

Establishing rail as the backbone of future mobility

Society expects an efficient, reliable, seamless, accessible, safe and green transportation system. UNIFE's Director General, *Philippe Citroën*, believes the future of rail lies in flexibility and how it can adapt and incorporate future technical advances.

decrease congestion and air pollution as well as move a large number of citizens in a sustainable way. Furthermore, several experiences⁴ have successfully shown how rail stations can be transformed into smart urban 'hubs', bringing all the public transport modes together under one roof – train, bus and tram, and with good accessibility for pedestrians and cyclists.

Growing interest for environmental issues: Public rail transportation as a remedy for climate change

Decarbonising transport is necessary to reverse a worrying trend: Greenhouse gas (GHG) emissions from transport in the EU have risen by 20 per cent between 1990 and 2013. Today, transport accounts for 23 per cent of the total CO₂ emissions in the world and 14 per cent of the total greenhouse gases⁵. Against this backdrop, the 2011 White Paper on Transport formulates an integrated vision of how transport should look in the year 2050⁶. Major opportunities to decarbonise transport must be grasped within all modes, but also with a shift to cleaner modes such as rail.

Societal changes: An ageing and growing population calls for increased mobility solutions (including rail transport)

There is an unprecedented, pervasive and enduring trend of population ageing. By 2050, the United Nations states that 22 per cent of world population will be above 60 years old⁷. Transport will also have to adapt to this new demographic landscape by offering dedicated services to an older population. In terms of social aspirations, it is also expected that more than 50 per cent of the world population will belong to the middle class by 2030. New behaviours will appear and create new needs (smart services, immediacy).

Long-term vision of the European rail sector

Besides the consistent benefits it already brings to the society at large, rail needs to increase its attractiveness, in terms of efficiency and reduction of life-cycle costs. Therefore, on the basis of its current assets and its potential yet to be unleashed, rail transport should be considered as the backbone of the mobility of the future for both passengers and freight. To this extent, the 'RAIL 2050 Vision Document'⁸ prepared and published in 2017 by the rail European Technology Platform – European Rail Research Advisory Council (ERRAC) – is a key document displaying the long-term rail sector vision with a forward-looking strategy by setting out the future capabilities needed from railways to meet the future needs of European end-users. ▶

TODAY'S transport system is comprised of different transport modes competing between each other and this is not considered as an efficient and reliable option when travelling. However, the evolution of existing modes of transport and the emergence of new mobility concepts will contribute to the setting-up of a new integrated and connected mobility landscape, with co-modality becoming key to answer society's mobility drivers. In this context, rail transport, which already brings many benefits notably in terms of capacity, a low carbon footprint, comfort and safety, shall become the backbone of the mobility of the future.

UNIFE, the association representing the European rail supply industry, is convinced that research and innovation will be of paramount importance to implementing this new vision with rail as the backbone of mobility of tomorrow.

The mobility drivers and role of rail transport

Transport mobility is a concept aimed at designing and implementing the best transport network in response to the needs of end-users (including passengers and freight). When analysing the mobility drivers, it appears that rail transport has a key role to play in the future:

Urbanisation: Continued growth in urban population drives the need for more rail transport solutions

Urban mobility is becoming the highest priority for cities¹ all over the world. The phenomenon of urbanisation generates significant investments in order to create, extend and develop cities' mobility networks. It is expected that by 2025, 65 per cent of people will live in urban areas² and the 600 largest cities will represent 65 per cent of the world's GDP³. Rail remains the most efficient transport mode to

Ensuring our railways are protected against cyber-attacks is of utmost importance



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 a 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, Philippe 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.

Research and Innovation: The nine UNIFE key enablers

New/emerging technologies such as digital solutions, artificial intelligence, robotics, blockchain, autonomous driving, the Internet of Things (IoT) and new 'intelligent' materials are crucial for the evolution of the rail system. The future of rail lies in flexibility and depends on its ability to adapt to and incorporate future technical advances.

In its Position Paper on 'Shift2Rail 2', UNIFE identifies the following nine key enablers as the areas of priority for European rail research and innovation:

1. Automated rail transport

One of the main characteristics of future rail transport is increased automation. The future of automated train operation in open networks (e.g. mainline, high-speed, commuter, regional, urban) is fully automated unattended train operation with grade of automation level 4 (GoA4). This key enabler aims at improving the efficiency and effectiveness of the overall rail transport system by further developing automation technologies.

2. Mobility as a seamless service

This key enabler aims at providing customers (passenger and freight) with seamless, personalised, efficient and cost-effective

door-to-door journeys (with rail as its backbone), minimising the environmental impact. It will also enable the adaptation of multi-modal transport which is currently in demand.

3. Digitalisation

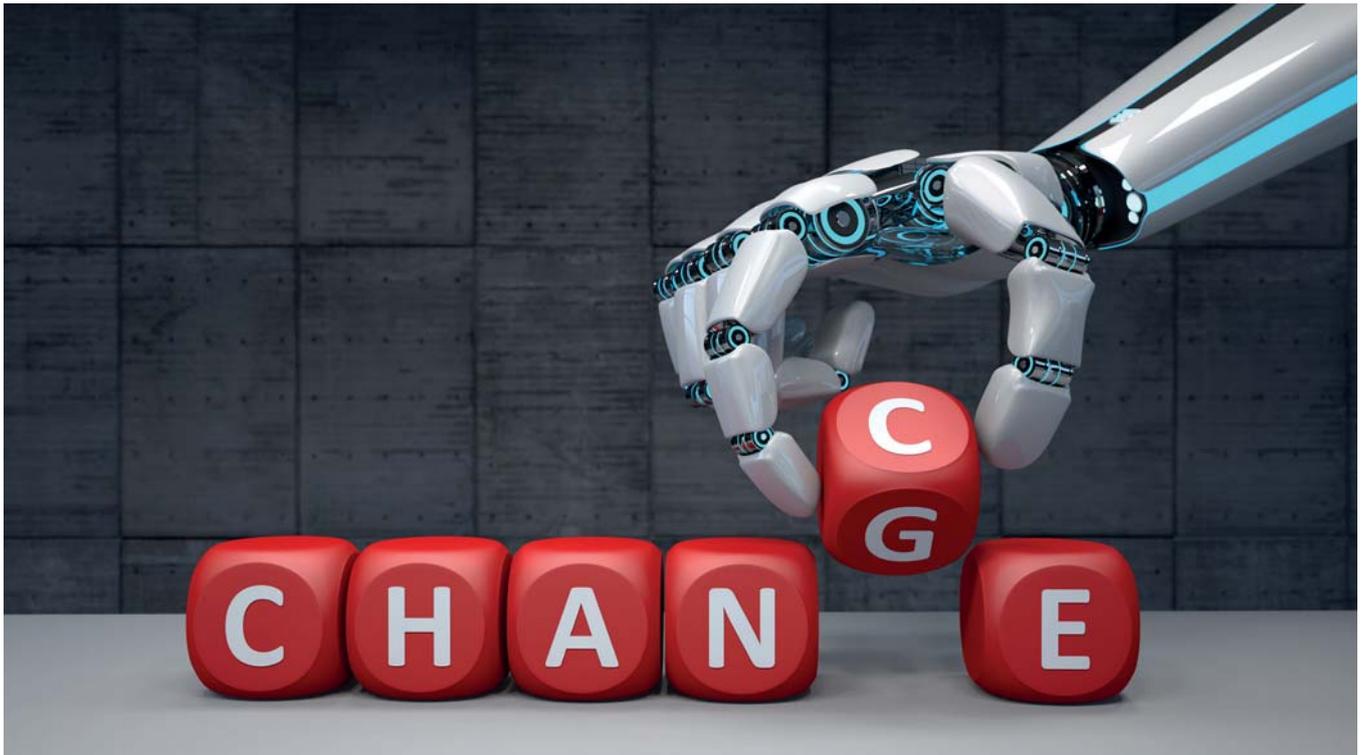
The main objective of this key enabler is to support a fast and widespread deployment of digital technologies across the railway system, and then to develop advanced data management and analytics tools that will open the door for implementing powerful applications in many areas of the system including the design, operation and maintenance of railway equipment.

4. Towards an efficient zero emission railway

Rail transport should stay the greenest mode of transport. Decreasing energy consumption in all railway applications is a general objective in order to keep rail as the most environmentally-friendly transport mode. The railway uniquely combines capacity with low rolling resistance. As the different technologies evolve, new opportunities arise to reduce the consumption of energy which needs to be adapted and implemented.

5. Maintenance of the future

Maintenance in the rail sector, with components having a life-cycle expectation of several decades, complex and high-tech components and a multitude of players in the supply chain, requires continuous attention and introduction of new and advanced technologies. The objective is to increase the efficiency of the required maintenance actions for both infrastructure and rolling stock and support a seamless train operation with zero avoidable failures. ▶



ABOVE: The future of rail lies in how it can embrace changes in technology such as artificial intelligence, robotics, blockchain and (IoT)



6. Enhancing the security and the protection of the rail system

Rail is recognised as one of the safest transportation modes. However, rail transport becomes a potential target for terrorist attacks. In addition, violence on public transportation, especially in urban areas, is creating stress to passengers and staff. Innovative solutions can be used to prevent or limit terrorism or violence and increase the level of confidence. Ensuring protection against cyber-attacks will also be a key achievement to a successful advanced mobility implementation.

7. Optimised infrastructure

The objectives of this key enabler concentrate around the full integration of rail transport in the multi-modal transport vision, the reduction of investment and operational cost and the increase of capacity in the urban area where rail (light-rail, metro) is the most effective mode of transport. For revamping existing infrastructure and building new infrastructure, sustainability is important.

8. Digitisation of the supply chain

Digitisation is one of the key emerging industrial revolutions. It shall bring substantial added value to the whole rail supply chain, by reducing lead-time delivery, manufacturing on demand, reducing warehouse storage, reducing goods transportation cost, enabling stronger collaboration between supplier/manufacturer/railway undertaking and improving the quality of manufacture.

9. New certification framework

Today the certification process has a long duration and a high cost. The introduction of new innovative solutions not covered by the current certification framework will make the situation worse and create new challenges (e.g. how to manage critical functions using information provided by artificial intelligence analysis). A new certification framework needs to be created to address these points.

From Shift2Rail to Shift2Rail 2

The Shift2Rail Joint Undertaking (launched in 2014) has truly represented a breakthrough for research and innovation in rail. Notably, through its programme, the whole sector – suppliers, infrastructure managers, operators and academia – has committed to invest together in rail research and innovation (R&I) in order to reinforce the attractiveness of rail transport for passengers and businesses whilst embracing innovative streams. The R&I activities managed by the Shift2Rail Joint Undertaking contribute partly to the UNIFE key enablers. However, the completion of these nine key enablers will require more research and innovation activities to place rail transport as the backbone of the mobility of the future. It is undisputable that the extension of the Shift2Rail activities after 2020 – through a 'Shift2Rail 2' programme included in Horizon Europe – will spread its benefits far beyond the pure market development, enabling rail to contribute decisively to the fulfilment of ambitious EU-wide objectives.

REFERENCES

1. Arthur D.Little future lab
2. United Nations world population prospects
3. McKinsey Global Institute
4. Stockholm Centralen; Utrecht Centraal
5. International Energy Agency
6. More than 50 per cent of road freight over 300km should shift to other modes such as rail by 2050
7. United Nations, World Population Ageing, 1950-2050
8. www.errac.org/wp-content/uploads/2018/01/122017_ERRAC-RAIL-2050.pdf