

Rail transport in the digital age

Over the last few years, technology and IT developments have been pushing the transport sector to the edge of great changes. Digital technology has had a significant influence on mobility patterns and customers' expectations, affecting the way the transport sector is dealing with user information, payments, integration and automation. For *Global Railway Review*, **Philippe Citroën**, General Manager of UNIFE, explains that we can reasonably expect that digital transformation to advance even further, as improvements are anticipated in areas such as asset management, operations and the user's role.

FOR RAIL transport, the digital transformation represents both a challenge and an opportunity. The challenge comes from its impact in transforming roles and creating new business models – such as Mobility-as-a-Service (MaaS). In addition, concepts that are already well established in the rail sector – such as automation – are now being adapted for trucks, cars and buses. Nonetheless, there are significant potential benefits for rail to harvest. Accordingly, big data, connectivity, the

Internet of Things (IoT), digitalisation and smart infrastructure – inter alia – offer the rail sector the opportunity to boost capacity, reduce maintenance costs and energy consumption, and optimise traffic management.

In its 'Digitalisation of Railways' Position Paper¹, UNIFE – the Association representing the European rail supply industry – identifies the following six areas in which the transport sector, and particularly rail transport, will be confronted by either ongoing or disruptive trends. ▶

“ The future of rail lies in its flexibility and ability to adapt to and incorporate future technological advances ”

1. Intelligent transport networks

The combination of interconnected technological solutions and components would make transport networks more responsive, reliable and efficient as they would be able to sense high demand, adjust capacity, measure performance, and monitor and identify the maintenance requirements of physical assets.

2. The role of users

It should never be forgotten that digital transformations are as much about humans as about pure technology. Passenger transportation is already witnessing a shift of power towards the user, as real-time information is becoming more 'personal' and multi-modal journeys are more integrated. The user's decisions, enabled by digital technology, can henceforth influence the business models and services offered by the market.

3. Pricing and payments

Nowadays, the digitalisation of tickets (e-tickets) and payments is becoming the norm, giving users more flexibility with their journeys and enabling more attractive solutions in terms of pricing. The objective is to achieve real-time passenger information and multimodal journey planning and booking across various transport modes through new interfaces for transport operators and mobility service providers.

4. Automation

Automatic Train Operation (ATO), enabled by the rollout of the European Rail Traffic Management System (ERTMS), would allow optimal train speeds and provide greater robustness in operation, whilst also positively affecting infrastructure capacity.

5. Open data

The digitalisation of the different sources of information, shared between data producers and data users, would provide the basis from which to exploit the increased possibilities of analysing big data sets. It would enable the forecasting of asset conditions and diagnosis towards risk-based predictive maintenance or optimisation of energy efficiency.

6. Cyber-security

The intensive use of digital data and communication links will increase the vulnerability of such systems. Due to the increasing integration of ICT into land transport, mobile units and infrastructure, the number of potential cyber-risks has risen steadily during the last decade². The development of better resilience against cyber-attacks is, therefore, fundamental if rail transport wishes to maintain its high reliability, safety and operational continuity standards.

The value of data: The role of the European rail supply industry

Granted, a common trend encompasses all the aforementioned areas: The significance of the collection, management and processing of data. In its 'The Data Opportunity' study, Siemens Mobility stresses how the emerging importance of the use of data in rail transport is transforming the sector's business-as-usual³. The size and amount of available data in the railways can, however, be staggering: Rail vehicles can today send between one and four billion data points per year, and rail infrastructure/signalling can send several billions of messages per year within the system. Additionally, data related to operations control systems, advanced vehicle inspection or even the weather can also be collected and analysed for the rail sector⁴.

The challenges and goals are, in principle, rather straightforward: To manage and channel this amount of data and to turn it into relevant information that can be used for targeted, effective decisions and actions. The rail supply industry, in this regard, has shown remarkable promptness in understanding the value of data and has proactively worked on solutions to utilise it. Data-focused solutions can increase value for society, operators and public authorities³: Maintenance can be predicted based on the true condition of a component – with a positive effect on the product life-cycle cost; failures can be prevented; energy consumption can be reduced; operational processes can be optimised on system level; and, eventually, the overall impact of problems on operations can be minimised.

There are already several data-managing solutions on the market, brought by the commitment to innovation of the rail supply industry. The objective is to offer our customers platforms for smart management of the rail system's assets. Through monitoring, analysis and prediction, using advanced algorithms, the following customer needs can be met: Increased availability, reduction of operational risk, life-cycle cost reduction and increased utilisation rate – with the objective of zero in-service breakdowns.

A way forward for digitalised rail systems


The most recent rail developments in the digital arena have shown promising steps in the right direction, encouraging strong engagement by the whole sector – and in particular the manufacturing industry. However, compared with other modes of transport, the deployment of IT and enabling technologies in rail is at an early stage. Therefore, it is fundamental for the whole sector to keep its commitment to make digitalisation, not merely an objective, but rather a means to achieve more ambitious and paramount goals.



PHILIPPE CITROËN joined UNIFE in 2011 as Director General. He began his career as Transport Advisor at the French Permanent Representation to the EU and then became Member of the Cabinet of the French Transport Minister. In 1993 he became Manager and Chief of Staff at RATP Paris, and joined the SNCF as Strategy Director in 1999. Prior to assuming his position at UNIFE, he served for eight years as CEO of Systra, one of the world's leading public transport engineering companies. Philippe is a graduate of Paris II University in Public Law, holds a Diploma from the Paris Institute of Political Studies (Sciences Po), and studied at the Ecole Nationale d'Administration (ENA), where he also lectured about Rail and Urban Transport.

The European rail supply industry believes that EU legislation and regulations should support digital transformation in transport, while providing the necessary tools to safeguard it. In this respect, UNIFE would reiterate its call on the European Commission to establish an overarching platform on digitalisation that would incorporate all railway stakeholders¹. Taking this further, the European rail supply industry welcomes the recent proposal by the Commission to allocate €9.2 billion – from the Multi-Annual Financial Framework (MFF) 2021-2027 budget – to a new programme to develop and reinforce Europe's strategic digital capacities; 'Digital Europe'. However, although transport is formally recognised as 'an area of public interest' for prioritisation of digital transformation⁵, the role of mobility and rail could be highlighted, as well as the synergies with the Connecting Europe Facility (CEF) programme should be strengthened.

Finally, the fundamental role played by research and innovation in the digitalisation of railways must be mentioned. In its 'Rail 2050 Vision'⁶, the European Rail Research Advisory Council (ERRAC) outlines how transformative future rail-related research and scientific advancement has the capacity to change technology dramatically. Moreover, the 'vision document' also points out that the future of rail lies in its flexibility and ability to adapt to and incorporate future technological advances. Following this further, digitalisation and automation are at the core of the Shift2Rail Joint Undertaking's vision, which will enable the railway sector to produce value-adding products and services.

Notably, through the Shift2Rail Joint Undertaking programme, the whole sector – suppliers, infrastructure managers, operators and academia – has committed to invest together in rail R&I in order to reinforce the attractiveness of rail transport to passengers and businesses, whilst embracing innovative streams. Building on the success of Shift2Rail, a refocusing of collaborative rail-related research activities would be needed for the post-2020 programming period. In this respect, the increasing need for shared mobility, customer-focused, digital and intermodal transport tools shall be a guiding principle for a 'Shift2Rail 2' in the next Horizon Europe framework programme. Accordingly, UNIFE and its Members have a strategy for the future: Nine 'key-enablers' – ranging from, inter alia, automated rail transport and MaaS, to maintenance of the future and optimised infrastructure – are currently being developed by the European rail supply industry, with the objective to make rail transport the backbone of mobility. This will be possible by cooperating with mainline and urban operators, making rail the digital backbone and system integrator of future mobility. 

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