Written evidence submitted by Skyral (PIB69)

Executive Summary

- Digital Twin Technology creates real-time virtual replicas of physical systems to simulate performance, predict outcomes, and support decision-making —transforming planning and delivery across the infrastructure lifecycle.
- Digital Twins can vividly demonstrate infrastructure benefits, aiding public understanding and acceptance. Clear, accessible simulations may reduce public resistance, shorten approvals, and foster trust—essential for delivering complex projects such as housing or transport schemes.
- With 91.5% of global projects facing delays or budget overruns, AI-powered digital twins offer a data-driven solution to get infrastructure delivery "right first time," saving time and resources.
- Building Information Management (BIM) Level 2 - mandated for major projects in 2016 - improved collaboration between stakeholders during construction. But it is now time to move to a mandate for BIM 3.
- Mandating BIM 3 would drive digital integration that enables unprecedented data-driven insights for project management while fostering transparent stakeholder communication, ultimately ensuring infrastructure developments remain within budget constraints and meet scheduled completion dates.
- The Planning & Infrastructure Bill is a once-in-a-generation opportunity to ensure this modern standard is required to achieve planning consents for major infrastructure, enhancing confidence among affected communities and achieving greater value for the taxpayer and private sector alike.

About Skyral

1. Skyral is one of the world's leading strategic modelling and simulation (M&S) software companies, using digital twinning technology to transform defence, national security, healthcare, and infrastructure around the world. By integrating proprietary data with public infrastructure and human behaviour models, Skyral offers comprehensive insights that empower decision-makers.

2. Skyral's strategic digital twins help identify the unknown, enhancing the ability to de-risk projects over their entire lifecycles, spot opportunities for efficiency gains, and plan for unintended consequences. By combining multiple decision-making contexts and the ability to simulate potential futures, digital twins enhance quality-of-life and safety, while promoting a faster pathway to results by planning for the future across multiple themes simultaneously.

3. In the UK, Skyral has established itself as a trusted partner to critical defence institutions. In 2021, Skyral built a digital twin of the MoD's national telecommunications network –

it not only supported the planning and mitigation of risk for the £2 billion Next Generation Communication Network (NGCN) programme, but reduced the number of common operational tasks by more than 50%, leading to projected cost savings worth tens of millions of pounds per annum. Skyral has also delivered Pathfinder, underpinning the simulation approach of the British Army's £1.5 billion Collective Training Transformation Programme (CTTP). This saw Skyral down-selected for CTTP-ITN2, alongside partners Raytheon, Rheinmetall, Capita, and Cervus. In 2024, Skyral delivered the first cloud-deployable at-sea M&S Operational Decision Support application for the UK Royal Navy, alongside Microsoft.

4. Outside of defence, Skyral increased the UK's COVID model execution rate by a factor of 10,000 – allowing for thousands of additional simulations to be run per day. In 2024 Skyral was also awarded a multi-year contract worth over $98 million to create and sustain a digital twin of Bali's entire transit, power, and telecommunications infrastructure along with the carbon and environmental impacts of the construction of a $20 billion major subway system.

An Overview of Digital Twin Technology

5. Digital Twin Technology refers to the creation of intelligent, real-time virtual replicas of physical infrastructure assets or systems. These digital twins integrate data from sensors (IoT), historical records, and operational models, and are enhanced by artificial intelligence to simulate performance, predict outcomes, and support decision-making.

6. Weather forecasting – taken for granted and routinely relied upon in the present day – can be used as a comparative analogy here. The incorporation and modelling of thousands of disparate, interdependent, and variable climatic factors – based on our best understanding of how those factors interrelate – produces the forecasts we see in our weather reports day-to-day.

7. Recent advancements now allow for Digital Twins to include massive-scale human behaviour modelling – representing full Patterns of Life, sentiment, and the positive and negative impacts to populations both during and after construction. Pattern-of-life modelling, specifically, relates to the prediction of how human actions and intentions may be impacted by and respond to changes in surrounding environments.

8. In short, Digital Twins are complex simulations that allow for plans, ideas, mitigations, and alternatives to be run thousands of times in a virtual world to see what works, what doesn't, assess risk, and make adjustments before deploying in the real world – saving time, money, and improving safety, while minimising risk to and impact on populations and the environment.

Moving from BIM Level 2 to Strategic Digital Twins

9. BIM has been a mandated process for centrally-procured public sector projects since 2016 (BIM Level 2), aimed at improving collaboration, efficiency, and data-driven delivery in construction. The UK BIM Framework, aligned with ISO 19650 standards, provides guidance on information management across project lifecycles.

10. The Planning and Infrastructure Bill seeks to streamline planning approvals and accelerate the delivery of housing and infrastructure. However, a critical omission in the current draft is the absence of mandatory BIM Level 3 requirements for major infrastructure planning consents.

11. By incorporating a clear mandate for BIM 3, the Bill would drive digital integration across project lifecycles, enable real-time collaboration, reduce costly design conflicts, minimise schedule and budget overruns, and provide unprecedented data-driven insights for project managers and their government counterparts.

12. Introduction of this technological requirement would represent a transformative approach to infrastructure delivery that would align with the Bill's ambition to revolutionise planning while ensuring projects remain on schedule and within budget constraints.

13. BIM 3 would also revolutionise public engagement – clearly demonstrating infrastructure projects' benefits through advanced, yet accessible, simulations. At a time when new and expanded infrastructure built at pace is needed more than ever, bringing the public – both locally and nationally – along the journey is crucial.

The Global Infrastructure Delivery Crisis

14. The global infrastructure delivery industry faces a crisis in project execution, with potentially devastating economic and social consequences.

15. According to research conducted by Oxford University Professor Bent Flyvbjerg, an overwhelming 91.5 percent of projects globally go over-budget, over-schedule, or both. This alarming finding, based on analysis of 16,000 global projects, reveals a systemic pattern of failure that transcends geographical boundaries and project types.[1]

16. This chronic underperformance in infrastructure delivery not only represents trillions of pounds in wasted resources but fundamentally undermines public trust in the government's ability to deliver essential services.

[1] Bent Flyvbjerg and Dan Gardner, How Big Things Get Done.

Project	Original Budget	Revised Budget	Original Timeline	Revised Timeline	Delay	Cost Overrun	Notes
HS2	£37.5 billion[2]	£80 billion (2024 estimate)[3]	Phase 1 by 2026; full by 2033[4]	Phase 1 (London – Birmingham) by 2029–2033[5]	3–7 years	£42.5 billion (113%)	Northern leg to Manchester cancelled in 2023
Crossrail (Elizabeth Line)	£14.8 billion[6]	£18.8 billion[7]	December 2018[8]	Partially opened May 2022; fully on May 2023[9]	5 years	£4.0 billion (27%)	
Aberdeen Western Peripheral Route	£745 million[10]	£1 billion (2018 estimate)[11]	By March 2018[12]	Completed February 2019[13]	11 months	£255 million (34%)	
Hinkley Point C	£18 billion[14]	£40 billion (2025 estimate)[15]	Operational by 2023[16]	2029–2031[17]	6–8 years	£22 billion (122%)	
Edinburgh Trams	£545 million[18]	£1.04 billion[19]	Operational by 2011[20]	Completed May 2014 (on a shortened basis)[21]	3 years	£495 million (91%)	

Figure 1: A small sample of recent major infrastructure projects in the UK that demonstrates the true cost of not getting it right the first time.

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[2] Institute for Government, HS2: Costs and Controversies.

[3] UK Parliament, HS2: Update Following the Northern Leg Cancellation.

[4] House of Commons Library, High Speed Rail 2: An Overview.

[5] gov.uk, HS2 6-Monthly Report to Parliament: December 2024.

[6] House of Commons, Committee of Public Accounts, Crossrail: A Progress Update.

[7] Reuters, London's $24 billion Crossrail finally opens.

[8] Association for Project Management, Crossrail Project 2019 to 2023: Completing the Elizabeth Line.

[9] ibid

[10] gov.scot, Aberdeen Western Peripheral Route: Capital Costs and Expenditure: EIR Release.

[11] National Records of Scotland, Rural Economy and Connectivity Committee December 2018.

[12] Auditor General, Scotland's Key Transport Infrastructure Projects.

[13] ibid

[14] Financial Times, UK nuclear plant hit by new multiyear delay and could cost up to £46bn.

[15] ibid

[16] gov.uk, Initial agreement reached on new nuclear power station at Hinkley.

[17] EDF, Hinkley Point C Update January 2024.

[18] Edinburgh Tram Inquiry, Report.

[19] ibid

[20] Railtech, Edinburgh tram inquiry is scathing in its criticism.

[21] ibid

17. Traditional approaches to planning, risk management, and project governance have proven inadequate to handle the complexity and interconnected nature of modern infrastructure development.

18. BIM 2 has helped, but as seen in the examples provided in Figure 1 above, projects continue to go over-budget by billions of pounds and overrun by a number of years.

Getting it Right the First Time: The Role of AI-Enhanced Digital Twins in Future UK Infrastructure Projects

19. Since the UK's introduction of BIM regulations, as outlined in the 2015 "Digital Built Britain – Level 3 Strategy", AI and digital twinning technologies have evolved rapidly, pushing the boundaries of what is possible in construction and infrastructure management.

20. In the years since, the integration of AI in infrastructure projects has dramatically enhanced digital twins' capabilities, enabling real-time data processing, predictive analytics, large-scale complex simulation of many interconnected systems and autonomous decision-making across entire asset lifecycles.

21. Where early BIM strategies focused on standardisation and collaboration, today's AI-powered digital twins incorporate IoT sensor data, machine learning algorithms, and cloud computing to simulate, monitor, and optimise complex systems continuously, consistently, and provide a common operating picture across all stakeholders.

22. These advances now support dynamic feedback loops between design, construction, governance, and operation phases — allowing for proactive maintenance and enhanced communication in the delivery of major projects. This transformation aligns with and extends the UK's original vision of a connected, data-rich built environment, positioning AI-driven digital twinning as a cornerstone of smart infrastructure and sustainable urban development.

23. Through using Strategic Digital Twin Technology, decision-makers gain the means to reduce delays and prevent increased costs, while also considering affected populations and changes in economic productivity for a region.

24. This is now commonplace in UK defence projects, where, for example, the MoD has integrated AI and digital twin technologies into the Tempest programme to revolutionise the development and operational capabilities of this next-generation fighter aircraft.[22] Digital Twins are employed to simulate and analyse the aircraft's performance, facilitating rapid experimentation and innovation.

25. This approach enables engineers to test new components and systems in a virtual environment, significantly reducing the need for physical prototypes and accelerating the

[22] Royal Air Force, Team Tempest.

design process. The same approach is now needed for critical UK infrastructure such as new transportation systems, road building projects, and housing developments.

Applications within the Planning and Infrastructure Bill

Mandating BIM 3: A Transformational Step for Project Success

26. BIM 3 should be mandated within the Planning and Infrastructure Bill as a core requirement to achieve planning consent for major infrastructure projects. It represents a critical technological solution that directly addresses the Bill's core objectives of accelerating delivery and improving project outcomes.

27. BIM 3 implementation would systematically eliminate data silos, enhance accuracy, and integrate facilities management across entire project lifecycles. UK infrastructure projects such as HS2 and Hinkley Point C have experienced dramatic cost increases of 117-200% and delays of 3-7 years, highlighting the urgent need for digital transformation in project delivery.

28. By mandating BIM 3 for major projects, the Bill would drive digital integration that enables unprecedented data-driven insights for project management while fostering transparent stakeholder communication, ultimately ensuring infrastructure developments remain within budget constraints and meet scheduled completion dates – saving billions in costs and years of unnecessary impact on the taxpayers both funding and benefitting from these projects.

29. Should BIM 3 be mandated, infrastructure projects could be planned on an end-to-end basis. Their business cases would be made more thorough, with potential delays and snag points highlighted early on via high-resolution modelling. Potential utilisation, too, would be clearer, increasing justification for the deployment of scarce public financing. During construction, unforeseen events could be integrated into digital models that elucidate their follow-on effects more fully. And after construction, BIM 3-based management systems would reduce operational friction – particularly for large and complex infrastructure projects.

Securing Public Support for Change

30. Alongside increased project efficiencies, the Committee should be aware of the potential for Digital Twinning technology to improve the communication of projects' benefits to the public. Such models could, for example, be deployed to demonstrate how planned infrastructure around new housing developments will help existing communities. Likewise, the models could be used to show how new power generation plants will help local residents and businesses, either by improving supply or by offering cost discounts to those around a facility.

31. Modelling could prove particularly beneficial for Nationally Significant Infrastructure Projects, whose approval process increased in length by 65% between 2012 and 2022[23]. While this can be pinned on a number of factors, public engagement and support is clearly a big part of the picture.

32. As a potent example, the Crossrail Bill faced 365 petitions against its passing in 2005-06, coming from interest groups, local authorities, concerned individuals, and MPs along the route – perhaps most notably Theresa May MP.[24]

33. If the scheme's benefits had been modelled and visualised more thoroughly, perhaps community concerns would have been allayed. After all, the Elizabeth Line has surpassed forecasted usage, now accounting for one in seven of all rail journeys in the UK. It has, too, led to urban regeneration along its route with 90% of its customers reporting that the line has changed their area for the better.[25] With a digital twin aligned with BIM 3 requirements, this could have been simulated and communicated clearly in a comprehensible and accessible format.

34. For government and industry this technology can become a powerful tool in fostering transparency and trust, allowing for a clear demonstration of how public funds are being used for, and what tangible outcomes communities can expect from projects which by their nature take longer than one Parliamentary term to deliver.

Conclusion

35. The Planning and Infrastructure Bill presents a critical opportunity to address the systemic failures in UK infrastructure delivery. However, without embedding digital transformation requirements, the Bill will fall short of its objectives.

36. We urge the Committee to amend the Bill to include mandatory BIM Level 3 requirements for major infrastructure projects. This amendment would not only avoid cost overruns and delays but position the UK as a global leader in infrastructure delivery – driving economic growth, technology exports, and restoring public confidence in the government's ability to deliver critical projects efficiently.

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[23] Department for Levelling Up, Housing & Communities, Nationally Significant Infrastructure: action plan for reforms to the planning process

[24] House of Commons, Petitions Against the Crossrail Bill.

[25] The Guardian, A prize worth pursuing: has Elizabeth line shown what rail investment can achieve?