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I. Introduction to this book

1. Crossing borders - a simple and complicated task

Whoever travels in Europe these days will often fail to notice the passing from one country to another, unless he or she looks out intentionally for the rather small square blue signs with the name of the country into which one is entering. Those travelling by air, rail or ship will usually not even be able to detect these and have to look out for subtle differences in signage, the design of infrastructure, symbols or advertisements and of course language to find out in which country they are. With border controls removed inside the so-called Schengen area, traffic flows freely across much of the continent. Transport is one of many fields where the European Union, the big project of uniting the continent in a peaceful way whose foundations were laid in the 1950s, can now be experienced in a concrete way.

This freedom of movement enjoyed today is both a political and a technical and societal achievement. The times where nation states sought to control and restrain international movement (for various reasons) are not that far back in history. There always was *some* cross-border mobility, with a few exceptions like the Iron Curtain during the coldest part of the Cold War. But to accept cross-border as equally valuable to domestic movement is a fairly recent development. Furthermore, cross-border mobility also had to be provided for in the design of the transport system. Technical standards, harmonised procedures, direct fares and other features of easy international travel did not develop automatically. Sometimes the foundations for such integrated solutions were laid by copying them from a neighbouring country or the company who used them first. But at least as often governments, manufacturers and operators thought about solving problems on their own, in their respective areas, only to find out later that some common standard was necessary to provide through services efficiently.

The railways were the dominant mode of transport from the mid 19th to mid 20th century, and contributed significantly to the emergence of the modern society, the industrial economy and thus also the notion of mobility as an integral part of life. Railway lines covered all of Europe by the 1860s, became linked together and formed an ever tighter network until the maximum was reached in the 1920s. Even after the following closures of many secondary lines, there is still a comprehensive network across the continent. Road and air transport only developed much later.

Considering this temporal advantage, it is surprising that rail is today the mode of transport most negatively affected by the existence of borders within Europe. Although particularly suitable for long-distance (freight) transport, rail struggles to maintain its market share. International passenger services also are under continuous threat - the traditional long-distance trains have largely disappeared as a result of coach and air competition, and new high-speed corridors are developed first for domestic services, leaving international connections as the Achilles heel of the system. Those still travelling by rail can sometimes experience the lack of integrative thinking: stops en route for technical reasons, having to change trains at border stations (figure 1) or not being able to get a through ticket are frequent examples. In other, worse, cases there may not even be the train across the border, or passengers may be actively deterred from travelling by hefty supplements on cross-border tickets. Since about the turn of the century, EU politics, and the Commission in particular, has realised the need to address these issues, but progress is amazingly slow.

2. Overview of contents

This book aims to provide insights into the international dimension of the railway business and how it has evolved over time. It brings together the rail-related findings of a larger research project that looked at the integration of infrastructure in different sectors. The focus of interest was mainly historical, but the aim was also to learn - if possible - from the past. Considering the difficult situation of the railways described in the previous section, the hope is to contribute to a better understanding on how this state of affairs came about, and perhaps find some ideas for future transport policy.

In this introductory chapter, the conceptual framework and main approaches of the underlying research activities are presented (section 3), and some key terms and theoretical concepts are described (sections 4 to 7). The necessity to consider the railway system as a means as well as an object of integration is discussed. The former refers to their potential for moving people and goods efficiently in space and in particular across boundaries. The latter highlights the need to achieve agreement on a multitude of technical and operational issues to make such movement possible. This is a matter of technical and operational standards as essential preconditions, but also of developing a common understanding of the role and objectives of running a railway. Failure to achieve such agreement will lead to slower services, lower capacity, poorer quality and cumbersome procedures for handling cross-border traffic.

Figure 1: Obstacles of cross-border rail transport in 2012: Following a series of technical problems affecting "international" rolling stock, passengers from Zurich to Milan have to change from a Swiss train (centre) to an Italian one (left) in the border station of Chiasso. In contrast to normal practice, Italian authorities take the opportunity to make all passengers walk through the customs hall in the building on the right rather than permitting a direct change between the two trains. An additional delay of 20 minutes is the result, causing most passengers with onward connections in Milan to miss their train and arrive at least one hour later (source: author).

These reflections are provided as background information for understanding the main part of the work, the three case study chapters on visions for international passenger rail services (chapter II), international infrastructure projects (chapter III) and international flexible (rover) fares (chapter IV). Each chapter discusses two case studies from the 19th and 20th century:

Chapter II discusses the *understanding of key stakeholders* in the railway industry regarding the *attitude to be taken towards international cooperation* in the development *of rail passenger services*. It is based on the assumption that the individual European countries' networks had been linked together by the 1870s, but a coherent idea for international services had yet to emerge. The chapter looks at the contemporary debate on the role of the railways for society. A similar analysis is also undertaken for the period after World War II.

Elements of the development of two *international infrastructure projects* are discussed in chapter III: The examples of the Swiss Gotthardbahn (opened 1882) and the German - Danish Vogelfluglinie (opened 1963) are analysed to consider the way the international dimension of these projects was seen and taken account of in the planning process. Although different in their practical characteristics, these projects have important commonalities in terms of their role in the European transport system.

The third case study looks at *passenger fares*. Chapter IV analyses two important cases: the "Fahrscheinheft" (first a catalogue of routes, later a flexible rover ticket) offered by the "Verein deutscher Eisenbahnverwaltungen" (Association of German Rail Operators, whose members also included neighbouring countries) and the "Interrail" pass, introduced in 1972 by the UIC (International Union of Railways). Both tickets offered flexible travel across company and political borders, mainly for leisure travellers.

These three case studies have all been written as self-contained pieces and may be read also on their own, each with its own introduction and conclusions. An overarching synthesis and comment is provided in chapter V by Christian Henrich-Franke of Siegen University, who looks in particular at the case studies' implications for the history of European Integration and the research into patterns of international standardisation processes.

The chapters differ in their internal structure and in the way resources are presented. The author's aim was to provide a good mix of synthesis and quotations and an accessible text through relatively short sections. Publications are usually given using the Harvard system. Archive sources are shown with document title and/or date, shelf mark and name of archive, but the details vary according to the different classification systems.

3. Governing infrastructures - the research context[1]

The issues presented in this book are the result of a research project sponsored by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) from 2008 to 2012. This project set out to identify, compare and analyse processes of integration in various infrastructure sectors, and hence to study international governance strategies in this field. Sectors covered were telephone, radio communication, postal services, pipelines, inland navigation and railways. In all sectors, the periods covered were - with some minor variations - the decades be-

1 Most of the information given in this section is based on material provided on the project's website (http://www.uni-siegen.de/ifer/infrastruktur/index.html.en?lang=en), partly modified by the author.

fore Wolrd War I and those after World War II, leaving aside the inter-war period with its specific economic, social and political tensions.[2]

Since the 19th century, infrastructure in Europe went through a process of increasing internationalisation (cf. for example van der Vleuten 2006, van Laak 2001). More and more goods, people or information travelled across borders using infrastructure networks. These (material) networks shaped Europe in many ways. They also gave rise to a European governance problem: trans-border infrastructure networks and services needed to be planned, organised and further developed. As a consequence, organisations were established which generated different forms of European governance. As this need arose very early in the era of 'Internationalisation' in the 19th century, infrastructure organisations are among the oldest international organisations.

Many decisions within these organisations were made by representatives (experts) from national administrations who actually did not possess any governmental competence. Subsequently, a network of international organisations and committees – modal or trans-modal; governmental or nongovernmental; administrative or private – emerged. This network then grew enormously in complexity in the 1950s. The complexity also intensified various organisations' or actors' competition with each other for power, competences and the contents of infrastructure policies. In the middle of the 20th century, infrastructure planning and policy were included as new elements in European infrastructure governance by organisations such as the European Conference of Ministers of Transport or the European Economic Community.

The processes of integration within each infrastructure sector were analysed separately in the various sub-projects. The three main guiding questions were:

- In which ways and in which forms did the integration take place?
- Which factors supported the integration in the two epochs and which factors hampered it?
- How were structures, processes and content of the integration tied together?

Across all sectors, a set of common tasks can be identified in the evolution of these governance processes. The project sought to address them through a common set of terms, definitions and approaches described in this and the next section. This was done in order to facilitate and focus on an abstract analysis of the various processes rather than a detailed narration of each case's particular development. The case studies were chosen in part based on the researchers' interest and availability of material, but also considering what might be interesting complements to existing research. The availability of comprehensive works on vari-

2 Further results from this project are presented in other books of the present series (Ambrosius/Henrich-Franke 2013, Benz 2013, Ahr 2013, Ambrosius 2010, Ambrosius 2009)

ous technical aspects (Hascher 2003, 2008,Hürlimann 2006, 2009, Puffert 1994, 2009), freight tariffs (Henrich-Franke 2012, 2013), institutional developments and general policy integration (Burmeister 2001; Degli Abbati 1987, Erdmenger 1981, Kapteyn 1968, Ribu 1985, Whitelegg 1988, Stevens 2004, Henrich-Franke 2009a) thus led us not to pursue these topics further.

The project had the main goal: to illustrate similarities and differences in the integration of infrastructure in (Western) Europe in the transport and communications sectors before the Great War and after the Second World War (up to the 1970s),

A comparative analysis (synchronous and diachronic) was to be made of all five infrastructure sectors in order to refine specific typologies of infrastructure integration. Ideally, this will lead to a multi-factor model for the integration of infrastructure (Ambrosius/Henrich-Franke 2013).

4. Standardisation and integration - key definitions

The terms "standardisation" and "integration" are key terms of this work whose understanding shall be briefly defined. Two meanings of the integration of infrastructure were identified in the project. Firstly, the *creation of interconnectivity and interoperability* of infrastructure networks and services through standardisation; secondly, the differentiation between *ways and forms used for standardisation*. In other words, integration refers to the structures of the international relations as well. The project analysed the structures of the international relations (polity), the processes of decision-making within these structures (politics) and the content of standardisation (policy).

We understand *integration* in a fairly wide sense as the reduction of friction losses[3] in the economic and social organisation of societies (cf. Jochimsen 1966:91seq). The railways are especially qualified as a case study of such integration processes; like hardly any other technology, their development is linked to industrialisation and the evolution of "modern" societies. By radically transforming space-time relations, the railways facilitated economic and social exchange in a revolutionary way and became an essential technical infrastructure (see sections 4 and 5 below).

At the same time, railway technology development placed high demands for coordination on all involved partners. Different technical arrangements as well as

3 In the context of this book, the main kinds of such friction losses are those that result from location and spatial conditions and in particular the spatially differentiated development of the transport system. Geographical theory also refers to these as "resistance of space".

differing ideas of the targeted arrangement easily led to friction losses. Furthermore, expectations on transportation services were not always free of disagreement. At this point, *standardisation* comes into play. Standards serve different goals; in this context they are primarily of interest as a *means of integration,* which reduces such friction losses by pre-defining (on behalf of the institutions using the standardised products) certain parameters of a product.[4]

Standards can be clustered in different ways, for example according to their subject as well as in the way they are developed and in their binding force. Main categories used in the project were:

- technical standardisation: such as material, gauges, size,
- operational standardisation: such as timetables, road signals, licences,
- administrative standardisation: such as data processing, clearings, statistics,
- standardisation of tariffs: such as tariffs for goods or people;
- juridical standardisation: such as insurance or customer protection.

Standardisation can be either achieved via economy or via politics (see figure 2). In both cases there is the option to standardise in a non-cooperative way through competition or in a cooperative way through negotiations. In the cooperative form we differentiate between informal or formal cooperation (within an organisational framework). Formal cooperation might have a supranational, a governmental, a non-governmental/private or a mixed governmental-private juridical basis.[5]

In the railway sub-project, the "standards" discussed were very much at the soft end of the spectrum in the form of a common vision of how the railway system should be designed. In other words, the research aimed to explore not only the role of specific institutional arrangements and power relations in transport policy, but also a distinct business culture among the people working in the railway industry (including the relevant public authorities). From a "technical" point of view, this area may seem less challenging and therefore of less interest. Nevertheless, the processes and institutions which are used for discussing these issues are often the same as for the technical matters (for an overview see Ambrosius 2009). From a political and social science point of view, such "weak" standards can even be a more interesting object of study, precisely because the need for "standardisation" is less obvious, leaving more room for the parties involved to develop their position.

4 On the definition of standards see for example Swann 2000; Blind 2004

5 A more detailed definition and discussion of these terms is for example provided in Ambrosius 2013 and Ambrosius/Henrich-Franke 2013

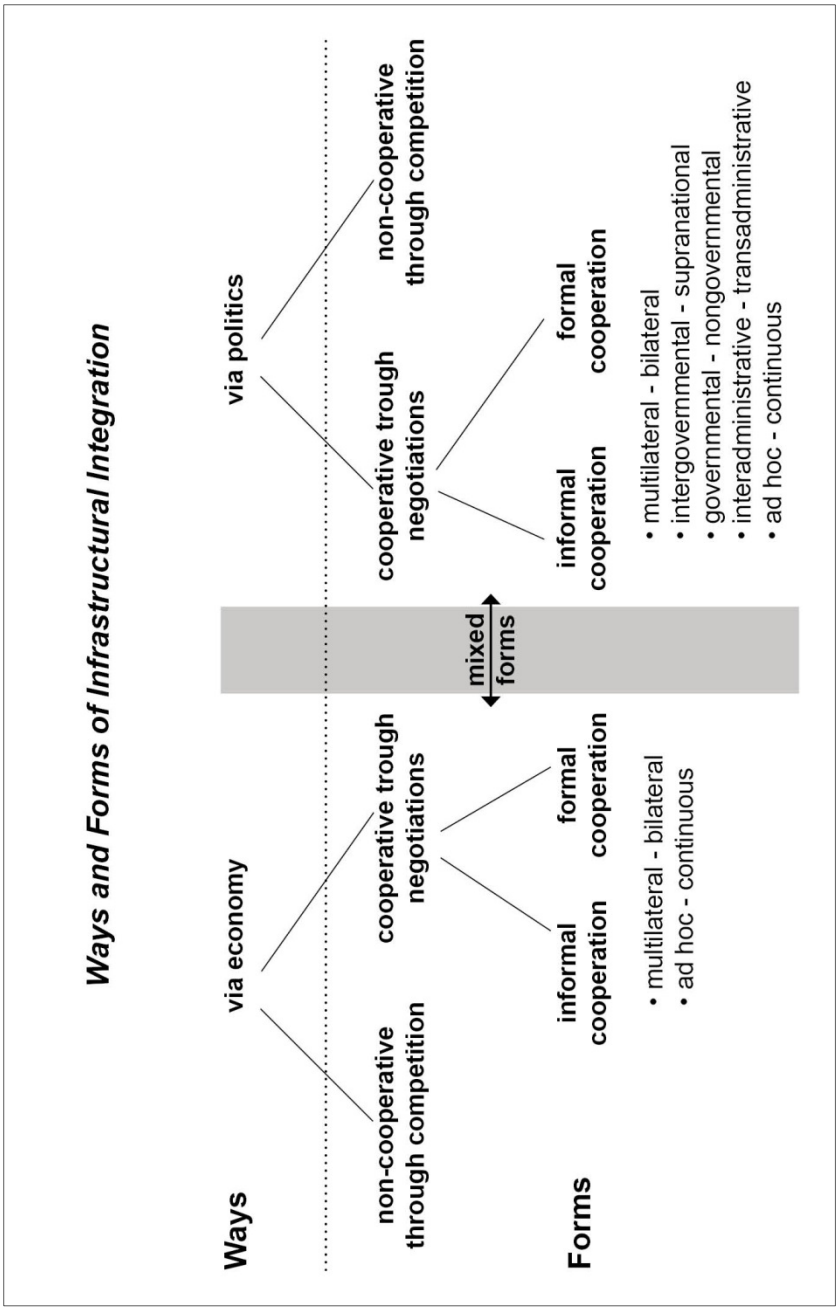

Figure 2: main ways and forms of infrastructural integration (source: Universität Siegen)

5. *The "railway age" and "automobile age" as periods of study*

The two periods (before WW I and after WW II) were common to all sub-projects. For the railway part, they are synonymous with two very different settings in terms of the industry structure, economic situation and political importance of rail transport: the "railway age" of the late 19th/early 20th century and the decades after World War II, when road transport conquered the prime position in the transport markets. The underlying hypothesis was that this difference is at least one of several factors contributing to the difficulties the railways experienced in the second period in keeping pace with, and participating in, European integration.

The railways emerged in the first half of the 19th century and soon demonstrated their superiority for many transport needs compared to all other modes of transport available at the time. With the development of networks instead of single lines, their ability to facilitate communication and integration both in passenger and freight transport became evident. The increasing use of - and dependency on - the railways shaped modern societies in many ways, a process to be repeated about 100 years later with the rise of motorised road transport.

In the late 20th century, cars and lorries had relegated the railways to a secondary role on all but few transport markets, in part by superseding it in situations where it was not competitive, but mainly by offering new possibilities for movement and land use and thus creating travel needs to which only the car could respond. The railways' position in the transport market therefore was a very different one, even though the volume of traffic they carried had not changed that much. Individual motorised transport dominated in most settings.

This is not the place to discuss in detail the many implications of these developments for transport policy or indeed society. But we think that three issues relevant for the approach to international integration can be identified that distinguish the railways before World War I from those after World War II. Differences can be found in:

- Economic, spatial and social setting: In the first period, the railway system was still expanding, and it was the dominant mode for both short and long distance, freight and passenger transport. In the second, rail felt the competition from road transport ever more intensively, losing market share and political support (see e.g. Burmeister 2001, Fremdling 2003, Frohne 1955, Gall et al. 1999). Settlement structures also changed from relatively dense, rail-based arrangements to more disperse forms of land-use, making it even more difficult for rail to compete (Heinze/Kill 1988). For freight movement, tolls and other regulations hindered cross-border exchange in both periods, but during the second they were stepwise reduced and replaced by a growing set of harmonised rules and "European" institutions.

- Railway industry structure: In the first period, the railway "network" in most European countries was actually a conglomerate of infrastructure networks owned by different public and/or private companies, the latter being more common.[6] In part, these different providers had distinct roles, but some also competed directly in the market (cf. Ziegler 1996, Klenner 2002, Fremdling 2003, Henrich-Franke 2012:95. Although the allocation of responsibilities was in reality more varied than can be discussed here (cf. Klenner 2002), the influence of public bodies on operators was usually indirect and limited. In the second period, all countries had one national carrier in public ownership. The railways therefore could become an instrument of transport and other policy objectives much more easily, although private sector activities continued in subsidiary roles (Kopper 2007; Mäger 1965, Nijkamp 1995).
- Approach to integration: In the first period, the benefits of coordination had first to be learned (also through costly parallel development of different solutions), and then implemented. Regulations and institutional arrangements had to be developed from scratch. A set of agreements, conferences and coordinating bodies evolved to develop the necessary common standards and rules as well as for operational matters like timetables and fares (cf. Allégret 1994, Anastasiadou 2005, anon. 1960). Their characteristic focus on concrete technical issues and a common pragmatic approach helped to develop a linked-up system. Despite the hostile political environment of the time, the railways thus became the main mode for long distance travel, and developed a network of international express trains across the continent. In the second period, this system was in place and had worked for some decades, although some further institutions like ECMT and Eurofima were added in the 1950s (cf. Reck 1974, Henrich-Franke 2009b, Henrich-Franke 2008).

6. The Railway as means of integration: the shrinking of spatial distances

The railways caused deep transformations of space and society through the emergence of fixed infrastructure (tracks, buildings, facilities) on the one hand, and through newly provided – more precisely: dramatically improved – travel and transport options on the other. The combination of guidance through the wheel flanges, the steel wheels' low rolling resistance on steel rails, the possibility of marshalling and operation of multiple units plus mechanical traction was in many ways superior to all other technologies available at that time. The constitution of exhaustive railway networks is closely linked to industrialisation and the

6 Exceptions are those few countries where a national network has been designed and developed by the state from the start (such as Belgium).

evolution of "modern" societies (cf. Heinze/Kill 1988, Green 2001, ch.6, Lyons 1963, Roth 2009).

Although railways were first built as individual lines in "niches" where they were particularly useful or circumstances favourable, the potential integration benefits of a comprehensive network were quickly recognised (see e.g. Heinze/Kill 1988, Cebulla 2003). The idea of Europe as a single market, as a (tourist) arena of experience as well as a space of self-realisation for the civil identity against the monarchist and aristocratic government with its political and military elites, became possible through the railways and fostered civil self-confidence on a massive scale. Even prior to the construction of the first railway lines in Germany, the vision of a civil European empire of peace was promoted using this technology. Nuremberg citizen Jakob Schnerr wrote the following poem for the inauguration of the train connection to Fürth:

> "Using rails, my friends,let's weave a web from Pole to Pole without worrying. Once Europe will feel trapped within this web, it will be for its final well-being." (Schnerr, Jakob, quoted in Glaser 1984:13)

And the German rail visionary Friedrich List predicted 1837:

> "How quick will national prejudices, national hatred and national selfishness among the cultivated peoples give room to deeper comprehension and better emotions, if individuals of different nations are linked through thousand ties of science, art, trade and industry, friendship and family relations." (Friedrich List in von Rotteck 1837:650-778)

These were eight and six years respectively before the first trans-national railway line in Europe was built from Aachen in Prussia to Liege in Belgium, predominantly financed with private capital and without state support, but filled with great expectations of the economic middle classes. From the 1850s, a hitherto regional and national rag rug of railways was developed into a European network while the great long-distance relations between metropolises mostly followed after 1860. The most famous European train *Orient Express* from Paris to Istanbul started in 1884 for example (des Cars/Caracalla 1984). In Italy, trains could use the Brenner pass line from 1867. The great alpine tunnels were built beginning with the Mont Cenis in 1871, followed by the Gotthard in 1882 (see chapter III) and Simplon in 1906. The first international sleeper trains – another precondition for a "European" network – ran in 1874. Nevertheless, these achievements in "integration" were also the subject of rivalries with governments seeking to get access to important rail routes at the expense of other countries and competition for the routing of trains and traffic flows, as demonstrated in chapter III of this book (cf. Anastasiadou 2011:243seq, Mester 1985, Stone 2003, Ziegler 1996).

With the emergence of such long-distance relations, Europe became a tourist and commercial part of citizens' (bourgeois) realm of possibilities (Dienel 2009, Sonnenberger 1985). However, this again did not lead to an enduring interest in

European integration within the politically crucial circles that went beyond concessions to the protagonists of free trade. Even though the bourgeoisie mapped out the dream of a peaceful European economic area with regards to the railways, it lacked the momentum to achieve an implementation of this idea on the political level (Dienel 2009).

The effects of the innovation "railway" have been widely described and explained in models by transport researchers and analysts (e.g. Voigt 1973; Heinze/Kill 1988, van der Vleuten 2004) as well as by social and cultural historians (e.g. Schivelbusch 1977; Behringer 1997). In a nutshell: the railway system facilitated long-distance exchange and thereby enabled communication, trade and cooperation, reducing disparities and making it an "integration instrument" par excellence.

7. The Railway as object of integration: the need for coordination in the system

At the same time, railway technology is an exceptionally challenging and complex *object* of integration. An "integrated" railway traffic, meaning its seamless flow across borders, requires the establishment of joint – or at least compatible – standards in many fields (e.g Schiefelbusch/Dienel 2010, Buiter/Anastasiadou 2010, Henrich-Franke 2012:95seq). It is not sufficient just to use the same track gauge, there have to be agreements on rolling stock, operating regulations and signalling, energy supply, documentation and clearing of services, configuration of prices and products and much more as well. Without these agreements and harmonisations, the interfaces – which do not necessarily have to coincide with national borders – will become points where travel chains break, or at least are held up. It may be necessary to change voltage, transfer cargo, change settings of on-board systems or staff, sometimes give out new tickets or even re-register freight. Often more than one of these procedures would have to be accomplished simultaneously, otherwise the journey cannot be carried out by rail.

The reasons for this situation are based in the close interlocking of infrastructure and operations, which requires a high precision in planning and operations. While other modes of transport do not have an equivalent of track gauge, railways depend on this being harmonised with hardly any margins.[7] Different velocities, crossings, stops and overtaking manoeuvres, too, are much easier to handle on roads and waterways than on rails. To cope with traffic, railway opera-

7 For development of gauges and their standardization cf. Metzeltin 1974, Puffert 1994, 2009.

tions have to be thoroughly planned and executed according to these plans as much as possible. The emergence of timetables, the harmonisation of time zones and the development of specific procedures in securing operations (regulations, signals) are therefore closely tied to the history of the railways.[8] Many of these issues were solved, but (as the following chapters show) it is useful to distinguish between the "compatible working side by side" that has often been achieved and the more comprehensive "coordinated working together", which does not always happen (Bouley 1985:779).

Further challenges arise from the overlapping of different demands on the rail network. While local and long-distance transport easily mix on the roads, and national and foreign mail is processed in the same post office, this is not readily the case with the railways: Trains stopping frequently, or travelling at low speed for other reasons, occupy a bigger part of track capacity than those passing without any stop at line speed. Resulting losses in capacity can be minimized through sophisticated timetable design, but solved only through the construction of costly sidings and loops.

That is the reason why conflicts of aims have always occurred between short and long-distance trains, as well as between passenger and freight traffic. With increasing network utilisation, the planning of these different services became more reliant on infrastructure design. This was especially the case at the end of the 19th and the beginning of the 20th century, when the railways – precisely because of their outstanding performance – turned into a "universal provider" of transport services, handling fast long-distance and long-haul freight traffic as well as local services which "stop at every corner". The railway systems' cross-border integration thus could not leave inland traffic unaffected.

With the growth of European railways' network density, the need for inter-company and trans-national timetable coordination became obvious to simplify and accelerate traffic. Numerous organisations for the technical and operational reconciliation were established, especially at the end of the 19th century, during the 1920s and a few after the Second World War.[9] Regarding timetable design, taking a central position here, notably the instrument of the "European Timetable Conference" is of major relevance. These conferences are documented for passenger traffic since 1872, since 1924 for freight, and – with gaps due to war – still take place today. During these meetings timetables are negotiated (relations, times, connections) and coordinated as much as possible; further conferences for

8 See e.g. Ambrosius 2005, chapter 5.4.1; Behringer 1997; Ebeling 1982; Gleber 2002, Berghaus 1960:233

9 For an overview cf. Jäntschi-Haucke 1991; Anastasiadou 2005, 2011; Dienel 2009; Henrich-Franke 2009b

the provision of rolling stock (equipment, type and number of wagons) are held to specify cooperation in passenger traffic.[10]

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