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THE LACK OF INTEROPERABILITY IN EUROPEAN RAILWAY SYSTEMS

A brief review of technical and political obstacles,

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Abstract

This report's purpose is to sensitize the reader to the subject of railway interoperability, and it is about the difficulties in the European railway sector. It states the incompatibilities among the countries national nets. The example of the Northern American railway transport has been used to introduce the reader to the problematic.

The reason for the decreasing impotency of the railway sector is shown giving examples of three technical and two political incompatibilities. The most important conclusion is that technical differences rises fares but are not easy to be changed because that would be very expensive. Political difficulties should be avoided because they are only bureaucracy.

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1 Introduction

The railway in Europe is an important mode of transport. However, the modal split[1] within the fright sector has been decreased over the last decade. As Figure 1 shows, the transportation work[2] for the rail sector keeps constant, whilst for the other modes it is increasing.

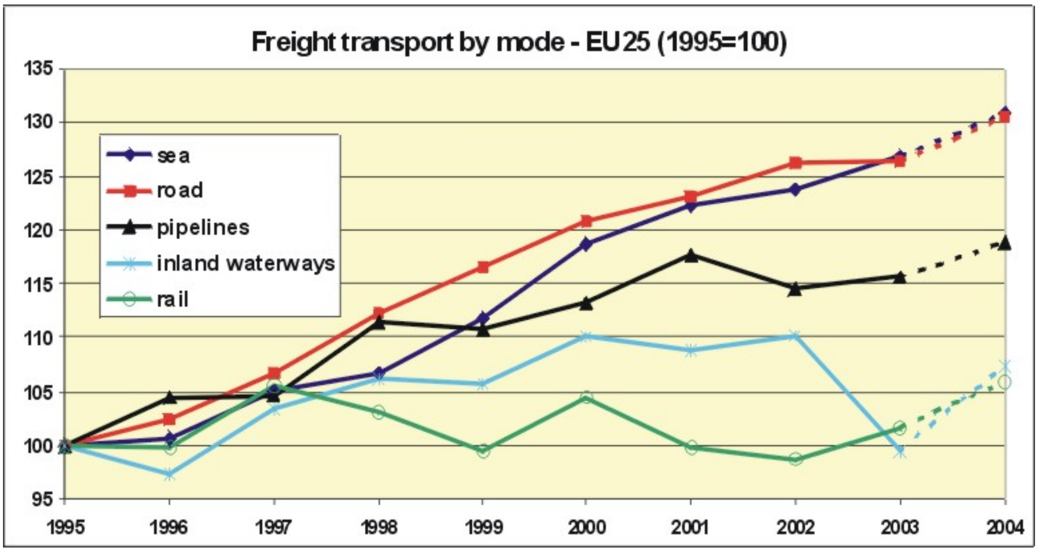

Figure 1 Modal split 1995 – 2005 [1]

Obviously transportation by rail does not meet the customer's requirements. It is too expensive, takes much time, and is often delayed. One of the reasons for this is the lack of interoperability[3] in Europe.

[1] Modal Split: Indicates the allocation of transportation work, between different modes of transport.
[2] Transportation work = distance * mass of transported goods
[3] Interoperability: ability of a system to use the parts or equipment of another system (Source: Merriam-Webster's Online Dictionary)

1.1 A Glimpse at North America

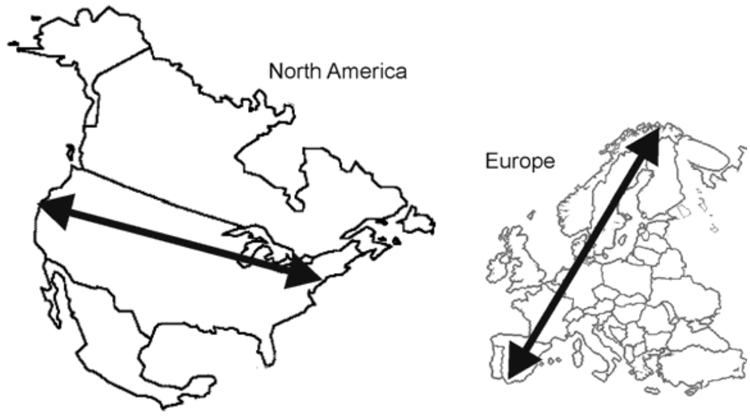

Figure 2: Shape of North America and Europe. The arrows show a distance of about 4200 km. [2]

To demonstrate the importance of interoperability, Figure 2 shows the shape of North America and Europe including their borders. In North America, fright trains are highly profitable, whereas in Europe they are in deficit.

A train from Norway to Spain has to cross several countries; it must change the engine, the staff and meet contradictory regulations in every country. Northern American trains can travel very long distances without interruption.

This report shows only a few factors influencing interoperability. The aim is to increase the reader's understanding about this mode of transport.

2 Technical Problems

2.1 Power Supply

Most of the transportation work is done by electric traction. Out of historical reasons, different countries established unlike power supply systems. Figure 3 shows a map which illustrates the situation in Europe.

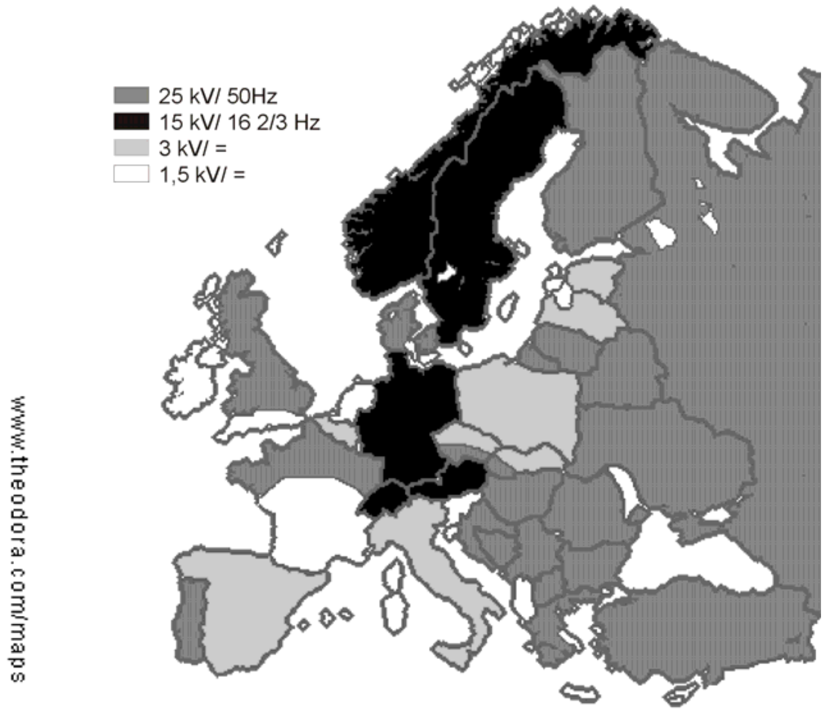

Figure 3: Different power supply systems within Europe. [2]

The problem with that incompatibility is solved by building more-system-engines. Modern semiconductor technologies allow the building of such engines with relatively affordable expenses. If travelling from one system to the other, the driver has to change the mode manually.

2.2 Automatic Train Control / Protection (ATC / ATP)

The most crucial technical difference in interoperability lies within the ATC / ATP systems, and nearly every country has its own isolated system. The goal of those systems is to deal with the driver's errors. The main task is to avoid passing signals at danger[4]. Depending on the system, more functions are installed.

Two examples will be introduced here. The German "PZB" is a very old system, and the first lines were equipped in the 1930s. Today, the system is installed at nearly all lines of the German railway network. The three information bits, the PZB can transmit, are amongst others used to indicate that a train has passed a warning signal[5] at the aspect "expect signal at stop", or a main signal[6] at the aspect "stop". The first initiates a breaking curve, that watches

[4]Signal passed at danger: describes an event where a train has run beyond its allocated line section without authority (Source: Wikipedia)
[5] Warning signal: signal that pre-indicates the aspect of the following main signal. It is necessary due to the long breaking distance (up to 3000 m) of a train.
[6] Main Signal: Indicates whether the line after the signal is clear or not.

the driver breaking the train; the other activates the emergency break. The breaking curve, once initiated, can not be reset even if the main signal aspect changes into “clear”.

The Swedish “EBICAB 700” system is very advanced. Introduced in the 1970s, it has much better possibilities to watch a train. At certain fixed points of the line, so called balises are mounted which contain information about the actual position, the allowed speed, the distance to the next signal, the allowed speed at the next signal and more. Consequently at every point of the line the train knows the allowed speed and can therefore prevent human failure. When a train approaches a signal showing “stop” and the signal switches to “clear“, the breaking curve can be reset by passing a balise updating the information.

If it comes to harmonisation, Germany claims that they have the largest railway net in Europe and thus a change over to another system would be too expensive. Likewise Sweden refuses to adopt the German system because they would be changing a modern system to a very old technique. Consequently, if an operator wants to travel on both networks, he has to equip his engine with both systems and this raises transportation costs.

2.3 Loading Gauge

Loading gage is the maximal possible size of the rolling stock[7]. It corresponds with the structure gauge that defines the minimum space to keep clear from obstacles along a track. The British railway has the smallest loading gauge in Europe. Russia has the largest. See also Figure 4.

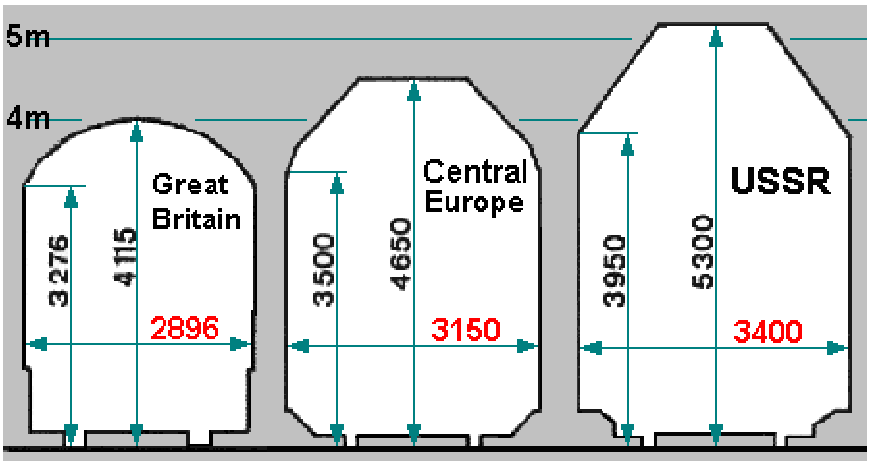

Figure 4: Different loading gauge in Europe. [3]

[7] Rolling stock: all vehicles of a railway together are called ‘the rolling stock’.

The Rolling stock that travels in the whole of Europe (generally, goods wagons) usually do that) must meet the strictest requirements, what is the British profile. If a waggon is smaller, it can carry a smaller load by equivalent costs, what increases the expenses for transportation. Today, there are special wagons for Europe-UK-traffic, and wagons for non UK traffic are of larger size. However, the diversity of wagon types raises the complexity in planning, because one has to find a UK-qualified wagon before getting a load to England.

3 Political difficulties[8]

3.1 Authorisation to access a national net as a foreign railway company

While a company may send its lorries through Europe without bureaucracy, the company must become authorised in every single country they want to run trains. This is partly due to the extremely differing systems and regulations in every country. At the same time it could also be arbitrariness. Not every country wants other train companies in their net. However, European law binds them. By making the process invisible and bureaucratic, they avoid too much competition to their own state owned railway. The authorisation process is rather straightforward, for example, in Sweden Germany and Switzerland, but very time consuming, bureaucratic and expensive in Belgium and France.

3.2 Permission for rail vehicles to access a national net

Not only the company but also the rolling stock must obtain permission from every national authority to access their railway net. Different tests and certificates must be handed in, stating that the national regulations are met. For the same reason as in the previous section, in some countries, only tests from a special institute are accepted. This institute often is identical with the main competitor, the national railway company, what gives them a good leverage to avoid opposition.

Therefore, tests have to be performed repetitively for different countries. That is very expensive and time consuming. Like in the last section, the lorry is in advantage - it needs only one national permission for the whole of Europe.

[8] See also [4]

4 Conclusions

The railway sector, especially goods traffic, has fierce competition from road transport. It has to deal with many negative factors compared with the Northern American railway, which is highly profitable. As a consequence, the railway share of modal split between the different modes is decreasing. Railway in Europe is too expensive and slow. This is due to the system's technical and political incompatibilities among different small countries in Europe.

The power supply system is different among the countries, even within some countries. If engines need to travel among those systems, they must be equipped with more than one system.

Even more problematic is the difference in "automatic train control" ATC systems. Germany with its system from the 1930s, has the largest railway net in Europe. Sweden has the most advanced system. Yet, none of them wants to change it, forcing the trains to be multi compatible.

Great Britain has the smallest loading gauge in Europe. Trains, which want to travel freely, must keep with this profile. Thus they can carry fewer loads by constant costs.

Political incompatibilities are often very time consuming and expensive. At least these costs are absolutely unacceptable since they are only due to overwhelming bureaucracy. The European Union is working on this problem, but still the railway sector is the most incompatible transport sector.

References

[1] European Commission (2005) Freight transport by mode

[2] Maps: www.theodora.com/maps (2006) Content: Florian Wieland (2006)

[3] Douglas Self (2003) Loading Gauges, www.dself.dsl.pipex.com/MUSEUM/LOCOLOCO/loadgauge/loadgauge.htm

[4] IBM Business Consulting Service (2004) Rail liberalisation Index, http://europa.eu.int/comm/transport/rail/market/doc/lib2004-en.pdf

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