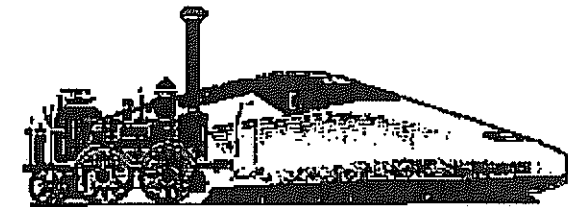




University of Žilina
CETRA
Centre for Transport Research



21st International Symposium
EURO – ŽEL 2013
"Recent Challenges for European Railways"



Symposium Proceedings

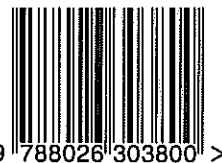
4th – 5th June 2013

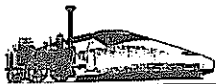


Žilina, Slovak Republic

Tribun EU

2013





EURO – ŽEL 2013

PROGRAM COMMITTEE

prof. P. Cenek, PhD., University of Žilina, SK - chairman
 assoc. prof. Ing. P. Fabián, PhD., University of Žilina, SK
 prof. Ing. K. Rástočný, PhD., University of Žilina, SK
 Ing. P. Márton, PhD., University of Žilina, SK
 prof. Ing. L. Skyva, DrSc., Academy member, University of Žilina Žilina, SK
 Dr. Ljiljor Lochman, CER Brusel, BE
 Ing. K. Višňovský, AŽD Praha, CZ
 prof. Ing. A. Janota, PhD., University of Žilina, SK
 assoc. prof. Ing. A. Dolinayová, PhD., University of Žilina, SK
 dipl. Ing. H. Laumen, Scheidt und Bachmann, DE
 prof. Dr. Ing. Dr.h.c. E. Schneider, TU Braunschweig, DE
 prof. PhD. G. Tarnai, TU Budapest, HU
 assoc. prof. Ing. J. Mikulski, PhD., Silesian University Katowice, PL
 assoc. prof. Ing. T. Molková, PhD., Univerzita Pardubice, CZ
 Ing. W. Olpinski, Instytut Kolejnictwa and ECTRI, PL
 prof. Miloš Ivić, PhD., University of Belgrade, Serbia

ORGANIZATION COMMITTEE

assoc. prof. Ing. P. Fabián, PhD., University of Žilina, SK - chairman
 Ing. P. Márton, PhD., University of Žilina, SK
 Ing. L. Krištofová, CETRA, University of Žilina, SK
 Z. Jakubcová, CETRA, University of Žilina, SK
 E. Kucharovičová, AURA, Žilina, SK

PAPERS INCLUDED IN THE PROCEEDINGS WERE REVIEWED BY

prof. Ing. L. Skyva, DrSc., University of Žilina, SK
 prof. Ing. Petr Cenek, PhD., University of Žilina, SK
 prof. Ing. K. Rástočný, PhD., University of Žilina, SK
 prof. Ing. A. Janota, PhD., University of Žilina, SK
 assoc. prof. Ing. P. Fabián, PhD., University of Žilina, SK
 assoc. prof. Ing. J. Slovák, PhD., University of Žilina, SK
 Ing. Peter Márton, PhD., University of Žilina, SK

Proceedings edited by L. Krištofová, P. Fabian, CETRA

Important note: The papers reflect only the authors' views and the University of Žilina is not liable for any use that may be made of the information contained therein.
 In some cases the original layout and formatting have been changed by the editors to suit better the format of the proceedings. The texts were checked for misspellings and grammatical errors by Microsoft® Word UK English facility and changed where considered appropriate. The editors would like to apologize in case of any unintentional misinterpretations and dependent changes.

©University of Žilina 2013
 This edition © Tribun EU, 2013

ISBN 978-80-263-0380-0



Contents

B. Abramović, D. Karalur, Z. Lacković Modelling Train Cost in HZ Cargo d.o.o.	6
R. Burdzik, J. Mikulski Analysis of Vibration Distribution in Means of Transport	14
E. Dahlhaus, J. Keilert Sorting Freight Cars with Own Power Units on Restricted Track Number and Track Length	22
P. Dorazil, T. Diringer Accuracy of ECTS Trackside Objects Measurement	29
P. Ercegovac, N. Pavlović, M. Marković, G. Stojić, I. Tanackov Effect of Perceptual – Motor Characteristics of Executive Railway Staff on Prediction of Railway Accidents	37
L. Fiala Analytic Methods of Railway Station Layout Capacity Estimation	45
H.-Ch. Graf, M. Egger, B. Rüger "Store&Go+" – Automated Luggage Store Systems Using Passenger Friendly Top Loading Containers	50
M. Halás, J. Gašparik, L. Pečený Rail Infrastructure Capacity Research as a Part of Train Paths Allocation	58
S. Hodas, L. Ižvolt Selected Operational, Environmental and Design Aspects of Building High Speed Tracks	67
P. Ihnát The Cooperation Between a Rail Freight Undertaking and the Carrier in the Context of TAF TSI	75
S. Janković, S. Mladenović, S. Vesković, S. Mitrović Cloud Databases in Railway Transport	82
K. Baudyš, V. Janoš Competitiveness of the National Rail Carrier in the Process of Market Opening for Public Passenger Rail Transport	90
I. Kempe Effective and Safety Train Detection System BUES 2000	96
Š. Klapka, L. Kárná Linear Code Composition	104
D. Krásenský Exchanging Information and Cooperation of Railways in the International Context	112
A. Lieskovský, I. Myslivec ETCS and ATO – Recent and Future Development	118
P. Márton Contribution to Efficiency Increasing of Wagon Sorting	124
J. Mašek, M. Kendra, J. Čamaj, J. Gašparik The Impact of Liberalization on Regional Passenger Transport in Slovakia	131



PASSENGER REQUIREMENTS IN LONG-DISTANCE PASSENGER TRAFFIC

Volker Benz, Bernhard Rüger¹

Summary: Within the project „Flexicoach“, in cooperation with Technische Universität Wien, Fachhochschule St. Pölten, Fachhochschule Joanneum, Siemens, netwiss and ÖBB Personenverkehr AG, passenger opinion surveys regarding their wants and needs were conducted. The aim of those surveys was to obtain information about everything a passenger requires; in order to get all information needed various subjects such as duration and frequency of journeys, activities during journey, well-being, stress factors, age, gender and group dimensions, were interrogated.

1. Introduction

Overall 3826 questionnaires were analysed. All questionnaires were conducted in summer 2012 on the Austrian Westbahn-line between Vienna and Linz. Due to the summer holidays a lower participation of students must be considered methodically. Furthermore and also due to summer vacations less rides to or from work are expected.

Approximately 50% of travellers undertake a trip lasting several days; around 10% are free time trips without an overnight-stay. Journeys in connection with education or work (rides from / to work, rides from / to education facilities, business trips either one-day or with a several day's duration) account for 25% of all journeys. The remaining 10% are to be allotted to private settlements.

Rail travellers mostly are young, approximately 12% are aged between 13 and 18 years, almost half of all interviewees are between 19 and 39 years old. 27% are part of the “40 to 60 years of age” group and around 12% are older than 60 years. The fact that children under the age of 12 are underrepresented is simply because they rarely fill in questionnaires.

54% of travellers are female, 46% are male. With the exception of people older than 60 years, in all age-groups female passengers form the majority.

Approximately one third of the passengers travel alone. Another third travels in a group of two persons. Around 11% travel in a group of three, 7% in a group of four and 12% in a group of five or more people.

The journeys were classified in journeys up to 30 minutes, 30-60 minutes, 60-90 minutes, 90-120 minutes, 2-3 hours, 3-4 hours, 4-5 hours and more than 5 hours. Most journeys (respectively 20-30%) in all age-groups last between two and three hours. With increasing age the duration of journey as well increases slightly, short-term rides mostly are done by younger people. Summing up all general information gained, elderly people take the train less frequently, but if they do, they go for longer

¹ Dr. Bernhard Rüger, Vienna University of Technology, Research Center for Railway Engineering, bernhard.rueger@tuwien.ac.at

free time rides. In opposition, younger people take the train more often, and mostly for short business trips.

The better part of all interviewees quoted “comfort” as the major reason to take the train, around 40 % of all passengers declared “environment”, “no car” and “price” as their major reasons to choose the train (see Fig. 1). “Safety” and “duration of journey” are an inferior aspect.

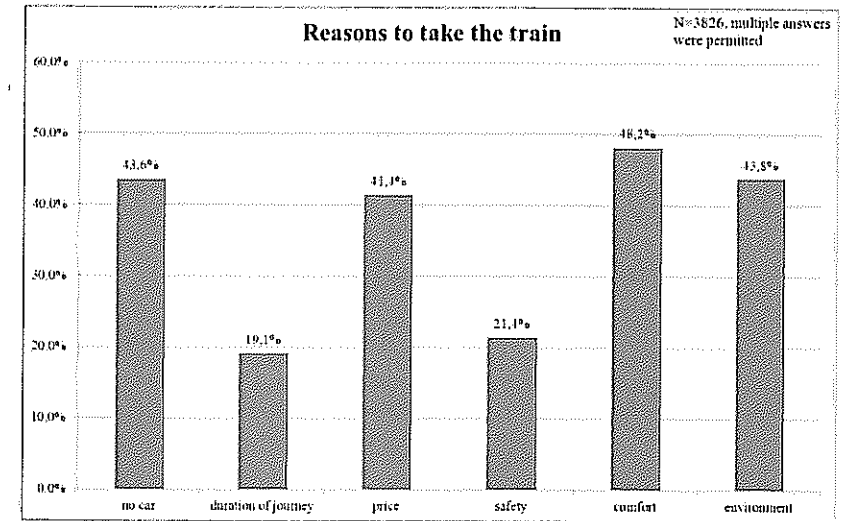


Fig. 1: Reasons to take the train

2. Baggage

Regarding baggage, most information were attained from a diploma thesis [1], which treats issues of baggage transport on an extensive data basis. Amongst other things, various pieces of luggage were weight and measured. The accumulated x-, y- and z-dimensions of all luggage measured (not included is carry-on baggage) are demonstrated in Fig. 2.

Those accumulated measurements can be used in order to design adequate storage between the seat backs or baggage racks.

Analysis show that there are two main issues regarding baggage room. First passengers do not want to lift their luggage, and especially not to the height of overhead storage. This attitude is more common amongst women and increases with age.

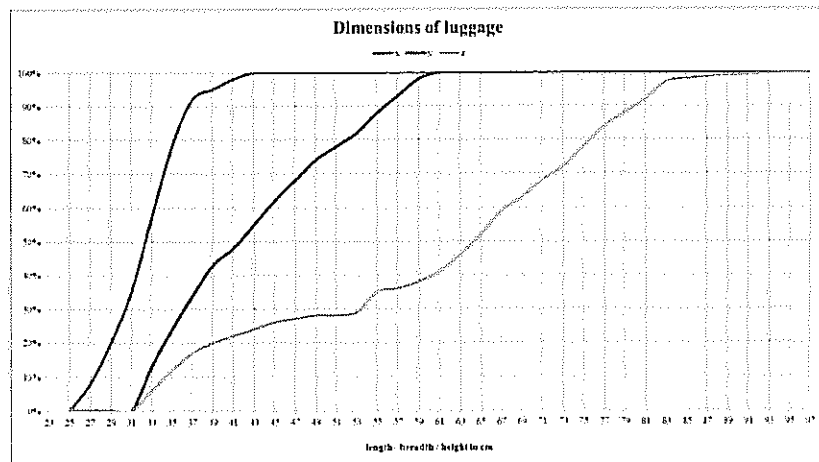


Fig. 2: Dimensions of luggage

Second and due to security reasons, passengers wish to have their luggage in visual range. If these requirements are not met, passengers are very willing to store their luggage in not-intended place, like seats or corridors. This behaviour leads to a lower quality level and to a loss in capacity due to occupied seats.

3. Actual use of journey time

A major aspect was the purpose of the journey (business trip or free time ride). Every other business traveller declares to use his laptop, smartphone or tablet while travelling, while only one quarter of travellers on a free time ride uses those devices. Fig. 3 shows the details.

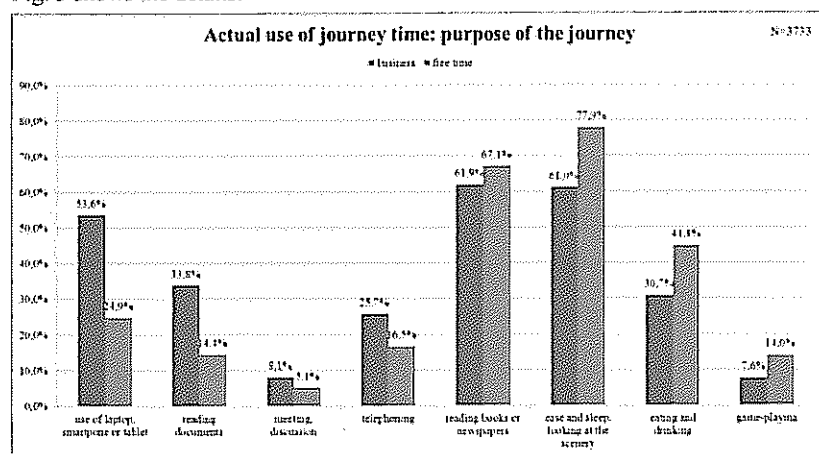


Fig. 3: Actual use of journey time - influence of the purpose of the journey

Another major aspect regarding the use of the journey time is the age of the traveller. Generally speaking there is a slight decrease regarding actually performed activities with rising age. However activities need to be considered separately, while using electronic devices decreases with increasing age, activities like "looking at the scenery" or "reading a book / the newspaper" increase with increasing age.

4. Exercises on the train

The longer the journey, the higher need to move. Around 20% of passengers travelling up to an hour wish to exercise during their journey. The percentage rises to 40% when the duration of the journey rises up to five hours or more.

5. Desired use of journey time

Analysis (Fig. 4) shows that there is a connection between the use of journey time and the purpose of the journey.

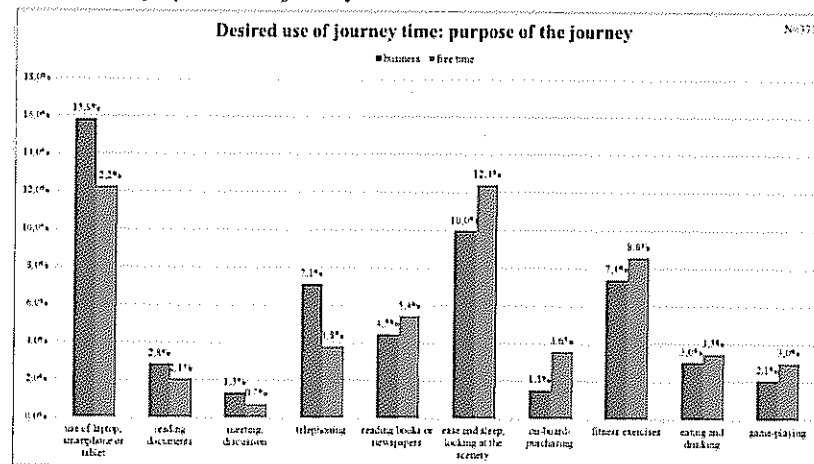


Fig. 4: Desired use of journey time: influence of the purpose of the journey

All too often (around 20% of all interviewees) passengers criticize missing mobile services. Because of several comments it is obvious that a missing WLAN-connection is intended. Together with the absences of tables (respond 12% of all interviewees), this is the biggest obstacle when it comes to using tablet, smartphones and laptops. Around 17% of all interviewees criticize uncomfortable and fixed seats as well as absent silence, which holds them from their desired activity "ease and sleep". The need to move reflects in the desire for a possibility to exercise.

The age has significant influence regarding the desired use of travel time. The younger the interviewee, the more non accomplishable activities are quoted. Anterior passengers are significantly more satisfied with the possibilities offered, respectively less frequently express a wish to use the time in another way.

In Fig. 5, every desired activity is marked in a different colour (the lowest layer indicates “using the laptop”, the second lowest “using tablet or smartphone” and so on).

Similar images with heavy age-related variation often occurred in the course of the examination, for instance regarding questions about well-being, stress factors, activities, etc.

The journey time is a major aspect when it comes to desirable use of time. The longer the journey time, the more requirements were quoted, in particular if the duration exceeds two hours.

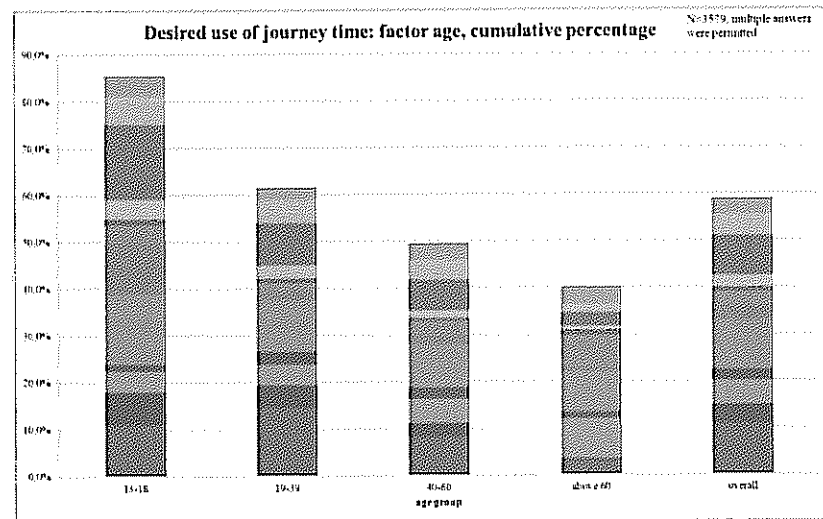


Fig. 5: Desired use of journey time: factor age, cumulative percentage

6. Well-being

Around 33% of the interviewees feel “very well” when travelling by train, about 52% feel “rather good”, 14 % feel “rather bad” and only 1 % of the passengers do not feel well during train journeys.

The assumption that those outcomes correspond with the fact that younger passengers mostly are on business trips, while anterior passengers use the train prevailing for free time trips, is unfounded. Around 50% of all train journeys are leisure time trips, lasting several days. Interviewees between 13-18 years, the group that feels most uncomfortable during train journeys, mostly goes on free time rides without an overnight stay. Thus there is no obvious connection between the purpose of the journey and the well-being.

Passengers travelling first class are feeling better than passengers travelling second class. Furthermore there is a strong connection between the well-being of the passengers and the degree of capacity. Therefore on weekdays from Monday to Thursday passengers mostly feel “rather well” or “very well”, while travellers on Fridays and weekend feel “rather bad” or “not well”. The higher degree of capacity

during weekends leads to an oftener nomination of stress factors like “high degree of capacity”, “search for seat”, “noise” and “fellow passengers”.

7. Stress factors

The stress factor most frequently nominated was “search for a seat”, around 20% of the passengers feel stressed (see Fig. 6). Also sensed as stress factors were “high degree of capacity”, “noise” and “fellow passengers”. The factors most frequently mentioned are those which appear at a high degree of capacity and obviously lead to a deterioration of the well-being.

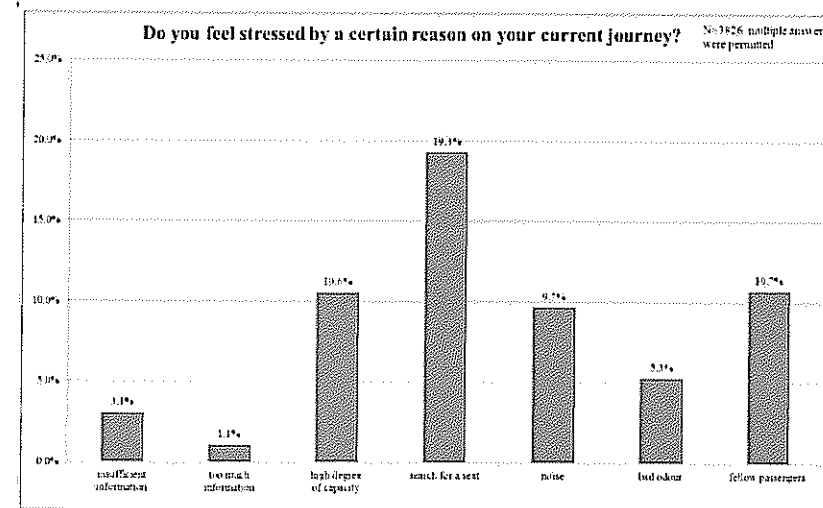


Fig. 6: Stress factors during the current journey

Analogue to the well-being, the age of the passengers is crucial when it comes to cognition of stress. Younger passenger are more stressed than anterior passengers, at least they quote it more often. With increasing age (groups from 13-18 years, till 60 years) the nomination of arising stress factors during an actual train journey decreases under 50%. Considering the most frequently quoted stress factor “search for seat”, the nominations in the age group “over 60 years” decrease even to a third of those from passengers between 13-18 years. This is a very notable fact, because precisely this stress factor was assumed to arise with increasing age, also in terms of luggage.

Generally speaking, anterior passengers are more satisfied with the frame conditions than younger ones.

8. Service features

Most frequently nominated when it comes to service features were „reasonable priced meals” (31%), “purchase of newspapers” (24%), “transmission of

knowledge" (23%), "entertainment" (20%), "possibilities to exercise" (18%), "relaxation practises" (17%). With increasing age the interest in service features heavily decreases.

With increasing journey duration, the interest in service features increases as well. Passengers on a free time ride show more interest in service features than travellers on a business trip. Around two-thirds of all respondents show interest in healthy nutrition during their train journey. This desire is more common under female passengers than under male ones.

9. Atmospheric environment

The outcomes of this particular subject won't be discussed any further. Generally speaking, the nominations made by the passengers are very subjective and do not always refer to any comprehensible objective criteria. For instance, in every sort of train the temperature was between 25 and 26 °C, nevertheless there are different sensations and evaluations regarding the temperature, which can be connected to the sort of train. The highest percentage of satisfied passengers is to be found in trains of the private operator Westbahn (over 80% satisfaction). The average registered temperature is exactly identical to the temperature registered in the Railjet-trains of ÖBB. However, Railjet was evaluated ten percentage points less than Westbahn. It is obvious that not only the temperature, but rather the general well-being or the consciousness of a deliberately taken decision to travel with a new operator (Westbahn was operating only eight months at the moment of the opinion survey) contributed to this outcome.

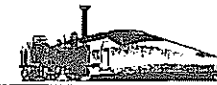
The opposite way around also Railjet was not only evaluated regarding temperature, but rather general well-being (for that matter Railjet scores rather low).

There is a similar effect notable when it comes to train categories (first or second class). Passengers travelling first class rated the atmospheric environment higher than passengers travelling second class, there was no objective difference however.

It has to be considered that subjective sensations had a great influence also on questions regarding well-being, illumination and stress factors. Advanced studies would be very helpful in order to interpret the outcomes in the right way.

References

- [1] Viktor Plank: Dimensionierung von Gepäckanlagen in Reisezügen, Wien 2008
- [2] Viktor Blank, Bernhard Rüger, "Grundlagen für eine optimierte Gepäckunterbringung in Reisezügen"; ETR - Eisenbahntechnische Rundschau (eingeladen), 07+08 2009 (2009), 07+08; S. 417 - 421.
- [3] Flexicoach, Endbericht AP2, Nutzerbedürfnisse, Wien 2013



EDUCATION IN RAILWAY ON INTERNATIONAL LEVEL - A WIN-WIN-WIN SITUATION FOR STUDENTS, UNIVERSITIES AND RAILWAYS

Bernhard Rüger¹, Georg Barta², Urs Brotschi³, Matthias Gather⁴, Frank Michelberger⁵

Summary: In winter term 2013 the new international master's degree program "European railway systems" shall be offered for the first time. The program constitutes a cooperative offer from the University of Applied Sciences Erfurt in Germany and the St. Pölten University of Applied Sciences in Austria with the involvement of the Zurich University of Applied Sciences (School of Engineering) at Winterthur in Switzerland. The idea is to offer students with a background in railway engineering a more comprehensive understanding of European and international "Railway Systems". The courses are based on the respective situation in Austria, Germany, and Switzerland, but, at the same time, a larger international perspective is integrated. The paper will present the motivation of those institutions to start cooperation like this. The challenges in the process of setting up an international program will be discussed and the specific didactic design that has been developed will be presented. Furthermore the added value for the students as well as for other players like universities and railways will be demonstrated. The conclusion will show the need of international education in railways and give an outlook on further developments.

1. Introduction

Traditionally university railway education is separated into civil engineering, mechanical engineering and transport engineering. In all three traditional studies railways have a minor priority and cover only part of the railway system. On the other hand the liberalization of the European railway market by European directives many railways were privatized during the 1990ies. This meant not only the privatization of directly transport related infrastructure and services but also the separation of other only indirectly rail related services. In Germany for example Deutsche Bundesbahn and Deutsche Reichsbahn had run their own institutions for higher education equipped with the formal sovereign right to graduate their students. These in-house universities were successively abolished in the course of privatization. Both effects support the defragmentation of railway education. Furthermore railway ran through a massive process on internationalisation in the last

¹ FH-Prof. Dr. Bernhard Rüger, Assistant Professor, St.Pölten University of Applied Sciences and Vienna University of Technology, Research Centre for Railway Engineering, bernhard.rueger@fhstp.ac.at and bernhard.rueger@tuwien.ac.at

² FH-Prof. Dipl.-Ing. Georg Barta, St.Pölten University of Applied Sciences, georg.barta@fhstp.ac.at

³ Urs Brotschi, ZHAW School of Engineering, urs.brotschizhaw.ch

⁴ Prof. Dr. Matthias Gather, Erfurt University of Applied Sciences, matthias.gather@fh-erfurt.de

⁵ Frank Michelberger, St.Pölten University of Applied Sciences, frank.michelberger@fhstp.ac.at