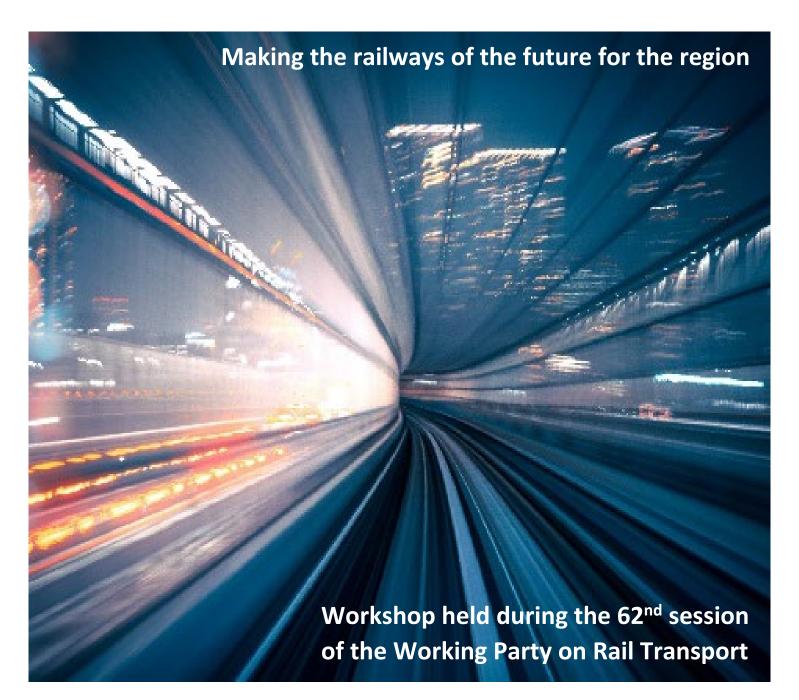UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

INNOVATION IN RAILWAYS

Making the railways of the future for the region

Workshop held during the 62nd session
of the Working Party on Rail Transport

UNECE

Making the railways of the future for the region

Wednesday 21st November 2018
Summary of proceedings

As part of the ongoing activities of the Working Party on Rail Transport (SC.2) a workshop titled "Making the railways of the future for the region" was held at the seventy-second session of the Working Party. Over 65 participants from national administrations, international organizations, non-governmental organizations and the private sector discussed, over a number of sessions, the role of innovation in the sector and good practices that are helping develop the railways across the region. This summary document provides an overview of the main discussions, all presentations and interventions from the session are available at www.unece.org/trans/main/sc2/sc2/meeting2018.html.

Introduction

In order to set the scene, the opening presentation was provided by the World Intellectual Property Organization focusing on a statistical review of patent data at an international level on railways and the wider transport sector. As a first comment it was noted that the first ever numbered patent was for railway technology. Looking in more detail at patenting, railway technologies are not growing as fast as other transport technologies, particularly in the last five years. The most important origins of innovation efforts in terms of volume are currently the China and Russian Federation, which have been major players since 2009. China is a very strong filer of patents in all technologies, including railways. Japan has reduced its participation since 1990, while the United States of America have significantly fallen in recent times. Regarding the type of patent filers, most of the applicants for railway technologies are companies. There is an increase of academic share, but a reduction of entrepreneurs and small companies. Finally, the information and communication technology (ICT) revolution does not seem to have yet strongly impacted railways innovation, where technologies are sourced mostly endogenously.
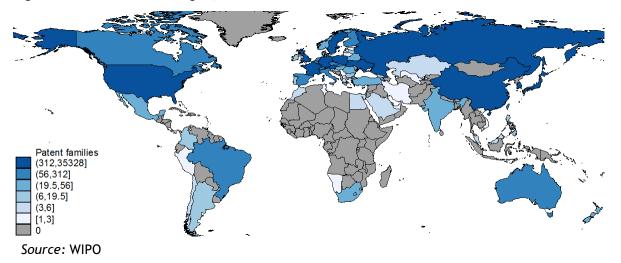
Figure 1: Innovation main origins, after 2009

Source: WIPO

National efforts to foster innovation

Discussions during this session underlined the need for sustainable mobility and growth, mainly by accommodating rising traffic flows, reducing the environmental impact and achieving energy efficiency. Digitalization and automatization are setting the pace with respect to the improvement of the efficiency for rail transport, but there are still barriers: getting the benefits of transformational technologies requires a change in the way systems and processes work: this is slow and difficult and involves cultural changes, changes to organizational boundaries and measures of success.

In Greece, initiatives such as "Shift to Rail" and the "Joint Roadmap Digital Railways" aim to develop and implement a new way of addressing the challenges for innovation in railway technology. The first Integrated Multimodal Transport Freight Center in Greece, in Thriasio Pedio, is the result of national efforts to deploy interconnection and link between big urban centres of the country and major freight centres, main ports and Trans-European corridors.

In the United Kingdom of Great Britain and Northern Ireland, the government created the Transport Systems Catapult, a not-for-profit company which works to identify and remove the barriers to the commercialization of innovation: historically, despite large investments for innovation in the rail sector, not enough of the research done has been implemented on the operational level. The size of the asset base and the length of the asset lifetimes in railway infrastructure and vehicles limit the speed of the changes needed. It is therefore in the services layer that rapid but transformational change can be delivered. The rail sector has to actively seek out ways to play a part in future multi-modal journeys.

International efforts to foster innovation

The session on international efforts to foster innovation covered initiatives coming from various regions and stakeholders: Shift2Rail (European Union), the Rail 2050 Vision from the European Rail Research Advisory Council, the draft Convention on the facilitation of border crossing procedures for passengers, luggage and load-luggage carried in international traffic by rail and the resolution No. 264 on International Rail Passenger Traffic on the Route East-West covering Asia and Europe, presented by the Russian Federation, and finally the development of China-Europe freight corridors and container block trains (supported by the Coordinating Council on Trans-Siberian Transportation).
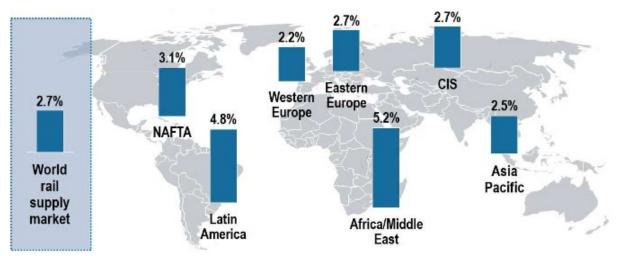
Figure 2: Total market growth rates per region (compound annual growth rate 2021-2023 vs. 2015-2017)

Source: Union des Industries Ferroviaires Européennes

In most of these initiatives, the development of multimodal trips and seamless ticketing illustrated the trend and need for interconnected systems and transport networks. Nevertheless, obstacles remain, especially regarding railway infrastructure that offers very different capabilities in different regions, making interoperability difficult at the regional and international levels.

The Shift2Rail initiative from the European Union has as five main objectives for the European rail sector: increase reliability and punctuality by 50 per cent, double railway capacity, halve life-cycle costs of transport, contribute to the reduction of negative externalities (noise, vibrations, emissions and other environmental impacts) and contribute to the achievement of the single European railway area. A System Architecture Approach has been adopted, requiring the development of Open System Interface ("do not reinvent the wheel", interconnect existing systems) and identifying enablers (digital technologies, automation, and so on, but also new regulatory concepts and framework). The next generation of the Shift2Rail project, for the period 2020-2030, will have a revised governance and include the ERRAC vision 2050, associated with a simplification of the regulation and administrative processes.

The ERRAC 2050 Vision as presented by UNIFE (Union des Industries Ferroviaires Européennes) is another initiative showing international efforts to foster innovation. ERRAC's primary objective is to deliver the common railway sector vision of research and innovation to the European Institutions and important stakeholders, in order to contribute shaping a favourable funding landscape for railway research and innovation, developing innovation via calls for projects and Shift2Rail. UNIFE strongly calls for the continuation of the Shift2Rail Joint Undertaking within the next Research and Innovation framework programme Horizon Europe 2021–2027. It identified nine Key Enablers: automated rail transport, mobility as a seamless service, digitalization, zero emission railway, maintenance of the future, enhanced security of rail system, optimized infrastructure, digitization of the supply chain and a new certification framework.

During this session, the JSC Federal Passenger Company (JSC FPC) reminded the international support that had been received by the UNECE resolution No. 264 on International Rail Passenger Traffic on the Route East-West covering Asia and Europe (ECE/TRANS/2017/17/Rev.1)[1]. This resolution invites Railway Undertakings along the East-West route to cooperate and establish rail passenger services by agreeing single services, time schedules, competitive and transparent tariffs and itineraries. The resolution also invites countries to finalize the new convention concerning the facilitation of crossing of frontiers for passengers and baggage carried by rail. Innovation is a tool for the implementation of the resolution, as digital services and attractive fares could increase the growth of passenger flows along with developing multimodal transport and the integration of booking systems, boosting cooperation between carriers. JSC FPC mentioned various related examples, such as the acquisition of modern rolling stock (night trains on the routes to Europe, automatic track gauge changing equipment) and the development of e-tickets sales channels in cooperation with foreign partners.

Finally, the development of China-Europe freight corridors and container block trains, supported by the Coordinating Council on Trans-Siberian Transportation (CCTT), also illustrates the international efforts to foster innovation. The CCTT actively works on increasing the competitiveness of trans-Siberian railway, by coordinating the activities of market participants, implementing unified information technology and electronic document workflow in cooperation with customs authorities, providing effective technological cooperation for different types of transport and ensuring the conformity of railway and intermodal transport products with international standards for cargo safety. However, according to CCTT, challenges remain on the European side of the east-west-east route for transit development, due to the lack of rail freight funding, the lack of rolling stock and a low coordination of rail freight participants in terms of speed of cargo transportation.

Innovation in railway systems

In this session, workshop participants highlighted the need for new business models and mobility services. Challenges for the railway systems are numerous: system complexity, expensive infrastructure development, lack of resources, increasing cost pressure, decarbonization, interconnected ICT services. Nevertheless, as representative of the Chemins de Fer Luxembourgeois underlined, the main challenge may be how to implement the new chosen solutions and how to manage the change.

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[1] www.unece.org/fileadmin/DAM/trans/doc/2017/itc/ECE-TRANS-2017-17r1e.pdf.

Figure 3: The core elements for innovation and transformation

Processes AND Technology

Ideation

« up-scagile »

Collaboration

Enterprise Culture

Mindset

Source: Chemins de Fer Luxembourgeois

More generally, participants remarked that innovation should come for business, not from information technologies. Innovation is about re-imagination of the processes, and technology can help on this but cannot, in itself, foster innovation. The work on the integration of digital systems should be considered across all transport modes together, targeting, as much as possible, seamless dataflow between stakeholders.

Figure 4: Austrian Federal Railways: decarbonization and automation

100 percent of the traction energy is obtained from renewables – including the use of eight ÖBB's own hydroelectric power plants

Reduction of 2.3 million tonnes

Source: ÖBB

In Austria, the Open Rail Lab, an independent research and testing centre, works on the development of strategic objectives and the coordination of in-practice examples with the users (for example infrastructure managers, railway undertakers). Up to 200 examples are currently being developed, for the testing, evaluation and authorization of new rail systems. It is a unique combination of think tank and test drive, offering open and shared infrastructures for innovation. During this session, the Austrian Federal Railways (ÖBB) also underlined that rail systems are expensive. Therefore, it is necessary to simplify the rail systems: railways need to tackle increasing system complexity and rising costs per unit despite a higher capacity utilization, new technologies and ongoing high investments.

The Swedish Transport Administration explained how they work on the integration of digital systems in the whole railway system, in relation with the other transport modes. Several themes have been identified to build an interconnected rail system: maintenance, asset digitization, real time network management and digital twining through smart data. The objective of this system would be to offer logistics on demand and mobility as a service.

Innovations for passenger services

Finally, the passenger focused session highlighted several challenges going forward. As already mentioned, one of the main challenges is to get from innovation to implementation.
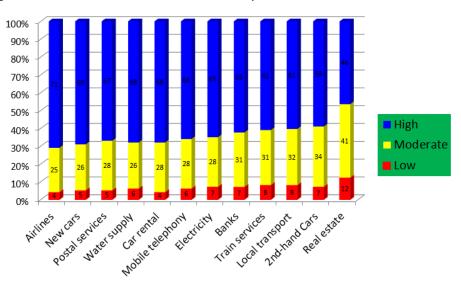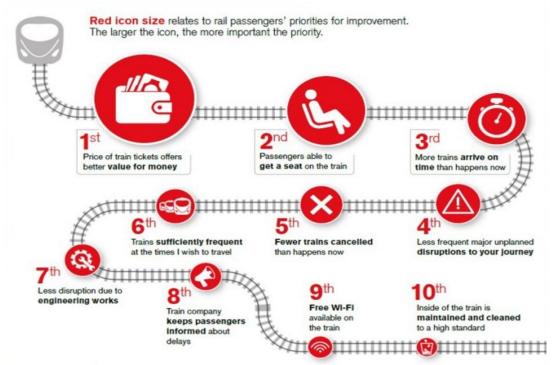
Figure 5: User satisfaction data across transport modes

Source: Poor comparative user satisfaction - "To what extent did services/products offered live up to expectations?" EU Consumer Markets Scoreboard, 2018, presented by the European Passengers' Federation

Figure 6: Rail passengers' priorities for improvement in 2017

Red icon size relates to rail passengers' priorities for improvement. The larger the icon, the more important the priority.

1st Price of train tickets offers better **value for money**

2nd Passengers able to **get a seat** on the train

3rd More trains **arrive on time** than happens now

6th Trains **sufficiently frequent** at the times I wish to travel

5th **Fewer trains cancelled** than happens now

4th Less frequent major unplanned **disruptions to your journey**

7th Less disruption due to **engineering works**

8th Train company **keeps passengers informed** about delays

9th **Free WI-FI** available on the train

10th Inside of the train is **maintained and cleaned** to a high standard

Source: European Passengers' Federation. Based on research commissioned in the United Kingdom of Great Britain and Northern Ireland by Transport Focus. Sample size – 12 804 respondents

How to make rail travel a natural choice? It is necessary to meet the end-users' needs by identifying their priorities, understanding the drivers of satisfaction, developing end-to-end journeys and mobility as a service. It should be kept in mind that performance and reliability remain the main passengers' satisfaction, while handling of delays is the first dissatisfaction.

In Ireland, among the explored solutions, the National Transport Authority (NTA) develops a platform for Mobility As A Service (MaaS). This platform, allowing public and private mobility providers to co-exist, will support innovations for passenger services. Using ticketing system as a catalyst, it intends to facilitate innovation in the mobility market and beyond by providing a single integrated solution where customers can seamlessly utilise the various modes of transport, both public and private, covering from door-to-door, from the first kilometre to the last kilometre.

Moreover, according to the European Passengers' Federation, passengers are particularly looking for better value journeys, punctual and with minimal disruption. The reliability, being the asset of rail transport, should be reinforced while the information to passengers could be improved. Several key enablers could allow to meet the end-users' needs: intelligent vehicles, automation, advanced control systems, real-time health monitoring of infrastructure and real-time personalized information, open data access.

During this session, examples of passenger's services offered by the "Italo", the first private high-speed train operator, were also presented (fare management, e-ticketing, intermodal transport). The development of these innovative services, stimulated increasing competition in the high-speed rail market across Europe and may have a knock-on effect on market growth, estimated to be in the order of 70 per cent in annual revenue by 2025.

Conclusions

All participants agreed that innovation is key to the development of railways across Europe and that the region remains at the forefront of introducing new technologies in the sector, thanks to national and international initiatives, both public and private in nature. It was agreed that discussions on this topic should continue and the Working Party would continue to review this going forward.

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