demonstrates where and how AI adoption can enhance connectivity and unlock value through the systems encompassing the built asset lifecycle.

Figure 5. Use cases within the two systems in infrastructure

Use of AI by principle

1. Determine the purpose
   - 1a Spatial location intelligence
   - 1b Automated Environmental Impact Assessment (EIA)

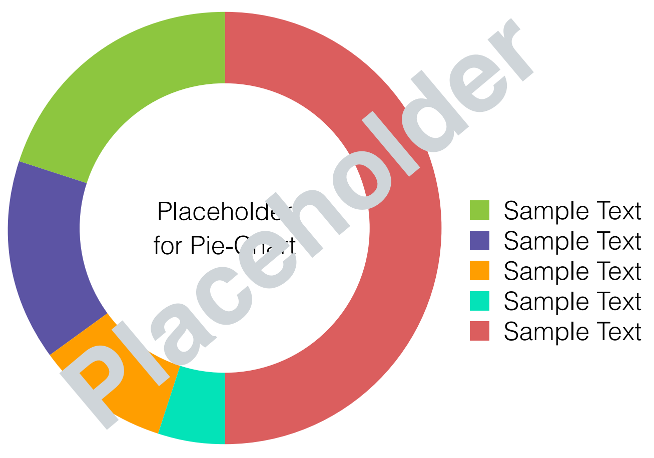
2. Plan for end-to-end delivery
   - 2a Generative concept design
   - 2b Intelligent risk and contingency quantification

3. Confirm operating model
   - 3a AI-ready digital twins

4. Integrate ways of working
   - 4a AI-powered Project Management Office (PMO)
   - 4b Autonomous construction solutions

5. Operate responsive assets
   - 5a Predictive rail maintenance
   - 5b Smart building energy management

Survey Q6: ranking of project level challenges in priority order where AI could support organisations



Maximising AI's potential will lead to swift, efficient, and socially responsive planning, execution and operation of infrastructure, enhancing connectivity and success outcomes

The AI use cases demonstrate how AI can enhance the planning and execution of assets, increasing the likelihood of realising their intended benefits that address the macro challenges in society. However, there is a lack of industry understanding and awareness of how and where these AI use cases can be deployed in the asset lifecycle, which deters uptake. By viewing infrastructure development through the lens of systems and outcomes, as illustrated in Figure 5, a more integrated understanding and mindset for AI and its ability to bridge gaps between systems and desired outcomes can be fostered.

High levels of AI adoption could lead to faster project delivery and greater societal benefits for end users

The growing complexity of infrastructure and its development and operational systems necessitates a faster understanding of options and trade-offs faced by infrastructure sponsors throughout the asset lifecycle to enhance their decision-making and response times. The AI use cases in infrastructure demonstrate the potential of AI-enabled technologies to foster connectivity, deliver faster and 'declutter' societal and project systems' interdependencies at all stages of the asset lifecycle.

Emerging AI technologies focus on helping industry stakeholders overcome major infrastructure challenges, including cost and schedule overruns and safety concerns. AI will unlock connections and drive insight-driven decision-making by increasing the infrastructure industry's ability to harness automated analysis and identify patterns in vast amounts of data created through the asset lifecycle. These new capabilities can generate greater efficiencies, increase productivity and lead to successful outcomes in less time. Given AI's power and opportunity to enhance our ability to deliver resilient infrastructure, exploring ways to accelerate and enable pathways to adoption is an industry imperative.

Placeholder: case study or interview

05 What are the barriers to deploying AI at scale?

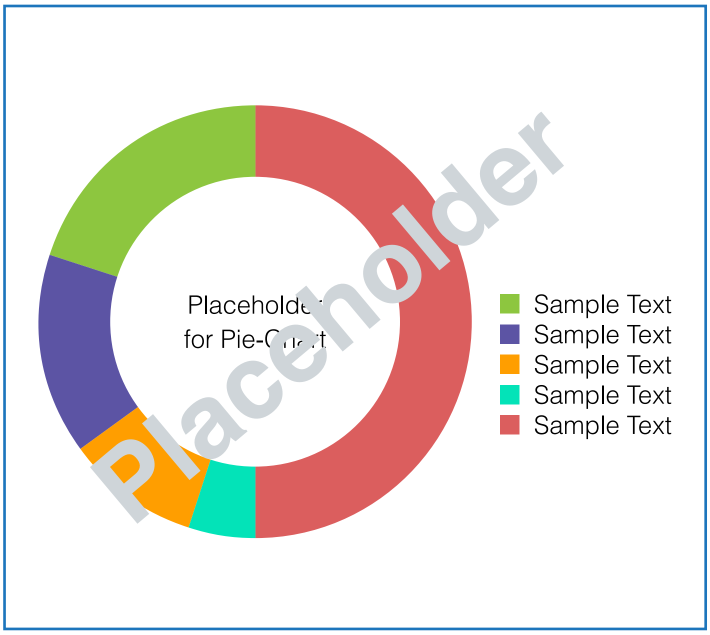
AI adoption in infrastructure has enormous potential, but access to asset data created through public and private sector infrastructure planning, delivery and operation is a significant barrier

Infrastructure delivery is fragmented and complex, involving multiple stakeholders at various stages. Coordination amongst diverse stakeholders can be difficult, leading to slower decision-making processes and reluctance to invest in technology to foster collaboration. The technology landscape itself is also fragmented, with various software solutions, hardware options and compatibility challenges. The lack of standardisation and data interoperability makes it difficult for stakeholders to select and integrate technologies seamlessly.

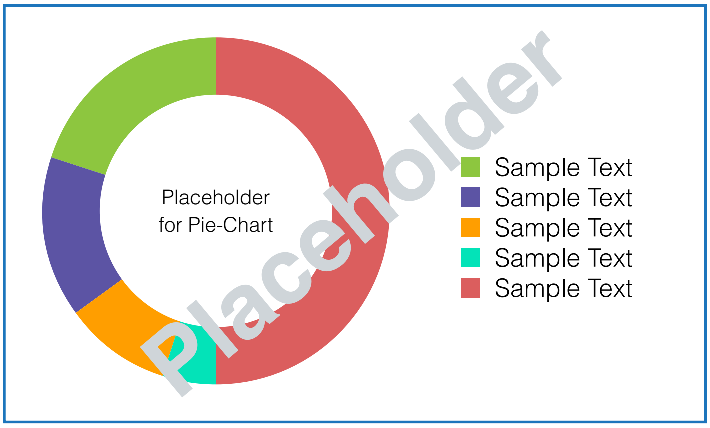
AI integration in the infrastructure industry remains mostly fragmented, compartmentalised and underutilised, due to nascent regulations and concern for new, largely unproven technology. This is exacerbated by common concerns related to data sensitivity, such as security, privacy, consent, transparency, ownership, and ethical considerations. These factors create barriers to sharing both internally, between government projects, and externally, between government and industry.

The data generated from infrastructure planning, delivery and operations is vast. By introducing the necessary support and facilitating collaborative effort amongst the wider industry using AI, the power of this data could be fully harnessed to optimise infrastructure assets and achieve improved outcomes.

Survey Q17: What is stopping you from deploying AI in your organisation today for the target commitments you have selected?



Survey Q13: Please rank the following potential risks associated with implementing AI in your organisation.

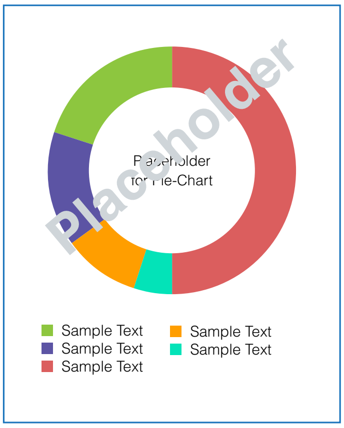


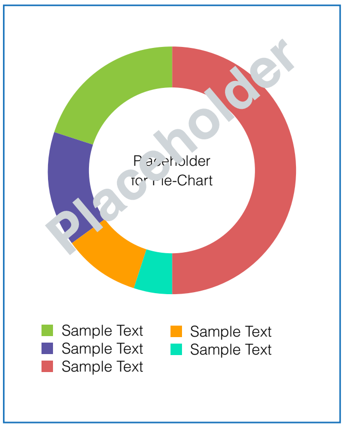
Wider adoption of AI in infrastructure requires a combination of more funding, increased collaboration and development of advanced networking systems to achieve it

The funding for AI in infrastructure is growing rapidly. The global AI in Infrastructure market reached US$38.34 billion in 2021 and is projected to grow at a 20.72% CAGR from 2022 to 2030[18]. Digital funding platforms are emerging to support this growth. For example, the Asian Infrastructure Investment Bank (AIIB) provided US$3.49 billion of total financing for three AI infrastructure projects from 2019 to 2021[19].

Funding platforms alone are insufficient. High initial AI implementation costs and unclear ROI, coupled with uncollaborative delivery models, siloed project delivery models and transactional contracts with the supply chain that limit data sharing, are impeding adoption. Revamping business approaches, commercial models and diversifying operating models across key industry stakeholders are critical to increasing AI uptake and achieving successful project outcomes.

Survey Q20 & 21: what excites and worries you the most about the future of AI?





Accelerating AI adoption requires buy-in from key industry stakeholders – however, the appetite for change is low, and a culture of suspicion persists

While AI in infrastructure has grown organically recently, faster acceleration is needed to improve the industry's performance and address societal challenges. However, the risk-averse nature of this safety-critical industry has made it lag behind others in technology adoption due to resistance to change.

The infrastructure industry relies heavily on traditional practices and established methodologies. Additionally, there remains an emphasis on hands-on skills and experience over digital literacy meaning that the workforce may lack expertise to effectively utilise new technologies like AI, creating a skills gap between age groups. This resistance is also seen at entry level, where infrastructure-related curriculums have been frequently slow to include new practices and emerging key industry trends until they become mainstream. This cultural dynamic poses a significant barrier to AI adoption that requires a focused response to overcome.

Targeted support and incentivisation are needed for key industry stakeholders to adapt

There is no single top-down, one-size-fits-all approach to enhancing AI adoption. Governments and industry must collaborate to create an environment conducive to AI innovation, where success is scalable, risks are mitigated, and issues are managed. Widespread adoption requires gaining executive-level buy-in from key stakeholders and targeted support that enable, encourage and incentivise AI adoption.

An industry rethink of business and operating models is required to accelerate AI adoption

Accelerating innovation in infrastructure requires rethinking the business and operating models, which the industry has historically been reluctant to do. Just as digitalisation transformed the construction and engineering process, introducing AI has the potential to bring transformative changes. To disrupt the status quo on project planning, design, construction, and management, businesses must adapt their models to extract value from innovative project delivery approaches and create novel service capabilities.

Placeholder: case study or interview

06

What actions can infrastructure stakeholders take to fully realise the potential benefits of AI adoption?

Increasing AI adoption in infrastructure requires a targeted industry effort driven by industry ambitions and supported by enablers from key players who can facilitate change

While organic AI solution improvements are happening, accelerating growth and maturity needs industry-wide strategic and targeted intervention. The targeted effort involves stakeholder groups owning focus areas (ambitions) to increase AI adoption across the asset lifecycle, enabled by support (enablers) provided by other stakeholder groups.

Realising these ambitions requires cross-stakeholder collaboration to identify and implement key enablers from others. Ambitions may differ based on how AI addresses stakeholders' business and policy needs, while certain stakeholders hold keys to enabling adoption at different lifecycle stages.

Seven key stakeholder groups or organisations play crucial roles in the infrastructure AI adoption equation:

1. **Asset managers:** Operate, maintain and upgrade infrastructure assets.
2. **Asset owners:** Fund asset development (either the private or public sector) and own the asset.
3. **Consultants:** Advisors, planners, architects, designers, cost consultants, engineers etc., that are appointed throughout the development and delivery stages.
4. **Contractors:** Coordinate and execute construction works (includes main contractors and subcontractors).
5. **Educational institutions:** Contribute knowledge, provide specialised training.
6. **Government:** Oversee relevant infrastructure policies, regulations, standards.
7. **Software vendors:** Develop and provide AI software solutions.

Each group has diverse interests, concerns and influencescritical to balance their complex interactions and stakeholder needs.

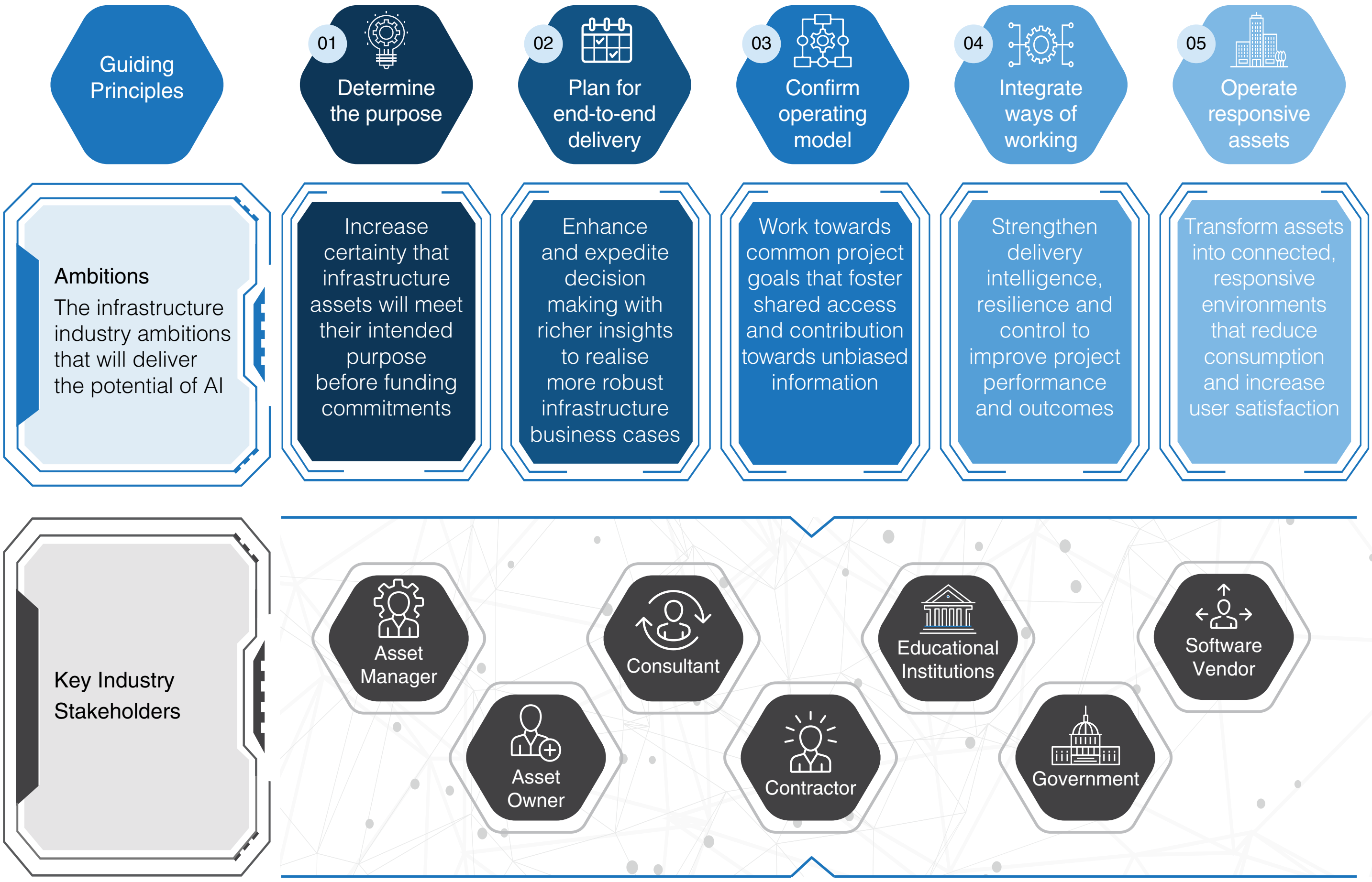
Realising the industry's AI ambitions requires implementing enablers that address the diverse interests of various stakeholders

Unlocking AI's value across stakeholder strategies and value chains requires creating an environment that benefits each group. Five key ambitions aligned with the five guiding capital project principles – along with enablers required from key stakeholders – have been identified to increase AI adoption and deliver more efficient infrastructure.

These ambitions and enablers collectively aim to facilitate automation, reduce duplication, strengthen controls and enable evidence-based, data-driven decision-making. This environment will boost productivity, increase confidence in infrastructure business cases and more consistently deliver end-user benefits, allowing 'more with less' to meet current and future challenges. Figure 6 illustrates the ambitions and industry stakeholders that are critical to realising increased AI adoption in the industry.

Placeholder: case study or interview

Figure 6. The ambitions aligned to the five guiding principles and the key industry stakeholders required to realise acceleration of AI adoption



To realise the ambitions aligned with the five guiding capital project principles, a proactive industry response is required from the key industry stakeholder groups. These stakeholder groups need to connect and collaborate in a complex industry environment within which the relationships change over time. On one hand, the stakeholders are the AI users who must make commitments to adopt the AI solutions, whilst on the other, have the ability to exert influence by providing enablers to AI users.

Considering this dynamic stakeholder environment, are we able to establish an industry-wide framework that sets out the relationships between the guiding capital project principles and the ambitions and commitments required from individual stakeholder groups to realise the ambitions? And what are the key enablers required from other individual industry stakeholder groups to realise the ambitions at each stage of the asset lifecycle? These relationships are explored and illustrated over the following pages.

Placeholder: case study or interview

Principle 1: Determine the purpose

Ambition: Increase certainty that infrastructure assets will meet their intended purpose before funding commitments.

Proactive industry response required: incentives and enablers initiated and implemented by *asset owners* and *government*, internally to achieve buy-in and sponsorship, and externally to *consultants*.

Stakeholder commitments needed:

Financial and resource commitments from *consultants* and *asset owners* to develop and implement AI solutions, skills and training

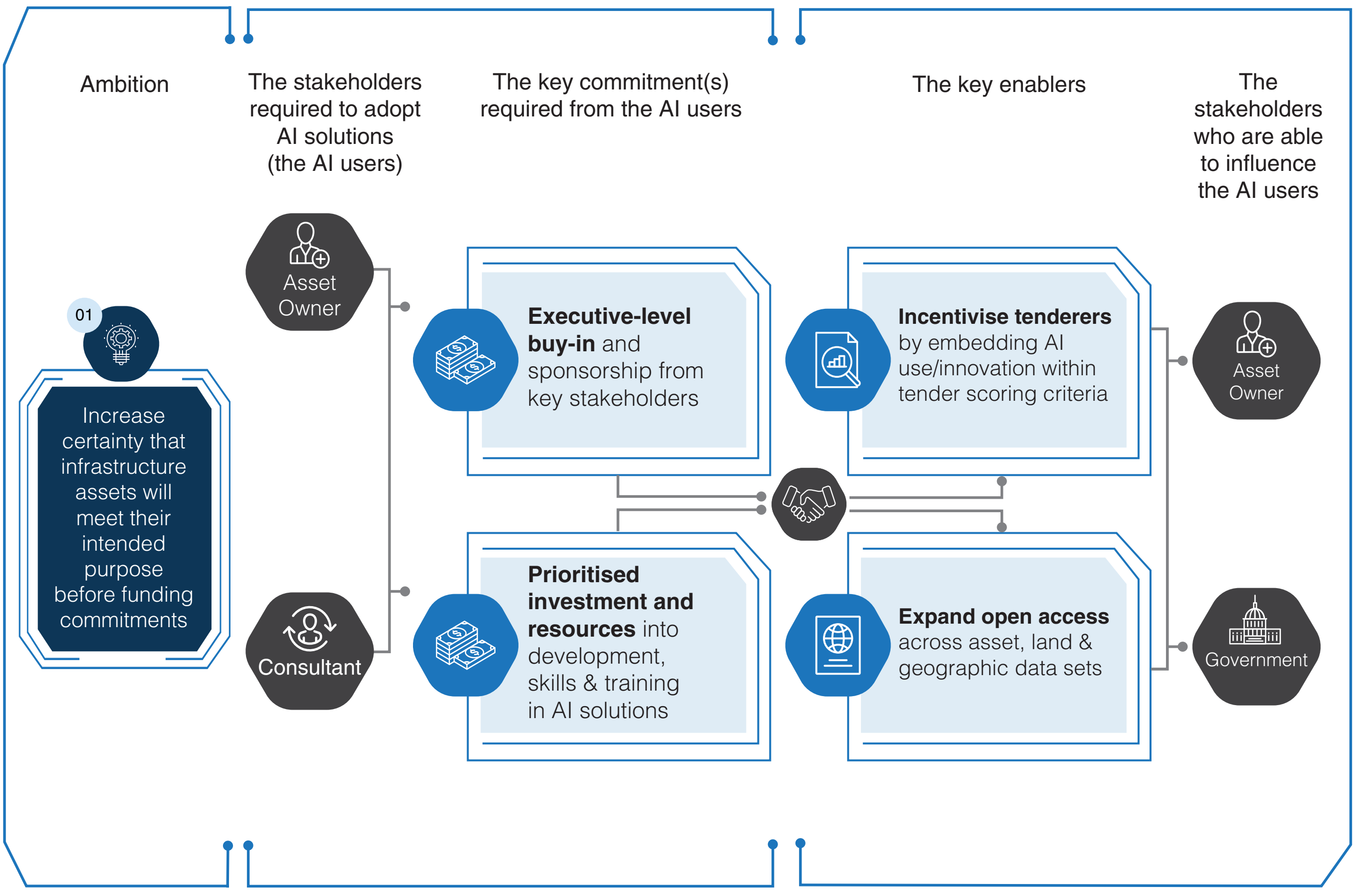
- Executive-level buy-in from *consultants* and *asset owners*
- Prioritised investment in developing and training in AI solutions

Key enablers include:

1. Incentivise tenderers: *asset owner*-led balanced scoring of consultancy tenders factoring AI innovation adoption (e.g., AI-enabled spatial intelligence solutions in use case 1a)
2. Expand open access: *government* expansion of open data access to asset, geospatial and other types of data used in AI tools like automated EIAs (use case 1b)

Target outcome: increased adoption of AI upfront to provide more certainty that assets will meet their purpose before funding commitments. Figure 7 illustrates the relationship between the industry stakeholders and enabler types identified to increase adoption of AI against this ambition:

Figure 7. Enablers, commitments and key stakeholders required to realise the 'determine the purpose' ambition



Principle 2 – Plan for end-to-end delivery

Ambition: Enhance and expedite decision-making with richer insights to realise more robust infrastructure business cases.

Proactive industry response required: incentives and enablers initiated and implemented by *asset owners* and *government*, internally to achieve buy-in and sponsorship, and externally to *consultants*.

Stakeholder commitments needed:

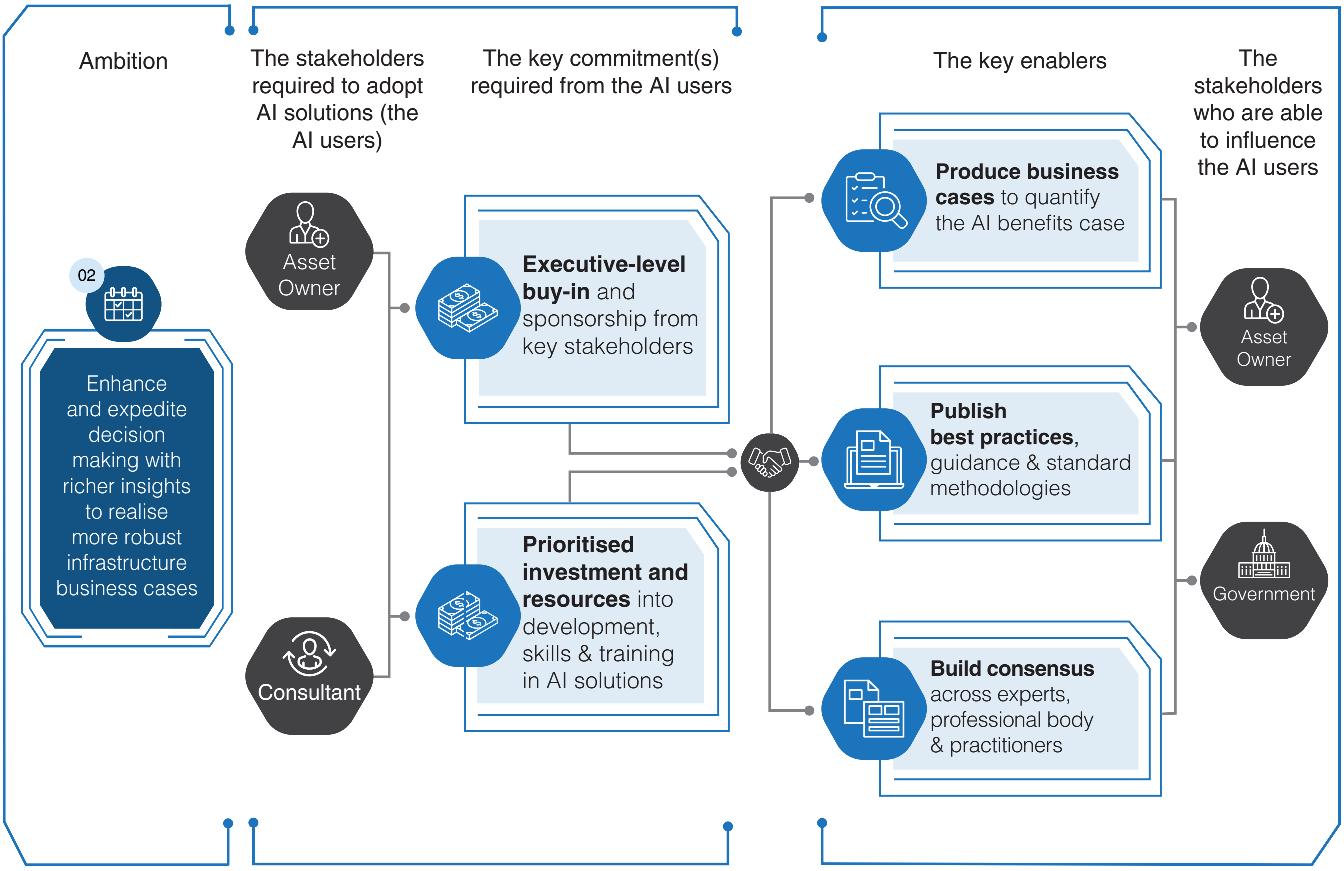
- Financial and resource commitments from *consultants* and *asset owners* to develop and implement AI solutions
- Investment in AI talent and training
- Executive-level buy-in from *consultants* and *asset owners*

Key enablers include:

1. Produce business cases: *asset owner* produce fundamental business cases that quantify AI benefits for functionalities such as generative concept design (use case 2a), including potential time and cost savings, and environmental/social impacts to determine benefit to cost ratio, secure executive buy-in and incentivise funders
2. Publish best practice: *government* published best practices, guidance, standard methodologies for functionalities such as AI-enabled risk/contingency quantification (use case 2b)
3. Build consensus: expert, professional body and practitioner engagement to inform best practice and foster consensus

Target outcome: an uptick in adoption that leverages AI's richer data-driven insights from solutions like generative concept design and risk quantification to enhance decision-making. Figure 8 illustrates the relationship between the industry stakeholders and enabler types identified to increase adoption of AI against this ambition:

Figure 8. Enablers and key stakeholders required to realise the 'plan for end-to-end delivery' ambition



Principle 3 – Confirm the operating model

Ambition: Set aside individual agendas by working towards common project goals that foster shared access and contribution towards unbiased information.

Proactive industry response required: incentives and enablers initiated and implemented by *asset owners*, internally to achieve buy-in and sponsorship, and externally to *consultants*, *contractors* and *asset managers*.

Stakeholder commitments needed:

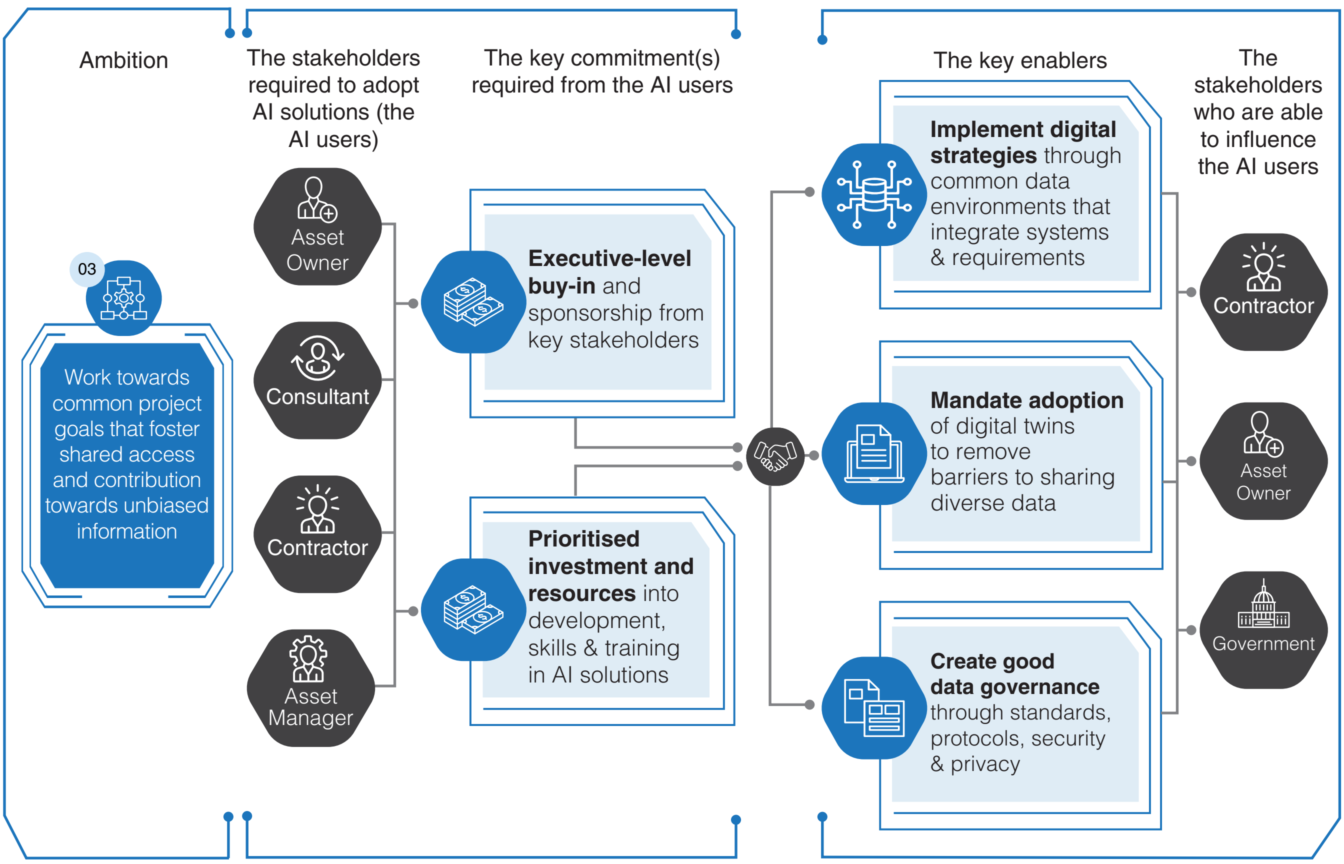
- Financial and resource commitments from all industry stakeholders to implement digital twins on projects, supporting the removal of barriers to data sharing and establishing a digital and data environment to deploy AI applications
- Project owners specifying digital twins as a project requirement to enable integration via a shared digital platform
- Investment in AI solution development and training
- Executive-level buy-in from *asset owners*, *consultants*, *contractors* and *asset managers*

Key enablers include:

1. Implement digital strategies: *asset owner* and *contractor*-led common data environments that enable unbiased information access and contribution across the project ecosystem
2. Mandate adoption: *asset owner* driven digital twin mandates for *government* funded projects to remove barriers to sharing high-quality, coordinated, current, diverse data (use case 3a)
3. Create good data governance: promote standards/governance for specific asset class data models, protocols, management, integration, security and privacy

Target outcome: set-up of projects and assets for AI-readiness as default by removing barriers to data sharing amongst project stakeholder organisations and ensuring availability of high-quality, consolidated data inputs that AI algorithms can utilise. Figure 9 illustrates the relationship between the industry stakeholders and enabler types identified to increase adoption of AI against this ambition:

Figure 9. Enablers and key stakeholders required to realise the 'confirm the operating model' ambition



Principle 4 – Integrated ways of working

Ambition: Strengthen delivery intelligence, resilience and control to improve project performance and outcomes.

Proactive industry response required: incentives and enablers initiated and implemented by *asset owners* and *government*, internally to achieve buy-in and sponsorship, and externally to *contractors* and delivery partners.

Stakeholder commitments needed:

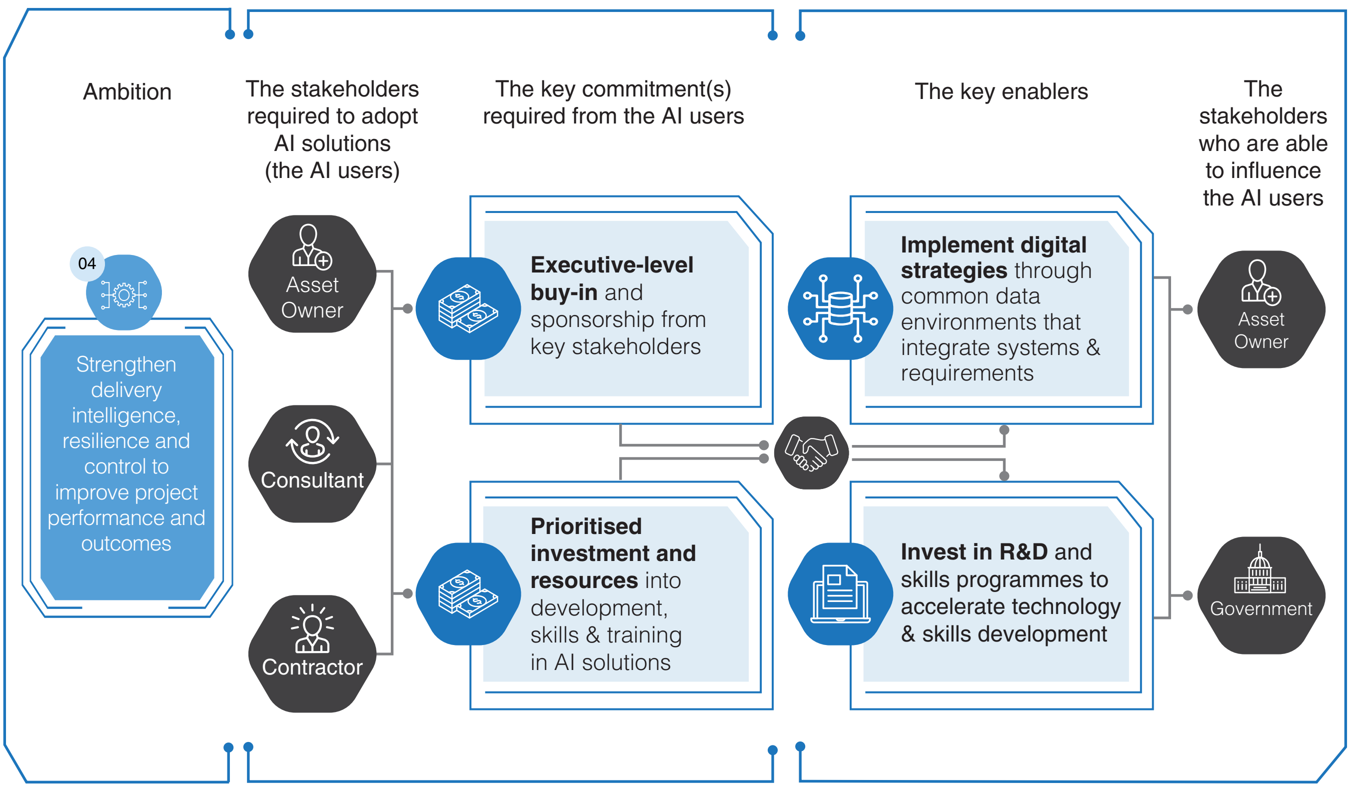
- Financial and resource commitments from *asset owners* and *contractors* to develop and implement AI solutions, skills and training
- Investment in AI solution development and training
- Executive-level buy-in from *asset owners* and *contractors*

Key enablers include:

1. Create common data environments: *asset owner* and *contractor*-led common data environments achieved through the implementation of digital strategies that standardise data, systems and requirements for AI-powered PMOs (use case 4a)
2. Invest in R&D: *government*-funded R&D programmes for AI-enabled autonomous construction (use case 5a) to:
   - Improve construction quality and productivity using AI robotics
   - Bring together academics and industry experts to accelerate technology development
   - Support transforming labour-intensive processes to increase productivity to address the skills gap

Target outcome: widespread uptake of AI solutions being leveraged on major projects to strengthen integrated project delivery by providing timely intelligence, resilience, and control over performance and outcomes.
Figure 10 illustrates the relationship between the industry stakeholders and enabler types identified to increase adoption of AI against this ambition:

Figure 10. Enablers and key stakeholders required to realise the 'integrated ways of working' ambition



Principle 5 – Operate responsive assets

Ambition: Transform assets into connected, responsive environments that induce operational efficiency, reduce consumption and increase user satisfaction.

Proactive industry response required: incentives and enablers initiated and implemented by *asset owners* and *government*, internally to achieve buy-in and sponsorship, and externally to *asset managers*.

Stakeholder commitments needed:

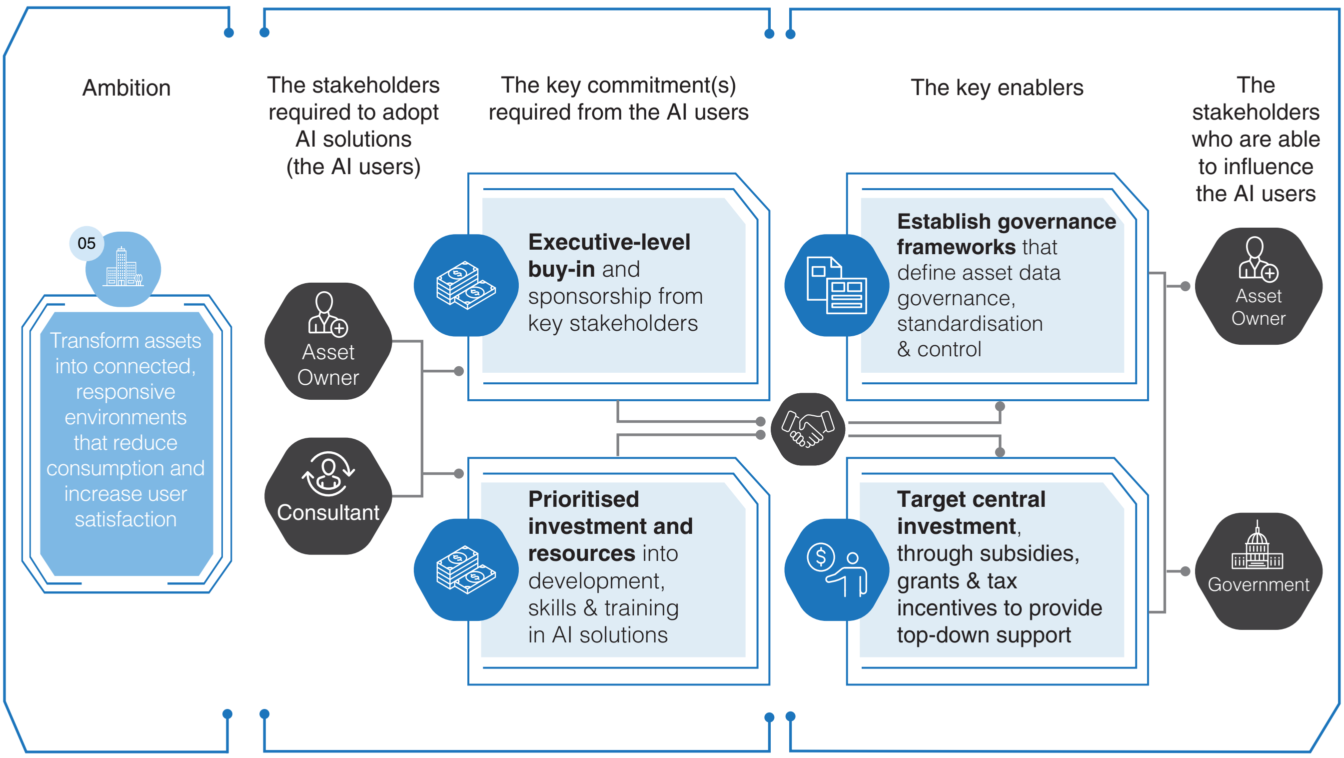
- Financial commitments and executive buy-in from *asset owners* to develop and implement AI solutions, skills and training
- Investment in AI solution development and training

Key enablers include:

1. Establish governance frameworks: *asset owner*-led data governance frameworks that define asset data standardisation and control that:
   - Mandate cross-functional digital twins for a 'digital by default' approach to enable functionalities such as AI-ready asset management solutions like predictive rail maintenance (use case 5a)
   - Provide standards/governance for specific asset class data models, protocols, management, integration, security and privacy
2. Target central investment: *government*-driven subsidies, grants and incentives which:
   - Financially support the integration of AI-enabled smart building energy management solutions (use case 5b)
   - Foster net-zero, energy efficiency, emission reduction, sustainable urban environments through proven AI technologies

Target outcome: AI solutions being routinely harnessed to transform assets into connected, responsive operating environments optimised for efficiency, sustainability and user experience. Figure 11 illustrates the relationship between the industry stakeholders and enabler type identified to increase adoption of AI against this ambition:

Figure 11. Enablers and key stakeholders required to realise the 'operate responsive assets' ambition



07 What is the business model transition that is required to enable AI adoption?

In addition to the enablers, we have identified three options that aim to start a transition traditional business and operating models to service and enterprise-centric models

While AI can capture value across the infrastructure asset lifecycle, the industry's technology market and delivery models remain highly fragmented, driven by individual point solutions with room for further integration. Realising AI's benefits requires transitioning from a cost-oriented approach to a service-oriented business model mindset.

The current landscape involves two key dimensions: 1) AI's internal value proposition for individual stakeholders and 2) How project operation models can collectively benefit from increased AI adoption.

To drive this fundamental shift, three options move beyond status quo business and operation models. This structural and perspective change helps respond to the required service-oriented transition to increase AI adoption.

Option 1: Integrated platform models

The integrated platform model embodies system thinking to facilitate connection and interaction among different stakeholders through the widespread adoption and integration of various data platforms offering infrastructure services, data management, analytics, and other functionalities. These platforms can enable data sharing, joint development of AI models, and implementation of innovative solutions benefiting the entire ecosystem.

To achieve integrated platform solutions, a shift in perspective is needed – from viewing digital platforms as siloed technological solutions to recognising them as business ecosystems encompassing resources, assets, and stakeholder participants[20]. Asset owners are inherently incentivised as the stakeholder most likely to gain benefit from a whole-of-life approach to data capture, collection and use due to the end-to-end value it unlocks. Asset owners can adopt a platform approach in the operating and delivery model design stage by establishing partnering agreements that obligate delivery partners to work together and follow a platform approach that utilises common data environments for stakeholders to collaborate in a unified way to share in the realisation of target outcomes.

Option 2: Data monetisation models

The goal of data monetisation is to extract value from data resources and turn them into tangible business outcomes, whether through direct revenue generation or enhancing operational efficiency. AI usage requires access to relevant and diverse datasets to fuel algorithms and models, allowing them to learn, make predictions and generate insights effectively. Without sufficient high-quality data availability, AI solutions cannot perform optimally.

Key industry stakeholders like governments, asset owners, consultants and contractors acquire and hold high-quality infrastructure data within their businesses. This data has the potential to be aggregated and monetised through various channels like licensing as a product, partnerships, or joint data exchanges to share or sell to other stakeholders or third parties with specific use cases. Monetising data creates new revenue streams while supporting AI innovation in and beyond the industry. Data-as-a-Service is a more advanced option where data is provided from remote services or cloud platforms, enabling stakeholders to access and utilise curated datasets without managing underlying technical infrastructure.

Option 3: Contract incentivisation models

AI adoption in the industry typically requires asset owners to acquire licenses or pay subscription fees to software vendors directly or indirectly through procured contracts. A key lever to encourage other stakeholders to adopt AI during project development stages is the contract incentivisation model. One approach adjusts tender scoring criteria to prioritise innovation and AI adoption, incentivising tenderers to incorporate AI solutions in their pricing. For major programmes, incentivisation mechanisms incorporated into contracts foster and financially reward the achievement of common strategic goals. By focusing on outcomes, contract incentives can reward stakeholders for AI adoption itself through metric scoring or by incentivising demonstrated target savings from implementation. In the context of AI adoption, benefits include cross-project collaboration for common AI-driven objectives, leveraging collective insights for better digital outcomes, driving efficiencies from a programme-wide perspective, optimising technological and skills resource allocation, and aligning stakeholder communication for shared AI-driven goals.

Call out box for quote or key message

08

GLFrecommendations to drive AI adoption

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09 Acknowledgements and thanks

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10 Appendix

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