Data and AI are tools for **asset management** now

Following a presentation at the grand-opening of Bentley Systems' new HQ, in which he emphasised the importance of using the data gathered by the multitude of means rail now has at its fingertips, Global Railway Review Editor, Elizabeth Jordan, had some questions for Network Rail's Asset Data Analysis Manager, *John Nolan.*

You mentioned in your presentation about the importance for certain systems to actually start interacting and talking to each other is crucial. Can you tell me a bit more about that?

In our region, in the industry, there's an awful lot of systems being used and there was a different system for project delivery, different systems for asset management and different systems for maintenance. At the last count I started with only 97 systems, now there are 110 or 112 all for different things, but no one ever discounts the legacy system.

The legacy system remains in use and then of course you have Excel and Word and people using those databases to store asset information as well. We're trying to avoid saying transform how you work as an individual, that's too transformative and takes a very long time. Why not bring all the information into one place?

We did that successfully with our capital delivery: We took the multiple systems that were legacy from Crossrail, from different people and different ideas which had all been siloed, I set up one environment and we carried on that way.

The challenges of project delivery has shown the success of that, which has highlighted how we can adapt other parts of the business as well.

> *With the data gathered from these special trains and the implementation of artificial intelligence, we can predict the degradation of rail over time*

Virtual reality always sounds very futuristic, but it's already being integrated into these systems. What part could virtual reality play in the near-future?

We use virtual reality in one way for our signal sighting and sign sighting on Crossrail, on the Greater West program, through the electrification creation program and everything was done in the virtual world. Having everything in this one shared space created a kind of 'one big room' mentality. This meant virtual design and construction were also part of it, but everyone made decisions from the safety of their own office.

From this process, we had 43 signal signs in one sitting where the norm was two to three on legacy. That really transformed our way of working because the way the virtual world was, you could move a signal or a design and then change it really quickly. Whereas traditional ways of working or other ways of working, meant the signal would move, but the whole design would have to change and that would take many weeks.

When it comes to site safety, we're looking at the virtual world goggles and making that more interactive and immersive. And that's the key thing. It's immersive. You can actually walk around the asset. If you're on site and it's modeled as it would be in distances, you can virtually walk out on site. You can go through where you're supposed to go, you can see the access points, you can see the equipment, etc.

Another big factor for the future is augmented reality. So, when we go on site, we have our digital twin which we use for various reasons, but if you can look at an asset on site and click on it in the virtual world, all the information about that asset comes up as well. I believe VR has a big role to play for planning of works and means testing safety before you go on site and role play and things like that. But augmented reality has a play when you come onsite to interrogate information.

Do you see AI starting to play a role in connecting with VR as well?

We're looking at AI and the different data sets and data quality that will have a role in VR because it means the model is accurate. Accurate asset data and accurate locational data is the key driver, otherwise you've no model and it's not real, it's not virtual. A few years ago,

we used Google Box, to create a virtual station and we walked up and down on that, which was awesome. When it comes to artificial intelligence, if you have forward-face video, drone imagery and any type data sets we can use that AI to interrogate the information that says here's where everything is. This can then be put into our digital twin, which feeds the VR as well.

Do you think the rail industry is mentally ready for AI and the technologies being looked into now?

In our region, our Director of Engineering and Asset Management has got an Intelligence Infrastructure Government board set up and the cover text is "AI will be commonplace in 30 years time, How are we going to prepare for that?"

I definitely believe we need to be taking AI seriously and the initiatives that are there, even talking to our own people inside our companies because a lot of the time we go to companies and they do work for us, but then we find out that our own people have done similar work internally. People learn different skills in different parts of the business, our job to do is to make contact and bring it together through that board, which is AI based for the future as well.

Data can be gathered to give us information that's preexisting and relevant now, but it can also be used to predict what's going to be needed in future. Does that mean we could have a timeline of models and VR experiences created and future issues would become visible for engineers to preempt?

We have already implemented technology on the railway that tells us the state of the rail set of points and they feed this information into the future digital twin. For physical assets there's a raft of innovation that comes in for monitoring various aspects. Then there are the digital assets and how you visualize all the data fed into it.

Network Rail has got National Measurement trains (NMT) that use line pattern recognition. With the data gathered from these special trains and the implementation of artificial intelligence, we can predict the degradation of rail over time based on imperial evidence that we had before which is key to maintaining healthy track. We can even use this technology for vegetation, using gathered data to track and forecast which vegetation might become an issue to the tracks in the future so that we can deal with it before it gets to that stage. This use of AI in predictive maintenance is very valuable, because it saves time and protects teams of people from spending an unnecessary amount of time out on the track. I think we're advanced in some respects but we're constantly learning. We're unsure where it's going, but we're getting benefit from it and there's plenty more work to do.

JOHN NOLAN

John Nolan is Network Rail Wales and Western Regional Head of Asset Data Analysis.
John has worked on many of high-profile projects including the Dublin Port Tunnel Project for Nishimatsu Construction Company and had a brief spell in Australia working for KBR.
In the UK John has worked on a variety of Rail and tunnelling projects including; The East London Line with URS Scott Wilson and on site with Balfour Beatty Carillon JV; Tottenham Court Road Station Upgrade with Halcrow; Crossrail Ltd with Arup Atkins JV; and currently with Network Rail.
In his previous role of Programme Manager BIM Wales and Western region Network Rail John developed the regional BIM Strategy , Exchange Information Requirements and Information Management Strategy and led with implementation of One CDE for project delivery . John has been at the forefront in promoting and implementing a more efficient way of working with BIM on the railway build environment. As part of this journey John has moved to Asset Data Management where he now provides leadership and strategic vision for whole lifecycle information management of network rail assets.

People can be suspicious of AI being unhuman, but the human influence is needed to make it work. Do you think this new connection to the latest technology and AI usage could be the draw that's needed for the next generation to join rail?

Yes, it is. Internally, we've created a digital knowledge and information data competency. It was a national initiative that went down to the website. We've revived and we added in our own regional sense. This shows everyone in our region of the company the criteria for data and the information fundamentals about lifecycle. It's important for our team to know about experience and application reporting, analysis and security, because these are the data fundamentals.

So, we have begun upskilling our people through these principles. We're having conversations with HR and we're going to go around to colleges, technical colleges and universities. All this has been planned for the next control period next year. We plan to tour around and say "Hello, this is what we do", show them what we're at, and then go through apprenticeship programs or go to universities and do work experience options as well.

What people (without rail experience) don't realize is they think about the railway, and they see a train going up and down and they don't understand all this cutting edge, cool stuff that we do. Being able to show people these factors in the model would be a great way of showing it to them rather than trying to explain all the systems.

If that then leads to their own innovations, the diverse nature of having people brought into the business from different directions, backgrounds with fresh thoughts and experiences and different knowledge. I think that's the key to survival for all industries, not just rail.

There are generations of children now who are born into a world where they'll know how to use an iPhone by three. When I was three, it was Cops & Robbers!

There are computer games and software out there now being played by younger generations who don't realise how similar they are to some of the systems we are now using. And they're so creative! If we attract that talent and nurture it, there won't be any need for in-house training because the new generation of people coming through schools are already working with the technology we need them to understand. Whereas, when I started off in my career, I was on a drawing board, then I went to cad and was there for a long time. Then the 3D model came in and people were trying and seeing how it worked in the real environment, which was station based. And then the 3D model led to intelligent modeling and now here we are.