

It's Make-or-Break for US Passenger Rail – Connectivity Is Key for Long-Term Success

By Martin Shaw, Head of On-Train Digitalisation for Icomera

The concept of the digital train is not simply an imaginary glimpse into the future; it is the imminent evolution of public transport tailor-made to meet the expectations of a connected world.

With every turn of the wheels, the very notion of travel is being reimagined, shaping up to fit into a digitally dominated era where seamless internet connectivity is as essential as the tracks upon which the trains ride.

Gone are the days when digital transformation within railways was constrained by bits and pieces of technology scattered across compartments. We are venturing into terrains where central connectivity platforms are not the exception but the standard. Guided by the insights of Martin Shaw, an expert, and Head of On-Train Digitalisation for Icomera, we chart today's ambitious course toward the digital train – an entity that encourages not only modern conveniences but marks a significant leap in transport technology.

Two years ago, the Bipartisan Infrastructure Law authorised the investment of more than one trillion dollars in federal spending on transportation, broadband access, clean water and electrical grid improvements. The transportation industry is now seeing the effects of that funding first-hand: across the country, rail operators are upgrading their infrastructure and purchasing new vehicles that will carry passengers for the next two decades or more. Our country's passenger rail network has never before seen such a comprehensive upgrade to its vehicles and technologies.



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This is a make-or-break moment for rail travel in the US. While the COVID-19 pandemic led to a sudden drop in ridership for rail operators, the American Public Transportation Association (APTA) reported that overall ridership has recovered to **79 percent** of pre-pandemic levels in April 2024. A widespread upgrade of the passenger experience could lead not only to a return of pre-COVID levels, but also a sustained period of growth as customers recognise the advantages of commuting and travelling by train.

This growth will only be possible if rail operators focus on delivering a modern, future-proof, customer-friendly experience. To succeed, these companies need to embrace the 'digital train – building off a single, centralised connectivity system to integrate everything from passenger Wi-Fi to video surveillance to energy metering to passenger counting.

Addressing the Digital Train Need

The digital train is crucial for two main reasons: interoperability and affordability.

Interoperability: A modern train includes a dozen or more onboard systems: GPS, on-train data recorders, real-time passenger information and other dedicated solutions for security and operations. Historically, these many tools have been installed and operated as standalone systems, each with its own source of power and connectivity. Each of these individual systems increased the overall complexity of operating and maintaining the vehicle, while also taking up more physical space in the train itself.

The lack of interoperability of these onboard systems limits the rail operator's ability to introduce new passenger services. For example, if the passenger counting system operates on the same network as the passenger information system, the rail operator can quickly and seamlessly display which cars are full and which are empty, allowing passengers to move towards the empty cabins for a more comfortable experience. When those two systems are walled off from each other, even this basic service is impossible to implement.

Affordability: Rail operators – and the rail industry in general – can no longer afford to look at these systems in isolation. Instead, every system upgrade or replacement should be looked at in the context of the train as a whole.

There are two paths for rail operators to adopt the digital train strategy successfully. As companies consider how to upgrade their vehicles, they must choose between 1) upgrading their systems all at once with a comprehensive solution or 2) taking a step-by-step approach with each individual improvement. **While some European and UK rail operators have achieved success with wholesale overhauls of their vehicles**, a step-by-step strategy will be more realistic for most rail operators.

Rethinking Strategy for a Digital Train

The digital train strategy starts and ends with rethinking relationships and mindset.

Rethinking relationships: Working towards a digital train strategy requires rail operators to rethink their relationship to their equipment. Previously, equipment was often sold as 'fit and forget' – systems that could be installed and operated with minimal ongoing oversight and maintenance. The next generation of onboard technologies will require more expertise and management.



Changing the mindset: Passengers will naturally be critical when systems don't work as they should – bad Wi-Fi and inaccurate passenger information are common complaints among rail travellers. Rail operators need to take a long-term view of their digital train initiatives and recognise that the short-term growing pains will allow them to deliver a more comfortable and more innovative passenger experience in the future.

Bringing IT internal: As rail companies upgrade their vehicles, they will need to bring on new personnel to manage the health and reliability of the system. Transportation companies must become technology companies to some extent to remain viable in the long-term; as a result, they'll need to hire IT experts. While some rail operators may be hesitant to take on the added expense, they will see a trade-off in reducing the maintenance costs associated with isolated, fragmented systems. Instead of having to install, maintain and replace multiple connectivity platforms, they will only need to look after one comprehensive system.

Monitoring cyber security: Rail operators have legal obligations to protect passenger data. They must conduct extensive penetration testing to ensure that systems stay compliant with regulations. But while the overall need for cybersecurity increases as a result of the digital train strategy, it's important to note that the overall risk does not increase when systems are combined on one connectivity platform. A combined connectivity platform allows for central monitoring to ensure resistance to cyber attacks. Networks can also be segmented, isolating any penetration to a single area, significantly reducing the overall exposure and risk.

Long-Term Implications of a Digital Train Strategy

Decisions made when upgrading transit vehicles will have long-term implications.

As rail operators use federal funding to upgrade their vehicles, the choices they make will have long-term implications both for their passengers and for the organisations themselves. Adopting a single connectivity solution keeps the door open in the

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future to integrate modern technologies and continue upgrading the passenger experience. Maintaining siloed systems keeps the rail operator frozen in place, unable to keep pace with modernisation.

When passenger rail operators deliver a truly modern customer experience, they can compete with private vehicle travel and steadily increase ridership: instead of being stuck behind the wheel of a car, passengers can stay connected, productive and entertained over the course of their journey.

This customer experience is only achievable with exceptional connectivity – the digital train is an essential strategy for the rail industry's long-term stability and growth.

The next few years will determine the overall trajectory of rail travel in the United States. Rail operators have an excellent opportunity to increase ridership and demonstrate why passenger travel is an appealing alternative to car travel. We can not afford to miss the opportunity by holding on too long to legacy technologies.

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