11ᵀᴴ European Rail Transport Regulation Summary

"Digital Single European Railway Area: How do we get there?"

A Summary of the Presentations

Florence, 27ᵗʰ November 2015

Editors: Matthias Finger, Nadia Bert, David Kupfer

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Forum Summary Document

■ PROGRAMME

08.30-09.00   *Introduction to the Forum*

Matthias Finger | Professor, Director of FSR-Transport and of the Chair of Management of Network Industries, EPFL

Olivier Onidi | Director for European Mobility Network, DG MOVE

Kathrin Obst | Policy Officer, DG MOVE Unit Single European Rail Area

A   *Question 1: Why digitalisation? What are the main benefits that digitalisation will bring to the sector and what are the customers' expectations?*

09.00-10.30   **Andrea Camanzi** | President of the Italian Transport Authority

Fumio Kurosaki | Researcher, Institute of Transportation Economics

Ichiro Takahashi | EJRC Brussels

Victor Vaugoin | Head of European & International Affairs at ÖBB

Round table discussions

10.30-10.45   COFFEE BREAK

B   *Question 2: What has been already achieved in terms of digitalization of the railway sector? Examples of digital solutions*

10.45-12.30   **Alice Polo** | Senior Interoperability and Safety Manager, UNIFE

Germano Guglielmi | Head of EU Regulations, FS Italiane

Markus Basler | Deputy Head of Digital Transformation at Swiss Federal Railways, SBB

Round table discussions

12.30-13.30   LUNCH BREAK

C   *Question 3: What are the regulatory challenges posed by the digitalization of the railway sector?*

13.30-15.00   **Joseph Doppelbauer** | Executive Director, European Railway Agency

Juan José Montero | Adjunct Professor, UNED Madrid

Nicolas Fourrier | Director of the Railway Strategy and Regulation Department, SNCF

Round table discussions

15.00-15.15   COFFEE BREAK

D   *Question 4: What are the long-term challenges? Privacy, security, safety, data protection, etc.*

15.15-16.45   **Markus Ksoll** | Head of Competition and Regulatory Policy, Deutsche Bahn

Jarl Eliassen | Expert Information and Ticketing, UITP

Luigi Rucher | Technical Director, THALES Italia

Round table discussions

16.45-17.00   *Conclusion*

Matthias Finger | Professor, Director of FSR-Transport and of the Chair of Management of Network Industries, EPFL

Olivier Onidi | Director for European Mobility Network, DG MOVE

The present document summarises the content of the presentations delivered during the 11th Florence Rail Forum, and the following paragraphs offer short summaries of each presentation, illustrating the main points made and matters treated. The thoughts and opinions reported do not necessarily reflect the views of the contributors, as they have been collected by the authors of this Summary.

To open the presentations, go to florence-school.eu, choose "transport" from the top menu bar and select "Forums" among the "activities". Clicking on the title of the Forum will take you to the relevant page. Alternatively, by clicking on a presentation's icon you may activate an internet link taking you to the full presentation, when available. Presentations are hosted on the FSR website by permission of the authors.

Introduction to the 11th Florence Rail Forum

Prof. Matthias Finger, Director of FSR-Transport and of the chair of Management of Network Industries (MIR), École Polytechnique Fédérale Lausanne (EPFL)

Introducing the 11th Florence Rail Forum Prof Matthias Finger made some observations focusing on the implications of digitalisation in the transport sector as well as in other network industries.

Five points can be identified that make the move towards digitalisation:

- **Automation** is affecting both transport and other sectors. In the not so distant future, also self-flying planes will become normality.
- Interfaces between companies and the end customer are becoming digital: this **digital customer access** – is replacing the physical interaction with the customer.
- **Connectivity** is evolving thanks to communication technologies. The result of this process had been termed the internet of things. In transport, this includes for instance smart cars capable of interacting with other cars.
- The exponentially growing amount of **digital data** is an important characteristic of digitalisation and the result of the availability to collect and store information.
- The ability to process this data relates to the ever increasing **computing power**, which is another central element of the digitalisation process.

Digitalisation affects the value chain of network industries on a general basis. Prof Finger illustrated how the physical value chain is replicated by an electronic value chain, which is added as a second layer over all industrial processes. This electronic value chain may be used to optimize the physical value chain. However, for the company it is important to maintain control

over the electronic value chain (the data): when it comes to interaction with the customer the physical transaction process (selling tickets) is being replaced by digital interfaces. The control over these interfaces is an important business opportunity in itself, and companies need develop the technology and capability to offer the most attractive service to the customer to make use of this business opportunity.

The process is not limited to transport but is affecting all network industries in a similar way. The European Commission is well aware of this. Commissioner for Digital Economy Günther Öttinger warned that European companies are losing this digital contact with their customers to American competitors, which are more actively exploiting these business opportunities.

The 11th Florence Rail Forum aims at addressing the state of play of the European agenda on shaping this process of digitalisation and in particular the Digital Single European Railway Area. Discussions during the day follows four guiding questions:

- Why digitalization? What are the main benefits that digitalization will bring to the sector and what are the customers' expectations?
- What has been already achieved in terms of digitalization of the railway sector? Examples of digital solutions
- What are the regulatory challenges posed by digitalization?
- What are the long-term challenges?

A Digital Single European Railway Area

Kathrin Obst
Unit B2-Single European Rail Area
European Commission
Directorate General Transport and Mobility

Florence, 27 November 2015

Introduction: A Digital Single European Railway Area

Olivier Onidi, Director for European Mobility Network, DG MOVE, European Commission

In his introduction Mr Onidi pointed out some general characteristics of the digitalisation process in the railway sector. Most importantly, it has many facets, some of which have been discussed also at other Florence Rail Forums. Regulation on this issue does not start from scratch as diverse organisations and companies are actively working on the topic. Digitalisation is about increasing safety, efficiency and the comfort of the passenger, but it also represents an opportunity for the rail sector as a whole to open itself towards its customer and towards integrating the other actors of the mobility chain.

The European Commission currently does not intend to propose regulation, but is rather interested in analysing the many implications of the topic and promoting cooperation of the different actors involved, for example by means of stakeholder platforms such as the platforms for rail infrastructure managers (PRIME) and railway undertakings (RU Dialogue). The discussion at

the Florence Rail Forum forms part of this process. . Following the publication of the Digital Single Market Strategy, DG MOVE is working on a reflection document on "A digital Single European Railway Area", a draft version of which has been circulated to stakeholders for comments and further input and which also served as a basis for discussion at the 11th Florence Rail Forum.

A Digital Single European Railway Area

Kathrin Obst, Policy Officer, Single European Rail Area, DG MOVE, European Commission

In her presentation, Ms Obst outlined the most important points of a reflection document on a "Digital single European Railway Area", on which DG Move has been working. This Discussion Paper had been open for consultation since July 2015 and received a lot of feedback.

Firstly Ms Obst illustrated **the reason for addressing digitalization** at this point and focused on the reasons that make this topic relevant for DG MOVE. EU legislation already exists for Intelligent Transport Systems (ITS) in the different transport modes (for example SESAR, SafeSeaNet etc.). Most important for rail are the Technical Specification for Interoperability (TSI) for Telematic applications for passenger services (TAP-TSI), and for freight (TAF-TSI) and the European Rail Traffic Management System (ERTMS). In view of the long implementation time of rail applications and the at the same time rapidly developing technology there may be need to further develop these exiting tools. Furthermore, specific measures for access to transport data and recognition of electronic documents can be a useful way to stimulate better mobility services and new business models.

By **addressing digitalisation** the Commission is looking at how it could affect internal processes of the various actors in the railway sector as well as the interactions between them (relationships between different railway undertaking, between railway undertakings and infrastructure managers, between different infrastructure managers). The Commission looks at digitalization not only of internal and intramodal processes, but also of interfaces between customers and railway undertakings and between railway undertakings and railway suppliers. In Addition to this there is a horizontal approach that takes into account all the elements of the rail transport production line. There is the need to address rail transport as an ecosystem. This means having a more global

view that takes into account how digitalisation affects the rail industry as a whole. This includes topics like big data and the effect that digital tools and platforms have on customer's expectations.

The Commission identified several **precursors to digitalisation**. These are most importantly the interoperability of IT systems, standardisation of documentation and procedures and the establishment of rules/terms and conditions for data sharing and use. But also several other "softer" aspects are crucial: a spirit of cooperation, awareness, knowledge and education. Digital solutions could bring a great added value in terms of increased safety, reliability, performance and efficiency, as well as contributing to sustainability also in a multimodal perspective.

Moreover, Ms Obst addressed the issue of responsibilities and the **role of the different railway actors in the process of sector's digitalization**. First of all, the **Commission** already plays a role in steering and programme management: this is most importantly done through the steering committees for TAF, TAP and ERTMS. Secondly, policy development is an important task of the Commission. This is done, for instance, through the "digital transport and logistics platform" , that has been set up by the logistics directorate of the European Commission.

The **European Railway Agency (ERA)** should play an important role according to the Commission: it should act as system authority, ensure a stable set of European specifications and check compliance. It should lead the architecture for a true interoperable intelligent railway transport system – a big task that includes many elements. ERA should build a common information and communication system by building up One Stop Shops (OSS) supporting a harmonised EU approach to safety and interoperability.

The rail sector is engaged in a lot of activity, in fact most companies have started their own projects on digitalisation. The sector needs to ensure the implementation of ERTMS and also that TAF and TAP remain on track. ERTMS is the backbone of the future systems. **Member States** need to ensure the proper implementation and enforcement of the TSIs, as well as the population of registers.

Toward more seamless and flexible passenger rail services

Ichiro Takahashi, EJRC, Executive Director of the Brussels Branch

Mr Ichiro Takahashi presented the experiences with digitalisation of JR East focussing on one particular example of digital applications in the context of the Japanese railway system.
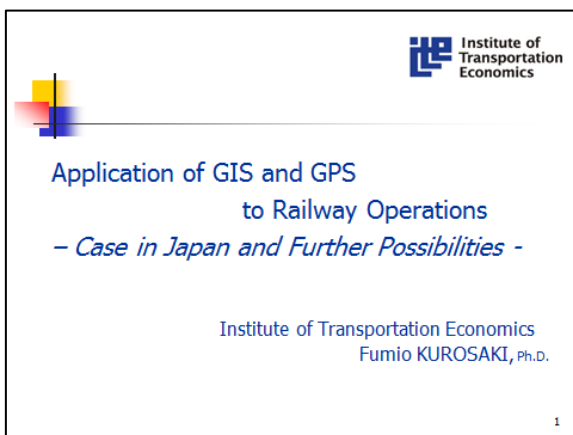
JR East started off in 1987 without any obstacles such as organisational challenges, high losses and resistance from unions that Japanese National Railways had suffered from. Therefore a new business model was adopted allowing JR East among other things to invest in non-transport business areas. Today Japan's railway system is characterised by private vertically integrated railway companies that operate on a commercial basis with an autonomous management free from political interferences. Passenger railway companies operate the services and own the infrastructure. These companies operate in a free market environment: they can take decisions for example on fares (within the price cap with prior notification) and they can define detailed technical specifications. Being autonomous in their management decisions railway companies have decided to become active in various business activities other than railways, such as retail, hotel business, car rental, leisure business and many others more. Mr Takahashi showed that today 33% of the company's revenues come from non-transportation businesses, mainly from shopping centres (9%) and use of station spaces (14%). The success of this business model is illustrated by the high share of rail in passenger transport in Japan (ca 30%) when compared to Europe. Nevertheless Mr Takahashi stressed that, despite major differences between Japanese and European railways, there are also some commonalties. Switzerland, for instance, has a very high share of passenger transport by railway, which is similar to Japan.

Turning to the issue of digitalisation in JR East, Mr Takahashi presented Suica, the smart card of JR East: It can be used to pay fares but is also accepted as payment in many stores. Especially, View Suica Card is a payment card combined with functions of a credit card and a smart card. It can be automatically charged without using cash or bank transaction. The automatic charge function card enables seamless and flexible travel for its users.

View Suica Card has been introduced in 2003 and since then 4.6 Mil cards have been issued. This example illustrates the role of digitalisation which in Mr Takahashi's view is an enabler of seamless and flexible services, not a supplement to what seems insufficient.

Summing up, Mr Takahashi stressed the importance of digitalization of the railway sector:

- For railway companies it is necessary to meet the increased customer expectations and respond to the demand for seamless and flexible services
- View Suica Card is an example of how digital technology can be used to meet this demand
- Entrepreneurial freedom is both a prerequisite for rail operators to invest in such new developments and the result of the benefits brought by digitalization.

Application of GIS and GPS to Railway Operations – Case in Japan and Further Possibilities

Fumio Kurosaki, Institute of Transportation Economics

Dr Fumio Kurosaki focussed his presentation on two concrete examples for digital applications in the railway sector and made a final point on their implications for vertically separated railway companies.

At first Dr Kurosaki recalled the structure of the Japanese railways in which the infrastructure is owned by the six passenger railway companies. These are therefore vertically integrated companies. The Japanese rail freight company, on the other hand, is using the tracks of all the passenger companies and is therefore a vertically separated company.

JR East, one of the six passenger railway companies, developed its **Railway Facility Management System** in order to overcome the inefficiencies of the traditional paper-based facility management system. The paper-based system makes it hard to:

- identify and obtain the latest information of the infrastructure;
- share information among different sections;
- manage the maintenance and upgrading of data; and
- develop coordination with train operations.

The new asset management system links each infrastructure assets to the kilometrage of the rail lines and makes that information accessible in a digital format. In this way the updated data and the latest information on the tracks can be easily identified. As the data are electronically recorded to the database, they can be retrieved in a timely manner. The digitized asset information provides a smooth and seamless data flow for construction and maintenance works. This has made it easier to share updated information among different departments.

The second example Dr Kurosaki addressed was **the application of GPS to railways**.

JR Freight introduced the positioning system for the Rail Network work, "PRANETS", which includes two main functions: a train driving support system and a container information system.

The train driver needs perfect data about the tracks. The train driving support system provides for

that by means of a flash drive containing all relevant and updated data for instance about speed limits or timetables. The information is transmitted to the driver by a display and by sound.

The container information system helps to improve the JR Freight's management and offer a better service to freight customers; it allows having exact real time information on the position of a container, and the data can be made available to the customer as well.

Dr Kurosaki also introduced another example of the application of GPS to railways. It is portable tablets that were introduced by JR East in 2013. At present, drivers and conductors take a portable tablet with them, and the necessary information can be transferred. Also, conductors and station staff can provide appropriate information to the passengers by utilizing the system.

In his final points Dr Kurosaki noted that digital applications could be especially useful to vertically separated railway companies or railway companies with a certain degree of vertical separation present in Europe. In these cases trains operate on tracks that do not belong to their own company and that they are less familiar with. Digital data makes it easy to give the train driver all relevant information on the track. Digital applications make it much easier to share information between different departments or between different sections of a vertically separated company.

Why digitalization? Main benefits and customer expectations

Victor Vaugoin, European and International Affairs, ÖBB Holding AG

Mr Victor Vaugoin presented some insights from the experience with digitalisation within ÖBB.

In the beginning he stated that digitalizing can be considered the keyword of 2015. While railway companies have been using digital tools for a while in the past, in 2015 a true change of pace could be observed. This process cannot and actually should not be reversed. Subsequently 7 key success factors for digitalization were presented:

• Client Focus – Deep understanding of customer needs to resolve pain-points via innovation
• Partnerships, Mergers, Acquisitions – Develop new skills, through collaboration and design new assets
• Speed, speed, speed – Agile evolution and quick pilots are essential
• Innovation-culture – Winners experiment and learn from failures
• Disrupt or be disrupted – Re-think the business model
• Performance – Process innovation through KPIs
• Simplified IT – Optimized data management

ÖBB started to digitalize and innovate, and teamed up with venture capitalists to found start-ups to further develop digital applications. Another novelty for OBB is its Open Data Policy.

One of the new applications that were developed is a tool that allows intermodal journey planning including a purchasing option. Such projects have changed ÖBB'S perspective for instance on how the customers are seen. It is not just about serving them but about giving them the experience they look for and making them want to come back.

Mr Vaugoin then presented some examples illustrating how this is put into practice. The discount card, which is something most railway companies offer, is now available in a digital form and does not have to be presented as a physical card. Tablets for stewards are being introduced to offer better customer services even though this can be improved as it is causing some tension with unions.

Illustrated by some graphs, Mr Vaugoin presented the costs of digital projects and the fact that

revenues created by them are rising. Online ticket purchases are still relatively low in Austria when compared to Scandinavia, but they are increasing.

The shift towards an ever more digitalized system also affects the cargo sector. Mr Vaugoin presented ÖBB's investment in the cargo business area on the medium and long term that will offer amongst other automatic shunting and cargo tracking. ÖBB will also invest in its digital infrastructure to be able to provide services such as Digital System Integration (interconnection of public transportation, Park&Ride) on the long term.

The development of these areas is very important. European industry needs to catch up as currently none of the innovative big firms that respond to modern customer's demands (google, apple, facebook, uber, etc.) are European.

Mr Vaugoin concluded that it is right to explore the right regulatory pillars at this moment, but it is just as important to leave enough freedom for experimentation and innovation (avoid the "one-size-fits-all approach"). Additional funding of digitalization projects would be beneficial, especially if they give preference to market- or company-driven initiatives: digitalisation can help railway companies to become more attractive for their customers and more efficient in their operations.

Why digitalization? The regulator's point of view

Andrea Camanzi, President, Italian Transport Authority

Mr Andrea Camanzi, President of the Italian Transport Regulation Authority, presented some considerations on the implications of the digitalisation process in the railway sector also based on his personal experience in the area of telecommunications and ICT.

Mr Camanzi started off by underlining his support for the Working Document "Digital single European Railway Area" and the approach of the European Commission and European Railway Agency (ERA) in addressing this issue. In his view the Single European Railway Area can only become a reality if it is digital because only digital technology can provide the necessary leverage for such a change. This is not an easy mission, yet it has to be the common goal of the railway sector in the short as well as in the long run.

There are some discrepancies between the need to digitalize the sector and the path-dependency of national railways: while digitalization is a global process, railway companies remain national. They coordinate at the EU level and EU policies in the area of technical interoperability may help a great deal. Nevertheless, business models (and not just the actual ownership regime of companies and groups) in the sector remain national. Railway companies accept and promote interoperability because it helps increasing efficiency and bringing down costs; however, there are no truly European business models in the railway sector at present. So far there are national champions and some engage in some activities in neighbouring countries, but this process is still at a very early stage.

Mr Camanzi drew an analogy between the current situation of railways and the process that started in the telecom sector about 20 years ago; digitalization is going to affect the railway system in a similar way, fostering a change in the established logics of the sector. European companies have to learn from that experience, and be prepared to the fact that digitalization will lead to a process of "deverticalization" introducing more competiveness. The networks will remain the same; however, new operators providing both network interoperability and new forms of integration of services (railway operation as well as ancillary services) will step into the market. This process has to be acknowledged and managed.

Customers demand global services, and freight and logistics are global by nature. Still the industry remains fragmented. Existing regulation is good but incomplete insofar as it is mainly concerned with regulating the infrastructure. What is important is that regulation facilitates access to data to the benefit of services that depend on it. Is the regulatory toolkit appropriate? The conclusion of the negotiation of the 4th Railway Package is very important but it will not be enough. This is not to advocate the need for a 5th Railway Package, yet new regulation is needed now for opening up the service markets in railways that be based on collaboration between experts in the field of IT, data protection, intellectual property rights and ICT.

Mr Camanzi underlined that, in his experience, technology and innovation provide useful tools to address problems rooted in legacies from earlier regulatory choices. An example of this can currently be seen in Italy, where high-speed train commuters demand more capacity and more flexibility in the access to services. Beside better use of capacity, a way to address this demand is to enable more efficient and higher loading of trains also by means of intelligent information systems which may ensure adequate flexibility and more efficient seat allocation.

How to achieve modernization and interoperability?

Alice Polo, Senior Manager Interoperability and Safety, UNIFE

Ms Alice Polo presented the manufacturing industry's point of view on the Digital Single European Railway Area.

The industry is ready to engage in digitalisation because it can increase performance, reduce life cycle costs and allow easier access to customers. UNIFE is actively cooperating with its partners in this process.

In the field of digital applications there is, first of all, the need to understand better how existing technologies can be used to improve rail transport and increase its modal share. This is a wide subject that affects all subsystems of the rail industry (Rolling Stock, Infrastructure, Signalling, Energy, Passenger / Freight customer information).

Looking at the current state of play, Ms Polo referred to the Commission document "A digital Single Market Strategy for Europe": among the most important initiatives there are ERTMS, TAP/TAF, Diagnosis and Maintenance tools and communication solutions such as TCMS.

ERTMS is a good example from the industry perspective: it came up as a solution to the fragmentation of the signalling systems in Europe which burdens cross border rail traffic with extra costs as vehicles had to be equipped with several different signalling technologies in order to cross borders.

ERTMS is the backbone of future initiatives and a solution the industry is heavily engaged in. Its implementation is constantly progressing in Europe and it is successful also beyond the EU as other areas are applying the technology. The number of vehicles equipped with ERTMS and the kilometres of equipped tracks is constantly growing worldwide.

Turning to the regulatory framework Ms Polo described the existing regulatory initiatives as sufficient. There might however be need for more funds to speed up their implementation. Regulation should not be too heavy handed. Instead a more strategic agenda to connect existing initiatives is needed. UNIFE identified the following priorities in the digital SERA Commission document:

1. **Speed up technology implementation**: in particular the deployment of ERTMS in

Europe needs to be accelerated. More funds could help speeding up the process.

2. **Implement predictive maintenance by digital solution**: existing digital solutions for maintenance tools are not exploited to the highest extend possible because implementation is lacking behind. Given that 2/3 of life cycle costs in railways are linked to maintenance the application of digital tools can massively reduce costs here.

3. **Better use of existing registers**: also here implementation is too slow. There is need for a second generation of registers that is more widely applicable and that can be used also in the everyday business.

4. **Allocate more EU funds to rail research (for digitalisation)**: Shift2Rail is very much supported by the industry and it will help to develop a long term research vision for the sector. The digital challenge is not present as an individual topics but cuts across and is part of all research areas. Horizontal research should be strengthened in the future and the industry is keen on contributing to that also outside S2R.

What has been achieved in terms of digitalization of the railway sector? Examples of digital solutions

Germano Guglielmi, EU Regulation Office, Ferrovie dello Stato Italiane

Mr Guglielmi presented some view points on digitalisation from the perspective of the FS group.

Firstly Mr Guglielmi underlined that digitalisation is strictly linked to making information interoperable. This is important for FS as it is active in all aspects of railways. Admittedly, as an integrated railway group FS has an advantage in researching and developing platforms that are interoperable yet FS makes all their solutions openly available to other players in the railway market.

The first example outlined by Mr Guglielmi is the integrated traffic management platform PIC. It includes operation management, monitoring and analysis reporting. It is owned by the Infrastructure Manger but linked with all other platforms which are open to all railway undertakings.

Another example is the online network statement (PIR web), an online platform that provides all relevant information on the network, for example on track access charges, traction system, information about the status of a line (whether it is available or out of service), the location of freight terminal and information about the services available at them.

Through another platform passengers can access all timetables with real-time information (PRM compliant) about arrival times, delays and platforms online (on-line train station time-table).

Other elements of digital innovation are "diagnostic trains" that exist in two versions: one for conventional lines and another one for high-speed lines. These trains are equipped with sensors that directly report the status of the infrastructure and are owned by the infrastructure manager. Diagnostic trains are part of a wider shift that is owed to digitalisation, namely the move from static to dynamic maintenance. The traditional static maintenance is carried out based on either time or kilometres travelled. Modern trains are equipped with on-board sensors that directly report to maintenance centres the status of the different components allowing a more targeted maintenance procedure. Digital tools also reduce the required number of specialized maintenance experts as these will be able to fulfil their work to large parts also from remote stations.

Turning to the customer side Mr Guglielmi stressed the importance of linking all existing applications (online ticketing, mobile ticketing, etc.) with the rest of the system. In this way such applications can bring cost savings to the operator by reducing the need for internal back office
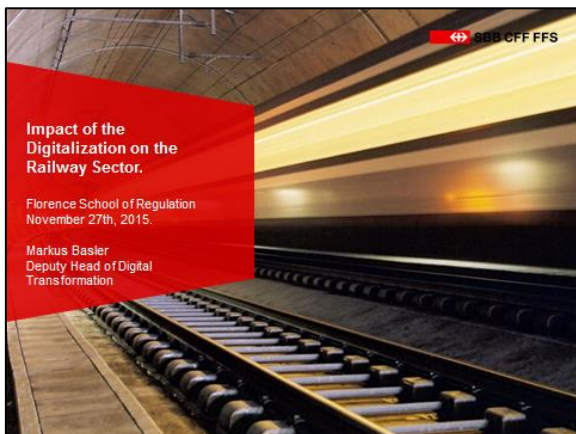
procedures related to fiscal and budget issues in the follow up of ticket sells.

Commenting on the issue of smart cards Mr Guglielmi conceded that the commercial offer was not able to keep track with changes in society. The offer of Trenitalia was developed from a commuter card to loyalty card, to a payment card later on. However the payment card may face difficulties because passengers may prefer handling payments with their own banks.

On the issue of digitalisation of paper-based procedures Mr Guglielmi reported that thanks to digitalisation all documentation that needs to be carried by a train driver has been completely digitalized. This has brought Trenitalia two million Euros in annual cost reductions, and freed train drivers from 8kg of paper to be carried on board. Most importantly however this has dramatically improved communication as the information can be easily exchanged in the digital format.

In his final statement Mr Guglielmi mentioned two specific areas where further developments are needed:

- **Mobile broadband** needs to cover the entire core network. However it is not clear whether telecom providers will be able to build the necessary infrastructure. There for a form of Public Service Obligation might be needed to provide for this.

- **Cyber Security** is still connected to a lot of unanswered questions that should be clarified in the upcoming network and information security directive, which the Commission is currently preparing.

Impact of Digitalization on the Railway Sector

Markus Basler, Deputy Head of Digital Transformation, SBB AG

Mr Markus Basler presented some examples and analysis of digitalization processes from the point of view of SBB.

Digitalization changes competition in the railway sector: Using the example of the mobility platform quixxit Mr Basler showed that these platforms ("over the top service providers") bring transparency into the market and offer easy to use, use-case optimized services to the customer. Comparing the mobility solutions that are displayed to the user of the platform it clearly shows that railways are still "in the race" as an important provider of mobility but facing new competition from services like Uber or blablacar. The intermodal transparency increases competition and make the weaknesses of the current design of the railway providers visible (railway track centric business models, inflexibility due to fixed timetables as well as complicated ticketing/pricing).

It is important to remember that market players such as SBB, unlike the over the top service providers, are asset based industries. Their business consists of three layers: a social layer that includes the touch points with the customer in terms of human interaction, a physical layer that includes physical assets such as rolling stock, stations, railway tracks, infrastructure (and their proper function, cleanliness and appearance) and a digital layer that is characterized by the data. The digital layer can be used to optimize the two other layers.

Most railway companies are applying different tools to optimize their interaction with customers or to develop new business models. While this is very prominent in the public debate there are also some difficulties as, especially when it comes to the design of sustainable business models. Reputational risks are high. And the competition on the customer interface is very strong. However digitalization can improve efficiency and safe costs also in the other areas. Therefore it is important to look at changes digital innovation can bring in the areas more closely related to the operations of railway undertakings namely capacity management (maximize the capacity of a given infrastructure, increase the load factor) and process optimization (operational excellence). Here Mr Basler presented two examples:

• **Hub Optimisation**: By use of traffic management systems the throughput of network bottlenecks can be reduced by delaying or speeding up trains approaching the bottleneck.

The system carries out all necessary calculations including the impact on the rest of the system and directly communicates with the signalling system in a fully automated way. By this means a capacity increase of 27 % at the respective bottlenecks could be achieved.

- **Energy optimization**: Due to its specific characteristics, SBB's traction power network has to reduce peaks in its energy consumption. SBB therefore applies demand side management using technology for "peak shaving" which includes switching off the trains' air conditioning during peak times. This measure decreases the need for investments in capacity (copper, concrete) and saves energy costs.

Switzerland has an integrated ticketing system in which 140 companies cooperate through a revenue sharing system providing tickets for all modes of transport including car and bike sharing and even ski (SwissPass). Travel information and tickets are available through a new interface for mobile applications. The redesigned user interface was developed by a start-up company which used OpenData provided by SBB to create its product which was then bought and reintegrated by SBB. This example shows that if rail companies provide the necessary data the market will come up with solutions. It is important for rail companies to do this selectively (exchange of data with respect to the value of data and to the nature of the addressed third party) but early enough to capture the value of data and to define the terms and condition of the use of this data. If the exchange of data is managed inadequate or too restrictive, third parties will find other sources to obtain the data required which weakens the position of the railway companies and lowers the market value of their digital assets.

To point out the general nature of the challenge posed by digitalization Mr Basler described two types of competition that are currently taking place:

Firstly there is an **intermodal competition** between the system of public transport on the one side and individual (car) transport on the other. Here the two sectors can actually help each other by increasing their collaboration through the use of open data. The ultimate goal is the optimization of all modes of transport from a customer, economic and environmental point of view.

The other type of competition is between the traditional "asset based" railway companies and companies that offer "over the top services" such as google. Here the challenge for railway companies is is to integrate these types of services and use them to optimize the end user's experience. To enable this, the current business models have to be adjusted to current and future realities in the digital ecosystem.

In his conclusion Mr Basler stressed that the railway companies are actually currently in in a very good position to face this competition: they have the know-how about the mobility needs of their customers, access to crucial infrastructure, a profound understanding of the intermodal transportation system, strong brands and reputation as well as sufficient funds to reshape their business to future needs.. In particular the knowledge about the customer and the transportation system will be crucial in the future. The most important thing is however to act fast as "the battle over the business models" will be decided, probably, no later than by the year 2020.

What are the regulatory challenges posed by digitalization?
Josef Doppelbauer, Executive Director,
European Railway Agency

Mr Josef Doppelbauer, Executive Director of the European Railway Agency, started his presentation by pointing at the controversy that combining "Single European Railway Area" with "Digitalization" might raise. Are they compatible or are they contradictory? Moreover, is this combination a challenge or is it a massive opportunity?

To begin with Mr Doppelbauer recalled the core of digital railways: in short, it is about transforming the physical world of paper and physical indications into digital (and mobile) communication, and eventually an internet of things. For the railway sector, the keyword is "data enabled railways". Technological capabilities are deployed on all processes across the entire value chain for passengers and freight (pre-trip, during-trip, after-trip for the user, and planning, operation, maintenance for the operator). Digitalization can have a variety of impacts on the different railway aspects such as customer experience, environmental impact, asset optimization, train control, and "big data".

Specifically **e-transport** is a priority area of the Juncker Commission, and it is one of the digital services explicitly mentioned in the Digital Single Market Strategy of the European Union. Its goals are competitiveness of the rail transport mode, quality in terms of reliability and availability, accessibility, attractiveness, efficiency and effectiveness of operations, and more capacity. However, e-transport must not hamper safety especially with regards to threats to cybersecurity.

Mr Doppelbauer then turned to the strategic priorities for the railway sector related to digitalization, in the European Railway Agency's view. First and foremost, railway undertakings need to focus on their customers. Railway specificities have to be accounted for in order to achieve better multi-modality (by nature we have to think multimodal especially for freight). Real-time information and (hyper-)connectivity are becoming a necessity. The sector has to become more agile in order to faster react to the changes. Last but not least, the need to exploit the full potential of the use of open data and big data has to be recognised and addressed (there are examples from other sectors that demonstrate the wide range of possibilities in this sense).

Bearing these priorities in mind, Mr Doppelbauer then described the "messy" current situation of railway in Europe.

It is undeniable that (at least some) European railway undertakings are investing heavily in digitalization, and there are a number of initiatives related to railway digitalization that are customer-oriented. However, the focus is currently on internal company use and not on a wider EU agenda and, even more importantly, not on cooperation.

The main task for the European Commission and the European Railway Agency is to come up

with a structured solution that addresses the several elements of this unsatisfactory situation. Mr Doppelbauer listed the following challenges:

- Going digital requires a change in mindset which is a difficult task for this conservative sector that builds on a philosophy that reaches back 175 years.
- railways has a tendency of looking backwards on existing practices whereas digitalization requires a forward looking attitude and solutions that are "future proof".
- Interoperability is a well-known challenge; it needs to be ensured that data is integer, reliable and available.
- Liability especially of open data is a challenge for example for instances of misuse of data.

Apart from these Mr Doppelbauer referred to the "unknown unknowns" that exist in addition to these challenges and mostly relate to security issues and the vulnerability of the future system.

Mr Doppelbauer stressed that, while addressing these challenges, digitalization should be an opportunity to enhance interoperability and not slow it down. Furthermore it can help to extend standardization outside the sector and foster interoperability. It can help to enter segments that are not strictly connected to rail for instance making use of social data for digital commerce.

Addressing ERA's current activities, Mr Doppelbauer listed at first the fact that the Agency is in the process of defining the successor of ERTMS which, together with the mobile communication system GSM-R, is clearly a starting point for digitalization. Important decisions on principles have to be taken on the future of GSM-R that relate to the development of a specific integrated communication system for rail or the split of the services into dedicated voice communications. ERTMS and GSM-R are the pre-requisites for Automated Train Operations (ATO), for which there is the intention to build a platform that standardises only the necessary interfaces leaving room for independent companies to develop apps that can eventually work in competition. A second fundamental element of the work of the Agency today is the registers. The key issue is how to make these registers operational, so that they are not perceived as an obligation but rather as an opportunity. Thirdly, ERA works on reference databases for rules and processes (towards the development of the OSS for safety certification and authorization) that are harmonized in Europe. Another element ERA is concentrated on is the Technical Specification for Interoperability (TSIs) on telematics applications for passengers and freight, where three challenges exist: implementation, guaranteeing TSIs do not undermine the development of the sector vis-à-vis other sectors and focussing on the right elements.

The last element of ERA's work that will be very important for digitalization is its communication strategy (dissemination, communication, consultation). This work is currently done autonomously, which is costly and doesn't exploit the advantages of the economies of scale.

To conclude, the work of the ERA in terms of digitalization includes in the short term: looking at registers to make them operational; going away from the approach "curing the symptoms, not the disease" (i.e. fixing the bugs in framework of existing legislation rather than addressing long-term challenges); rationalizing vehicle-related registers among member states; establishing guides and appropriate documentation for the OSS; pursuing the combination "as little regulation as necessary and as much freedom as possible". In the long term, the Agency is committed to: helping to build the Single European Railway Area and promoting EU know-how worldwide; playing a fundamental role by influencing policy (also outside EU) through technical insight (e.g. digitalisation in SHIFT2RAIL) and playing a stronger role in education and research.

What are the regulatory challenges posed by the digitalization of the railway sector?

THE DIGITAL SINGLE EUROPEAN RAILWAY AREA:
HOW DO WE GET THERE?

What are the regulatory challenges posed by the
digitalization of the railway sector?

Juan J. Montero
Professor UNED, Madrid

What are the regulatory challenges posed by the digitalization of the railway sector?

Juan J. Montero, Professor at UNED Madrid

The presentation of Prof Juan Montero focused on the regulation of the interaction of the railway system with other players, namely in the form of online platforms that are having a growing impact on the transport sector.

Online platforms such as Uber (urban transport) or Blablacar (intercity transport) are expanding at a steady pace. Regulation on digital services already exists, and a consultation from the Commission on the regulatory environment for online platforms, online intermediaries, data and cloud computing and the collaborative economy is currently open. The Commission defines online platforms as "an undertaking operating in two (or multi)-sided markets, which uses the Internet to enable interactions between two or more distinct but interdependent groups of users so as to generate value for at least one of the groups." Examples of transport services that fall under this definition are Uber, Blablacar whereas examples from other sectors include, AirBnB, eBay, but also Google, Facebook and Tripadvisor.

Mr Montero stated that these online platforms are disrupting the transport market, yet rather than considering them a future threat they should be seen as a reality of transportation today. This is illustrated by a current example: today in Spain on specific routes at specific times (from big cities to coastal areas on Friday afternoon) Blablacar provides 25% of the total volume of the seats that is provided by trains.

What is the legal status of these platforms? Are they transport services that should be governed according to transport regulation or are they rather information society services as defined by the e-commerce regulation?

- If the service provided through an online platform is merely a transport service, the freedom to provide services stated in Art. 56 TFEU and the Service Directive would not apply. Member States could impose restrictions on online platforms established in other Member States (ie Uber is established in the Netherlands and Blablacar in France. They provide services from their country of establishment to other countries ("recipient country")). Courts and Administrations from the recipient Member State (as it was the case of Uber in Spain, Portugal, and Italy) might ban the provision of services, for instance on the grounds of unfair competition.

- If the service provided through an online platform is an information society service, the freedom to provide services would apply as stated by the art. 56 TFEU, the Service Directive and the E-Commerce Directive. The E-Commerce Directive defines a very strict regime for the protection of information society services' provision, and it includes a list of reasons for restrictions that can be imposed by recipient Member States.

In light of this, Mr Montero stressed the importance of definitions, and recalled that there is a legal definition in place of Information Society services (Directive 2000/31/EC) that states that information society services are: 1) normally provided for remuneration; 2) at a distance; 3) by electronic means; and 4) at the individual request of a recipient of services.

Do online platforms that provide transport services meet these conditions? Probably yes. However, even if there is no EU legal definition of "transport", there is a recent judgement by the European Court of Justice that ruled on a wide interpretation of "services in the field of transport". Therefore, with the attribution "in the field of transport" a set of ancillary services that are connected to transport are included in the definition.

To conclude, Mr Montero pointed out that the debate on the very nature and legal definition of the transport services provided through online platform is just beginning. This is a relevant debate because eventually a level playing field for the actors operating in this field needs to be established.

Digitalization and Regulatory Challenges

Nicolas Fourrier, Director of the Railway Strategy and Regulation Department, SNCF

At the beginning of his presentation, Mr Nicolas Fourrier listed several numbers underlining that digitalization is already an important element of the travel experience, at least for customers: according to a recent survey 30% of the internet requests in France are concerning transport and trips; 75% of travelers use their smartphones before or during their travel; 80% of the online buyers declare that they take into consideration peers' opinions and 68% actually even trust these opinions posted online by other customers. Moreover, the first action of French people when planning a trip is to compare the prices online. These numbers, according to Mr Fourrier, show not only that digitalization is a reality but also that it is an opportunity for future development.

Secondly, Mr Fourrier pointed out that digitalization of railways is not only about customers and their habits. There is strong political will, both at the national (French) and at the European level, to develop digitalization. In fact, at the European level there is wide consensus on the need to integrate information and distribution of rail services, and at least four initiatives have built this in the past four years. Also in France great attention is dedicated to the issue of digitalization, however there are four different projects that are underway and are eventually overlapping in the way to create new rules for the use of data that is just necessary to digitalize railways.

Despite the great attention and the work that has been done already towards digitalization of railways, in Mr Fourrier's view there are still two major issues (and many related challenges) to be addressed: firstly, the issue of open data and secondly the issue of distribution.

As for data accessibility, first of all, it has to be borne in mind that this issue is different for PSO and open access services: in both cases the ultimate question is who the owner of the data is (and how they use the data). However, for PSO we are talking about public data managed by public transport authorities, whereas for open access services the concern is about train capacities and prices in real time. Mr Fourrier stressed that data are subject to different degrees of sensitivity: the lowest level of sensitivity relates to data for general prices and timetables; an intermediate level of sensitivity is about real-time information; the highest level is about real price information and reliability of the trains. As they are the owner of data, SNCF is pursuing the "freemium model" in which data are free for students, researchers and companies that request little amounts of data, yet they have to be paid for if a big amount of data is requested. If control on the data is lost, the sector will soon face the strong "GAFA" (Google Apple Facebook Amazon) risk, namely a situation where companies that are outside the sector become competitors for

certain services, but not necessarily on operation (and for sure never on maintenance and investment in rail infrastructure).

As for the issue of distribution, Mr Fourrier stressed several challenges in the realm of digitalization. As for the issue of data accessibility, it has to be differentiated between PSO and open access: for PSO, the PSO authorities (not the railway undertaking) are responsible for ticket distribution in France. For historic reasons, they invested in different ticketing systems. Therefore, from the authorities' point of view, more investment into digitalization cannot be done. For open access, the issue is different as the customers' demand for digital transport concerns first of all door-to-door services, and secondly the possibility for multimodal comparison. Also, Mr Fourrier stressed that customers' demand for cross-border ticketing is very limited except for local transport. Some examples of same standards for ticketing (Lille area and Wallonia) exist, but it is difficult to have a common rate cross-border on a single ticketing support. With regard to this, it is useful to recall that interoperability is not standardization; going interoperable is easier than standardizing.

To conclude, Mr Fourrier addressed the issue of regulation and stated that a bottom-up approach is necessary. He touched upon several aspects that are relevant for regulation and standardization:

- Only physical distribution is directly in the scope of regulation for the moment: the website of the incumbent RU isn't an "essential facility" and should not be regulated.
- Digitalization is not only an issue for railway undertakings. It is a shared responsibility of different levels of government (including regional and local) and other actors.
- A top-down "one-size-fits-all" mobility solution is not feasible especially because it would require too big investments and, mainly, because of the dynamic nature of the transport market and the fast technological change.
- Interoperability solutions are possible and actually more welcome than standardization, yet also interoperability should be on a voluntary basis.
- It is not easy to define the tasks for public authorities: for sure they should not slow down innovation and not force railway undertakings to do unnecessary investments; also they should create soft-law measures to create a favorable environment to the delivery of multimodal travel information, planning and ticketing services and provide incentives to pilot projects, to develop and apply standards.

Digital Transformation and Long-Term Challenges

Markus Ksoll, Head of Competition and Regulatory Policy, Deutsche Bahn

At the beginning of his presentation, Mr Ksoll stated that, for railways in Germany, digitalization is the most radical change since the Rail Reform in the '90s. Digitalization is affecting almost all of DB's activities. Other sectors have already faced a strong changes of traditional markets, and transport is about to face similar developments. Many examples of digitalization can be identified, and most of them are to the benefit of customers, but increase competition for traditional operators by easier substitution and access to alternative products and new parties (online booking through platforms, autonomous trucks and cars, 3D printers, ride share by car, etc.). As an indicative example, data on long-distance passenger transport suggests that digitalization has already increased pressure from intermodal competition (long-distance buses, ride sharing, low-cost airlines) on the railways considerably. At the same time, digitalization offers large opportunities to improve the railways.

In this context, DB has launched six entrepreneurial "4.0-initiatives", firstly to improve mobility, logistics, and infrastructure services, secondly to address cross-cutting aspects, such as production (automatization and smart maintenance), working environments, and IT services. Among the main issues are digital customer interfaces, digitalization of production processes, autonomization, and new products.

All these initiatives have two major objectives: first and foremost, to better serve the customers throughout the journey; secondly, to reach the level of operational excellence. Mr Ksoll quoted more than 260 individual projects which are being raised within DB's 4.0-initiatives so far, and gave insight to some examples. In order to fully exploit the opportunities DB is also implementing a change in innovation culture, including the establishment of labs and new forms of collaboration with start-ups as well as other partners.

Summing up Mr Ksoll gave an overview of reasons, achievements, regulatory implications and open challenges of digitalization from DB's perspective:

- Why is digitalization at the top of DB's priorities? Digitalization is the key enabler to put the ever more customer centric approach of the company into practice and to reach the necessary operational excellence.

- What are the achievements so far? As a starting point, managerial awareness and culture have changed. Currently, a large number of entrepreneurial initiatives and projects have been raised.

- What are the regulatory implications that this shift towards digitalization entails? There is an inevitable change of relevant markets with increasing transparency, lower transaction cost and

thus easier substitution between modes. Regulators need to take this into account. In addition digitalization of the regulators themselves (processes, documents etc.) needs to be adressed.

- What are the remaining long-term challenges? The permanent and long-lasting challenge is to improve attractiveness of products and services, to warrant commercial success in changing environments. Particular long-term challenges relate to investment in capital-expensive and durable assets (infrastructure and rolling stock), as a basis for automization and connectivity. Also, with increasing digitalization cyber-security and data-protection become increasingly important issues.

What are the long-term challenges that digitalization poses?

Jarl Eliassen, UITP

Mr Jarl Eliassen, expert on ticketing and digitalization, presented the point of view of UITP on the long-term challenges posed by digitalization. Mr Eliassen explained that UITP has a specific committee for "IT and Innovation" composed of member representatives from the different transport operators and transport authorities. They also have a similar committee called ITSI for their IT- service industry members. The aim is to address IT-issues in general including the digitalization issue that touches upon short-distance passenger transport services by all modes and in all countries. In particular, in the context of the 11th Florence Rail Forum, Mr Eliassen stressed the impact on regional and suburban rail.

Digitalisation is changing our lives and will also change our sector. Digitalization of the urban public transport sector has been ongoing for some years now. Just think of how travel planners and ticketing services have developed by the use of apps on smartphones. Our passengers now view these apps as necessities in order to undertake a trip. Smartphones are more and more in the hands of everyone providing new opportunities for new services. On average, users refer to their smartphones more than 200 times per day. Digitalization is changing user habits and business rules in every sector and transport cannot risk falling behind this development. Furthermore, digital journey planners are providing the customers with more transparency of alternatives, which is influencing customers' mobility choices. Many advanced third party journey planner solutions are already available all over the world, and these solutions should be seen as an opportunity rather than a threat for public transport. This enhanced competition based on open data drives public transport forward.

Firstly, Mr Eliassen stated that the technical solutions for booking and buying tickets through the internet and smartphones already are widely adapted by many PT operators. The question of interoperability is thus not a technical issue any longer but rather an organizational and political issue. Our politicians should ensure that we can have real competition in the business of pan-European multi modal information and ticketing services.

UITP is supporting the joint efforts led by the European Commission towards the digitalization of our sector and some aspects are considered to be particularly relevant.

Within the Railway Undertakings' dialogue chaired by DG Move, a new EU discussion platform has been created for rail operators. The platform is named the "Digital Railways group" and is

chaired by UITP/SNCF. The main objectives are:

- Establish an inventory of current initiatives.
- Define how digitalization could serve the sector and its customers.
- Suggest supporting actions to DG MOVE (best practices, research, financing…).
- Place the railway sector as an active contributor to a digitalised EU.

Another major objective pursued by UITP is multimodal ticketing and information, as information and ticketing systems are very much related. It has to be acknowledged that e-ticketing systems has a legacy, therefore initiatives of interoperability must take this legacy into consideration; preferably by building on bottom-up solutions. Furthermore, Mr Eliassen recalled that open data distribution plays a key role in the digitalization of our sector: collecting and distributing data from all operators is a demanding task and for this there is a need for national access points for data. Several member states have already established such national access points for PT data, but this work needs more support.

UITP believes that the global transport sector should be proactive in supporting the provision of Open Data, preferably on a cost free basis and with limited or no restrictions. Mr Eliassen stressed that there is no need for further regulation of what data one should or should not share, as the transport sector would simply need to respect the rules that are already in place: namely, personal, sensitive and confidential, and copyrighted data should not be shared.

To conclude, Mr Eliassen noted that, in UITP's view, data access is crucial in order to allow 3rd party developers to assist in developing new and modern solutions. However; the data owners will always be in the position to set the terms and conditions for the reuse of their data.

But it could be risky to depend entirely on 3rd party developers. The public transport sector therefore needs to continue to develop their information services.

Finally, better share of best practices (especially from those Member States where Open Data policies have been implemented already for nearly 10 years) should be supported with great attention but without fear of misuse of data.

What are the long-term challenges that digitalization poses?

Luigi Rucher, Technical Director, Thales Italia

At the beginning of his presentation, Mr Luigi Rucher introduced Thales Transportation, which is world leader in transportation technologies and in a top position in many rail control areas such as signalling, communications and supervision, and fare collection. Ground Transportation Systems provided by Thales cover the five key capabilities for a complete ground transportation offer: signalling for mainlines, signalling for urban rail, services, integrated communications and supervision, revenue collection systems. This means having a complete overview of the entire ground transportation project made of main line railways, urban public transport, and roads, which builds upon different yet interconnected blocks: civil works, track works, traction power and energy, IT-based critical system, and rolling stock.

Mr Rucher stressed that thanks to this Thales Transportation is in a good position to understand the needs of infrastructure managers, operators and transport users and interact with them. Unlike competitors that work in the railway sector and focus on rolling stock, Thales has a positioning in digitalization that derives from experience gained from other sectors as well (aviation, defense, aerospace). Such experiences made it become a partner for most of the EU transport initiatives (it has been playing a key role in projects such as ETCS, Galileo and Egnos, CleanSky, SESAR and Shift2Rail) and a partner of the major European railway companies that are moving towards digitalization.

These partnerships are the expression of the Thales' core strategy for digitalization, which is made of three pillars: 1) digitalization to improve end-user experience, 2) smart station (hub), and 3) digitalization to improve network operation. In the description of these three points, Mr Rucher highlighted the highly innovation potential of digitalization, which would eventually serve the customer needs by providing the users (passengers, operators and network managers) with customized solutions that help them to experience a complete, seamless, energy-efficient and safe journey. In particular, Mr Rucher stressed that as the ground transportation system is changing from analog to digital there are security implications that should not be underestimated. The biggest challenges in this sense relates to the fact that the railway system has a life cycle of more than 25 years, yet cyber threats to new technical functions evolve rapidly and security systems must be supported.

To conclude, Mr Rucher recalled that the rail industry landscape is being significantly reshaped by digitalization: rolling stocks are impacted, rail control businesses are refocusing on profit-making, and multimodal industry players are blossoming. Railway operators as well as governmental institutions are well aware of this, and they are all working towards better use of digital solutions. Manufacturers and system providers such as Thales are part of this and are keen on contributing to the move towards an ever more integrated mobility system.

FSR-Transport: Events 2015

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Date	Title
6 February 2015	FSR-Conference: Smart Cities, Smart Regulation?
23 February 2015	Executive Seminar: Aviation Safety
9 March 2015	3rd Florence Intermodal Forum
18 May 2015	10th Florence Rail Forum
12 June 2015	4th Annual Conference on the Regulation of Infrastructures
18 September 2015	7th Florence Air Forum
19 October 2015	6th Florence Urban Forum
27 November 2015	11th Florence Rail Forum

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