RailBusinessDaily

The digital solutions to enable systems integration

May 14, 2021

For the third day of Railway Industry Association's (RIA) Unlocking Innovation series on Whole Systems, the focus was on providing solutions to managing the complex array of systems across the railways through frameworks and digital tools.

The first speaker was Derek Price, Technical Head of System Integration at Network Rail, who has spent his career using systems engineering approaches on major transport projects. Derek took the opportunity to highlight Network Rail's Systems Integration for Capital Delivery (SI4D) framework, or in other words, the pathway for delivery of a rail project – whether that is new signalling or software, for example – to ensure it fits in with the current railway system.

Derek covered recent reports which emphasises the importance of whole systems integration, including the McNulty, Hendy and Bowe reports, as well as the Infrastructure and Projects Authority (IPA) "Lessons from transport for the sponsorship of major projects" from 2019.

He said that they currently have around 100 projects using their SI4D framework, after pilots with 30 projects. According to Derek, the team has identified a number of benefits, which include providing a

simpler route to managing compliance with critical regulations and legislation, identifying issues with scope and performance earlier, and providing better support to project teams. These benefits of a system engineering approach were further emphasised later by Paul Whitcombe of Harmonic Rail who shared their experience of finding and mitigating problems throughout the project life-cycle.

On the transition from GRIP to PACE, a live process in the industry as Network Rail looks to simplify rail project delivery, Derek stressed that they are trying to “hardwire systems integration into these new processes”.

Professor Clive Roberts and Dr Heather Steele, both from the University of Birmingham, were the next speakers and discussed Synthetic Environments, often called ‘Digital Twins’. To begin, Clive defined a synthetic environment as being a combination of models (of the railway network), simulation (how that works dynamically), people and real-world equipment (referred to as ‘hardware in the loop’). So it is ultimately a representation of the real world, used to understand what might happen when you integrate new systems and technologies in different circumstances.

Looking at its application in the industry, Clive highlighted the Target 190+ project – an industry initiative led by Network Rail to reduce the cost of signalling – with synthetic environments expected to help reduce on track testing on the railway which is time and cost intensive. Clive and Heather highlighted the work that UKRRIN, Network Rail and RIA and other supply chain partners are undertaking to develop a model to help find cost savings for signalling and find a “golden thread” to link across the industry.

Clive also highlighted that the University of Birmingham has developed a Siemens Class 700 cab model, and can “make it think it is in the Moorgate tunnel”, to test door systems, passenger information and signalling which will be used on the actual line – just one example of how synthetic environments could be used.

Heather explained that being able to run thousands of tests in an automated environment provides a huge range of benefits. The team found a few issues that could be solved by shifting to synthetic environments, however there are still a number of challenges to overcome in the industry, including; the fact that models are currently used disparately, are often bespoke for specific projects, that there is a culture of resistance to change, high reliance on manual data generation and translation, and finally that there can be a disconnect from suppliers to clients and customers. However, it can be expected that these issues will be progressively overcome as this approach becomes more routine in rail as it is in other sectors.

All speakers found a range of good examples from the defence and automotive sectors – a recurring theme from across the week’s events – where synthetic environments are an accepted and critical part of testing. Crucially, Heather stressed, using these tests to find faults and make changes can reduce risk of projects.

And finally Andrew Simmons, Head of Systems Authority for Digital Railway, Network Rail covered assurance and approval. Andrew explained that the programme is focusing on the whole life cycle of signalling, from procurement, supplier engagement right through to testing and operation, where benefits of whole systems thinking can be found. The key aim is to develop a complete end to end approach clarifying the roles of all the many regulations etc and linking requirements clearly to the desired outcomes so that testing and assurance are built into the project from its conception.

Andrew emphasised, “If you don’t get the assurance right at the end, you can have unforeseen circumstances, which can lead to time delays and costs”.

And to wrap up, RIA heard two Elevator Pitches from two member companies. The first came from Harmonic Ltd’s Paul Whitecombe, mentioned earlier, and the second was from SEMP Ltd’s Stuart Gilbey who both presented on their respective system engineering solutions that support clients with managing projects through the complete systems lifecycle.

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