Setting the Scene

By almost any measure you care to mention, the United Kingdom (UK) rail sector is flourishing. Passenger numbers are at their highest levels for 100 years, infrastructure renewal and expansion are near the top of the political agenda, and the supply chain can look forward to a planned £35 billion investment over the next 15 years.

This is often said, but not all parts of the UK have seen the same public transport boom. Although rail passenger numbers in Northern Ireland are growing, the number of rail journeys per capita per year remains six times fewer than in the rest of the UK. More road miles are travelled per capita in Northern Ireland than in any other UK nation or English region. Just 6 percent of people in Northern Ireland use public transport to travel to work, compared to 18 percent in Great Britain (GB).

2011 - Albert Bridge / *C4K train, Belfast (1)* / CC BY-SA 2.0

It's hard to deny that for this to change, Northern Ireland would need more tracks, more trains and more stations, but the rail network has not been a priority for investment. Articles are being written about whether it can survive as a going concern, never mind the idea that it would need to dramatically expand to catch up to what has been achieved in the rest of the UK.

Public transport can only go so far in the region without this investment, but in the meantime, and perhaps even to help challenge this reality, Translink needs to be able to do more with less. Engineering isn't the problem, but even better and more value-conscious engineering could be part of the solution.

In particular, Systems Engineering (SE) techniques are now extensively used by Network Rail and other industry players, for purposes as diverse as building temporary wireless systems for individual signals, and industry-standard modelling of the GB railway network as a whole.

SE is about drawing on the science of finding patterns in organised complexity, and the analysis of the emergent properties of a whole rather than the specific behaviour of individual components.

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The critical shift in understanding that SE brings to the table is that it is the structure of a system that generates its behaviour, more than the mechanical details.

In the rail industry, SE is particularly good at driving up the lifetime value of assets by making it easier to see the value of an individual project in the context of the railway network around it. By bringing insights, processes and tools designed to make this complexity tractable, systems engineering can drive down costs and push up quality.

The main ways it does this are by enabling as much expenditure as possible to be moved after assurance that the right asset is being built in the right way, and by introducing a specialised, rigorous approach to project information that streamlines communication and stakeholder engagement while keeping everyone, even external suppliers, on the same page, all the time.

By making greater use of systems engineering, the Northern Irish railway system could do a lot, today, to better maximise the value of its assets, and work to thrive in challenging economic circumstances.

It could have a development process which is better able to anticipate project risks and prevent incurring costs, when a failure is spotted too late.

It could have a more integrated supply chain, with clearer and more active coordination in the development and upkeep of railway systems.

It could adopt a scientific approach to requirements and quality management to ensure projects are done right every time.

It could have an approach to project information which breaks down walls inside and outside the organisation, and make it more adaptable to risk and change.

And most importantly, it could design its engineering process to place the lifetime value of its assets to the network at the heart of the way it works.

Getting Northern Ireland to use the railway more is an uphill battle, requiring dramatic change that extends to the highest levels of policy. Engineering is only a part, albeit an indispensable part, of that journey. But demonstrating even better and more value-conscious engineering could, perhaps, make that journey seem a little easier for everyone involved. We want to do our bit, and have some ideas we think might be valuable.

This information sheet is an excerpt from SyntheSys Technologies White Paper about Engineering a Better Railway for Northern Ireland. Read the full White Paper [here].

About SyntheSys

SyntheSys provides defence systems, training, systems and software engineering and technical management services over a spectrum of different industry sectors. Along with distinct support and consultancy services, our innovative product range makes us first choice provider for both large and small organisations. Established in 1988, the company focus is on fusing technical expertise with intuitive software applications to solve common industry challenges.

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