How Finance and Digital Twins Can Shape a Better Future for the Planet

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FOREWORD – ALEXANDRA BOLTON

The finance industry has long been at the forefront of using data and technology to make better decisions, to de-risk, to improve return on investments, and to create better outcomes. Tackling the big challenges of our day – climate change and resilience, energy, healthcare – relies on having the right technologies and data to make the right interventions.

At Centre for Digital Built Britain (CDBB), we have seen how digital twins can improve decision-making in the planning, design, build, and operation of assets. We have also seen the benefits of connecting digital twins across organisations and sectors. The finance community has a huge opportunity to realise the benefits of digital twins by using them to add value, track sustainability targets, attract new investments, and manage risk better. However, collaboration across the industry is key. When we collaborate, across boundaries, across borders, we can do amazing things. We can make better business decisions that drive better economic, social, and environmental outcomes.
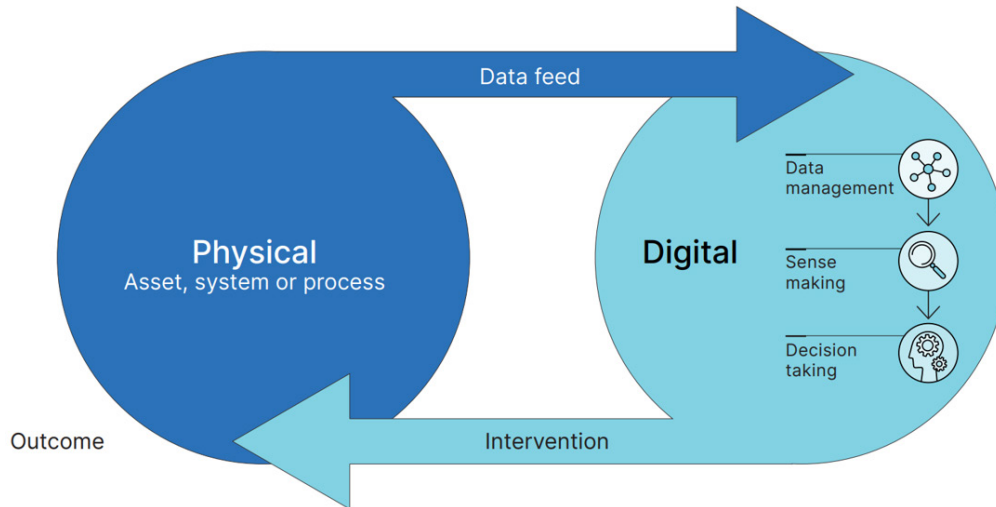
On behalf of CDBB, I would like to thank everyone involved in this paper; Mark Coates and Bentley Systems for their leadership, which was key to making this paper a reality; and all who so generously shared their expertise, experience, and knowledge.

I am excited to see how the finance community will join with the wider infrastructure community and solution providers to use higher quality data and digital twins to improve investment returns, meet ESG goals, and create the sustainable future we all want to see.

DIGITAL TWINS[1]

Centre for Digital Built Britain (CDBB) describes a digital twin as "a digital representation of an asset, system, or process."

What distinguishes a digital twin from any other digital model is its connection to the physical twin. Based on data from the physical asset or system, a digital twin unlocks value by supporting improved decision-making, which creates the opportunity for positive feedback into the physical twin.

Data feed

Physical
Asset, system or process

Digital

Data management

Sense making

Decision taking

Outcome

Intervention

A digital twin can be:

- *dynamic, capturing current performance data from the physical twin, or*

- *static, a model of a system, with input of long-term condition data from the physical twin via corporate reporting systems and the capital investment process.*

Better Outcomes for All – How the Finance Community Can Shape the Future of Digital Twins

At the heart of the Transforming Infrastructure Performance Programme lies the need for a step change in productivity. [...] It will require data from all parts of the system to inform decision-making, from improved information management in delivery to the creation of digital twins for asset maintenance and optimisation.

Nick Smallwood, CEO, Infrastructure and Projects Authority[2]

In recent years, there has been an explosion of interest in the potential role of digital twins in the transformation of how infrastructure and the built environment are planned, designed, constructed, and operated.

Modern digital approaches are at the heart of an emerging government-industry change programme captured in the work of the Centre for Digital Built Britain (CDBB) and in key documents, such as the Construction Playbook[3], Transforming Infrastructure Performance Road Map to 2030, and the Gemini Papers.[4]

During the five years of the CDBB programme, we have seen a step change in the quality of the dialogue between industry, academia, and the public sector. It has created a greater shared understanding of the use cases and benefits of digital twins at all stages of the asset lifecycle, as well as having unlocked increased investment in digital solutions that have generated ever more economic, social, and environmental benefits.

The catalyst for this paper was to ask if the same has been true for the dialogue between an increasingly tight-knit industry, driving the digital transformation of infrastructure, and the investors, insurers, banks, and other institutions who provide much of their funding and finance.

To answer this question, we have spoken with a wide range of investors to get a better understanding of how and why they are currently using infrastructure-related data, as well as their level of knowledge and interest in the potential of digital twins.

Our conclusion is that there is huge untapped potential for investors to influence how data is used to improve infrastructure decision-making—and that taking on a greater role in the digital transformation of infrastructure will provide better outcomes for businesses, people, and nature.

There is also a significant opportunity to leverage digital twins to support key challenges facing the finance community: where to allocate capital; screening and managing risk; enhancing asset value by improving performance and reliability; and complying with environmental, social, and governance (ESG) requirements.

The key to unlocking this potential is to apply the fundamentals of the information value chain.

The finance community can collaborate with the wider industry to develop practical use cases that help them use the insights derived from data to solve their most pressing problems, make better decisions, and create more value.

The infrastructure sector needs to play its part and approach this dialogue with openness and flexibility. Infrastructure professionals need to understand that investors generate their return on investment (ROI) in a variety of ways, via different types of assets and at different stages of the infrastructure lifecycle. Some of their use cases overlap with those already developed for supply chain businesses or operators while others will not.

In the remainder of this paper, we set out three steps for improving the quality of the dialogue between investors and other parts of the infrastructure sector, re-imagine the information value chain from an investor's perspective, explore how investors can expand their leadership role, and share some use cases investors are currently pursuing.

Finally, in the spirit of encouraging dialogue and collaboration, the paper ends with a series of open questions that we hope will kick-start a debate that will bring investors into the heart of the effort to digitally transform infrastructure performance.

IMPROVING COLLABORATION BETWEEN THE FINANCE COMMUNITY AND THE WIDER INFRASTRUCTURE SECTOR

STEP 1 – UNDERSTANDING THE VARIETY OF INFRASTRUCTURE INVESTORS AND WHAT THAT MEANS FOR THE DIFFERENT WAYS THAT THEY CAN BENEFIT FROM DIGITAL TWINS

The first step to bringing investors into the heart of the debate on digital twin adoption is simply to recognise that they are not a homogeneous, undifferentiated group.

Infrastructure investor is a broad term that embraces a range of institutions that invest in the debt or equity of infrastructure assets or businesses. Investors may fund the construction of new (greenfield) assets or acquire operational (brownfield) assets.

There are numerous types of infrastructure investors pursuing a variety of strategies to achieve ROI.

- *Private equity firms and asset managers* typically invest pools of funds on behalf of institutional investors, such as pension funds, insurers, or sovereign wealth funds. Funds will hold these stakes for different lengths of time, depending on their investment strategy, but it will normally be at least three to five years. Fund managers use their expertise to support asset managers to maximise performance, revenues, and re-sale value. They will normally receive an annual management fee based on the value of the fund and be entitled to a share of gross profits.

- *Commercial banks* provide both debt and equity, depending on their investment strategy. Debt may be in the form of the purchase of bonds issued by infrastructure asset owners or loans secured against the asset. Issuers of debt will normally be more hands-off than an equity investor and have a shorter-term interest in the underlying asset.

- *Institutional investors (pension and/or sovereign wealth funds)* may also employ their own internal teams to invest directly in the equity of infrastructure assets and businesses. Major players in the market include big Canadian pension funds and the sovereign wealth funds of states, such as Abu Dhabi and Singapore.

- *Development banks* are national, regional, or financial institutions that provide debt, equity, and guarantees for higher risk infrastructure investments, normally in developing countries that cannot be supported in their entirety by private markets. Development banks are typically set up by governments or non-profit organisations and normally operate to policy mandates, setting out the social, economic, and environmental objectives to be supported by the bank's activities. Examples include the European Bank for Reconstruction and Development. The new U.K. Infrastructure Bank has many of the characteristics of a development bank and is providing GBP 22 billion of finance to support climate change and levelling up objectives.

- *Others key stakeholders include insurers, advisors, and guarantee providers.*

I'm not looking for a grand vision. I need something scalable, interoperable, intelligible and above all useful.

STEP 2 – UNDERSTANDING HOW INVESTORS CATEGORISE INFRASTRUCTURE

A second step is to understand how digital twins are likely to relate to how the finance community typically categorises infrastructure. Many investors divide the sector into four categories of opportunities (see figure below[7]).

CATEGORY	DESCRIPTION	EXAMPLES	SOURCE OF REVENUE
CORE	Assets essential for society	Energy, rail, road, water, and waste utilities Schools, hospitals, and other social infrastructure	Rates charged to users agreed upon with regulators Long-term contracts with government counterparties based on availability or similar payment mechanism
CORE-PLUS	Similar to the core category but with potential for greater variability of cash flows	Contracted power generation Toll roads, airport, and seaports	Long-term contracts Concession arrangement
VALUE-ADDED	Greenfield projects that will become core assets post construction Assets with opportunities for growth, expansion, or repositioning	New build utility, school, or hospital projects Data centres, air, or seaport expansion	Long- and short-term contracts Revenues from expanded services
OPPORTUNISTIC	Assets in emerging markets Assets in financial distress Assets exposed to high level of cost or revenue uncertainty	Merchant power generation or waste processing	Contracts with less reliable counterparties Volatile revenues

STEP 3 – RELATING DIGITAL TWIN USE CASES TO DIFFERENT INVESTOR STRATEGIES

A third step is to link potential use cases for digital twins to how investors build investment strategies. At the most basic level, infrastructure is seen as an attractive investment because it offers stable, reliable returns, often backed by a government counterparty. In times of economic uncertainty, investments in real physical assets that provide essential, government-supported services are unsurprisingly particularly attractive. Behind that general rule, however, lies a variety of approaches to generating an acceptable ROI. Figure below (Source: Preqin[8]) shows how the four categories of infrastructure can form the basis of strategies based on expected ROI, risk appetite, and the balance between generating returns from maximising revenues or profits from the re-sale of assets.
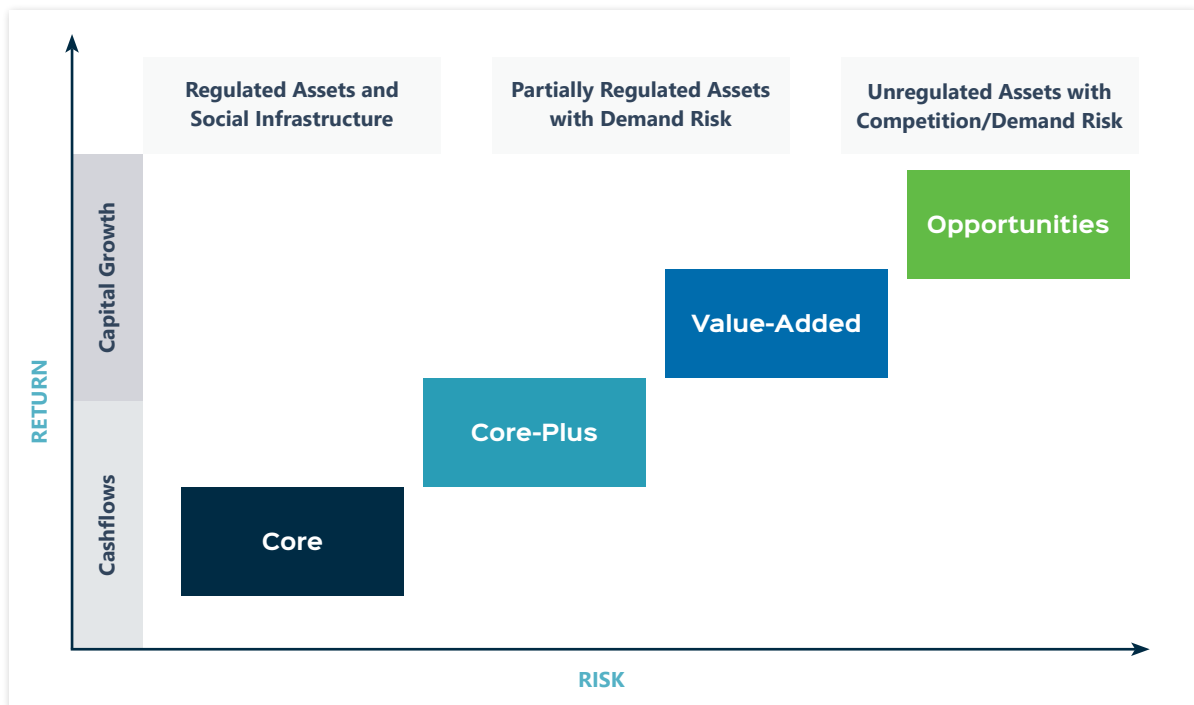

REIMAGINING THE INFORMATION VALUE CHAIN FOR INVESTORS

The use cases for a digital twin will vary for different types of infrastructure investors pursing different strategies.

The fundamentals of building a use case for deriving value from data are, however, no different for investors than for any other organisation.

Collecting data has no inherent value. It must be used to make better decisions that lead to improved outcomes. Sense-making is needed to convert data into insights that can support this process. This simple idea can be captured in the information value chain.

The figure above sets out how the information value chain could look for infrastructure investors.
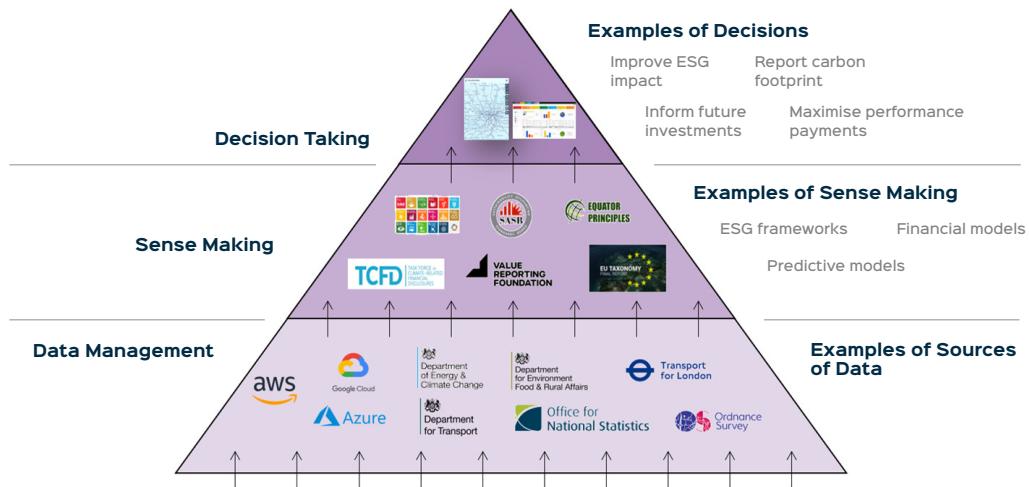
ESG: THE BIGGEST DATA CHALLENGE FOR THE FINANCE COMMUNITY?

The U.K. government has set out detailed plans for Greening Finance to support its ambitious 2050 net-zero carbon target.

The plan includes the Sustainability Disclosure Requirements announced by the Chancellor in July 2021. In October 2021, the Chancellor also confirmed that the U.K. will adopt in full the recommendations of the Task Force on Climate Related Financial Disclosures (TCFD).

The goal is to ensure that the financial flows across the economy shift to align with the net-zero commitment and wider sustainability goals.

HOW INFORMATION AND CAPITAL FLOWS THROUGH THE ECONOMY

Source: HM Government (2021) Greening Finance and Roadmap to Sustainable Investing

The Sustainable Disclosure Requirements will create a single integrated framework for "decision useful" disclosures on ESG related issues.

It will cover three categories of disclosures:

1. **Corporate Disclosures:** Requirements for companies, including financial services businesses to make sustainability disclosures. This reporting will adhere to agreed international standards.

2. **Asset Manager and Asset Owner Disclosures:** New requirements for asset managers and asset owners (including occupational pension schemes) to disclose how they take sustainability into account in their decision-making.

3. **Investment Product Disclosure:** New requirements for creators of investment products to report on the products' sustainability impact and relevant financial risks and opportunities. This information will also form the basis of a new sustainable investment labelling regime.

In addition, despite Brexit, the EU Sustainable Finance Disclosure Regulation will affect anyone raising money from investors inside the EU, and there are signs that the U.S. is moving in a similar direction.

In a recent article on Infrastructure's ESG Revolution,[6] Gordon Bajnai, head of global infrastructure at private equity business Campbell Lutyens, summed up the current situation. "Sectors such as energy and transportation have a measurable impact on our efforts to decarbonise the world, while sectors such as digital have a huge role to play in bridging divides in society. ESG measument, reporting, and benchmarking have become standard in infrastructure. If you want to raise money, these things are must-haves and not nice-to-have."

This situation is creating a big demand for processes and technology to monitor, measure, and report on ESG risks across an investor's portfolio. It also means that ESG assessments are playing a greater role in due diligence processes for lending, as well as for the buying and selling of assets by equity investors.

Unfortunately, as a recent survey published by Preqin demonstrates, the finance community is being held back by a lack of consistent, high-quality data.

Fund Manager Views on the Main Challenges of Implementing an ESG Policy
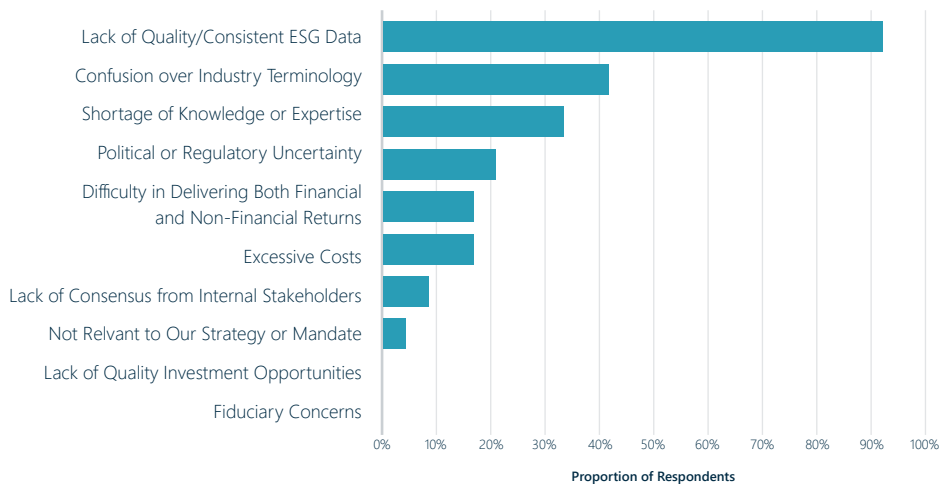
Source: Preqin Fund Manager Survey, November 2021

The need for a step change in the quality and usefulness of ESG-related data looks like one of the greatest information challenges facing the finance community—and perhaps the single biggest use case for a digital twin that can create a bridge between financial data, physical assets, and the natural environment.

HOW CAN INVESTORS TAKE A MORE ACTIVE LEADERSHIP ROLE?

It is necessary for the infrastructure sector to improve how it engages with infrastructure investors. In fact, it is vital if we want those investors to play a bigger role in driving the roll out of digital twins of built environment assets.

Investors themselves need to take the initiative and use their leverage to encourage creating digital twins in ways that align to their interests.

Talking with investors, it was once again clear that different types of investors have different opportunities to take this leadership role. One way to think about this is through the lens of investors' different relationships with the organisations planning, constructing, and maintaining infrastructure assets.

Debt – Incentivising the creation of better-quality data

Banks providing debt to infrastructure businesses or project-based special purpose vehicles have a very transactional relationship. They lend money to support the creation, expansion, and maintenance of assets, and then receive repayment at an agreed rate of interest in an agreed upon time frame.

These loans are normally secured against assets, and lenders have first call on their revenues or resale value if things do not go according to plan. However, they will not receive any share of the upside if the assets outperform. Therefore, lenders' opportunities to influence digitalisation are generally shorter term and linked to their need to de-risk lending and meet their reporting and regulatory requirements as efficiently as possible.

One public-private partnership (PPP) equity investor talked us through how they used a spatial-temporal digital twin developed for a mega-project to demonstrate to their banks that risks were being managed effectively during the construction and commissioning phase. This technology allowed the investor to secure market-leading rates from the consortia of banks, providing the debt finance for the project.

We are also aware of cases like that of Great Portland Estates (GPE)[5], who in 2020 signed a GBP 450 million, ESG-linked, revolving credit facility (RCF) as part of its plan to become net zero by 2030. This innovative facility, the first to be issued by a U.K. real estate investment trust, incorporates three ESG-linked key performance indicators (KPIs), aligned to GPE's sustainability strategy.

These KPIs include annual pre-agreed targets and are based on:

- Supporting GPEs target to decarbonise its existing buildings and reducing the energy intensity of its portfolio by 40% by 2030

- Supporting GPEs target to build net-zero carbon new buildings from 2030

- Providing better quality urban greening measures by increasing biodiversity across GPEs portfolio

GPE's lenders have agreed that a decrease or increase of up to 2.5 basis points will be applied to their headline margin based on performance against the KPIs.

In both cases, the bank's goals were not to drive the digital transformation of buildings and infrastructure. These targets incentivise GPE to accelerate the decarbonisation of their business and will support continued behavioural change across their supply chain.

However, it is easy to see how the existence and use of high-quality, up-to-date data linked to the physical assets increased their confidence that construction was being de-risked and that ESG KPIs were being met.

These examples demonstrate that there is a case for big lenders to get on the front foot and be more vocal about the digital information that they want to see alongside the physical assets that they are financing—and translate it into competitive interest rates and other returns.

As one interviewee told us, "When people price big infrastructure jobs, they price what they don't know. As the information improves, they'll have to 'go lean' because the risks are known."

Equity – Maximising the value of assets

Equity investors, on the other hand, usually take a higher risk but share in increased revenues during the lifetime of their investment and can sell on their stakes at a profit. Therefore, their business model typically already involves working closely with owners and operators on improvement plans. This situation opens up many more opportunities to drive progress, including through digital transformation initiatives.

It is particularly true for investors with larger portfolios, often spread across many counties. One such investor explained to us how they sought to ensure at least a base level of digitisation across the businesses in which they had equity stakes, telling us:

"If you have two wind farms, and one has some form of digital twin and one just a PDF with some annual performance reporting, it's obvious that, for the owner and their engineers, the former is less risky and it is clearer where we can add value. Then, when it comes to re-sale, assets that have a transparent life history are more transactionable."

This investor explained that they helped local managers to exploit the benefits of being part of the fund's portfolio; for example, helping a smaller local utility in one country work with larger businesses in the same sector to access digital expertise and share knowledge.

The construction and infrastructure sectors have, for decades, talked about the importance of intelligent clients. Many of the equity investors that we spoke with talked about the importance of being an intelligent shareholder, a big part of which is having plans to increase the digital maturity of their assets.

Government – Catalysing data sharing for the public good

One final category of investor that has a leadership role to play is government. The public sector provides much of the finance that goes into the U.K.'s infrastructure.

Many of the wider benefits from better infrastructure data derive not solely from digital twins of individual assets, but also from the ability to share data safely and securely across organisational and sectoral boundaries. To realise the systematic benefits of better data and connected digital twins, governments must play a catalysing, convening, connecting, and co-ordinating role, as demonstrated by such initiatives as the CDBB's own National Digital Twin programme and the National Infrastructure Commission's Data for the Public Good[9] study.

Our interviews highlighted several intriguing opportunities for government.

The government of Queensland in Australia is sponsoring the Cross River Rail project to build a new 10.2-kilometer rail line in Brisbane. Influenced by its conversations with the U.K. Crossrail Project, Cross River Rail, the public company delivering the railway, has invested heavily in a detailed digital twin of the project.

The potential uses of the model go beyond the delivery and operation and maintenance of the rail infrastructure. For example, the original goal of the Cross River Rail project was to monitor the roadway. However, there are ripple effects of this digital twin project. The rail organization can now measure traffic in certain areas and make investments in the right infrastructure. Our view is that the model has the potential to form the basis of a city-wide digital twin, a connected ecosystem, that can deliver benefits by supporting investment decision-making on a city-wide basis. This type of digital twin would deliver value greater than the sum of its parts, especially in the run up to Brisbane's hosting of the 2032 Olympics. Other publicly funded mega-projects have leeway in their budgets to make these kind of anchor investments. They can also use their influence to establish de-facto norms for data management and interoperability.

Elsewhere, investors are looking to exploit public data sets that might not normally be associated with an infrastructure digital twin. We spoke to one investor who is exploring how they could align their in-house corporate data with public data sets relating to measures such as educational attainment, crime, and local economic development. This application would open opportunities for investors to demonstrate how their activity was contributing to policy goals, with the potential for more effective allocation of resources and the creation of new income streams for investors. The quality, accuracy, and accessibility of these data sets remain a barrier to realising this vision, despite the efforts of the Office of National Statistics, Cabinet Office,[7] and others. However, our investor was convinced that if government worked to make better quality data openly available, private sector players would lean in and develop new solutions to help meet national goals like net zero.

What kind of use cases are investors interested in? In our conversations with different types of investors, we heard about a variety of current and potential use cases. Here are just a few examples.

How can I use data and digital maturity to help increase the value of assets? While equity investors have different strategies for how long they want to hold on to assets, they will look to sell on at a profit at some point. Several interviewees told us that they are developing strategies to ensure that assets are more digitally mature at re-sale. They are confident that it provides an objective demonstration of high performance and reduced risk that will increase re-sale value. Enhanced performance will also increase revenues during the period of ownership and can help crowd in further value enhancing investment.

Seeing benefits is much more important than embracing leading edge technology.

How can I use data and digital maturity to screen ESG impacts and comply with regulations?
Multinational development banks explained to us that they have a fundamental need to demonstrate the impact of their investments against a variety of economic, social, and environmental metrics. They told us that they are exploring actively how digital technologies can improve the efficiency and transparency of how impact is measured.

We also heard from investors in social and economic infrastructure about an opportunity to go beyond ESG reporting and open up potential new revenue streams by demonstrating a direct correlation between their investments and government policy goals, such as crime reduction or educational attainment. These investors are looking to work with digital specialists to blend publicly available data such as crime figures with their own in-house data.

More broadly, investors also face a host of ESG and safety-related reporting requirements, these demands are creating one of the most powerful use cases amongst investors for better data.

Safety

The Grenfell Tower tragedy has ushered in a renewed focus from government and regulators on the safety of higher risk buildings.

The Buildings Safety Act is expected to receive royal assent in the first half of 2022, with significant changes to duties around risk management being phased in over the subsequent 18-month period.

The act builds on the findings of Dame Judith Hackitt's review of building regulations and fire safety. Dame Judith recommended the introduction of a "robust golden thread of key information to allow all parties to use information to safely and effectively design, construct, and operate their buildings." She stated that this data must be passed to future building owners to underpin more effective safety management. The recommendations and the subsequent legislation are intended to address the problems within the industry of vital information not being effectively managed—or sometimes not even available in a usable form— to ensure that the right people have the information that they need to ensure the safety of buildings.

The act also requires that the data be used to create a safety case owned by an accountable person. In practice, it means accountable persons—normally, the landlord or freeholder—will need to demonstrate that risks have been identified and assessed, and that a credible plan is in place to reduce or control them to an appropriate level. These plans must be maintained, and regular reports must be submitted to regulators.

How can I optimise energy performance? Real estate equity investors told us that improving energy performance was the single most appealing use case for digital twins in their world. Success would tick ESG and carbon reduction boxes, while promising to enhance ROI via performance improvements and enhanced user experience. These investors are actively exploring how scenario modelling and analysis can help identify the interventions with the greatest energy performance benefits.

How can I mitigate risks created by bad data? The Grenfell Tragedy is educating the whole built environment sector on the human, reputational, legal, and financial risks created by poor or incomplete data. The Building Safety Act will be phased in over the next 18 months, introducing the requirement to maintain a golden thread of asset information through the lifetime of the highest risk buildings. It shows how better data practices, up to and including the creation of digital twins, can mitigate the risks created by poor data, which is an increasingly compelling use case for many investors.

How can I maximise my income from availability payments? Many investors have revenue streams tied to payment mechanisms based on performance standards, such as lane availability on their roads or classrooms heated in their schools. These investors are pursuing use cases for digital twins that help investors maximise revenue by ensuring operational teams are alerted when action is needed to head off any drop in service levels. This data can also provide a historic record of performance useful for proving compliance with contractual obligations over the course of the contract.

How can I reduce my cost of capital? One PPP investor talked us through how they used a spatial-temporal digital twin developed for a mega-project to demonstrate to banks that the construction and commissioning risks were being managed effectively by the project delivery team. This situation allowed them to secure market leading rates from the consortia of banks providing the debt finance for the project.

MOVING THE CONVERSATION FORWARD

The goal of this white paper has been to kick-start a dialogue that can bring infrastructure investors closer to the centre of efforts driving digital transformation of the infrastructure sector.

Instead of finishing with a traditional conclusion, we decided to convert some of the themes explored throughout the paper into a series of questions that initiate that conversation. These questions are by no means an exhaustive list, and we are very happy to be told other questions are more important. The key, however, is to start the conversation.

What changes do digital twin solution providers need to make and how they operate to better serve infrastructure investor interests?

In our conversations with infrastructure investors, we picked up a hint of frustration that some digital twin solution providers focus on pitching the capabilities of technology rather than focusing on investors' problems and how digital twins can provide solutions. We were also reminded that investors are not engineers or digital specialists and need these solutions explained to them in their language.

Can digital twin solution providers change their mindset and play a more proactive role in communicating the benefits of digital twins to investors, working with them to co-create solutions that meet their business needs? As a first step, can they pull together some existing use cases that can really communicate and celebrate success?

Can we reach a consensus on the most promising use cases and set some shared challenges?

As we have seen, there are many use cases already being explored by infrastructure investors. Can a dialogue between the investor community and the infrastructure sector reach consensus on what are the most pressing and promising? Can we set some shared challenges? What level of digital information will really be needed to serve them? Is visualization the requirement or can needs be met, at least in the first instance, by something simpler?

Should a digital maturity assessment be a standard part of investors' due diligence process?

We heard from several investors who have developed simple metrics to assess the digital maturity of the people and organisations in which they are investing. They help with risk assessment and identifying opportunities for adding value to the assets and barriers to their realisation. Should these steps become a much more standard part of the due diligence process? Is there a role for non-commercial players like CDBB and its successors to help codify and standardise digital maturity?

The sophistication of an infrastructure owner's cyber security measures will be a key metric in any digital maturity assessment. One development bank told us that many of the projects that they invest in form part of developing countries' critical national infrastructure. Supporting the digitalisation of these nations' energy grid or similar projects not only delivers real economic, social, and environmental benefits, but also increases vulnerability to cyber-attacks. In response, the bank has taken a very top-down approach to using its leverage to improve data security and standards, as well as ensuring that the maturity exists to maintain them over time.

> Infrastructure is paradoxically very simple from an investor's point of view but also very murky—there is no Bloomberg for infrastructure! Contractual relationships mean information can be really ambiguous.

In the commercial market, we heard that fears about the additional complexity and risk created by cyber-security can be a barrier to investors embracing digital innovation. How can solution providers and the finance community collaborate more effectively to deal with the challenges of cyber-security? Are there lessons that can be transferred from development banking into the commercial sector?

What will make providers of debt offer competitive interest rates for assets with digital twins?

We heard from one investor who had secured highly competitive terms from banks that are providing debt for a greenfield mega-project. The use of digital twins to de-risk the construction phase played a key role. We know that some banks have been willing to offer competitive rates to projects demonstrating performance against ESG targets, something that generates a strong use case for comprehensive asset and performance data. Can we encourage banks to be more proactive in offering competitive lending terms to projects utilising digital twin technology to address these risks and opportunities? Are there other motivations that the sector could tap into?

What more can governments do to help?

Cross River Rail in Brisbane is an example of where a publicly sponsored mega-project can provide the catalyst for a city-level digital twin that can support better investment decisions.

We also heard that some of the most useful data sets for building a use case are those held by governments or agencies. It can include data needed to assess the impact of investments, such as changes to crime rates, educational attainment, and economic development. Unfortunately, many of these data sets are patchy or out of date. Can government be encouraged to tackle this problem and then to challenge the industry to lean into this data to drive progress towards big policy goals like levelling up and net zero?

> As it's the operational results that will give us the momentum to engage.

THE TAKEAWAYS

The goal of this white paper has been to kick-start a dialogue that can bring infrastructure investors closer to the centre of efforts driving digital transformation of the infrastructure sector.

The Value of Information Management in the Construction and Infrastructure Sector report estimated that every GBP 1 invested in information management could potentially secure up to GBP 6 of labour time savings, all while boosting government efforts to reach net-zero carbon emissions by 2050. Five takeaways are proposed to advance digital twins and unlock their benefits for the finance community:

1. Adopt the Gemini Principles in your digital strategies: CDBB is calling on leaders involved in managing and investing in the built environment to build the Gemini Principles into their digital strategies. The principles enable a values-based approach for the development of digital twins and alignment for organisations.

2. Digital twins to support ESG reporting: There is a great data challenge facing the finance community in terms of access, accuracy, and consistency of data. This challenge is on the critical path for ESG reporting. Digital twins should be built on high-quality data, and there is large overlap between data required for ESG reporting and data needed for managing of assets. Advancing the use of digital twins will drive better data quality and improve chances for timely ESG reporting.

3. Open data to unlock its value: Data has value in isolation, and an increased value is realised when it is shared and connected. Open data does not mean that everyone has access to the data, but rather means that data is shareable within the ecosystem of partners, clients, and the supply chain. According to the Gemini Principles, data must be as open as possible while remaining consistent with the principles of holistic security to create maximum value for everyone. Including data from many sources is essential to maximising value of digital twins.

4. Assess and upskill digital capabilities: The changes brought by digitisation are driving a need for new services across the industry, such as cyber resilience, data engineering, data science, and software development. Organisations in the finance community should assess digital capabilities and upskill as required to ensure a resilient and productive value chain that is fit for the future.

5. Collaborate: The finance community is core to the infrastructure industry and is positioned to reap benefits of better communication and information sharing across the industry. Established communities like the Digital Twin Hub are a great place to shape the future of digital twins in the industry by sharing success stories and lessons learned, as well as connect to others involved with digital twins.

CDBB has worked closely with the industry, academia, and the government to explore and create solutions for the challenges facing the built environment. The Gemini Papers present their learnings from the past five years, capturing the consensus viewpoint of the connected digital twin community and serving as a blueprint for future leaders. The finance community is in a strong position to lead the industry forward.

NEXT STEPS – JOIN THE CONVERSATION

This white paper is one of the final pieces from the Centre for Digital Built Britain, which completes its mission at the end of March 2022. However, many of its activities will continue, including the Digital Twin Hub, which has created a community of infrastructure professionals who are committed to change.

As members of that community, we are committed to working with colleagues to bring investors into the mainstream of the movement and to drive the digital transformation of the infrastructure sector, creating better outcomes for people and the planet.

If you would like to be part of that effort or have views on any of the questions or issues raised in this paper, we would love to hear from you. You can get in touch via the Digital Twin Hub or reach out to us individually on LinkedIn.

We look forward to hearing from you.

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European Bank for Reconstruction
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Financial Conduct Authority

Landsec

Macquarie Infrastructure
& Real Assets

Mott MacDonald Digital Ventures

Pacific Partnerships

Preqin

Pinsent Masons LLP

P2G LLP

References:
1. Centre for Digital Built Britain (2018) *The Gemini Principles*
2. Infrastructure and Projects Authority (2021), *Transforming Infrastructure Performance: Roadmap to 2030*
3. Construction playbook: *https://www.gov.uk/government/publications/the-construction-playbook*
4. Gemini Papers: *https://www.cdbb.cam.ac.uk/news/gemini-papers*
5. Based on Mercer (2021) *Infrastructure Investing – A Primer*
6. Infrastructure Investor, 1 February 2022 *Infrastructure's ESG Revolution.*
7. Major Projects Association & Bentley Systems (2021) *The Power of Data for Long Lasting Change*
8. Preqin: *https://www.preqin.com/academy/lesson-4-asset-class-101s/infrastructure*
9. National Infrastructure Commission (2017) *Data for the Public Good*
7. *https://www.gov.uk/government/publications/how-fair-are-the-uks-geospatial-assets*