

Digital Construction in Norwegian Infrastructure: visit report

Department for Transport and Arm's-Length Bodies

April 2026



Document control

Internal or external	External	Version	1.3
Project name	Digital Construction in Norwegian Infrastructure	Client reference	-
Report title	Visit Report	Originator	Thomas Levermore, Gavin Summerson
Issued	April 2026	Reviewer	Gavin Summerson
CPC reference		Authorisation	Gavin Summerson

Catapult / Third Party Sensitive Information

Confidentiality level:

This report gives an overview of the visit by the UK Department for Transport, UK Department for Business and Trade, National Highways, Network Rail, East West Rail and Connected Places Catapult to Norway to better understand Digital Construction in Norwegian Infrastructure.

Public

Contents

Introduction	4
Key findings	5
Visit details	7
UK Stakeholders	7
Norwegian Organisations	8
Meeting details	10
NPRA E16 meeting	10
Skanska meeting and E18 West Corridor site visit	15
Consultant meeting – Sweco Norge AS	17
Public client meeting	19
Consultant meeting – Norconsult Norge AS	23
Training meeting	24
Conclusions	26
Next steps	28
Vision for the future of transport infrastructure construction	29
Baselining the UK	29
Knowledge sharing	30
Common specification sections	30
Engagement with UK stakeholders	31
Deeper international engagement	31

Introduction

Norway is seen as a global leader in digital construction. The Norwegian Public Roads Administration (NPRA) and Bane NOR, the Norwegian railway network owner and operator, have both used a digital model-based approach to projects since the early 2010s.

This use of a digital model as the primary mechanism for exchanging design and construction information rather than individual drawings came in response to increasing construction costs. The model-based approach has brought improvements in project cost management, the scheduling of tasks and materials in projects and collaboration between designers, contractors, and the client. To understand more about and identify lessons from the Norwegian approach, representatives from the UK Department for Transport, UK Department for Business and Trade, National Highways, Network Rail, East West Rail and Connected Places Catapult visited Norwegian road and rail stakeholders in and around Oslo between 20th and 21st October 2025. This visit report outlines the key findings along with details of each of the meetings with Norwegian stakeholders.

The visit built on initial research into Norway's model-based approach to infrastructure projects undertaken by Connected Places Catapult in early 2025. The visit objectives were for UK transport infrastructure decision-makers to:

- Understand how utilising a digital model can improve project delivery, productivity, reduce waste, and enhance asset management.
- Identify transferable lessons from Norway's approach and consider how they might be adapted to UK policy, procurement, and delivery environments.
- Develop actionable insights to accelerate Building Information Modelling (BIM) adoption in UK transport infrastructure.

The remainder of this report contains the key findings from the visit, a summary of the individual meetings, conclusions and recommendations for next steps.



Key Findings

The presentations and discussions in Norway covered a range of topics from digital technologies to contractual arrangements on infrastructure projects.

The key findings were:

- The Norwegian road and rail construction sectors deliberately have **fewer layers in the supply chain** than in the UK – this is driven by public procurement rules in Norway. This means fewer, larger organisations who can afford to train their workforce and equip site operatives to follow a model-based approach successfully on a project.
- The Norwegian **public clients responsible for road and rail infrastructure played a foundational role** in driving digitalisation – standards, setting requirements and are involved in a common training programme alongside industry.
- While Norwegian clients are mature in their use of digital models during planning, design and construction, the use of digital models *after* construction, **in operations and maintenance remains an issue** in Norway (note: this is also a common challenge currently in other international markets including the UK and is a focus area for the UK Department for Transport).
- **Collaboration** on digitalisation of infrastructure projects and assets is strong in Norway between sectors such as road and rail (e.g. BIM Nordic¹), within the supply chain (e.g. BIMSnacks², BIMCorner³, Consulting Engineer's Association⁴) and between public clients and the supply chain (e.g. the collaboration on guidelines and standards such as NPRA's R110).
- In parallel with progress on the model-based approach over the last decade, **changes to contracting arrangements** in Norway public clients have also taken place which complement the model-based approach. These include moving to more design-build contracts rather than design-bid-build⁵ driven by capacity within the public client to support government investment plans⁶. The distribution of risk between client and designers and contractors is more even in Norwegian design-build projects than in the UK where the risk is broadly with the contractor.
- **Champions** were crucial to the success of digitalisation. A small number of pilot road projects provided the evidence to support scaling the model-based approach but after key personnel were bought into the model-based approach, these champions ensured its success.

1 Nordic perspective on BIM Yearbook 2024: Nordic Road & Rail BIM Collaboration

2 <https://bimsnacks.no/>

3 <https://bimcorner.com/>

4 <https://rif.no/>

5 Managing the Room of Maneuver in Design Build Contracts – A Comparative Study of Norwegian Road Projects – S. Aandahl et al. 2017.

6 [Design-Build Contracts in Norwegian Road Projects - Riksheim, H., Lædre, O. & Wondimu, P., 2020.

- A focus on the **end-users of a model** was crucial to fully realise the benefits of a model-based approach. Different users need different information and presented in different ways and work is still ongoing to optimise the delivery of model-based data, particularly on-site.
- Model Maturity Index was a key concept to enable the **coordinated use of a model** across multi-disciplinary teams. This enables teams to understand which elements in a model can be used for interdisciplinary control and then for production, improving coordination on complex projects. The details of the index and its implementation were developed jointly between road, rail and real-estate stakeholders in the public and private sectors.
- Norway makes use of established **data standards** to support the model-based approach e.g. ISO 19650 (BIM/IM), ISO EN 7817 (specifying information need relating to BIM and, Industry Foundation Classification (IFC) to facilitate data interoperability, reduce dependency on specific systems, and provide a consistent requirement to support capability development within the supply chain.
- The model-based approach follows guidelines produced by NPRA, the latest version is R110 issued in 2023. The guidelines provide a structure for models:
 - **Base model** – existing situation for a specific discipline
 - **Situation model** – compilation of all base models.
 - **Discipline model** – planned situation for a specific discipline (lighting, geology, water and sewage, etc)
 - **Interdisciplinary model** – compilation of all discipline models.
 - **Coordination** – base, situation + all discipline models.
- The benefits of the model-based approach that were highlighted included:
 - A reduction in additional costs due to errors through the design and build process compared with projects without a model-based approach. Data presented showed an 11% reduction in cost due to changes when comparing traditional and model-based projects.
 - Improved scheduling of construction tasks with just-in-time delivery and more accurate ordering of necessary materials reducing storage space requirements.
 - Improved collaboration and decision-making through co-located working sessions using the digital model as the focus as well as unlocking multi-discipline and multi-domain understanding of a project.

In addition to the benefits of the model-based approach during the design and construction phase, benefits can also be realised across the remaining lifecycle of an asset from good information management processes starting with the design and construction data.



7

Visit Details

	Day 1 – Monday 20th October
Morning	NPRA E16 site visit. Contact: Marit Due (NPRA) NPRA project team presentation on the use of digital models
Afternoon	Contractors' perspective – advantages of models, challenges, examples. Contact: Konrad Naborczyk (Skanska) Site visit – Skanska E18. Contact: Konrad Naborczyk (Skanska) Consultant perspective – backstory to model-based approach, consultant experiences, costs, benefits, collaboration within the sector. Contact: Øystein Ulvestad (Sweco), Konrad Naborczyk (Skanska)
	Day 2 – Tuesday 21st October
Morning	Client perspectives on digital construction NPRA, Bane Nor, Nye Veier. Contact: Marit Due (NPRA) UK Presentation to Norwegian stakeholders
Afternoon	UK knowledge sharing internal Consultant perspective. Collaboration, adopting a model-based approach. Contact: Gjermund Dahl (Norconsult) Presentation – training on Virtual Design and Construction. Prof Eilif Hjelseth (NTNU)

UK Stakeholders

- **Sam Allwood** – Head of Engineering & Technical Strategy, Shadow Euston Delivery, Department for Transport
- **Colin Bird** – Project Director, Enhancements, Major Projects, National Highways
- **David Bray** – Exec Programme Director, East West Rail
- **David Coles** – Chief Engineer, Department for Transport
- **Jeff Davies** – Director, Rail Investment Centre of Excellence, Network Rail
- **Fergus Harradence** – Deputy Director, Construction, Logistics, Airports & Water, Department for Business and Trade
- **Tom Levermore** – Senior Consultant, Connected Places Catapult
- **Gavin Summerson** – Head of Construction and Infrastructure, Connected Places Catapult

Norwegian Organisations

The public sector organisations met on the visit were all under the Norwegian Ministry of Transport as outlined in the diagram below with further details below.

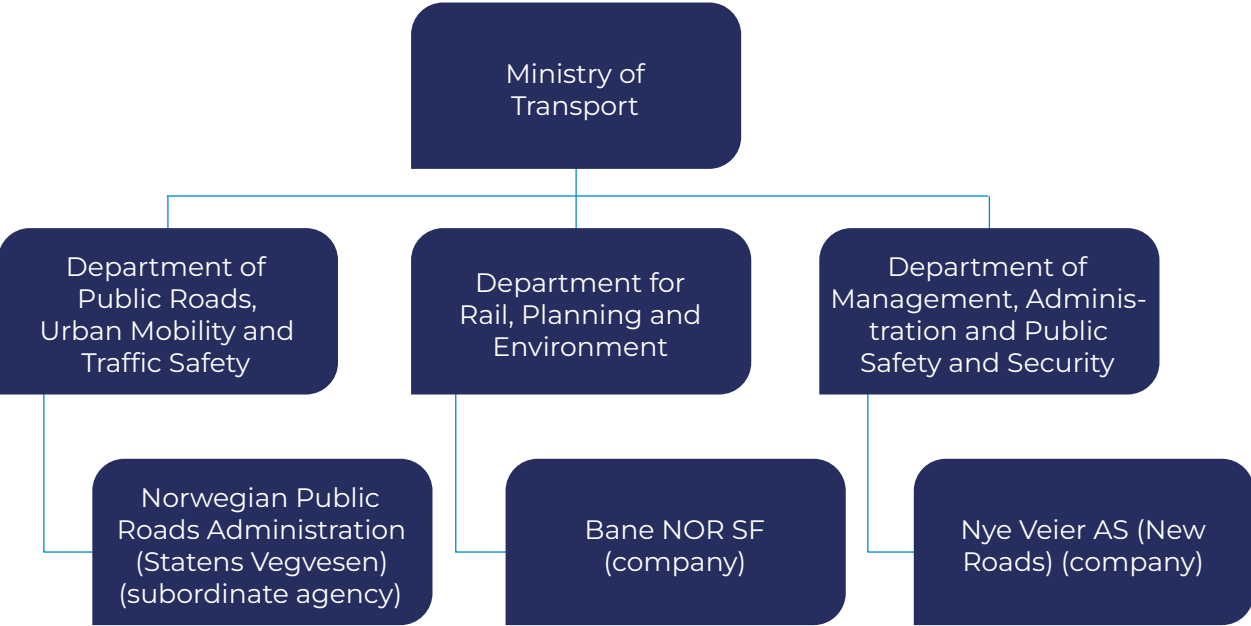


Figure 1 : Public sector organisations location within the Ministry of Transport structure.

Norwegian Public Roads Administration

“The Norwegian Public Roads Administration (Statens vegvesen) is responsible for the national road network as well as for road users and vehicles. The agency’s principal tasks are developing and creating conditions for an effective, environmentally friendly, future-oriented and safe road transport system.”⁷

The Norwegian Public Roads Administration (NPRA) has six divisions as outlined in the figure below.

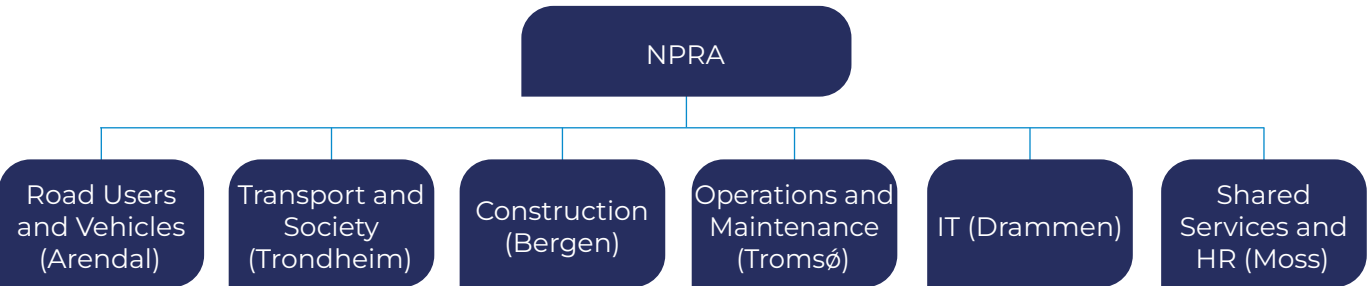


Figure 2: Divisions of NPRA

7 <https://www.regjeringen.no/en/dep/sd/organisation/subordinate-agencies-and-enterprises/norwegian-public-roads-administration/id443412/>

Ban Nor

Bane Nor is the Norwegian equivalent of the UK's Network Rail. “Bane NOR SF is a public enterprise owned by the Ministry of Transport. Bane NOR SF’s main task is keeping the railway infrastructure functioning normally and available for passengers and cargo transport on the national railway network. The enterprise has been assigned specific tasks that involve planning, physical development, management, operation and maintenance of the national railway network, along with overseeing rail traffic control and managing the plots and properties on which the railway network is laid.”⁸

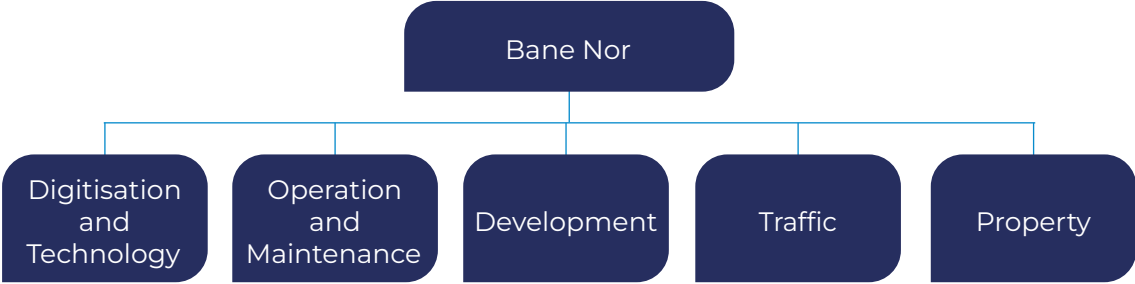


Figure 3: Divisions of Bane Nor

Nye Veier

“Nye Veier AS is a limited company wholly owned by the government. The Ministry of Transport administers the government’s proprietary interests and the Minister of Transport is the company’s AGM [Annual General Meeting chairperson].

The company’s activities include planning, construction, operation and maintenance of major highways that bind our country together and connect Norway to major highways abroad.”⁹

Contractor

On the visit we met staff from Skanska Norge AS – the Norwegian arm of the multinational construction firm Skanska.

Consultants

On the visit we met staff from:

- **Sweco Norge AS** – the Norwegian arm of the multinational engineering consultancy company.
- **Norconsult Norge AS** – is a pan-Nordic consulting firm based in Norway.

Education

On the visit we met staff from Norwegian University of Science and Technology (NTNU) – a public research university which runs the Virtual Design and Construction programme in Norway.

8 <https://www.regjeringen.no/en/dep/sd/organisation/subordinate-enterprises/bane-nor-sf/id2525823/>

9 <https://www.regjeringen.no/en/dep/sd/organisation/subordinate-enterprises/new-roads-nye-veier-as/id2412797/>

Meeting Details

NPRA E16 meeting

Technical discussion and insights

- **Date:** 20th October 2025
- **Location:** NPRA office, Sandvika.
- **Presenters:**
 - May-Bente Hiim Sindre, Project Manager – Statens Vegvesen (NPRA)
 - Pål Holmefjord Lorentzen, Design Manager – Statens Vegvesen (NPRA)
 - Oliver Hinchey, Geomatics Engineer – Statens Vegvesen (NPRA)

Summary:

The subproject *E16 Bjørum – Skaret* from the broader *E16 Sandvika – Skaret* project was explained by the NPRA team, with details in the figure below.

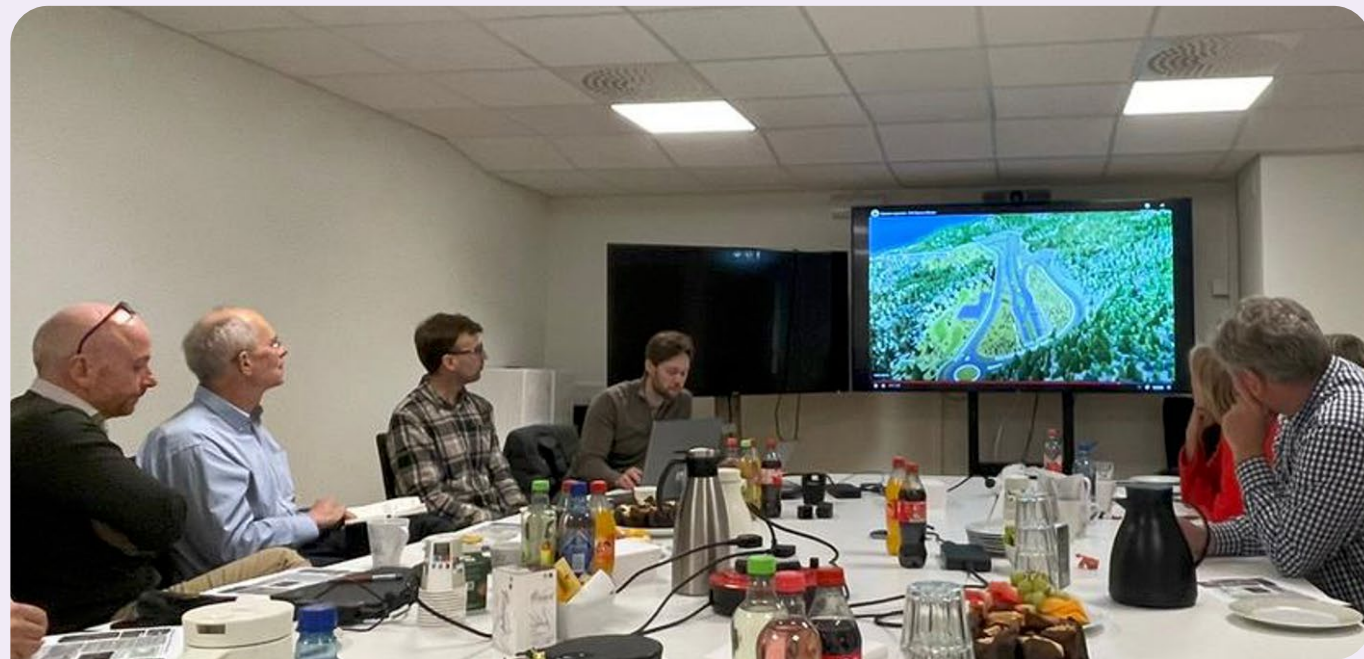


Figure 4: NPRA E16 presentation.



E16 Sandvika – Skaret

Subproject E16 Bjørum – Skaret

Development contract – 1 large total contract + 1 local contract



Statens vegvesen



8.4km 4-lanes highway where:

- 2 tunnels
 - Sollihøgdtunnelen 3,4km
 - Bukkesteinshøgdtunnel 0,8km
- Large rock cuttings. The largest is 900m long, and up to 36m high
- 2 large crossroads: Avtjerna og Skaret
- More than 30 constructions; among other things:
- 5 large bridges in the E16-line; up to 220m
- 8 tunnels portals
- Redevelopment of the old E16 into a local road incl. A pedestrian/cycle path

Sustainability in focus with:

- Electrification of plan operations for example, installation of wall elements in tunnels
- Resue rock masses
- Sampling stations in stream/rivers, benthic animals, foaling algae, plankton

Cost total enterprise:

4.033 billions excl. vat (2024 kr)

Contractor total contract:

Skanska

Local road:

Rebuilding old E16 =>
Estimated 90% reduced traffic

Keywords:

- Along a vulnerable watercourse
- Narrow corridor
- Near nature reserve

Status per 20 October, 2025:

Opening planned December 2025

Norways first full scale treatment plant for nitrogen runoff from blasting stone

Reuce nitrogen emissions to nearby waterways.

Prevent negative impacts on ecological systems in water areas.

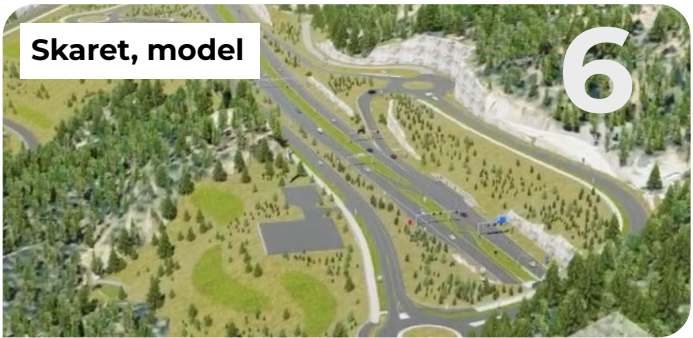


Figure 5: E16 Bjørum – Skaret subproject details.

Environmental

The environmental focus in Norway means maintenance and repairs are preferred to rebuilding assets¹¹, and the first option is for public transport. Accommodation for cycling is evolving with the adoption of e-bikes increasing commuting ranges. Cycle paths in this project are to be salted and brushed for year-round use. Concrete structures are protected from de-icing salt with waterproof membrane and run-off contained. A 1 in 200-year flood risk model was used in the project.

Contract

The contracting model in NPRA has broadly moved from design-bid-build to design-build. It was discussed that in the design and build projects, contractors can retrospectively reframe a site error as a “redesign” to avoid rework, this is mitigated to some extent by having involved clients who are engaged as the project progresses and good working relationships between client, designers and contractors.

The E16 project had three rounds of tendering, with three companies involved. The process took nine months and had an approximately 5m NOK (£375k) “losing fee” for bidders. This didn’t however grant NPRA use of Intellectual Property within those bids (which has been the case in some UK tendering although not common). The contract combined fixed price elements for discrete portions of construction with variable price elements where the actual number of items used is billed.

Key points:

The shift from design-bid-build contracting to design-build has been a big shift for NPRA and is complementary to the model-based approach to projects.

The Model Maturity Index as developed across sectors was crucial for optimising construction scheduling and collaboration.

NPRA contracts generally require no more than two layers of contractors, which is primarily for transparency and reducing fraud. This also means they avoid the challenges the UK have with large numbers of small companies in the lower layers of the supply chain who lack the necessary equipment or training for digital construction. UK stakeholders raised concerns about this approach being adopted in the UK due to many small businesses.

Digital

Trimble Connect was the Common Data Environment used on the project. During the project the contractor owned the data but is required to deliver the data at completion, along with maintenance instructions.

Drones are used weekly to monitor the project with 3D terrain models and photography as outputs.

Model Maturity Index (MMI)¹²

MMI was developed collaboratively between NPRA, Bane NOR, other public sector clients and contracting and consulting associations as a consistent approach to describing the maturity of objects within a model. This maturity level is an unambiguous way to communicate what can be done with each object in a model i.e. is it ready for interdisciplinary control, ready for executing on site, or as-built.

¹¹ National Transport Plan 2025-2036

¹² MMI-veilederen 2.0 (The MMI Guide 2.0)

Skanska meeting and E18 West Corridor site visit

Technical discussion and insights

- **Date:** 20th October 2025
- **Presenter:**
 - Konrad Naborczyk – Skanska Norge AS

Summary:

Skanska moved to a “paper-free” approach in 2008, had their first model-based project in 2016 (a power plant) and between 2018 and 2022 delivered the first bridge project without any drawings only a model¹³.

Skanska follow the Virtual Design and Construction approach (see section 4.6 for more information on this) which emphasises collaboration, with colocation of designers, clients, and contractors for Integrated Concurrent Engineering (ICE) meetings. The working sessions are planned to involve the right people and digital tools to enable multi-disciplinary design decisions to be made.

The E18 West Corridor is a complex road construction project to the west of Oslo started in 2023 and due for completion in 2030. It consists of 2.3 kilometres of new 2x3 lanes with two tunnels of 660 meters and 440 meters. The construction work is split into three areas with two contracted to Skanska and one to a Spanish contractor. Design and build contracts are used with annual schedules of work and payment – although it was mentioned during the presentation that this was originally intended to be a design-bid-build project.



Figure 6: “BIM station” with rugged computer for interacting with the model.

¹³ The world’s longest bridge built without drawings – Part 1. Konrad Naborczyk, BIM Corner, 2023

Digital platforms

Client-contractor interactions that were emphasised were the monthly interface coordination meetings, a six-week review period for model items that reach Model Maturity Index (MMI) of 400 (there are requests to reduce this period). The MMI handbook was produced with input from both client and contractors.

The model is used for ordering and scheduling material deliveries and enables just-in-time delivery. It was noted by stakeholders that UK rail projects often have a small site footprint to hold materials so would benefit from just-in-time delivery.

Viewers have been used for external parties e.g. for local residents to view early design plans using the model.

On cybersecurity, it was noted by Norwegian stakeholders that client requirements on cybersecurity would help ensure a consistent level of cybersecurity across the supply chain.

Key points:

The use of the VDC approach with frequent working sessions using the model to make decisions was a strength of projects Skanska highlighted.

Seeing the use of the digital model directly on the construction site was powerful with the use of tablets and the BIM station commonplace on Norwegian infrastructure construction sites.

On site

During the site visit, the BIM station was demonstrated, where staff on site can interact with the digital model via a rugged computer (one specifically designed for harsh environments) in a site cabin. The model was also shown on tablets that staff on site use to interact with the digital model. Cellular connectivity was generally considered to be sufficient on most sites to access the digital model, but it was mentioned that where cellular connectivity was insufficient, an offline version of the model could still be used on site with frequent (daily) updates.



Consultant meeting – Sweco Norge AS

Technical discussion and insights

- **Date:** 20th October 2025
- **Presenter:**
– Øystein Ulvestad, BIM Developer Infrastructure – Sweco Norge AS

Summary:

Seven years ago, Øystein started working with NPRA on quality control with BIM models. He has a particular interest in how staff access models onsite and has also been working with the Norwegian government on the challenges of models transitioning into use in operations and maintenance. Greenfield projects with cast in place concrete particularly suited the model-based approach.

UK bottlenecks in the adoption of models across an asset lifecycle were discussed and included:

- Contractors' use of commercial tools with limited access to data after construction for clients and particularly Operations and Maintenance (O&M) teams.
- Funding allocated for big projects with limited budgets for older assets getting updated (with accompanying model data)
- Asset information management strategies haven't achieved their goals so far as buy-in across the organisation is needed to ensure the asset information is gathered at all relevant stages of the asset lifecycle by all relevant departments.

Community

Øystein discussed the small community within the Norwegian infrastructure construction sector and therefore only a small group of people need to be convinced about the model-based approach for it to catch on.¹⁵

The model-based approach started with a focus on the design and build phase, but it was highlighted that starting with O&M requirements for the model would likely have made slower progress. The collaborative nature of the sector was highlighted, for example with the BIMSnacks¹⁴ group of the four leading infrastructure consultancies in Norway (Sweco, Norconsult, Aas Jakobsen, Cowi) organising weekly meetings to standardise property naming used in BIM models.¹⁶

Key points:

Collaboration between consulting companies and the wider sector was highlighted as a strength in Norway.

Work is ongoing to optimise the delivery of information in the model to user groups, particularly staff on site undertaking tasks having the relevant information easily accessible.

The use of models

Øystein presented on the different approaches that have been taken to improve the useability of the digital models on site, with different users having different needs. This was noted by the UK stakeholders present as crucial to realising the benefits of a model-based approach. This topic is explored in an article about the E18 West Corridor project by Buildingpoint Scandinavia

Øystein presented analysis that, on average, drawing only projects had incurred a 19% cost overrun, projects with a BIM model that still require drawings to be produced incurred a 9% cost overrun, and projects with BIM model as the source of truth incurred a 5% cost overrun .

Software companies Infraspac¹⁷ and Vektor¹⁸ were noted as example of smaller companies innovating in the sector.

14 [LinkedIn post on BIMSnacks - Oystein Ulvestad, 202](#)
15 <https://buildingpoint-scandinavia.com/blog/skanska-makes-construction-of-e18-vestkorridoren-easier-with-apps-from-buildingpoint>
16 [Best BIM Project And Infrastructure Project | Randselva Bridge with Øystein Ulvestad](#)
17 <https://infraspac.tech/>
18 <https://vektor.io/our-solution/for-infrastructure>

Public client meeting

Technical discussion and insights

- **Date:** 21st October 2025
- **Presenters:**
 - Thor Sigurd Thorsen – NPRA
 - Eivind Pagander Tysnes, Discipline Manager BIM – Bane NOR
 - Bjørn Børseth, Strategic advisor – Nye Veier

Summary:

NPRA

In 2006 NPRA were finding as-built costs were 25% higher than the contract cost and began to investigate the causes of this. A crucial factor was errors in terrain basis data. Moving to a model-based approach required high quality terrain data and NPRA analysis identified a reduction in additional costs from 19% on traditional drawing-based projects to 7.5% on model-based projects.

Regarding the push for a model-based approach, it was raised during the discussion that a model was utilised to convince the railway operator to accept NPRA building a bridge over the railway – they needed to see how it would work in 3D to be suitably convinced.

Proposed solutions in 2008

- Scan terrain and objects before planning, don't use maps
 - Reduce elevation errors in design data
- 3D modelling instead of drawing-production
 - Better quality control, models can be reused more efficiently
- Share 3D-models with bidders when tendering - all parts have same information
 - Reduce claims from contractors caused by errors in mass-calculations
- Establish a new vocabulary
 - Define model types to replace standard drawings
- Exchange of data on open, standardized dataformats
 - No vendor lock in, build system and workflows around common data-structures
 - Not solved

Figure 7: Extract from NPRA presentation showing model-based approach being proposed in 2008. Source: NPRA

The model-based approach at NPRA was outlined in Handbook V770 “Basis for modelling” which was issued in 2012, and was developed with Contractors, Engineers, Surveyors, Software Developers and NPRA. The cost to develop the Handbook was around 1m NOK (£75,000). Early projects using the approach such as the Bjørvika road project in Oslo, had no special funding to support this new way of working.

The model-data is now used across all phases of a project from zoning, tendering, design, construction, and maintenance and operations.

Lessons learned since 2012

- 3D-modeling works:
 - Significant cost reduction in model based projects - when done properly
 - Processes are streamlined
 - Values outside of cost reduction: Better communication, faster decisions
- Data on open formats is important
 - Especially in MOM-phase
 - No perfect standards/formats exist
 - Road projects involve a multitude of disciplines, software-systems and world coordinates
 - Norwegian road projects involve a multitude of formats
 - To get data on open formats, one has to agree on standards
 - For infrastructure, the national guideline is to use geodata-standards
- Transition from old to new methods take time
 - Not enough focus on education
 - Still suboptimal methods in projects
 - BIM concepts may add confusion - strategies for buildings may not always be the best for infrastructure

Figure 8: Extract from NPRA presentation showing lessons learned from using a model-based approach. Source: NPRA

In 2023 the V770 Handbook was updated and became R110, mandatory for use in all NPRA road projects.

Regarding building the capacity to support a model-based approach, it was highlighted that Norway has been working on 3D models since the 1980s starting with the digital road model VIPS (Vegvesenets Interaktive Vegmodell). Further background can be found in a report on Digitalisation in Norwegian Tunnelling¹⁹ from 2019.

The supply chain in Norway was discussed, with contractors in Norway embracing the model-based approach but UK stakeholders highlighted the risk-sharing and contractual arrangements in the UK may be a barrier to the buy-in of contractors to a model-based approach. This is mitigated in Norway with a design-build contract. NPRA tenders are open to all bidders and therefore the supply chain is theoretically as big as anywhere else in Europe.

19 Digitalisation in Norwegian - Norwegian Tunnelling Society, 2019

Bane NOR

Bane NOR is responsible for operating, maintaining and building the railways in Norway. Bane NOR had model-based requirements from 2014, with a strategy to have all projects model-based approved in 2017. Currently all projects in the construction division require model data to be provided in IFC 4.3.2.0 format. The example project Nygårdstangen Bergen – Fløyen was completed in 2024 20m EUR under the 420m EUR budget, construction time reduced from 4 to 2.5 years and the track closure period reduced from 6 months to 8 weeks (not continuous). The analysis of NPRA drawing-based vs model-based projects was crucial evidence for Bane NOR to move to a model-based approach.

Work is ongoing at Bane NOR on the structuring and standardisation of information in development projects building on the existing model-based approach. This Requirements for information Modeling (Krav til informasjonsmodellering (KIM)) initiative focused on this is funded by around 10m NOK (£750k).

The adoption of the model-based approach was discussed with Eivind highlighting that including a broad range of stakeholders in using the model builds support. Bane NOR use IBM Maximo as their asset management database and have used Novorender for their Common Data Environment on projects, with connections between the two systems. The cost of updating an existing asset model and the need for an efficient process were highlighted to ensure the O&M makes the most of the model data.

Nye Veier (New Roads / New Ways)

Nye Veier were established in 2016 as a Limited company by the Norwegian Ministry of Transport to reduce the cost of building roads and increase the social benefits of projects. They have a 20-year portfolio of projects to deliver, focusing initially on the projects with the most social benefit for the cost. Nye Veier have annual state funding of around £500m and total turnover of £750m (from operating tolls). Staff have a range of backgrounds to bring in lessons from other industries.

From the first projects, Nye Veier required the use of BIM (Level 3) – which requires the use by all delivery partners of a shared digital model in a single repository. This has evolved to now focus on information management rather than purely BIM, using ISO19650 to underpin this approach. The contracting approach has evolved to currently using design-build contracts as the default, with early contractor involvement.

Nye Veier benefit from data in four different ways: data they hope they never need but which is critical when it is needed, data used every day, data used almost every day and data where there is an opportunity to increase the benefit of in the future. This is illustrated in the figure below with significant benefit expected from critical but rarely used data.



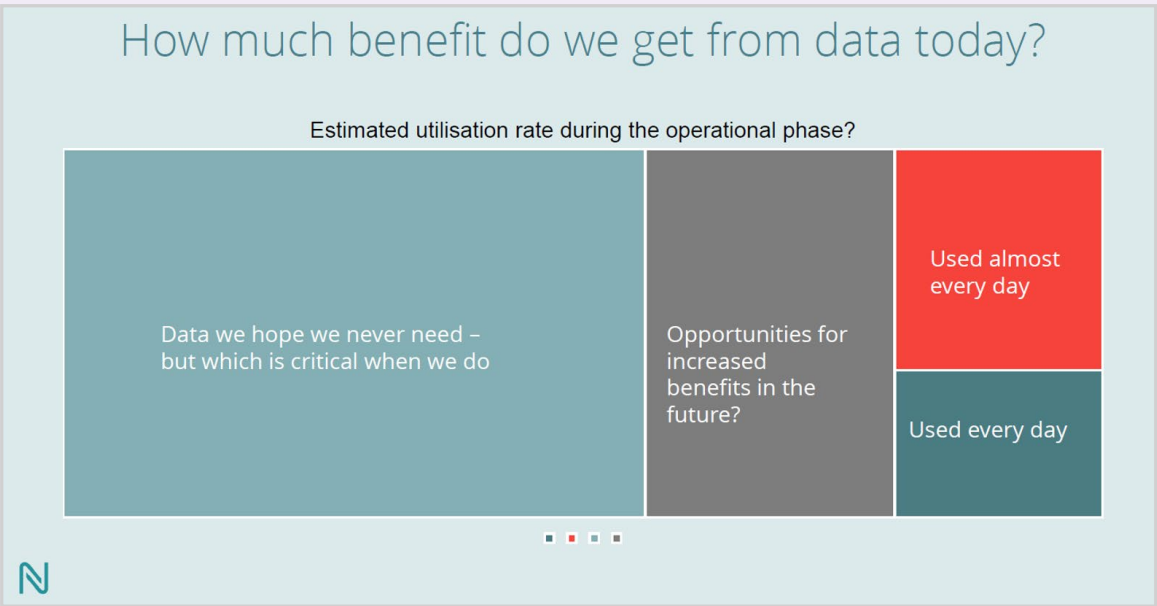


Figure 9: Visualisation of data benefit categories. Source: Nye Veier

As a small, innovative organisation, Nye Veier collect suggestions for how a model-based approach can be improved with suggestions being taken forward when they have been developed with an accompanying business case.

Key points:

The collaboration across domains was a key takeaway from the session, with NPRA, Nye Veier and Bane Nor all contributing to and using common data standards to support model-based working.

The standards-based approach and automation of activities based on the solid foundation of having a model at the core of projects showed the maturity of the Norwegian stakeholders and offered a vision of a future for digital construction.

These organisations also use a standard approach to tendering and contracting for digital model and standards based projects. They developed a specific BIM/Information Management (IM) annex to the standard construction contract suite, which specifies IM requirements for the project model, the need to create a Common Data Environment, and which links to the R110 Handbook.

Consultant meeting – Norconsult Norge AS

Technical discussion and insights

- **Date:** 21st October 2025
- **Presenters:**
 - Gjermund Dahl, Leader Digital Transformation – Norconsult
 - Inge Handagard – Norconsult

Summary:

Norconsult gave an overview of their involvement in model-based projects starting with a pilot project with NPRA in 2012. The risk and cost associated with moving to a model-based approach for the client was secondary to the demand from clients for such an approach – they had to.

All NPRA projects now require a BIM Execution Plan to be approved before construction starts and can delay a project due to this – such is the importance placed on the model-based approach. Nye Veier as a client are looking to standardise a BIM Execution Plan template.

Public clients’ requirements related to models have often been hard for consultants to meet as software tools do not always conform “out of the box” and so need in-house modifications. Demands for hardware are also challenging, such as having offline model viewers.

A Nye Veier project that Norconsult undertook as model-based had a 95% reduction in drawings produced, a 20% reduction in costs and project related CO₂ emissions compared to the preliminary design.

Key points:

Public sector clients in Norway are setting requirements for digitalisation that are stretching for the supply chain to meet, particularly with the software tools available.



Training meeting

Technical discussion and insights

- **Date:** 21st October 2025
- **Presenters:**
 - Eilif Hjelseth, Professor in the Department of Civil and Environmental Engineering – Norwegian University of Science and Technology (NTNU)

Summary:

Prof Eilif gave a brief history of the Virtual Design and Construction (VDC) programme, starting with Norwegian companies bringing Stanford University staff to teach their employees in Norway, before a joint programme was created between Stanford and Norway's NTNU to teach VDC. VDC is built around core concepts of:

- Integrated Concurrent Engineering (ICE),
- building information modeling (BIM),
- process and production management, and
- goal management.

Prof Eilif emphasised the eco-system built up around the training programme in Norway and this being a big part of the programme with mentors from industry supporting participants. The programme involves applying VDC to an ongoing project at a participant's company *during* the programme.

Having VDC-certified staff is a quicker way to document competency as required in some contracts, rather than having to evidence competency through experience. Some of the Norwegian organisations who have participated in VDC training are shown in the figure below, showing a mix of contractors, designers and public clients participating.

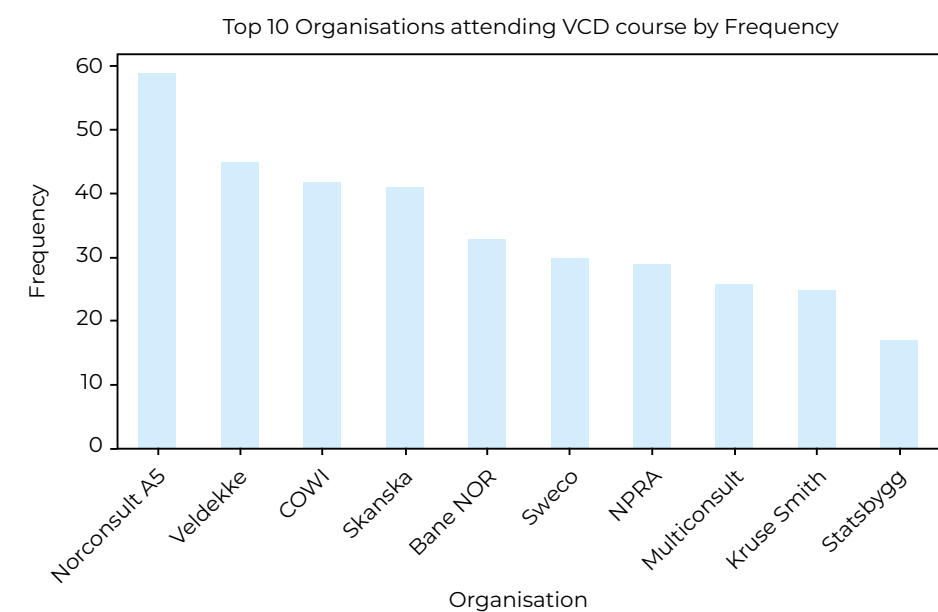


Figure 10: Top 10 Norwegian organisations by number of employees attending a VDC course. Authors figure based on data from <https://www.vdcnorway.org/>

Key points:

It was noted by the UK stakeholders and Prof Eilif, that in the UK there has been a focus on Lean construction²⁰ rather than VDC but similarities were acknowledged. Lean was discussed as focused more on production rather than digital tools and techniques. The approach to implementation of either methodology across organisations differs. A key difference in the countries was the consistent adoption of VDC across public clients and the supply chain in Norway.

²⁰ https://leanconstruction.org.uk/about_lean/

Conclusions

From Norway, the learnings were as follows. The Norwegian road and rail construction sectors deliberately have fewer layers in the supply chain than in the UK. This means fewer organisations need to be equipped and trained to follow a model-based approach for it to be successful on a project.

The **Norwegian public clients played a foundational role** in driving digitalisation – standards, setting requirements, involved in common training programme.

While Norwegian clients are mature in their use of digital models during planning, design and construction, the use of digital models *after* construction, **in operations and maintenance remains an issue** in Norway (as elsewhere). There are exemplar projects and sectors that are better at this handover, but it is still a challenge for asset owners, even where the use of BIM in the construction phase is mature. ISO 19650-2 and ISO 19650-3 set out a process for information management during the construction and operation of an asset.

Collaboration on digitalisation of infrastructure projects and assets is strong in Norway **between sectors such as road and rail** (e.g. BIM Nordic), within the supply chain (e.g. BIMSnacks, BIMCorner, Consulting Engineer's Association) and between public clients and the supply chain (e.g. the collaboration on guidelines and standards such as NPRA's R110).

In parallel with progress on the model-based approach over the last decade-plus, **changes to contracting arrangements** in Norway have also taken place which complement the model-based approach. These include the use of specific and standardised contractual clauses relating to the digital model and IM standards.

Champions were crucial to the success of digitalisation. A small number of pilot road projects provided the evidence to support scaling the model-based approach but after key personnel were bought-in to the model-based approach, these champions ensured its success.

A focus on the **end-users of a model** is crucial to fully realise the benefits of a model-based approach. Different users need different information and presented in different ways and work is still ongoing to optimise the delivery of model-based data, particularly on-site.

Model Maturity Index was a key concept to enable the **coordinated use of a model** across multi-disciplinary teams. This enables teams to understand which elements in a model can be used for interdisciplinary control and then for production, improving coordination on complex projects.

From considering how the UK compares with Norway, there are pockets of leading digital construction practice in UK infrastructure but the level of adoption is not consistent. Model-based projects are the default across NPRA, Nye Veier, BaneNOR.

The multiple layers of the supply chain in the UK present a challenge to driving the adoption of innovation²¹, and is likely to require greater investment in training and capability development. Norway has fewer **layers in the supply chain**.

The UK needs to look beyond the current state of the art in digital construction and agree a **common vision** for the future. For example, autonomous plant is expected to be used more widely in the coming decade with associated benefits. For this to be realised, the use of a machine-ready digital model is a crucial enabler.

The role of software developers in the UK eco-system needs to be investigated to understand the **uptake of open formats** and impact of vendor lock-in.

The **thin client model** in UK was noted in comparison with the Norwegian model of public clients themselves driving digital innovation. The involvement of Norwegian public clients with industry in the common VDC training programme was noted by the UK stakeholders.

In the UK the **contractual arrangements and risk-sharing** on projects were seen as barriers to collaboration and digitalisation. It was also discussed that the Norwegian supply chain has shown a willingness to contribute to standards, to commit resources to working groups, and to share best practice with peers. To some degree this is also the case in the UK, but further investigation is required to assess this. Risk sharing on projects was also noted as being approached differently in Norway, with a greater share of the risk held with the public clients and early agreement in the project regarding risk sharing responsibilities.

The overarching conclusion drawn from the visit was that while the technologies used in the Norwegian sector are not unfamiliar to UK construction, their consistent use and the approach to projects and collaboration were the major differences identified when compared with the UK. It is now for the UK stakeholders to shape what the visit can mean for their organisations and the sector more broadly.



Next steps

To ensure the legacy of the visit results in positive change in the UK infrastructure construction sector, several recommendations are presented by Connected Places Catapult.

To structure the recommendations, the strategic framework for public sector BIM programmes in the Handbook for the introduction of *Building Information Modelling by the European Public Sector*²² from the EUBIM task group is used. This framework considers industry capacity, common collaboration frameworks, a common vision and communities, and a foundation of public leadership as the key attributes for BIM programmes.

These recommendations are aligned with the UK Government’s missions, particularly on growth and infrastructure investment, as outlined in the UK Infrastructure 10 year strategy²³. Following the visit, recommendations have been developed as follows.



Vision for the future of transport infrastructure construction

A shared vision across the transport sector on what infrastructure construction will look like in ten years’ time with respect to digitalisation is recommended. The appropriate level of detail and actionable steps to achieve the vision are crucial to ensure buy-in from key decision makers and drive real change. Key to the success of a shared vision is having a realistic foundation of where UK infrastructure construction currently stands in relation to digitalisation.

Baselining the UK

Building on the earlier research project, the visit allowed the group to better understand the state of digitalisation within transport infrastructure construction in Norway. To ensure the appropriate lessons can be learned by the UK sector, an impartial assessment of the state of digitalisation in infrastructure construction in the UK is needed, leveraging existing work that public clients have undertaken and identifying gaps in existing assessments. This baselining should consider aspects of ‘the diamond’ BIM strategic framework to agree on recommended actions across leadership, communications, common collaborative framework and capacity building.

At the **project level**, several examples were noted for further investigation of their level of digitalisation. These included the Transpennine Route Upgrade, High Speed 1, Crossrail, A428, and the Smart Motorways Programme. Ongoing projects were also suggested for investigation to understand the current state of the art in the UK, these included HS2 and East West Rail.

At the **organisational level** the arm’s length bodies’ level of digitalisation in construction, operation and maintenance needs to be

assessed. This would consider capability and capacity of the client work force, as well as the contracting and tendering approach as necessary to underpin digital innovation. The adoption of the public sector Information Management Mandate (Annex B of the Infrastructure and Project Authority’s *Transforming Infrastructure Performance: Roadmap to 2030*²⁴) within arm’s length bodies would be a particular focus, to understand successes and challenges as well as subsequent activity on Information Management.

Within the DfT, an assessment of their role in the digitalisation of infrastructure is needed particularly around the adoption of the public sector Information Management Mandate.

At the **national level** there have been initiatives related to this topic that should be reviewed to understand their success, what worked and what didn’t. These include the Better Information Management guidance for Infrastructure Bodies²⁵, Project13²⁶, and the government’s Construction Playbook²⁷. The standards-led approach to BIM in the UK should be compared with the more activist and engaged client-led approach in Norway.

22 Handbook for the introduction of Building Information Modelling by the European Public Sector - EU BIM Task group, 2019
23 UK Infrastructure: A 10 Year Strategy – HM Treasury and National Infrastructure and Service Transformation Authority, 2025

24 <https://www.gov.uk/government/publications/transforming-infrastructure-performance-roadmap-to-2030/transforming-infrastructure-performance-roadmap-to-2030#annex-b-information-management-mandate>
25 <https://ukrlg.cih.org.uk/media/11806/bim-guidance-for-infrastructure-bodies-12-low-res.pdf>
26 <https://www.project13.info/about-project13/>
27 <https://www.gov.uk/government/publications/the-construction-playbook>

Knowledge sharing

It was noted that Norway has many successful channels for knowledge sharing and collaboration on digitalisation within and between the supply chain and public clients, and across road, rail, and other relevant sectors. While the UK also has many groups and fora for sharing knowledge on digitalisation in construction and infrastructure, an assessment is needed of whether funding or additional power is needed in an existing group to drive change or whether a new forum is needed. In 2024, the Infrastructure Client Group reported that only 6% of survey respondents felt that lessons learnt on digital initiatives were adequately shared²⁸.

Common specification sections

As part of improved knowledge sharing and collaboration, the development of common specifications and contractual requirements across domains are recommended. This would, where appropriate, give a consistent message to the supply chain on what infrastructure clients need from the digitalisation of construction, operation, and maintenance of assets. Using pilot projects would be the vehicle for progressing this, with sufficient involvement of stakeholders across domains or using a cross-domain pilot project with road and rail elements.



²⁸ Infrastructure sector must collaborate more and boost digital investment - Construction Management, 2024

²⁹ UK Infrastructure: A 10 Year Strategy - National Infrastructure and Service Transformation Authority (NISTA), 2025

³⁰ GBRx

Engagement with UK stakeholders

During the research, visit, and subsequently, several organisations were identified as key stakeholders to engage in the development of further recommendations for the UK to mature its approach to digitalisation of infrastructure construction, operation and maintenance. These organisations are:

- National Infrastructure and Service Transformation Authority (NISTA) in line with their objectives of:
 - “Unblocking barriers and streamlining delivery of the government’s major projects: advising on project set-up, planning, project delivery, benefits realisation and providing expert commercial and financial advice” and
 - “Setting standards and improving the government’s project delivery capabilities”²⁹.
- Office of Road and Rail (ORR) in their role monitoring the performance of National Highways and Network Rail.
- GBRx in their role as mandated to “break down the barriers to innovation that enable the railway to adopt the technologies it needs to thrive in the decades ahead”³⁰.
- The transport infrastructure construction supply chain and technology vendor community in the UK to better understand their perspective on digitalisation.
- The authors of *PAS 2080:2023 Carbon management in buildings and infrastructure* and those with knowledge of the roll-out and embedding of this publicly available standard, as an example of driving change across the road and rail sectors. The sponsor for this standard was the Infrastructure Client Group.
- The leads for the DfT sponsored Publicly Available Standard on productivity (PAS 4010) to better understand how an evidence-based approach to assessing the potential productivity benefit of a model-based approach in the UK could be applied.

Deeper international engagement

To build on the positive, fruitful engagement with Norwegian stakeholders, deeper engagement with Norway and wider Scandinavian peers in transport infrastructure is recommended. Engagement would include sharing learnings from digitalisation approaches and collaborating on shared digitalisation challenges that remain such as:

- data handover to operations and maintenance, and
- the human factors challenge of conveying the right information to users for their needs, for example those accessing digital models via tablet on construction sites.

Get involved

Ready to accelerate innovation in transport, built environment, or public services?

Connect with us:



info@cp.catapult.org.uk



cp.catapult.org.uk



[@cpcatapult](https://www.linkedin.com/company/cpcatapult)

Connected Places Catapult is part of the UK's Catapult Network, connecting businesses with the UK's research and academic communities to accelerate innovation.