Amey Digital Consulting

Big Data in planning, operations and maintenance.

Andy Willetts, Principal Consultant

Personal pride in our public service

EMPOWER | ENGAGE | EXCEL

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Introduction

Amey Group

One of 5 top leading services and engineering companies

Amey Group Employ skilled experts' people over Rail/ Highways/ Defence/Buildings, Justice & Government agencies

16,000 globally

We are a multi-disciplinary principal contractor providing supporting operators and maintainers across the U.K

Amey Consulting

We provide design and consultancy to major infrastructure clients to help their transport networks and infrastructure assets

We deliver infrastructure solutions using our insight into systems, People and technology
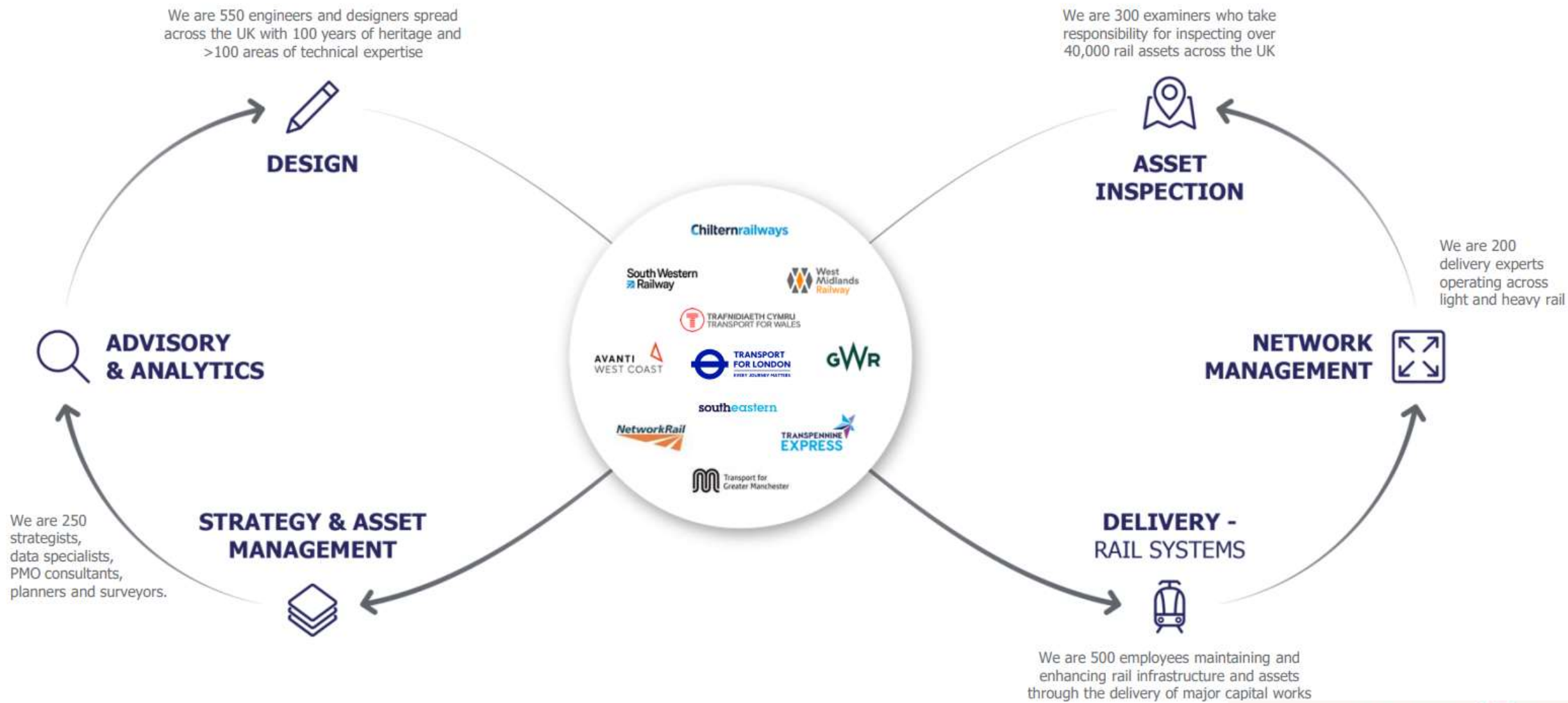
We are the only company in our sector to combine operational infrastructure maintenance and management with a world leading, in-house, data science capability.

1,800 in rail- Engineers, data scientists, and developers

COMPLETE -**END-TO-END CAPABILITY**

We are 550 engineers and designers spread across the UK with 100 years of heritage and >100 areas of technical expertise

DESIGN

We are 300 examiners who take responsibility for inspecting over 40,000 rail assets across the UK

ASSET INSPECTION

ADVISORY & ANALYTICS

We are 200 delivery experts operating across light and heavy rail

NETWORK MANAGEMENT

We are 250 strategists, data specialists, PMO consultants, planners and surveyors.

STRATEGY & ASSET MANAGEMENT

DELIVERY - RAIL SYSTEMS

We are 500 employees maintaining and enhancing rail infrastructure and assets through the delivery of major capital works

Chiltern railways

South Western Railway

West Midlands Railway

TRAFNIDIAETH CYMRU TRANSPORT FOR WALES

AVANTI WEST COAST

TRANSPORT FOR LONDON EVERY JOURNEY MATTERS

GWR

southeastern

Network Rail

TRANSPENNINE EXPRESS

Transport for Greater Manchester

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Let's look at the amount of data that is generated in 1 minute on the internet...

2.1 Million

1.0 Million

4.5 Million

3.8 Million

188 Million

That's a lot of data!!!

How do you classify 'Big Data' for Transport?

5V's =

Volume

Velocity

Variety

Veracity

Value

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Data- how do you put a value on it, where does it come from, and when is enough data enough?

Since the 1990s, digitalisation has been advancing at speed.

- Implementing new applications using digital technologies for providing more travel information and leisure services on board & improving the monitoring of assets or automating more operations.

- Enhancing passenger experiences (creating additional revenue)

- predictive maintenance (cost savings)

- As most Big Data projects start, the connectivity architecture needs to be open. E.g. a rail operator may start with the predictive maintenance of door operations, connecting to the sensors on the vehicle.

- A later step could be enhanced services for conductors and drivers, which implies connecting with the ethernet and Wi-Fi network.

- The key to unlocking Big Data in rail is connectivity. By streamlining data collection, rail operators can easily deliver predictive maintenance with Machine Learning, or enhanced passenger experiences with Artificial Intelligence.

- Big Data implies there is a need for vast amounts of storage. However, storage, whether in the cloud or on-premise, is costly. Therefore, there is a need to build intelligence at the edge, be it on trains or at the station platform.

Key wins for 'Digital transformation' for rail industry

- **Digital data**, which, once collected and analysed, provide for better predictions and decisions;

- **Automated systems**, which increase speed, and reduce error rates and operating costs;

- **Connectivity,** which synchronises supply chains and shortens innovation cycles;

- **Digital customer access**, which enables companies to offer customers transparency and new services
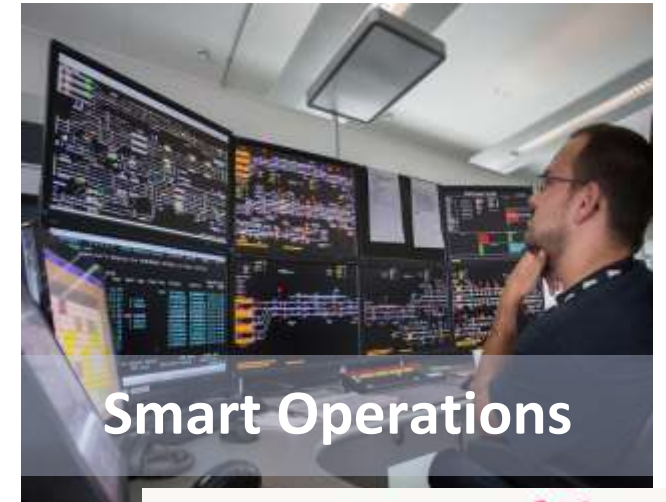
Smart Stations

Smart Maintenance

Smart Mobility/ Connected services

Smart Operations

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Benefits of Digital Rail

The Digital Railway is a benefits-driven, cross-industry change programme enabled by technology, which will facilitate the delivery of systems, technology, business and people change in an integrated way.

Successful delivery of the Digital Railway will be dependent on overcoming a number of challenges and managing risks relating to:
- Industry collaboration
- Funding and financing
- Business change
- People and skills

Challenges in transportation

Information management

No central repository unable to get insights, respond to changes, or make educated business decisions unless you have capacity to correctly manage information

User friendly and effective

Users lose faith in usage due to complexity and poor user interface. Lack of competency. Time constraints with adoption

Siloed working

No, or reluctant information sharing between groups, Conflicts, no collaboration, no vision.

Training

Costly and slow adoption, knowledge retention, staff retention. Resistance to change

What's important to Light Rail?

Operational

- Smart driving techniques to optimise energy consumption
- Safety-critical staff alertness and wellbeing with associated monitoring
- Better Customer information systems
- Avoidance of track circuits
- alternative power sources

Maintenance

- Rolling stock wear
- Infrastructure renewals
- OLE maintenance
- Track alignment
- Lineside comms
- Updates to tram stops
- Signalling

Security/ failures

- Security briefing and training
- Authority to work permits for greater safety of staff working on the infrastructure
- Staff competency
- Access to non-public areas
- Emergency procedures
- Terrorism threats
- Cyber threats with operational systems (engineering assets and critical assets)

So, for many consumers, infrastructure is….

Out of date

World Economic Forum ranked UK infrastructure 11th in the world

Unreliable

Aging infrastructure has low resilience for future conditions

A poor experience

With little resilience, customers can experience cumulative negative impacts

Inefficient

Lack of integration can result in poor efficiency of the overall system

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For owners / operators it can be…

Power Hungry

Highly intensive to maintain and energy inefficient

Polluting

Building, maintenance and operations may generate vast quantities of pollutants

Complicated

Often hard to operate, even harder to optimise, frequently analogue

Unpleasant

Infrastructure working conditions present challenges for workers

But imagine if infrastructure owners and operators could more easily:

Adapt
...to changing trends and social need

Improve
...the strategic planning of asset investments

Apply
...digital enhancements to infrastructure design & op

Connect
...data with decision makers

Optimise
...operations, maintenance and renewal

Automate
...mature processes for scalable high performance

Integrate
...transformation and digital capabilities

Build
...new capabilities to sustain the change

Prove
...emerging technologies and methods deliver value

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Big Data can benefit the transport industry by helping with…

Predictive operational maintenance

Data can be used in real time to help determine the condition of in-service equipment in order to predict when maintenance should be performed.

✓ developing issues to be flagged in real time

✓ triggering the maintenance and servicing process as a preventive measure

✓ use of IOT devices such as sensors to monitor assets

✓ reduce downtime and cost on infrastructure and transport services

✓ prevent damages to the train and the rail

✓ optimise train servicing & repairs

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Big Data can benefit the transport industry by helping with....

Big Data in Asset Planning

As there is so much data connected to these assets, it needs to be harnessed and analysed so rail planners can plan works efficiently and reduce overheads.

It means these assets are maintained exactly when they need to be rather than the reactive approach so many rail companies currently take.

- ✓ The ability to generate valuable insights from large amounts of data
- ✓ Accurately predict trend analysis
- ✓ Cost control and budget forecasting
- ✓ Resource allocation
- ✓ Spares & Materials procurement
- ✓ Health and safety
- ✓ Staff competency

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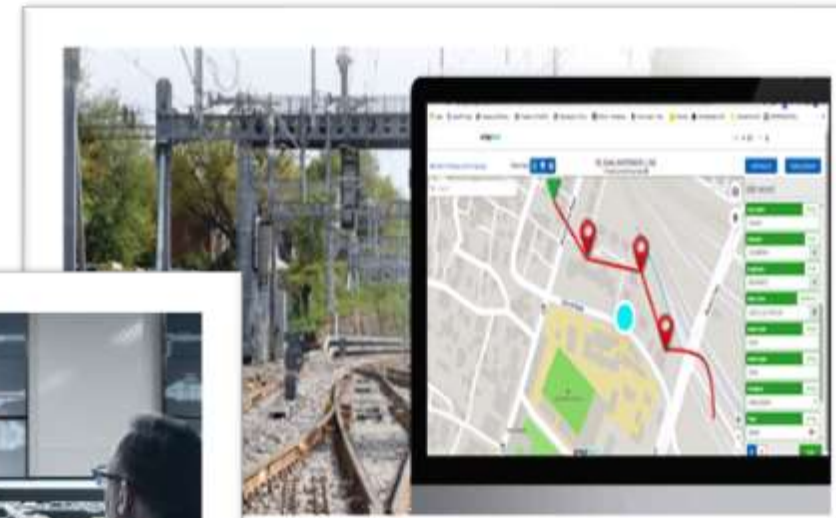
Big Data can benefit the transport industry by helping with….

Big Data for passenger experience

Improving train service and availability. Many train operators have custom dashboards which feeds from real time data, to support drivers, which is essential for getting the train back into service as soon as possible.

The ability to obtain status information and obtain quick train response to queries is vital to keeping trains on time and in turn ensuring the passengers are happy with the service.

- ✓ Big data can be used to tag passenger flow based on their preferences, behaviours, habits, and travel itineraries
- ✓ Enables passengers to enjoy self-service check-in at barriers and boarding transport
- ✓ Real time notifications of transport delays, route, platform and timetable updates
- ✓ Onboard catering and services
- ✓ Real time journey tracking

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So how can Amey digital help?

Enhancing Decisions, Transforming Infrastructure, Improving the World.

We develop and support software solutions that enable clients to make better informed decisions

> Underpinning improvements to the management and operation of critical national infrastructure

> Creating tangible value through cost efficiency, improved safety or customer experience

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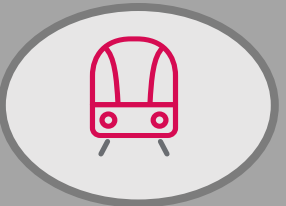
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data — Better use your data and technology to derive insights and impact through improved decision-making
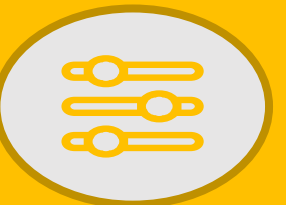
change — Define and shape customer focused value that support your vision through digital services and strategies

customer — We identify and understand what value is to the customer and build our solutions around user experience

infrastructure — Effective Asset Management and operations through processes, people, technology & data

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DELIVERING- **'digital' CONSULTANY SERVICES**

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- Be your partner with any form of digital adoption

- Provide guidance and reassurance with software services / applications and training

- Apply expert advice with governance around regulatory standards, policy and strategy.

- We recommend the most appropriate solutions, systems and suppliers based on your strategic objectives, budget and value for money

- access to over 1800 experts in engineering, design, digital technology and asset management.

- Full PMO support

- In summary -Our advice covers the full range of the project life cycle, from concept, project development and delivery through to operations and maintenance.

Our Commitment to Our Offices Diversity & Inclusion

- We're an organisation representative of the communities which we serve. To do this it is essential we become a more open, diverse and inclusive organisation, harnessing the skills and expertise of all our people and attracting the best talent to help deliver outstanding service to our clients.

Digital data, when transformed with business intelligence or aggregated as big data, can become an incredibly valuable resource. It is critical in nearly every sector—from supply chains to transportation to space travel.

Were here <u>to understand </u>your needs !

CASE STUDIES

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NETWORK RAIL -SOUTHEAST AND QUARTZ

BACKGROUND: In 2017, East Croydon was identified as the worst station on the Southeast Route in station delays. Affect network performance - impacting passengers at key times.

It also resulted in **large compensation payments** being paid to train operating companies

SOLUTION: We worked with Network Rail to understand how data could be used to improve operational decisions. We created a model that enabled the operations staff to track and record the journey of every train in real time.

To support this, we created a tool **(Quartz)** that enables station teams to identify operational improvement opportunities and key performance trends. This dashboard provided drill down functionality to help station staff understand where delays were occurring and where actions had to be taken to resolve the issues. Subsequently Quartz has now been deployed across all stations in Great Britain.

OUTCOMES: Enabled a **40% decrease** in station delays at East Croydon, contributing an estimated £3.5 million savings to Network Rail over 5 years.

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MANCHESTER METROLINK

BACKGROUND

In 2017, KeolisAmey Metrolink took over the operations and maintenance of Manchester's Metrolink. In July that year, a fault with the Ethernet Network was reported to the Trafford Control Centre.
Over the following 10 hours, one by one the systems failed, including the complete loss of communication to the Tram Management System . The radio system failed, which meant the control room at Trafford lost the ability to speak directly to the tram drivers. As a safety critical failure, the Metrolink service was suspended for 14 hours.

SOLUTION

We identified the root cause of the failure and worked with the TMS supplier, to identify recommendations that would not impact the operation of the TMS. We submitted a Network Outage Report with a list of recommendations with the aim of improving network performance and resilience. Our project deliverables included:
• Identifying the root cause of the failures • Implementing an automated daily backup routine • Improving network monitoring • Establishing collaborative ways of working with all major stakeholders • Providing all stakeholders with regular updates on the impact of the changes

OUTCOMES

We identified and corrected the root cause of the failures

Our Clients