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Digital Single European Railway Area: how do we get there?

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Highlights

Digitalization is currently transforming the railway sector in a profound way. As we know from the experience in other sectors this process has an impact on the basic functioning and business model of the entire sector.

Concretely, railways are dealing with technological transformations in operations, rolling stock, infrastructure management, customer services and ticket distribution. These innovation processes lead to efficiency improvements while some of them also open the door to new forms of competition.

The 11th Florence Rail Forum brought together regulators, operators, associations and academics to discuss state of play and challenges of the digitalization of railways.

What emerged was that the digital transformation offers more opportunities than challenges for the sector and alters the role of regulation. Both companies and regulators urgently need rules for the treatment of data and for the functioning of an ever more "digital" transport sector. However, where regulation cannot keep pace with innovation, it risks being an obstacle for it.

# The Digital Single European Railway Area: how to think it?

A comment by MATTHIAS FINGER | FSR-Transport Director

The digital transformation is rapidly unfolding since the late 1990s affecting all industries and sectors. Not astonishingly, it will not stop at the railway sector either and will inevitably transform it. The 11th Florence Rail Forum was dedicated to understanding and exploring how this digitalization can and will affect the development of the Single European Railway Area as foreseen by the European Commission since 2012 (Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area). Here I would like to do three things: I will first recall the main features of this so-called digital transformation. I will then crystalize these generic features of how digitalization is affecting all industries and sectors. Finally, I will try to anticipate what such digitalization is likely going to do to the European railway sector.

The four features of digitalization

The digital transformation can be characterized by the four following features, which, all combined, make up for what we call today "digitalization":

- The probably most basic feature is the fact that physical states or characteristics can be replicated digitally, for example by digitalizing voice or by taking pictures. By now, almost anything can be digitally replicated including sound, images, temperature, smell, etc. As a consequence, we produce **digital data**, which can then be stored as such.

- Growing **computing power** not only allows ever bigger amounts of such data to be stored but, more importantly, analyzed by ever more sophisticated algorithms. The growth of such computing power and analysis has been exponential ever since it started.

- The third key feature of the digital transformation pertains to so-called **connectivity,** i.e., the ability to access such (analyzed and non-analyzed) data ever more instantly and, more importantly, from any place on the planet (e.g., global access). Such exponential growth in connectivity of course results from substantial progress in telecommunications, first
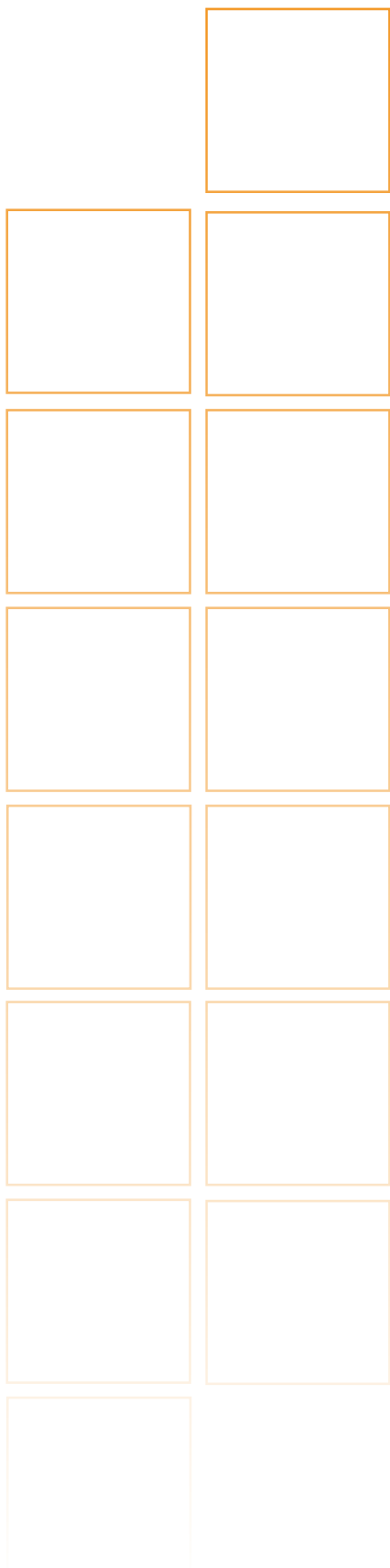
in the area of mobile telecommunications and more recently in the area of fiber optics.

- The fourth, and most recent feature of this digital transformation stems from the progress in the area of **geo-localization**, itself the result of significant progress in satellite technology. As a result, all movements can now also be digitalized, analyzed and accessed.

Industry transformation resulting from digitalization

These four features combined are now affecting all **industries** and sectors, and more generally all societies and cultures on a planetary scale. Let me focus, here, on industries and sectors, and briefly outline how they already and continue to be affect by digitalization. I will do this in the following three steps:

- As a first step, digitalization now allows for the (digital) **duplication** of any physical value chain, i.e., from production (supply) to distribution (consumption). Such duplication is simultaneously also a globalization in that this digitally duplicated value chain is now globally (and electronically accessible).

- As a consequence, the **customer interface** evolves from being physical (of course the products are still physically delivered) to becoming electronic. In other words, the customer is now before all a digital customer, even though he or she consumes a physical product.

- This, thirdly, changes the **nature of the business**: whereas the traditional physical business comes under pressure because it can be controlled and ever more optimized by the ones who control the electronic (global) value chain, new business models can now emerge at the interface of the owner of the electronic value chain and the (digital) customer.

This digital transformation of any physical value chain already has transformed and increasingly will have the potential to transform any industry, making any of the industries potential a global one, and degrading any of the local and physical activities to a simple execution of globally controlled data flows.

Towards a Digital Single Railway Area?

As said above, the digital transformation will not stop before the national and the European railway sector. The above features will inevitably also apply to the railway sector (industry) and transform it. Physical transport of persons and goods will be duplicated electronically,
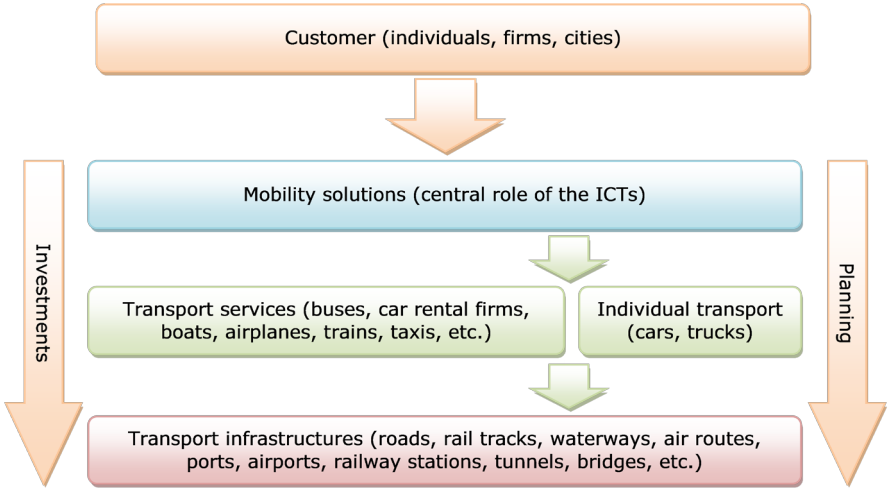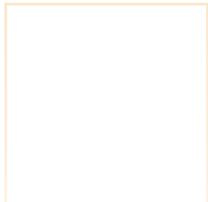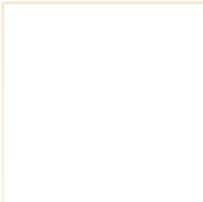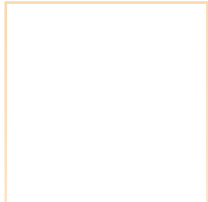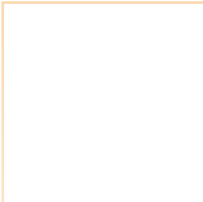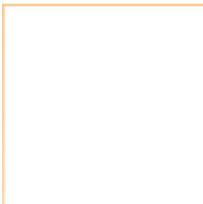
digital intermediaries will emerge and place themselves in between the traditional railway operators and the (now digital) customers, thus degrading railway operators to simple "transporteurs" of people and goods. Very concretely, companies with access to data will use these to offer customized mobility solutions.

This creates opportunities for European (and global) "digital intermediairies", offering (digitally) integrated timetables, tickets and ultimately transportation services. This also constitutes the opportunity for creating a digital Single European Railway Area, something which can be actively favored by regulatory policies of the European Commission. Digitalization is a process that can reinforce integration supporting the European Commission's goal of creating a digital Single European Railway Area, as digital transformation will likely require the different European Actors to act together in order to withstand competition from over the top service providers such as Google.

However, this evolution will, most likely, not stop at the railway sector: indeed, digitalization has the potential to integrate all transport sectors and create integrated (digital) mobility solutions, in which railways will simply be one, unfortunately not particularly attractive transport mode. The following graph summarizes this likely evolution, i.e., implication of the digitalization of transport.

Customer (individuals, firms, cities)

Investments

Mobility solutions (central role of the ICTs)

Planning

Transport services (buses, car rental firms, boats, airplanes, trains, taxis, etc.)

Individual transport (cars, trucks)

Transport infrastructures (roads, rail tracks, waterways, air routes, ports, airports, railway stations, tunnels, bridges, etc.)

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This, finally, also raises the question at which level such digital mobility solutions will make most sense, i.e., will ultimately be offered. Will it be the urban (agglomeration), the national or the European level? The answer to this question will ultimately determine the actions of the European Commission in matters of regulating (digitalized) railways in particular and transport in general.

Digital Single European Railway Area: how do we get there?

A summary of discussions:

The discussion showed early on that digitalisation is an all-encompassing issue affecting the railway sector as a whole. At the Forum many examples of digital transformation processes were provided by railway operators while the general characteristics of digitalisation as a cross-sectoral transformation process were discussed as well. Furthermore, the regulatory implications and the role of regulation were looked at – most importantly by drawing analogies to previous experiences and to other sectors like the telecommunication sector.

Discussions at the Forum were structured around four major topics:

- Why digitalisation? What does it mean for the railway sector?
- What has been already achieved in terms of digitalization of the railway sector?
- What are the regulatory challenges posed by digitalization?
- What are the long-term challenges posed by digitalization?

Why Digitalisation - what does it mean for the railway sector?

Inflated expectations?

Everybody agrees that railway digitalisation is a prominent topic, which is not completely new on the agenda as it covers many different initiatives that have, in fact, been ongoing for many years. But in which direction is digitalization expanding and how can regulation support the railway digitalization?

While most saw an immense potential in digital innovations other warned of the phenomenon of inflated expectations as illustrated by the Gartner "hype cycle", where the technological trigger is indeed digitalization. As it was acknowledged by many at the Forum, the most prominent example of an ongoing challenge in railway digitalization is the ERTMS deployment. Continuing in this direction, the potential for improvement in **operations** thanks to digitalization is self-evident. With regard to the improvement of **customer service**, most digital applications and tools that are currently expanding in the railway sector, such as electronic ticketing, are however

coming relatively late when compared to other sectors; therefore their potential seems very certain.

Major concern was expressed on how and where to focus, especially from the regulatory perspective, to make the most out of the digital transformation. The concept of "data enabled railways" was put forward as the future model for railways: using the data available to them railways should use digital technology to optimize their operations and improve their customer service.

Towards a multi modal approach and going beyond transportation

On the distribution side an interesting example of digital transformation was provided by a non-European company, the Japanese railway operator JR-East. Their suica is a multifunctional, multimodal payment card for metro, train and bus services and, at the same time, a well-accepted method of payment accepted in many shops all over Japan. This example shows two facets of digitalisation namely that it can allow railway undertakings to go beyond the classical railway business and that it can facilitate the seamless travel experience customers ask for.

This was contrasted to the too narrow company and sector specific approach of European rail companies. Also several European examples of payment cards were presented: these have, however, not reached a similar level of integration with different transport modes and with the credit card companies.

Making uses of geo localization and improving train localisation tools

The improvements that geo localization tools for trains can offer are straightforward and could potentially largely improve the overall system performance.

However, the full benefit of this technology cannot be reaped because of a lack of cooperation of Infrastructure Managers on this point. Such data would allow a better appreciation of the whole journey of a train. Infrastructure Managers should make information on the network status, maintenance work, the localization of trains and their priority decisions transparent. In fact the implementation of the 4th railway package will require making such data available to operators

and eventually establish full transparency of the planning decisions of the Infrastructure Managers.

Access to Data

Large parts of the discussion focussed on the issue of data, specifically data related to operations. The call for a better availability of data was very present at the Forum. At the same time, companies highlighted the different degrees of sensitivity of different types of data and made clear that not all data can be made openly available. For instance, data on general prices and timetables are already widely available. However as a result of digitalisation itself the amount of highly sensitive data is increasing: for instance, some data on prices (real prices) can reveal business-relevant information and new maintenance procedures built on digital data about wagon parts that are crucial for manufacturers and cannot be shared with competitors.

The discussion showed that the rail companies' general approach to open data may be the most crucial element of the digitalisation process, especially when we deal with customer interfaces and intermediary online platforms: if railway companies develop a pro-active approach to open data they will be able to define terms and conditions of data use and actually benefit from the innovation that others (for instances start up) will develop using it. More harmful (for the railway company) alternatives would otherwise develop: either legislation will eventually force them to share their data under conditions defined by the regulator, or online platforms and service providers (like google) will implement their own way to find data on their own behalf and just disregard the companies' role. Therefore, it was said that companies have to make use of their still advantageous position and be ready to open data access to third parties. This is crucial in order to allow third parties to assist in developing together new and modern solutions that could improve the railway system as a whole.

What has already been achieved in terms of digitalization of the railway sector?

The variety of examples of digital solutions that were presented can be differentiated between those referring to the interaction with the customer and those improving the infrastructure and the management of operations.

Customers and ticketing distribution

Most railway operators use some form of electronic ticketing, and the trend towards a higher percentage of paperless tickets is continuing. Railway Operators noted that also here a differentiation between PSO and Open Access Services is necessary. For many PSO lines public entities are in charge of ticketing. Those have in many instances invested in different ticketing systems making it hard to move to a single electronic ticket. There were different opinions on whether electronic tickets can enable better cross border integration of tickets: while a variety of cross modal offers exist some rail operators were doubtful on the economic relevance of integrated cross border tickets.

Rail companies also reported positive experience with an open approach to data: one example portraits a successful application that was developed by a small company on the market, after the railway operator had provided it with the necessary data. Car sharing companies are looking for collaborations with rail companies, because rail companies are in possession of crucial information about passenger volumes at stations.

Infrastructure and Operations

Examples on the operational side included: digital tools for hub optimisation that in one example could increase traffic throughput at a bottlenecks by 27% by automatically evaluating traffic data and slowing down and speeding up trains approaching the bottleneck. Several operators presented examples of predictive maintenance vastly increasing the efficiency of maintenance thereby reducing lifecycle costs. Also diagnostic trains automatically detect the status of the infrastructure to rationalize maintenance work[1] . Tablets and dedicated apps facilitate the maintenance work and allow experts to work from remote locations.

In fact digital innovations in infrastructure maintenance and operations may be the lower hanging fruit for railway companies: several examples pointed out the enormous cost savings and efficiency gains that digital applications can unfold on the internal side of railway undertakings. The great advantage of these types of innovations is that they can be pursued internally without external competition. For customer interfaces on the other hand there is already a fierce competition in place.

Nevertheless such profound changes require a change in mindset of the railway sector that may continue to be a challenge in the future.

What are the regulatory challenges posed by digitalization?

A "digital" Single European Railway Area?

The Florence Rail Forum put the process of digitalization of railways in the context the Single European Railway Area, which is the goal of the European Union in the railway sector.

The relationship between the single European Railway area and the digital transformation of railway companies was mostly interpreted in a similar way: both developments can be mutually reinforcing. But also, seen from a different angle, the one goal can not be attained without the other.

This logic could be observed on several examples: many operators recognized the urgent need to move forward with digitalisation in order to withstand competition from the new players on the transport market. For passengers, this competition is twofold: Google, Apple and others offer new transport-related services and rapidly improve their offers. As more customers get used to these services rail companies slowly "lose touch" with their customers. On the other hand, digitalisation increases the competition with other transport modes such as bus services and car

1.   Summary of presentations for reference

Unleashing the digital potential of the railway sector

Maria Patrin - EUI European University Institute

Digitalization is the new frontier of modern industries. Year after year new industrial sectors are becoming increasingly digital. In network industries, this trend started with the telecommunications sector but swiftly spilled over to postal services and, with the advent of smart grids, to the energy sector. This post argues that rail, because of its direct customer interface, lends itself neatly to a genuine digital revolution too.

European Commission President Jean Claude Juncker declared in May 2015 that 'the Internet and digital technologies are transforming our world – in every walk of life and in every line of business. Europe must embrace the digital revolution and open up digital opportunities for people and businesses'[1] This applies to railways too as the disruptive potential of digital technologies for rail is globally recognized by both regulators and rail operators. It lies at the heart of Juncker's combination of businesses and people, at the intersection of society, where consumers' choices and people lifestyles become a driving force for business innovation and transformation. Indeed more than anything the digital revolution in rail is a customer revolution. Awareness, information and flexibility are the key words through which digitalization has helped empowering rail passengers. They have enabled the shift from the concept of "passenger transport" to a more inclusive idea of "passenger mobility" and even beyond of "passenger smart mobility", putting passengers in control and at center stage.

The digital revolution of railways is already underway. Yet it is only the beginning of a challenging journey: while digitalization is widely recognized as a clear necessity, Europe still relies on an infrastructural system and on a business model that are partly resistant to the digital change. In particular the preeminently national character of rail operations as well as several shortcomings in inter-modality are clear counter-tendencies to the advancing global digitalization of transport. But there is more: if it is true that the user-centric approach to transport predominantly pushes for digitalization, what about passengers who are not digital natives? Their number is still very high in several regions across Europe and might remain so in the coming years, especially against the background of an ageing population.

Rail companies are heavily investing in digital technologies. But is rail up to the challenge? A report by Deloitte estimates that by 2020 90% of all transport transactions will be paperless[2] . Europe is a worldwide leader in rail innovation. The 11th Florence Rail Forum itself has shown a clear consensus on the need for digital change. In truth, digital technologies are perceived to deploy their revolutionary potential as transformation's trigger. And they can constitute a very powerful trigger. Their take-up will lead to crucial new developments in all key rail areas such as better business-customer interface and improved end-user experience; improved network operations and congestion management; inter-modality; increased safety; better environmental performance; improved flexibility; and cost savings.

However, the path towards a fully-fledged digital transformation is not without difficulties. It requires European railways to cope with old and new challenges. Overcoming the fragmentation of national rail realities is a pre-condition of full digital development, whereas issues related to the management of big data, data protection and cyber security emerge as threats proper to the digital business-model. It remains an open question whether the digitalization of railways will allow for the advent of a true two-way relationship between rail service providers and clients. Beyond the obvious benefits that big data will provide in terms of consumer profiling and tailor-made services, railway companies will also need to face other uses of digital technology, such as positively engaging with feedback from their customers and increased competition on their services.

1. European Commission, Press release: A Digital Single Market for Europe: Commission sets out 16 initiatives to make it happen, Brussels, 6 May 2015

2. Deloitte, Transport in the Digital Age, Disruptive Trends for Smart Mobility, March 2015

sharing for passengers. But also in freight transport trucks may improve their competitive advantage even further as they implement digital tools more rapidly. Nevertheless by making use of their data and their knowledge of the sector railway companies could develop their own digital tools and win this competition. Such competitive edge can however only be reached if solutions are cross modal and cross national.

From the regulatory point of view overcoming the fragmented railway system has been an ongoing challenge for many years. Digital tools may now ease the process of harmonization: in fact with the implementation of the 4th Railway Package the European Railway Agency will become the One-Stop-Shop (OSS) in the EU for issuing vehicle authorisation and safety certifications. These will be submitted electronically using the same digital platform. This will affect the work of National Safety Authorities throughout Europe and the standardized digital platform will be a helpful means to facilitate this change. Similarly, a harmonized digital tool will be used for occurrence reporting.

Regulation needs to stimulate innovation and avoid being an obstacle for it. Some Rail Operators advocated a "leave us alone approach" when it comes to new standards stressing the risk of early standardization in a field were technology is still evolving. While financial support is needed for R&D Investments (like Shift2Rail) standards for data need to develop out of the business practice. This was recognized also by the regulators: the new approach is to not apply TSI in the area of data but to let innovative firms on the market define the standard.

Digitalisation and Competition

Several concerns were raised that relate to the impact of digitalisation on competition regulation. With the emergence of new travel applications, competition authorities may need to redefine markets along the transport chain. It has to be decided whether services offered by intermediaries such as blablacar, which grow in their relevance as competitor to railways,

should be defined as "transport services" or as "digital information services" (see the comment by Juan Montero).

For railway undertakings it is of high importance that the companies' website is not considered an "essential facility" and is not going to be regulated as such.

Regulating Open Data

From the regulatory perspective some points emerged on the role of regulation for open data. Most prominently stressed was the point that the (mostly state-owned) Infrastructure Managers need to meet their obligation as public companies and enable a better access to their data by the relevant parties. National Safety Agencies need to have a closer look at the proper implementation of existing rules on this but most importantly the Infrastructure Mangers themselves need to apply a proactive approach and establish methods of efficient data sharing.

Even though a bottom-up approach is advocated also by regulators, some form of regulation on data access will inevitably come. All actors from the rail operator side should now cease the moment and organize open data in a way that corresponds to their interests. The concern of operators about retaining ownership of their data was responded with the clarification that "open data" doesn't mean "free data". Furthermore it can't be ensured that operators can maintain the ownership of their data as companies like google have proven in other sectors that they are capable of collecting data also independently.

What are the long-term challenges posed by digitalization?

Most change processes in the railway sector are of a long term nature. An important point was that the speed of transformation processes needs to increase in order to meet the ever more rapidly changing customer needs.

ONLINE PLATFORMS: TRANSPORT OR DIGITAL SERVICES?

Juan J. Montero UNED University, Madrid

Online platforms for the intermediation of transport services have proliferated over the last years, being Blablacar and Uber the leading examples. Online platforms have different business models that pose different but significant challenges to the existing regulatory framework: licensing, taxation, labour relations, etc. It seems urgent to clarify the legal regime of the online platforms, in particular whether such intermediation platforms qualify as transport services or as digital services ("information society services" in the EU lingo).

EU law has a very specific definition for the "information society services". Such services are (i) normally provided for remuneration; (ii) at a distance; (iii) by electronic means; and (iv) at the individual request of a recipient of services, as defined in the E-Commerce Directive (Directive 2000/31/EC).

Furthermore, the E-Commerce Directive is built on the basis of the freedom to provide services, which is exceptionally reinforced. The protection against restrictions to the cross-border provision of information society services has no equivalent for any other kind of service. Not only prior authorisations are excluded as such. Furthermore, exceptions to the freedom to provide these services are limited to an exhaustive list of exceptional reasons. As a consequence, recipient States have limited chances to restrict the provision of information society services from another Member State. Reasons such as unfair competition do not justify such restrictions.

On the contrary, if the service provided by such platforms is included under the legal framework for transport services, Member States have an extraordinary capability to impose restrictions on the provision of such services. Transport services are out of the scope of Article 56 TFEU on freedom to provide services and out of the scope of the Service Directive (Directive 2006/123/EC). As a consequence, Member States have traditionally been able to define national restrictions for the provision of transport services, in particular for local transport.

Despite the relevant implications, in EU law there is no legal definition of transport services. There are specific definitions for each transport mode in the relevant secondary legislation. Furthermore, the wording both of art. 56 TFEU and the Service Directive refer not to transport services as such, but to "a service in the field of transport", a wider category. It seems clear that online platforms do not provide transport services as such. However, it is not clear whether the online intermediation service might be included in the wider category of "services in the field of transport".

The CJEU has recently adopted a wide interpretation of the exception for services in the field of transport. It decided that services to control the roadworthiness of motor vehicles, even if they are not transport services as such, they are services in the field of transport. As a consequence, exceptions to the freedom to provide services were allowed (Judgement of 15 October 2015 in Case C-168/14, Grupo Itevelesa SL and Others v OCA Inspección Técnica de Vehículos SA and Generalidad de Cataluña, EU:C:2015:685). Roadworthiness is a pre-requirement for the provision of transport services, and as a consequence, the CJEU decided that the legal regime for transport services should apply.

The question on the classification of the services provided by online platforms has been elevated for a preliminary ruling by the Court of Justice of the European Union (Case C-434/15). A Spanish Court has posed the question in relation to a request of a taxi association to outlaw the provision of intermediation services by Uber as contrary to the national unfair competition law. The judgment of the CJEU will not be delivered before 2017.

On the one hand, the services have to be digitalized and customer interfaces have to become more attractive and secure to allow fast and easy transactions. On this point, disagreement emerged on the urgency to address the issue of possible misuse of data and the thread of cyber-crimes: while so far, no concrete examples exist, the risk should not be underestimated.

On the other hand, major investments in digitalization of infrastructure and rolling stock have to be made. Everybody agrees that investments in infrastructure and rolling stock require a long term perspective. Perhaps the most prominently mentioned issue in this regard is the challenge of cyber security. While currently a lot of attention is paid to the regulatory and institutional prerequisites for a digital transformation, on the long term there is need to address some risks related to system security that are unknown at present. The point was raised that with life cycles of over 25 years rail rolling stock is normally not upgraded in a way that would allow it to cope with the evolving threat of cyber-attacks. It seems however that procedures exist to address the problem not least thanks to the vast experience of European companies that provide secure IT systems for other sectors such as Air Traffic Management. The point was furthermore raised that the risk of cyber threats together with other prominent challenges of digitalisation namely liability issues and data protection, may not serve as an excuse to not continue with the innovative efforts. Many tools have been developed to address these challenges and they should not stop the railway sector from addressing the digitalisation challenge that, according to many participants, is decisive for the future of the railway sector as a whole.

Further readings

Florence School of Regulation Transport Area, 2015, 11th Florence Rail Forum Summary of presentations

This document offers summaries of the presentations given by the participants of the 11th Florence Rail Forum "Digital Single European Railway Area: how do we get there?". The workshop addressed the discussion questions that were also the basis for this Observer:

- 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?

- What are the regulatory challenges posed by digitalization?

- What are the long-term challenges posed by digitalization?

Finger, Matthias and Messulam, Pierre, 2015, "Rail economics and regulation" in M. Finger and P. Messulam (eds.) Rail economics, policy and regulation in Europe, Cheltenham : Edward Elgar Publishing Ltd, 1-21

The first chapter of the book "Rail economics, policy and regulation in Europe", sets the stage and recalls the fundamentals of rail economics and regulation in the context of de-regulation and re-regulation as promoted by the European Commission. It focuses on the specific role that regulation and regulators play – and are supposed to play – in the shaping of the European railway sector (past) or industry (future). It does so by considering the economic dimensions of railway de-and re-regulation, as opposed to the technical and safety dimensions.

This chapter is divided into three distinct sections. The first section presents the European Commission's (EC) history and programme of railway de-regulation and re-regulation, especially with regard to economic regulation. In the second section, we look at the underlying railway economics from the perspective of the main three types of rail market players that have emerged as a result of the EC's de-/re-regulation initiatives; namely, infrastructure managers, train operating companies and station managers. The third section discusses the challenges for railway regulation, and European railway regulatory policy more generally, that result from the newly emerging and increasingly fragmented European railway industry structure.
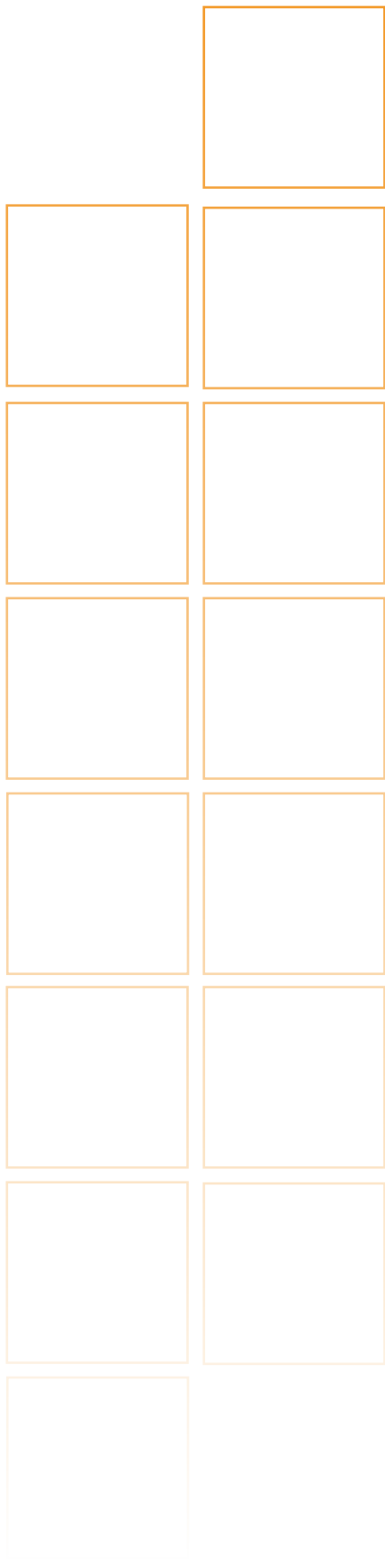
Hofmann, Klaus Markus, 2015, "Connecting people - An Evolutionary Perspective on Infraculture" in A. Picot, M. Florio, N. Grove and J. Kranz (eds.) The Economics of Infrastructure Provisioning: The (Changing) Role of the State, MIT Press, 237-266

Infrastructure is the operating system of modern economies, offering performing platforms and a multitude of services to deliver essential functions. Institutions and networks for transportation, energy and communications have evolved interdependently, facilitating economic and societal development and should be understood and developed as one converging infracultural system. Thus public and private infrastructure investments can be considered as transaction costs immanent to any society, connecting flows of social, economic and environmental capital, decreasing with access to efficient infrastructure systems. As an historic analysis shows, effective institutions are needed for the perpetual transformation of the infrastructural foundations for economic and non-economic socio-cultural functions. The infracultural meta-function being, to enable the accumulation of wealth, support social stability and ensure a sustainable quality of life, the allocation and provisioning of infrastructural services and the conditions for access may require a rethinking of specific governance schemes. Regarding the challenges and synergies offered by digitalization the role of private and public actors has to be reconsidered. Facing the digital perspective that will transform infrastructure users into prosumers, the rights of customers and citizens should be reconsidered, depending on socio-economic factors, including non-economic values and belief systems.

Kurosaki, Fumio and Kobayashi, Mitsuaki, 2015, "The Digitised Railway Facility Management System and the Application of GIS and GPS to Railway Operations", presented at the 11th International Conference of Eastern Asia Society for Transportation Studies, September 11-14, 2105, Cebu Philippines

The railway facility management system that incorporates a geographic information system (GIS) is now widely used in Japan's railway sector. This system was originally developed in Japan for the maintenance and management of railway facilities by digitising asset information. Digitising asset information facilitated a seamless flow of data for railway engineering projects and the different sections and organisations of the railways. As operating railways through vertical separation has become the norm, this system can be utilised to share data among organisations. Moreover, the application of a global positioning system (GPS) made it possible to detect train locations, which resulted in developing train location and train driving support systems. The experiences in Japan demonstrate that the operation and management of railways can be improved by digitising asset information and using the GIS and GPS.

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The Florence School of Regulation (FSR) is a project within the European University Institute (EUI) focusing on regulatory topics. It works closely with the European Commission, and is a growing point of reference for regulatory theory and practice. It covers four areas: Communications and Media, Energy (Electricity and Gas), Transport and Water.

The FSR-Transport Area's main activities are the Florence Transport Forums, which address policy and regulatory topics in different transport sectors (Rail, Air, Urban, Maritime, Intermodal transport and Postal and delivery services). They bring relevant stakeholders together to analyse and reflect upon the latest developments and important regulatory issues in the European transport sector. These Forums inspire the comments gathered in this European Transport Regulation Observer.

Complete information on our activities can be found online at: *fsr.eui.eu*