# Digital Roads Prosperity Partnership Impact Theme

James Merrett, Ioannis Brilakis, Phil Proctor, George Economides, Kyriakos Kantarakias, Rachel Judson, Lavindra de Silva, Alex Gillies, Abir Al-Tabbaa, Fumiya Iida, Lilia Potseluyko, Alix Marie d'Avigneau, N'zebo Richard Anvo

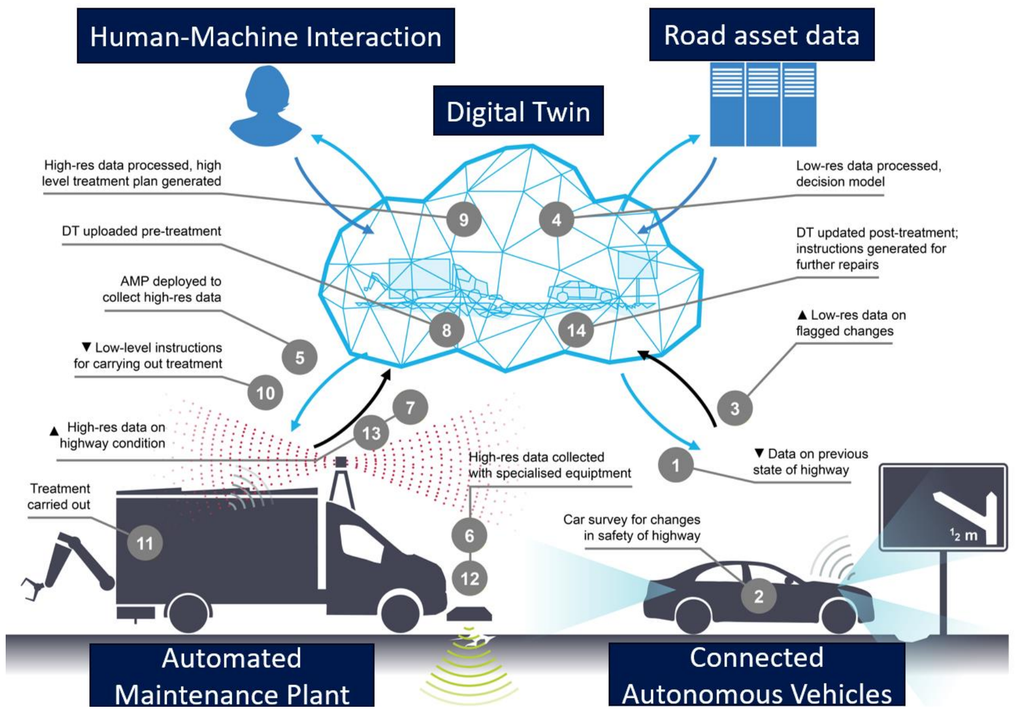
The Digital Roads impact theme has been broadly looking into converting the Digital Twin (DT) research work from Theme 1 into a functioning prototype, including exploring the relevant business models for its commercialisation, and into transitioning the Autonomous Maintenance Plant (AMP) being conceptualised and simulated in Theme 2 into a physical platform prototype.

The impact theme is also responsible for dissemination of the DR research and development work, including the preparation of white papers, research papers, EPSRC submissions, and award applications.

The main updates over the past 12 months include:

- Developing a backbone DT based on dataset prep work in yr 1
- Deriving a business model/canvas for DT commercialisation
- Using AMP simulations to inform the physical AMP prototype
- Applying for or receiving awards and recognition, e.g. BBC coverage

## Digital Roads Platform




## Outcomes

Spinoff

Didimi

Road Dataset

Proud to be shortlisted for The IET Excellence and Innovation Awards 2024

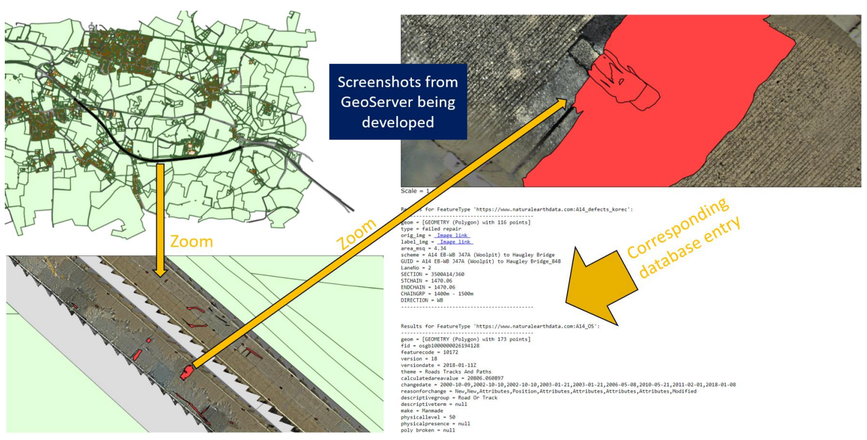
BBC NEWS

2nd place

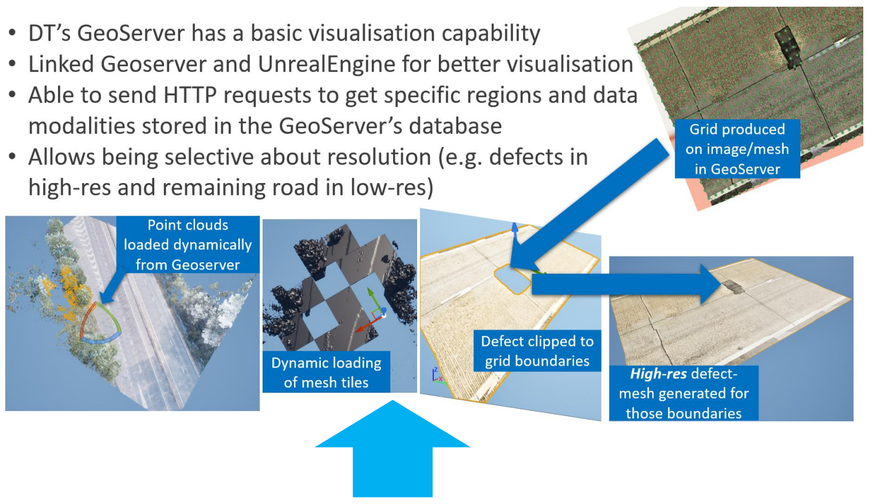
ICSR'24

International Conference on Social Robotics
Odense, Denmark

## Develop a backbone DT platform

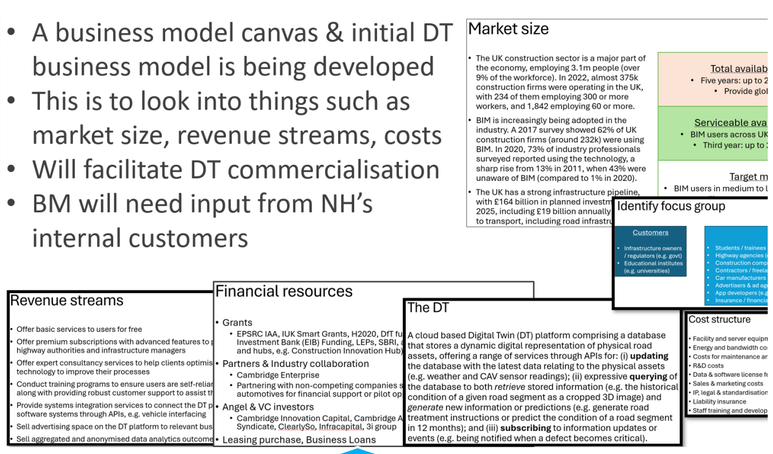



- DT's GeoServer has a basic visualisation capability
- Linked Geoserver and UnrealEngine for better visualisation
- Able to send HTTP requests to get specific regions and data modalities stored in the GeoServer's database
- Allows being selective about resolution (e.g. defects in high-res and remaining road in low-res)



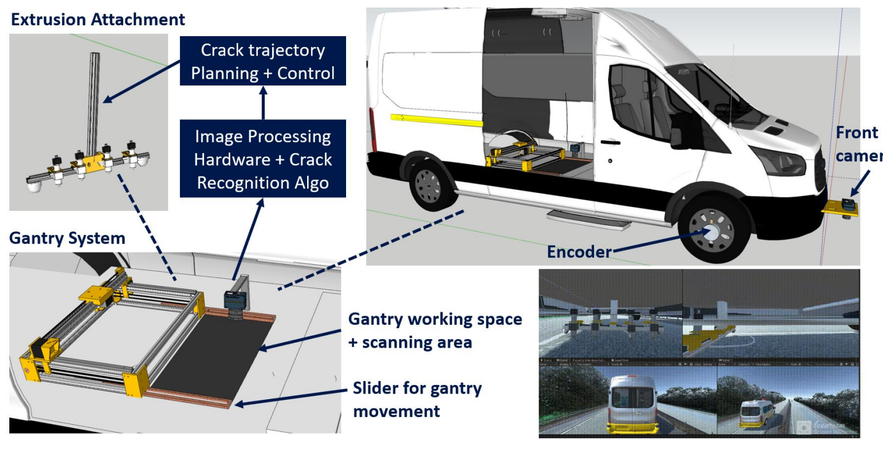

## Deriving a DT business model

- A business model canvas & initial DT business model is being developed
- This is to look into things such as market size, revenue streams, costs
- Will facilitate DT commercialisation
- BM will need input from NH's internal customers




| Key Partners | Key Activities | Key Propositions | Customer Relationships | Customer Segments |
|---|---|---|---|---|
| **What are your key partners to get competitive advantage?** | **What are the Key steps to move ahead to your customers** | **How will you make your customers' lives happier?** | **How often/will will you interact with your customers?** | **Who are your customers? Describe your target audience.** |
| - Car manufacturers<br>- Regulator (e.g., NH)<br>- Contractors<br>- Infrastructure owners<br>- Tech companies<br>- Omniverse<br>- Autodesk Revit<br>- Bentley Microstation<br>- Trimble Tekla<br>- AVEVA LFM<br>- Edgewise<br>- hardware suppliers<br>- cloud server vendors<br>- University of Cambridge<br>- Investment partners<br>- innovate UK<br>- Entrepreneur 1st<br>- Cam Innov Capital<br>- UK government depts<br>- External data providers<br>- Advertisers, ad agencies | - Design the architecture<br>- Align with the data model<br>- Develop pipeline to integrate with car companies & regulators<br>- Human/software interfaces<br>- Creating common standards with car companies & regulators<br>- Customer support<br>- Product promotion<br>- R&D<br>- POC? | DT for infrastructure & buildings<br><br>- More communication about the state of the road<br>- More reliable prediction for safety/navigation/travel time<br>- Better use of car data<br>- Interoperability & data exchange<br>- Online storage & backup<br>- Freemium model<br>- Data processing<br>- Multi trillion pound industry? | - Meetings<br>- Events<br>- Conferences, academic and industrial<br>- Webinars<br>- Sharing trial products<br>- Networking events<br>- Customer support for premium customers<br>- C2C support in forums | - Contractors<br>- Car manufacturers<br>- Regulator (e.g., NH)<br>- Infrastructure owners, eg NH<br>- Tech companies<br>- UK government departments<br>- Insurance companies<br>- Advertisers & ad agencies<br>- Universities, learning centres<br>- Freelancers: architects, engineers, structural engineers<br>- Financial institutions |
| | **Key Resources** | | **Channels** | |
| | **What resources do you need to make your idea work?** | | **How are you going to reach your customers?** | |
| | - Car company data: e.g. safety, traffic, infrastructure, weather<br>- Regulator data (e.g. NH): historic data (incl. traffic, maintenance reports, climate)<br>- People with specific skills<br>- GIS, BIM and other software; server hardware, PCs, internet<br>- Intellectual property | | - Presentations<br>- Technical reports<br>- Papers, academic and white<br>- Stalls/demonstrations at exhibits<br>- Social media and ads<br>- Magazines<br>- Regular newsletter<br>- Website<br>- Partners' tech forums | |

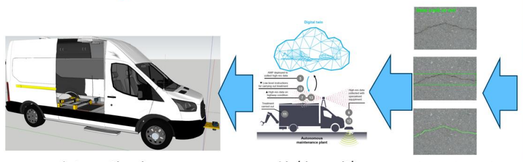
## Develop the physical AMP concept




- Cold bitumen injection is novel w.r.t. overbanding
- Robotic injection is less slippery, neater for drivers, removes workers from traffic; cold bitumen is safer
- Injection reduces material waste & carbon impact

*Simulation*

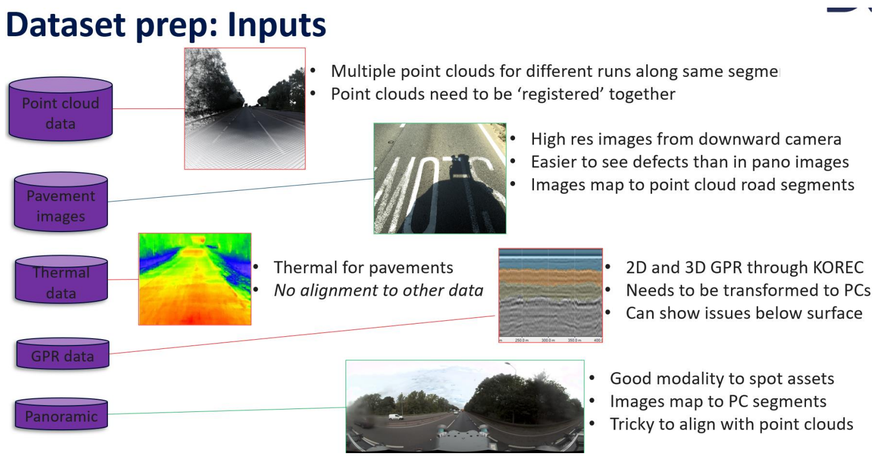
- **Next steps:**



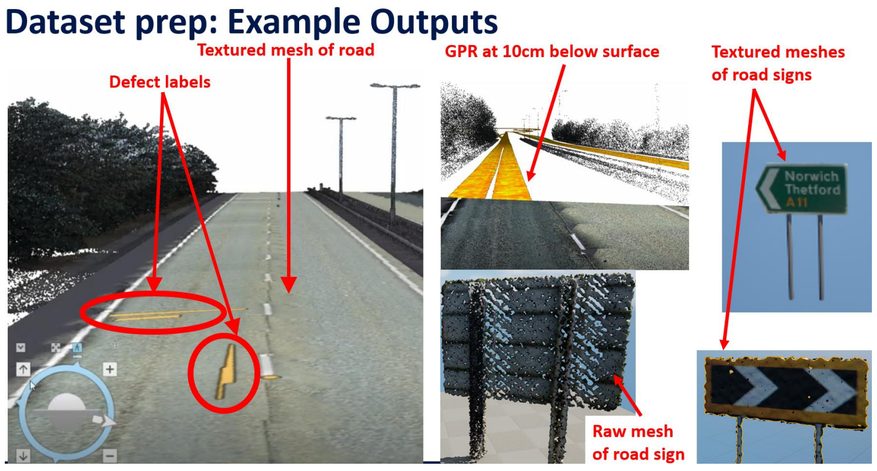

## Dataset preparation (year 1)

The above DT was made possible by the CAM Highways dataset, prepared through work done in the first year.

### Dataset prep: Inputs




### Dataset prep: Example Outputs




## What next?

Plan for the coming 12 months. Tasks can be found in the DR Technical Annex.

| Task | Activity |
|---|---|
| T3.1.1 | Work with T1 team to progressively develop a backbone DT platform<br>• Create a platform that allows simulation, and interfacing with work done by FR fellows |
| T3.1.5 | Derive the most suitable business model for the cloud DT platform<br>• Finalise the BM work, and include feedback from relevant National Highways stakeholders |
| T3.2.4 | Purchase & integrate material application components onto a van to form a full-scale AMP<br>• Build an initial version of the *automated* extrusion system in the lab w.r.t. van dimensions |
| T3.2.6 | Develop road surveying guidelines for low- and high-resolution surveying<br>• Use existing knowledge in internal publications to inform future surveying practice |
| T3.3.3 | Acquire available CAV datasets to simulate low-res data capture and sharing with the DT<br>• Continue to talk to relevant companies to get low-level CAV data, e.g. pavement images |
| T3.4 | Ongoing dissemination tasks<br>• Submit papers currently being internally reviewed; come up with a dissemination plan |

Engineering and Physical Sciences Research Council
Department for Transport
national highways
Didimi
COSTAIN