

A supply-demand study of practice in rail logistics higher education

[Um estudo das praticas de oferta e demanda no ensino superior de logistica ferroviária]

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Abstract

This paper includes a study conducted to analyse the current state of supply and demand for higher education in rail logistics. More specifically the study presented consists of two surveys, as follows. The first survey, Supply Survey, explores existing transport and logistics-related courses and educational programmes offered in higher education institutions. The second survey, Demand Survey, examines demands for rail logistics higher education and aims to understand the current needs for higher education in the sector. This paper shows that a spectrum of rail, freight transport and logistics related courses and programmes exist, however there is a strong need for a more specific training and education offering operations management skills needed to improve the company performance, efficiency and quality of service provided.

Key words: rail logistics, higher education, supply-demand analysis.

Resumo

Este trabalho apresenta um estudo realizado para analisar o estado atual da oferta e da demanda por ensino superior na área de logística de transporte ferroviário. Mais especificamente, o estudo apresentado consiste de duas pesquisas, como se segue. A primeira pesquisa, Pesquisa Abastecimento, explora de transporte existente e logística relacionados com cursos e programas educacionais oferecidos em instituições de ensino superior. A segunda pesquisa, de levantamento de demanda, que analisa as demandas para a educação superior e de logística ferroviária, tem como objetivo compreender as necessidades atuais para o ensino superior no setor. Este trabalho mostra que existe um amplo espectro de transporte ferroviário de mercadorias, logística e cursos relacionados e programas, mas que, no entanto, há uma forte necessidade de uma formação mais específica e de educação que possibilite a formação de competências em gestão de operações, necessárias para melhorar o desempenho da empresa, a eficiência e a qualidade do serviço prestado.

Palavras-Chave: logística ferroviaria, ensino superior, análise de oferta e demanda.

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Introduction

The freight transport industry constitutes a major enabling factor for most economic and social activities taking place in the world. Global changes and environmental issues have come into agenda. The freight transport is now seen as a green logistics concept involving green transport modes. We are witnesses of an explosive growth of freight moving around the world. Globalization and integration have contributed to significant changes in the way we have lived. New mobility patterns are observed. Population in the cities is on the increase. Modern society has been tackling negative impacts on living conditions such as congestions and pollutions. And it appears that these problems are not going to disappear any time soon.

Within the freight transport industry more efficient, reliable and environmentally-friendly freight operations are needed more than ever before if this industry is to comply with the Kyoto Protocol and other treaties, international agreements and framework conventions on climate changes and the environment.

It is believed that “Rail” will set up new “strategic, tactical and operational” concepts, policies and practice for new generation “green” freight services based on innovative logistics principles.

On the other hand, it is stated in the Freight Transport Logistics Action Plan of the European Commission (COM 2007) that today, training provided by universities and other institutions varies greatly in Europe. Efforts are required to focus and enhance the qualifications of logistics personnel, notably by strengthening competence in transport and to support lifelong learning.

It is expected that in the future, jobs related to rail logistics will require a higher level of skills and better qualifications. Learning is a natural skill but good sources to learn from are needed. One recent contribution to this global need is a multilateral curriculum development study that conducted a supply-demand analysis with the purpose of developing a portfolio of courses and modules on rail freight and logistics as an epicentre of creative thinking, emerging knowledge and deep learning that is ever growing.

This paper presents two surveys (for simplicity: Supply Survey and Demand Survey) recently conducted as part of a wider curriculum development project to analyse supply-demand patterns for rail freight and logistics higher education. Specifically this paper is organised as follows: Section 1 introduces the objectives of the study and discusses the methodology employed. Section 2 elaborates on the supply survey conducted to analyse the current state of practice with educational programmes in transport and logistics in Higher Education Institutions. Section 3 presents the demand survey conducted to examine the current needs for rail logistics higher education. It should be noted that the focus of both surveys is on freight services. Section 4 is the final section of this paper and offers conclusions and future work.

1. Objectives and Methodology

1.1 Objectives

The main objective of this study is to analyse the supply-demand patterns of rail logistics higher education and hence understand the current needs of skills and qualifications in the sector to satisfy customer requirement and provide a service of good quality that generates healthy profits and more opportunities for business in the context of rail freight and logistics.

1.2 Methodology

The methodology employed in this study is a multi-method approach that includes a combination of activities such as state of the art/practice surveys and demand analysis, development of inventory of rail, transport and logistics curricula, courses and programmes, as well as analysis of collaborations between Academia and Industry in the sector.

More specifically a questionnaire has been developed to collect information for different levels of learning and structures of higher education such as single modules, bachelor courses, master courses, PhDs as well as programmes and patterns promoting mobility of staff and students. An online platform has been used for collection of information on existing relevant programmes in Higher Education Institutions (HSIs), where European HSIs were in focus. The data collected has been processed and organised in clusters, such as curricula, programmes, institutions, etc which made it easier to read and analyse that data collected.

A second questionnaire has been developed to collect information for demands for rail logistics higher education. Rail freight and logistics companies have been approached for the purposes of this survey. The need for innovative learning and teaching methods in rail logistics higher education has also been researched.

2. Supply Survey

The objective of the Supply Survey was to analyse current educational programmes in transport and railway logistics offered in Higher Education Institutions. The survey aimed to understand if there are any gaps and issues in the existing transport and railway logistics-related educational programmes, which can be addressed by a new programme.

The Supply Survey has been conducted in two stages, as follows:

- The first stage employed the online survey platform “SuperSurvey” to collect information for existing programmes in transport and rail logistics. The questionnaire developed for the purposes of the Supply Survey was addressed to professors, lecturers and teaching assistants as well as programme managers and directors, mainly from European institutions, involved in Masters Programmes in transport and logistics.
- The second stage employed a desk-top research method to identify and analyse rail logistics education projects that could be of interest to this research. The following projects have been identified and analysed:
 - EURNEX – a rail research network of excellence contributing to a more competitive future European rail system via research and education activities organised in scientific poles;
 - TUNRAIL is a policy oriented measures project intended to “tune” and intensify the railway higher education knowledge exchange and collaboration between the EU and the US;
 - FUTURAIL an EU project contributing to the enhancement of the railway sector by fostering a better match between the human resources needs to make railways a more competitive and innovative sector and the offer of skills

coming out of the different research based education and training institutions across Europe;

- SKILLRAIL an EU project designing a sustainable framework, EURAIL “European University of Railway”, for creation, dissemination and transfer of knowledge within the railway sector.

The information obtained from both the questionnaire – “Supply Survey - *Stage one*” and the desk-top research – “Supply Survey – *Stage two*” has been compiled and analysed. A total of 45 transport logistics-focused courses for Masters offered by HEIs have been identified, 33 out of which are for Masters (Table 1). The sample for this analysis consists of 15 European HEIs and 3 non-European HEIs from Australia, India and USA.

Table 1 – Courses offered by Higher Education Institutions participated in Supply Survey¹

Name of country	Total number of courses analysed	MSc	BSc + MSc	Other course
European countries				
Austria	4	3	1	
Bulgaria	1	1		
Denmark	1	1		
France	1	1		
Germany	9	9		
Greece	1		1	
Italy	1	1		
Netherlands	2	2		
Poland	2	2		
Portugal	5	1	4	
Romania	3	3		
Spain	6	2		4
Switzerland	1	1		
United Kingdom	4	3		1
Ukraine	1	1		
Other (non-European) countries				
Australia	1			1
India	1	1		
USA	1	1		
Total	45	33	6	6

¹ Source: Rizzetto (2011).

For the purposes of the supply survey (*Stage one*) the questionnaire developed has been organized along key-words such as: Transport Engineering, Railway Engineering, Civil Engineering, Freight Transport, Logistics, Economics, etc. The participants in the survey were asked to choose one or more key-words from the list, and/or add new key-words if necessary, to best describe the relevant courses and programmes offered in their institutions. Figure 1 shows courses identified as described freight transport and logistics related keywords.

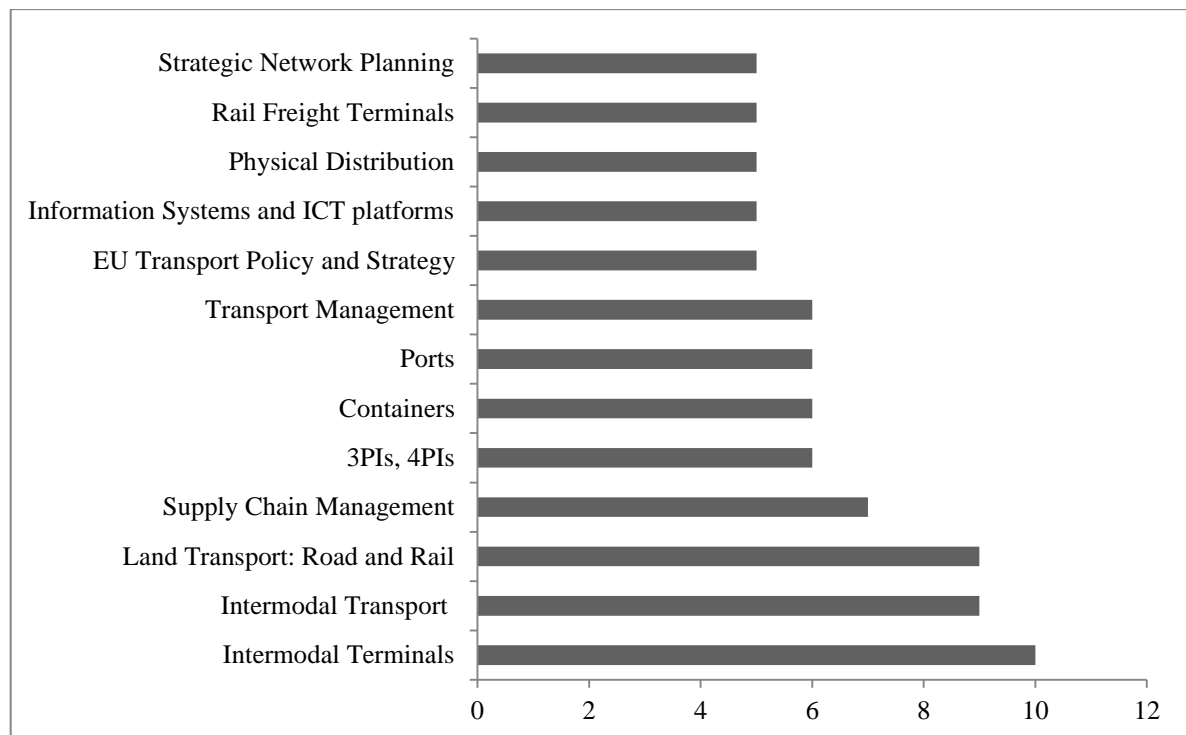


Figure 1 - Courses as described by Freight Transport and Logistics-related” Key-words²

It should be noted that the three most popular key-words describing freight transport and logistics courses, as understood by the participants in this survey were: intermodal terminals, intermodal transport and land transport: *road and railway*.

The Supply Survey conducted allowed to understand educational patterns and structures of curricula in the universities of the participants. As a result of it a list of compulsory and optional courses has been developed. Compulsory and optional courses identified were grouped into 11 subject areas, as follows: Transport Engineering, Railway Engineering, Civil Engineering, Freight Transport and Logistics, Economics, Mechanical Engineering,

² Source: Rizzetto (2011).

Environmental Engineering, Information and Communication Technology, Mathematical and Statistical Methods and Tools, Human Factors and Sociology, and Interdisciplinary Subjects.

Table 2 - List of Compulsory and Optional Courses currently offered (as per survey sample)³

Status	Courses offered in transport programmes	Courses identified for a new master programme in rail freight and logistics
Compulsory	Analysis and simulation of transport and City logistics	Analysis and simulation of transport and logistics
	Combined transport	Intermodal terminals
	Design and management of logistics chains	Intermodal transport
	Dispatching	Dispatching
	Freight transport and commuter traffic	
	Freight transport and logistics	Freight transport and logistics
	Freight transport on rail	
	Fundamentals of logistics	
	Introduction to supply chain	Supply chain management
	Logistics and freight transportation	
	Logistics management and planning	Transport operations research
	Logistics of traffic flow	
	Logistics strategies	
	Supply and distribution logistics	Supply and distribution logistics
	Transport expeditionary activity	Transport expeditionary activity
	Waste logistics	Waste logistics
Optional	Analyzing and designing logistics and supply chain games	
	Combined transport and multimodal transport	
	Container and package transportations	
	Design and management of business logistics processes	
	Freight optimization	
	Intermodal networks and transport systems	
	Introduction to research in logistics	
	Logistical transport systems of industrial enterprises	
	Logistics technology	
	Multimodal access and layout of transport terminals	
	Network and fleet management	
	Optimization techniques in logistics	
	Packaging	
	Quality in logistic services	
	Simulation of logistic systems	
	Storage and maintenance	
	Supply chain engineering and management	

³ Source: Rizzetto (2011).

Based on the list developed compulsory and optional courses for a new master programme in rail freight and logistics have been identified. Table 2 shows compulsory and optional courses for a new master programme in rail freight and logistics against all freight transport and logistics related courses identified.

The selection of course for a new master programme in rail freight and logistics, as presented in Table 2, was generally based on the frequency of their appearance in the programmes being studied.

The Supply Survey also examined whether the participating institutions in the survey:

- 1) cooperate with railway and logistics sectors;
- 2) conduct railway and logistics related research;
- 3) participate in any students' interchange programmes.

The results are presented in Table 3 showing that more HEIs cooperate with railway companies (about 80%) than with logistics companies (about 53%). On the other hand a great majority of the participating institutions in the Supply Survey, about 87% of the respondents stated that they conduct railway and logistics-related research and also provide opportunities for student and staff exchange, which suggests high levels of mobility in transport and logistics higher education.

Table 3 – Activities conducted by sample institutions [%]⁴

Issue	Yes	No
Cooperation with railway sector	80	20
Cooperation with logistics sector	53	47
Railway and logistics related research	87	13
Participation in students' interchange programmes	87	13

⁴ Source: Rizzetto (2011).

3. Demand Survey

The objectives of the Demand Survey were to analyse demands for rail freight and logistics higher education based on the opinions of representatives from the transport logistics sector.

More specifically the aim was:

1. to collect information about demands for experts in rail freight and logistics;
2. to analyze all expectations for staff training;
3. to assess requirements for modern rail and logistics higher education.

The Demand Survey used the online platform SuperSurvey as well. The questionnaire designed was addressed at inviting senior management of rail, transport, logistics companies to participate in the survey. 39 companies representing 17 countries responded to the call. Table 4 shows number of companies per country who participated in the survey.

Table 4 – Number of Companies from Different Countries represented in Demand Survey⁵

Country	Number of companies per country
Austria	2
Belgium	1
Bulgaria	5
Estonia	1
Finland	1
Italy	2
Latvia	1
Lithuania	1
Netherlands	4
Portugal	1
Russia	1
Slovenia	1
Spain	4
Sweden	1
Switzerland	3
United Kingdom	7
Ukraine	2
Total	38

⁵ Source: Todorova et al. (2011).

The respondents to the survey are mainly from consultancies, international transport companies and transport departments at universities. The ratios between large-medium-small enterprises are as follows:

- Large enterprises - 36%;
- Medium-sized enterprises - 26%;
- Small-sized enterprises - 20%;
- Micro-sized enterprises - 18%.

It should be noted that 85% of the companies that took part in the survey operate in the European Union, where 64% of the respondents being on senior management positions in their companies and 13% of the respondents being operations managers and/or executives.

The results from Demand Survey showed that rail logistics-focused companies prefer to employ staff with at least a BSc degree in planning and management positions. It has been revealed that 93% of employees in “information systems in railway and logistics” hold a BSc or an MSc degree.

68% of the companies that participated in the survey conduct regular training for their staff (Table 5).

Over 50% of the respondents think, however, that the current educational courses offered in rail freight and logistics in HEIs are inadequate.

It has been found that great majority of the companies, about 83%, already collaborate with higher education institutions and nearly all agree that rail freight and logistics experts should be involved in rail higher education and training. This finding confirmed the fact that universities do collaborate with industry as revealed in Supply Survey as well.

Over 60% of the companies agreed that the key areas, as shown in Table 5, where performance could be improved via staff training are:

- management of internal logistic processes;
- technology and management of rail freight;
- information systems in railway and logistics and supply chain management.

Table 5 - Demand Survey Questionnaire: *selected questions and answers* [all figures in %]⁶

Question asked	Yes	No	Don't know
Do you conduct training for your staff on a regular basis?	68	29	3
Are the current courses in rail freight and logistics addressing the current industry needs?	21	52	27
Is MSc programme in rail freight and logistics needed?	66	31	3
Would it be of interest to involve rail freight practitioners and logisticians in rail higher education and training?	97	3	0
If you are a rail-focused organisation, does your organisation collaborate with institutions providing higher education?	83	13	4
Is additional staff training needed to improve competence and increase the level of performance in:	Yes	No	Partially
Procurement	20	65	15
Purchasing	10	50	40
Inventory	5	74	21
Management of internal logistic processes	43	40	17
Technology and management of rail freight	42	29	29
Finance and commercial operations	29	33	38
Distribution (physical distribution)	9	43	48
Information systems in railway and logistics	40	28	32
Warehousing	32	47	21
Supply chain management	35	30	35
Managing loading and unloading activities	19	48	33
An MSc in rail freight and logistics should be mostly inclined towards:	Yes	Maybe	No
Railway engineering	45	45	20
Railway management operations	82	18	0
Rail policy	52	35	13
Rail infrastructure	50	44	6
Rail safety and security	58	32	10
Intermodal transport	81	16	3
Transport engineering	39	45	16
Civil engineering	11	50	39
Logistics	88	9	3
Economics and finance	50	41	9
Other	3	0	97

⁶ Source: Todorova et al. (2011).

Regarding staff training needs about 66% of the respondents agreed that MSc programme in rail freight and logistics is needed, where the three most needed courses within such an MSc have been identified to be:

- railway management operations (82%);
- intermodal transport (81%);
- logistics (88%).

When investigating most appropriate forms and duration of rail freight and logistics education for employees the companies have not shown single preference. Table 6 shows that opinions are split between evening (12%), part-time (18%), full-time (15% - 4 semesters, 6% - 3 semesters), distance learning (12%) and block learning (12%).

The most effective collaboration between companies and HEIs is experienced where providing guest speakers from industry to deliver university lectures (80%), but also offering scholarships (57%) and working closely with student career services (58%). Next, it has been revealed that a relatively small number of companies cooperate in research projects (19%) and or fund university research (4%).

Based on the results obtained within Demand Survey, 40% of the companies are planning to employ graduates trained for freight and logistics sector in the next year and 75% in the next 5 years (i.e. by 2016).

The expectations from the respondents are to prepare and deliver courses covering the whole spectrum of rail and logistics-associated activities including management, finance, training, personnel and IT. Moreover, the emphasis should be put on commercial, operational and managerial aspects, which is expected to have a positive impact on the rail logistics performance and productivity. It is also advised that the universities use all expertise available to offer short courses of specific nature to encourage lifelong learning amongst rail logistics employees.

Table 6 Preferred Forms of Rail Freight and Logistics Higher Education⁷

Considering the specificity of your business the MSc programme in rail freight and logistics would employ:	%
Evening courses	12
Part time	17
Full time (4 semesters)	15
Full time (3 semesters)	6
Distance learning	12
Linear learning	0
Block learning	12
Modulate (a combination of linear and block learning)	26
Other	0
What type of education is appropriate for your enterprise?	%
Vocational courses	6
BSc programs	15
MSc programs	29
Postgraduate courses	35
Other	15
Please specify what collaboration your organisation is experiencing with higher education institutions:	%
Providing guest lectures	80
Cooperating in research projects	19
Funding research	4
Funding educational programmes (e.g. student clubs,	20
Funding faculty or staff positions	10
Providing endowments	46
Offering scholarships	57
Working with career centres and attending job fairs	58
Organising university events to promote railways	24
Other ways to increase on-campus visibility	40

Conclusion

Both surveys conducted for the purposes of this research provided useful information about the current practice of supply and demand for rail freight and logistics higher education. The HEIs involved in this research have shown that a spectrum of rail, freight transport and logistics related courses and programmes exist, where collaborations with rail logistics-focused companies are present.

⁷ Source: Todorova et al. (2011).

The companies that participated in this research, however, have recognised a strong need for a more specific staff training that offers and promotes operations management skills expected to impact positively the company performance.

Future work will be based on analysing the information obtained within this research and will include the development of a new masters' programme in rail freight and logistics employing an innovative multidisciplinary approach promoting mobility of staff and students. The programme will also be equipped with curriculum modelling tools, facilitating its management on a day-to-day basis.

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