Olli-Pekka Hilmola (eds.)

Third Research Meeting Held at Kouvola - Value Adding Role of Logistics in Northern Europe

LAPPEENRANNAN TEKNILLINEN YLIOPISTO
LAPPEENRANTA UNIVERSITY OF TECHNOLOGY

TEKNISTALOUDELLINEN TIEDEKUNTA
TUOTANTOTALOUDEN OSASTO

FACULTY OF TECHNOLOGY MANAGEMENT
DEPARTMENT OF INDUSTRIAL MANAGEMENT

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RESEARCH REPORT

Foreword

In everywhere former transportation and freight forwarding companies are seeking for value added services. This is mostly due to deregulation effects in global transportation system – increasing competition in air, sea, road and rail sectors is a fact everywhere (and leads into prosperity, declining transportation prices and low profits of transportation). For example, one Swedish transportation company ended up producing tires for automotive manufacturing, since the assembly process of rim and tire together was simple enough, and offered proper profit margins. Nearly five years ago colleagues of mine in Singapore argued that logistics service companies are increasingly taking responsibility of product returns (reverse logistics) of their customers, and this service covered in number of cases whole set of process phases (e.g. regional distribution center, service centers and field service centers).

Selected research papers in this research report are showing increasing importance of value added services in especially transit logistics between EU and Russia (and other eastern countries). Interestingly Tapaninen et al. as well as Jumpponen & Märkälä both conclude that total cost of transportation via Finland to Russia are possibly higher than in other routes, but value added services and predictability as well as safety of an environment makes it competitive and sustaining route of eastern transit. This observation holds significance especially among expensive consumer items for years to come. However, as constraints for further enlargement of this route are identified, e.g. un-competitiveness of railways through European/Asian corridor after year 2006, and of lack of railway wagons. Hämäläinen analyzes container traffic through Kouvola-Moscow-Asian ports of Russia, and concludes based on second hand information and survey results that transports in this corridor have hardly improved from year 2006 collapse. As both Ivanova and Toikka show in their research works, that simple transportation platforms of railways face increasing demand in forthcoming years in Russia as well as in Ukraine – this is mostly due to the investment focus on raw material transportation via rails in recent years (which has been completed by private market actors) as well as lack of overall investments during 90's. Further development of functionality of railways and sea ports is major topic in Rybin & Fomenko research work, while Bessolitsyn as well as Odintasov et al. highlight the importance of increasing value added in railway transportation and logistics university level education. Maintenance management of cross-border of traffic high speed trains is introduced by Romanov, and Korovyakovsky clarifies issues related to oversized cargo fastening and placement (railway context). Interesting Latvian point of view is provided by Kabashkin, and concrete logistics

park establishments are on their way in rather large-scale manner in that country (to serve local, but increasingly transit cargo). More general, as well as larger context logistics/supply chain issues are dealt in the rest of the research papers; Lorentz et al. introduce manufacturing location selection problem solving methodology, Nazarko et al. discuss about trust in supply chain relationships and Szoltyzek concentrates on issues of city logistics. In the last research paper of this book Szekely et al. introduce development of liberalization of railway market in four selected countries.

As final words, I would like to express our gratitude for the city of Kouvola giving us an opportunity to arrange this third international research meeting concurrently with the annual Innorail Seminar. I also would like to use this opportunity to welcome you all in Kouvola, Finland to facilitate the exchange of knowledge, enjoy good presentations as well as building networks among researchers in this important topic area.

In Skövde, Sweden May 2007,

Olli-Pekka Hilmola
Prof. (act.), Docent, PhD

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Business Expectations and Bottlenecks of Finnish-Russian Transport

Ulla Tapaninen[1], Tommi Inkinen[2], Pentti Ruutikainen[1]

[1]*University of Turku, Centre for Maritime Studies*
[2]*University of Helsinki, Department of Geography*

Abstract

When Soviet Union collapsed in the beginning of the 1990s Russia lost most of its ports on the Baltic Sea. The "Finnish route" to Russian markets is widely used in Asian-Russian transports. In this paper we will take an insight to the business expectations and views on the current bottlenecks and future prospects of the Finnish-Russian transportation. Our data is based on face-to-face interviews with 28 companies. The interviewed persons are managers and executives responsible for Russian transports. The paper is organized as follows. First, we will provide review of Russian trade analysis and transportation systems. Second we will present the results of interviews of several companies with business in Russian traffic. Third, we will analyse the results and make some conclusions how Finland should see the challenges and opportunities of Russian transit in future. Finally future research priorities are identified. In conclusion, Finland route is likely to remain a transit route for high quality products. Finnish advantage is based on add-on services, reliability, safety, security, two-way traffic on shipping, competitive infrastructure and know-how in logistics.

Keywords: transit traffic, transportation, transportation modes, Finland, Russia

1. Introduction

The trade between Russia and European Union has increased steadily during last years. The growth is expected to continue in the near future. European Union has made a strategic decision to target freight transportation to some selected key routes, commonly called as "corridors" (see Albrechts & Coppens, 2003; de Vries & Priemus, 2003). These corridors together form the Trans-European Network including all modes of transportation. Before 1990s Soviet Union had an extensive port infrastructure by the Baltic Sea. When Soviet Union collapsed in the beginning of the 1990s Russia lost most of them.

Today, the "Finnish route" to Russian markets is widely used due to the high standard of the Finnish safety and transport infrastructure that is combined with reasonably high costs. Therefore, mainly high quality products are transported via the Finnish route, including e.g., electronics and passenger vehicles (Ministry of transport and communications, 2005). The transportation of cars grows every year tens of percents, creating a heavy load on the road infrastructure (see e.g. Statistics of Finnish Customs, 2006)

In this paper we will take an insight to the business expectations and views on the current bottle-necks and future prospects of the Finnish-Russian transportation. Our data is

based on face-to-face interviews with 28 companies. The interviewed persons are managers and executives responsible for Russian transports. First, we will provide review of Russian trade analysis and transportation systems. Second we will present the results of interviews of several companies with business in Russian traffic. Third, we will analyse the results and make some conclusions how Finland should see the challenges and opportunities of Russian transit in future. Finally future research priorities are identified. This study has been partly financed by European Union, South-Eastern Finland - Russia neighbourhood programme.

2. Russian trade and traffic developments

Finnish route is a part of the EU-corridor 9. Finnish route is connected to the central Europe via the Baltic Sea. Finland is an interesting case to analyse EU-Russian freight flows. There are several reasons. First, Finland has the longest land boarder with Russia in the European Union and substantial amount of Russian road transit goes through Finland. Second, Finland has higher infrastructure costs (salaries, rents and port costs) than other countries with Russian border (e.g. Baltic States, Poland and Belorussia). However, Finland has managed to keep its competitiveness and it has become one of the main routes to Russia, when high value goods are in question. Third, for many of these high value goods (e.g. high tech from South-East Asia) Finland is nor the shortest neither cheapest route, but goods are transported first from Japan and South-Korea to Finland to be warehoused and then further transported to the metropolitan areas of St. Petersburg and Moscow making hundreds of kilometres extra journey.

Logistical overall expenses have been over 10% of the turn over of Finnish industries and commerce (Ministry of transport and communications, 2006). This equals a sum over 20 billion euros. These costs can be cut down by enhancing the processes in a logistical chain. The measurement of logistic costs is not a straightforward process. Various actors operating on the field use different measures and include different costs. Currently, the logistical guidance is fundamentally driven by private sector such as industries, commerce and construction organisations. Outsourcing practices expand the scope of logistics to various fields such as ICT, handling and transportation. Commonly, it is a necessity to evaluate the logistical chain from the producer to end customer.

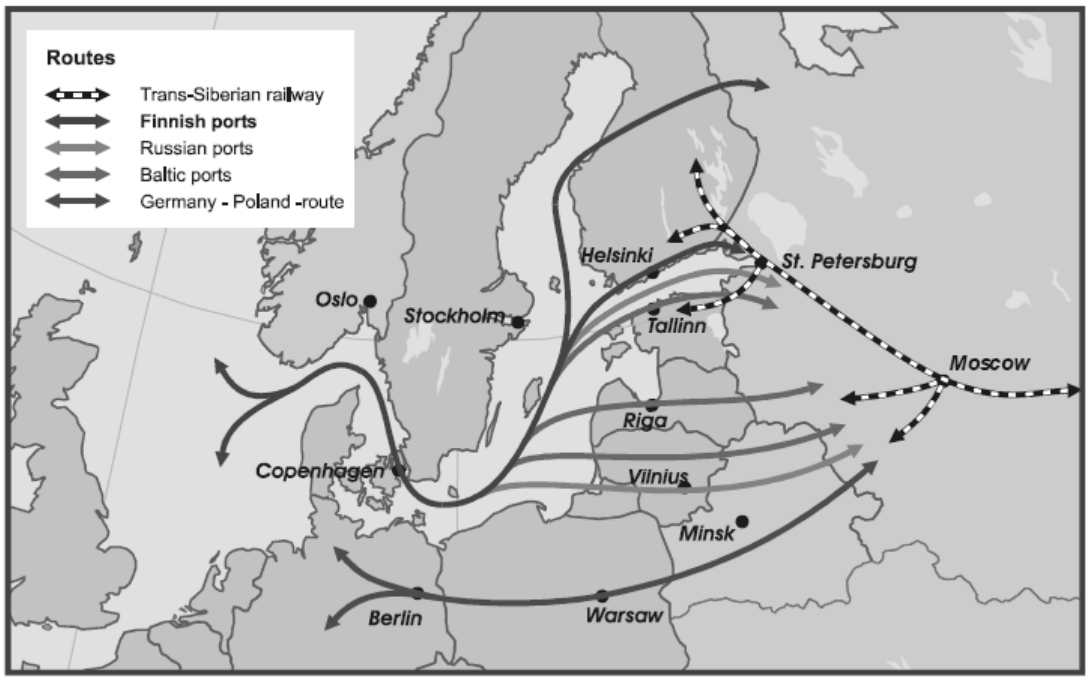

Figure 1. Main transit routes to Russia. Source: Ministry of Transport and Communication 2005: 98.

The Russian transit traffic is an everyday issue and very visible reality during the November-December periods each year. The heavy loaded truck queues are long in boarder areas (maximum lengths up till 60 kilometres) creating serious safety and environmental problems. On the other hand, this traffic brings needed volumes for Finnish ports and logistics companies creating jobs and tax income (see Ollus & Simola, 2006). There are strong arguments placed to either stop this traffic totally or invest heavily on it.

The current increase in Russian economy is also reflected to local consumer markets. The demand for high-quality products (for example cars) is increasing rapidly. A majority of the Russian car imports are transited through Finland. The continuous increase in transit flows has caused bottle-necks, particularly in road transit. For example, Kilpeläinen & Lintunen (2005) have discussed the viability of the Finnish transit route to Russia. They have analysed the role of free-zones and their possibilities to enhance the economic activity in the SE-Finland. They argue:

"It is suggested above that a free zone covering the South Eastern part of Finland could bring potential benefits to the national economy of Finland. In this context, it is impossible to estimate the potential costs and benefits involved. It is assumed that with proper co-ordination of activities on both sides of the Russian border profitable business activities can be enhanced." (Kilpeläinen & Lintunen, 2005: 77).

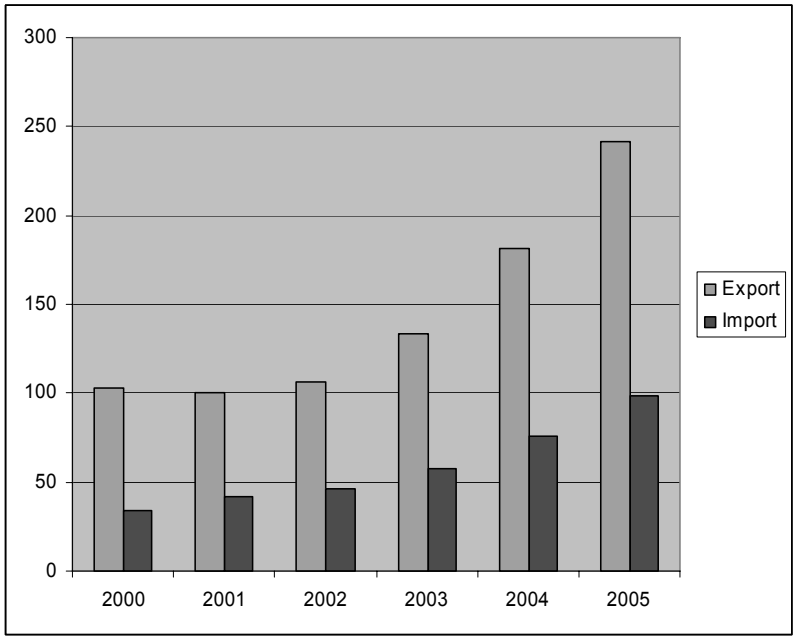

Figure 2. The development of imports and exports in Russia (USD) 2000–2005.

Along with road traffic, the Baltic Sea has experienced a rapid growth in transportation. The ports used in Russian international trade are located on shores of Sea of Japan, Black Sea, Barents Sea and Baltic Sea. The ports located in Gulf of Finland are St. Petersburg, Vysotsk, Vyborg, Primorsk and Ust Luga. Vysotsk and Primorsk are mainly oil product ports where as Vyborg and Ust Luga are import and export nodes for bulk.

The development and creation of new port locations in Russia is directed by the Russian transport strategy that was enforced in 2004. The strategy stresses the importance that the majority of the sea exports should be routed through Russian own ports. In 2003 the market share of Russian ports of their exports was 75%. The target goal of the strategy is 90% (www.mintrans.ru). The total amount of transport taking place through ports of the Baltic Sea has increased over 120 million tons in 2005. The corresponding figure for 1995 was only 18.7 million tons. The annual growth has been more than 20% each year. Also the general trade between European Union and Russia has increased rapidly during the early years of 2000. Figure 2 shows the overall development of Russian exports and imports 2000–2005.

Kovács and Spens (2006) have analysed the relationship between transportation infrastructure and regional growth in Baltic States. They (2006: 430) argue that the occurring developments "point to a decrease of Russian transit traffic to Baltics". This notion has a particular interest to Finnish case, because we are analysing the view of transportation and logistic firms on Finnish-Russia transportation. The bilateral trade between Finland and

Russia has steadily increased during the ten year period of 1996 to 2006. The total amount of exports from Finland has tripled and the total amount of imports to Finland doubled. The transit flow from other countries to Finland and then to Russia started in the 1970s. The first flows were transportations from European markets to Japan and vice versa. Ollus & Simola (2006: 5) state the importance and difficulties in Russian transit traffic:

"Transit transport through Finland to Russia is another large and growing area of Finnish-Russian economic relations. According to our calculations, already a quarter of total Russian imports are transported through Finnish territory. Finland has so far been competitive as a transit hub for value goods, especially to Northwestern Russia, as the Finnish corridor is reliable, safe, and effective. However, as Russia's own infrastructure as well as that of other competing countries improves, further development of the transit transport infrastructure is needed to maintain the current position. In contrast to imports, Russian exports through Finnish territory are small, accounting for only about 4% of total. The impact of the Russian transit traffic on Finland is twofold: on the negative side, it erodes Finnish transport infrastructure, but on the positive side, it employs about 4,000 Finnish people."

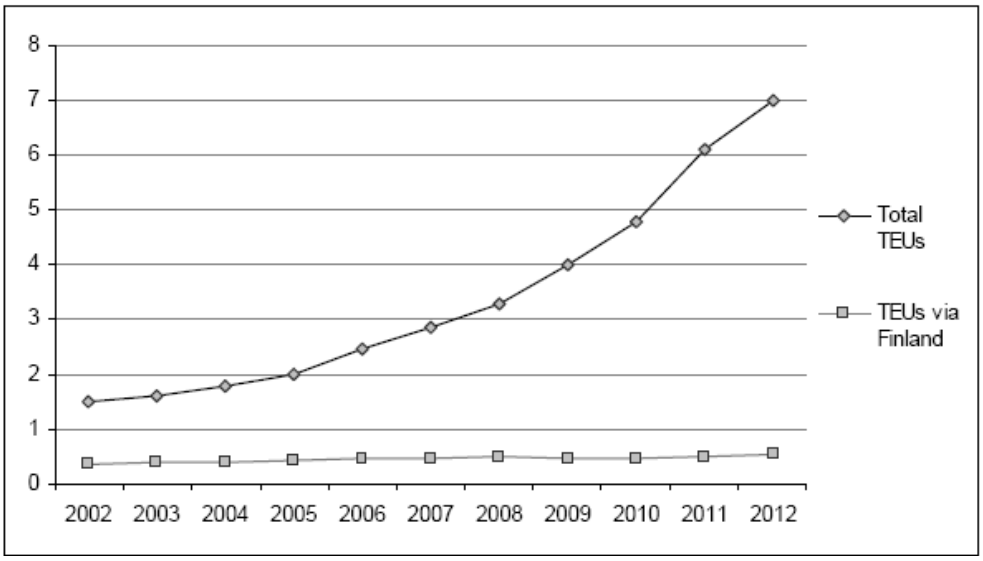

Figure 3. Forecast of the Russian-related Container Traffic in 2002–2012. Source: Pekkarinen (2005: 42)

The expected growth has been discussed e.g. by Pekkarinen, who uses Kilpeläinen's (2004) work to demonstrate the container traffic growth (Figure 3). The figure shows that the overall container growth is estimated to be substantial. However, the Finnish share of TEUs is expected to increase only slightly. Pekkarinen (2005: 42) estimates that the relative growth from 2002 to 2012 is approximately 50%. The scale used in Figure 1 is not appropriate to demonstrate the small growth compared to the overall growth of 1500%.

Based on the presented figures it seems evident that Russian transit and trade is going to expand extensively during the coming years ahead. In the following we will present the key results from the interviews of the selected companies in order to learn how and to what extend they are prepared themselves to this change. In addition we discuss the current bottle-necks and problems experienced by the companies in their business efforts.

3. Interviews

We interviewed 28 persons responsible for Russian transit traffic during 2006. We will analyse the operability and operations related to Finnish-Russian logistics. Thus, the analysis is made with targeted sample group of key firms handling the physical product distribution. Table 1 shows the key figures of our interviewed companies.

Table 1. Key figures of interviewed companies.

Branch	N	Turnover	Employees	% working in Asian transports	N of organisations in Russia
Forwarding and freightage	8	5 - 394 mill. € (1.	8 - 1700	10-98%	6
Transportation services for road transport	1	2,0 mill. €	5	1	1
Transportation services for rail transport	3	2 - 333 mill. €	4 - 200	10-100%	0
Maritime and shipping	3	170 - 747 mill. €	10 - 110	10-50%	2
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Cargo handling	3	1,0 - 4,9 mill. €	8 - 43	1	1
Port operations	2	10,0 - 18,4 mill. €	37 - 67	0,3	0
Public administration	2	Unknown	31 - 76	52-80 %	
Other	1	10 mill. €	1	1	

(1. Two unknown

(2. Consolidated corporation turnover

Table 1 shows that our data includes both small and large sized companies in terms of employees and turnover. The data has limitations regarding the generalisation of results to all companies working with Russian and Asian logistics. However, the variety of actors provided us with essential insights. Thus, the results are stating the reality of this small data segment but we regard that these results have also more general relevance particularly due to the strict selection criteria to logistics companies dealing with Russian transports and that some are major players in the Finnish logistic business.

Figure 4 identifies problems of the Finnish route experienced by the interviewed companies. An essential problem in road traffic is congestion at the border that makes transit times unnecessary long. Queues can be tens of kilometres long and it takes days to pass the border. There are two reasons for this queue: first, bureaucracy, a truck has to stop at least 8

times when passing the border and authorities will handle 19 documents in total 57 times (TEDIM, 2005) and second, the border infrastructure that has been built for much less traffic. However, if the waiting times are compared to ports of St. Petersburg, where some of the vessels have to wait up to one week, the Finnish border is considered reliable. This is also the case at the border between Russian and Baltic states.

Considering the rail traffic, the major problem is lack of Russian wagons. In addition, there is a problem of customs procedures in Moscow. However, there are numerous plans to improve the situation in both areas and rail transport will be one of the growing modes of transport.

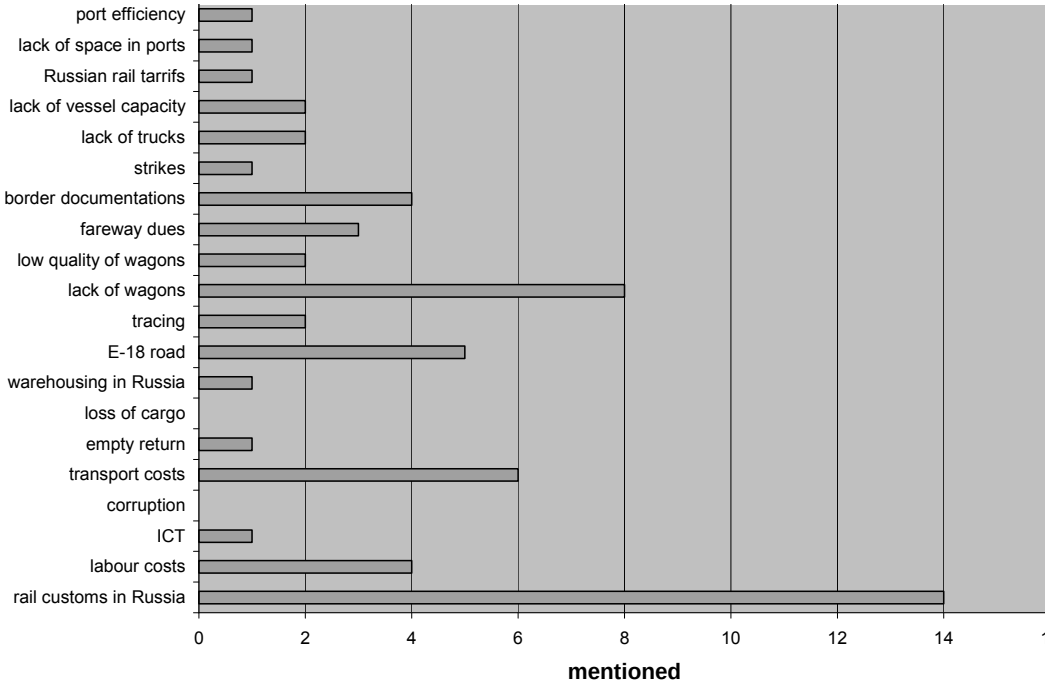

Figure 4. Main problems of the Finnish traffic according the interviewed companies.

There were many advantages raised about the Finnish route (Figure 5). One of the most common one was long-term relationship. As a neighbouring country Finland has common history with Russian and also during the Soviet times the business relationships were close. In logistics point of view, Finland is offering efficient services that can be bought in packages. In addition, safety and security are at high level in Finland. Most surprisingly, Finland with its reputation of high salaries is seen as quite inexpensive. There are two reasons for that: first, the services are efficient; and second, due to Finnish paper industry export, there is a two-way-traffic on container vessels. This results to a reasonable priced sea leg to Finland.

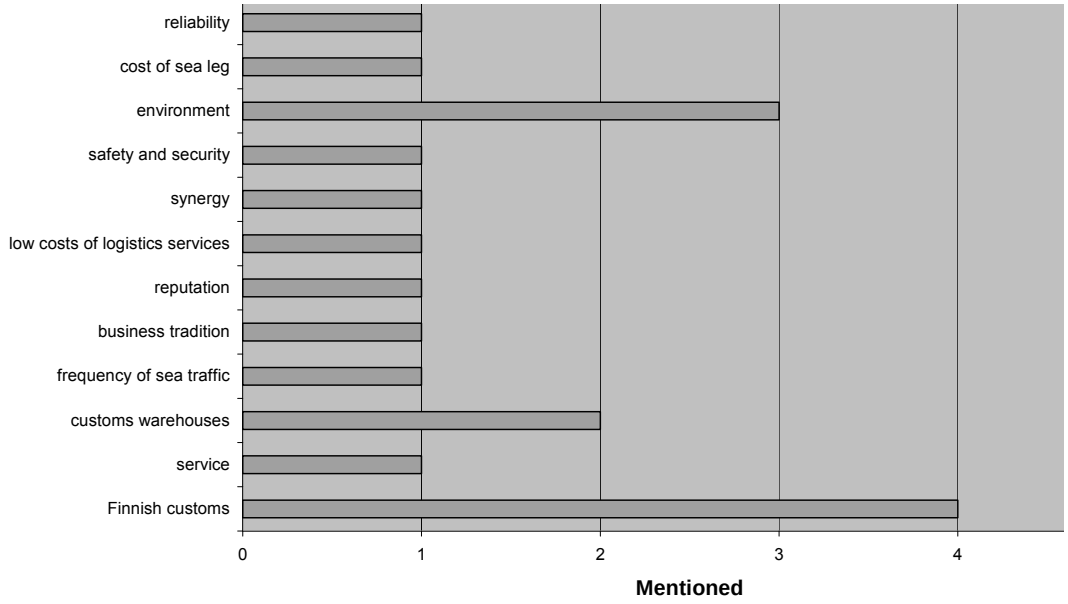

Figure 5. Main advantages of the Finnish route according to the interviewed companies.

4. Summary and conclusions

Russian export and import is growing tens of percents per year. Due to this high growth, Russia is not likely to be able to handle the traffic by itself. Russia is likely to create its export ports first and then the port of consumer goods. In other words, Russia will first ensure export of energy products, chemicals and fertilisers. Only after that investments for import of consumer goods will be on the list. It is expected that Ust Luga, having also a high volume container and automobile harbour, will be ready for taking over some the St. Petersburg's load in five years.

The ports at Baltic States are mainly concentrated in bulk and liquid cargo due to historical and infrastructure reasons. However, there are plenty of plans to invest also on e.g. container and passenger car handling facilities. The route via Finland is likely to remain as a transit route for high quality products also in the future. Finland's advantage is on add-on services, reliability, safety, security, competitive infrastructure and know-how in logistics. Our results support other studies in the area (e.g. Ministry of transport and communications, 2005). Also main problems in Finnish route have remained the same, lack of railway wagons and problems at the border.

However, to be able to keep up the status, Finland has to invest on the infrastructure, speeding the border crossing and keeping up the cost-level. The interviewees believe that

Russian traffic will keep up growing via Finland. However, its percentage of the whole Russian foreign trade will decrease. It is important for Finland to answer Russian expectations and develop the competitiveness of the route.

There have been some arguments whether the competitiveness of the Finnish route would increase if Finland would be connected to the Baltic States - to Tallinn - by a truck or a railway tunnel under the Gulf of Finland. Based on this study there are no arguments supporting this alternative. The Finland route's competitive position is strongly based on two-way traffic on the sea leg, the same containers import Russian goods and export Finnish paper products to overseas markets. Connecting the containers carrying overseas products to Baltic stated would not bring any advantage.

5. Further research

There are several future research themes that require further addressing. There is a clear need for regional level data that would enable the local scale analysis of economic and environmental impacts of increasing transportation. Also the measurement indicators should be further developed. We propose the following future research trends possessing challenges for logistical analysis:

- Analysis of the development of Russian infrastructure and the development of logistical operability. These future developments have an impact on Finnish logistics operations and therefore needed to be studied further.
- Analysis of the actual development of transit transfers and logistical solutions behind these developments. The role of warehousing and increasing demand of data-analysis on freight flows is important.
- Analysis of the expansion of the transportation business in Finnish-Russian transit. This includes the evaluation of the dynamics of Russian transport markets and the role of foreign actors to expand their operations to Russian markets.
- Analysis of the logistics cluster development in Southern Finland. Are there feasible grounds to expect that Finland could act as a European Union hub to Russian exports and imports?

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About the author(s)s

Prof. Ulla Tapaninen, Dr (Tech), University of Turku, Centre for Maritime Studies. email: ulla.tapaninen@utu.fi

Doc. Tommi Inkinen, PhD, University of Helsinki, Department of Geography. email: tommi.inkinen@helsinki.fi

B.Sc. Pentti Ruutikainen, University of Turku, Centre for Maritime Studies. email: pentti.ruutikainen@utu.fi

Impacts of Price Revisions on the Trans-Siberian Railway Logistics

Erkki Hämäläinen

Kymenlaakso University of Applied Sciences, Kouvola, Finland

Abstract

This paper has a focus on the supply chain management in a chaotic situation. In this case logistic operators are obliged to guarantee regular deliveries for their international customers. Their main transport mode is loosing its competitive edge due to a drastic increase in logistic costs on the Trans-Siberian Railway (TSR).

Transit lead-time and safety are the key competitive advantages of the TSR against the deep-sea transportation in the international east-west trade. Container flows were constantly increasing on the TSR until 2006. Sudden increase of tariffs in the Russian railways collapsed the container freight flows almost totally in a few months during 2006.

Price increase pressed the lead-logistic providers to redesign logistic flows especially from rail to sea and arrange local material handling and possible warehousing. This accordingly changed the roles of operators in an intermodal chain. Higher logistic costs and longer delivery lead-times caused tension in customer relationships between them. It also increased competition between logistics operators, -centers and transportation modes. This survey refers that drastic changes of terms may have many logistical, relational and managerial consequences.

Keywords: SCM, intermodality, logistic flow, railway tariff, customer relationship, transport mode

1. Introduction and background

Trans-Siberian railway (TSR) is the backbone of the Russian railway logistics. Railway has been the main transportation mode in building the Russian economy. It is connecting Vladivostok in the east and Moscow, the capital of Russia in the west.

Trans-Siberian has also a wide consequence in the international trade. It connects Asian markets with the EU and other western markets. It is a possible logistic opportunity in the east-west trade. TSR and TEN (Trans-European Transport Network) is, undoubtedly an interesting alternative in the supply chain management. The main route has been the deep sea transportation from Asian ports to West-European ports and other international markets.

As a logistic alternative the deep sea transportation is the dominant alternative. TSR has a possibility to be a challenger that is comparable with the deep sea transportation. There is good evidence of the logistic operation from the South-Korean, Chinese and Japanese manufacturers to the western and Russian markets. International companies were apt to use TSR until 2006 as the railway tariff increased so high that TSR volumes collapsed.

The purpose of this study is to analyze the consequenses of freight increases among the customers (manufacturers and logistic operators), logistic trade lows (mode of transportation, logistic centres) and opinions of confidence as a logistic alternative (attractiveness of the route).

2. Description of the research

Our TSR-research has now been two years time on the field on the Russian territory and China: harbours, logistic centers, operators and supply chain management. This research is a new aspect to the information, we have gained from the field. This research is a survey among the Finnish logistic operators and their customers. We studied the volumes of container cargo flows in 2005 and 2006. We asked also experiences of the logistic operation and opinions about the consequences after the revision of the railway tariffs 1.1.2005. These two years have been chosen as they are very different in a logistics role: Years 2004 and 2005 were the peak seasons of traffic and year 2006 a drastic collapse of the TSR cargo flows. TSR turned too expensive alternative for international customers.

This research has a focus on the following:

- Have the logistic operators redesigned their logistic concept and trade flows?
- What has been the impact of the tariff revision on the total costs?
- What customers think about future operation of TSR?

This survey was made among 50 logistics operators and companies, which are dependant on the railway logistics or are supportive service providers to the railway operation. They located in Kouvola-Kotka-Hamina regions. The companies were chosen from Yritystele directory and Fonecta Profinder. This sample covers logistic operators on the Kouvola region and nearby logistic centres.

Survey was performed by internet with additional phone interviews of prominent logistics operators. Answers and response has high validity: more than one third responded with additional information. Secondly, timing of the enquiry was right to give answers of redesign of the logistics flows and evaluation of the impacts for their logistics. Survey was completed 29.1.-9.2.2007 as the operators and customers had one year's experience of higher tariff period. The respondents were also aware that Russia had decreased TSR railway tariffs by 30% in 1.1.2006.

The questionnaire to logistics operators consisted of six questions focusing on the tariff system: tariff impacts on the logistical flows, various modes of transportation, costs, customer relationship and customer satisfaction. This survey has additional information about field research on logistic operation in Russia (Vostochny, Nakhodka, Vladivostok, Krasnoyarsk, Ekaterinburg, Moscow, St. Petersburg) and border crossing in Mongolia and China.

3. Logistic role of the Trans-Siberian Railway

Trans-Siberian Railway (TSR) has traditionally connected Vladivostok and Moscow. In the east-west trade TSR is a link from Nakhodka-Vostochny port to Buslovskaya (Russia) and Vainikkala-Kouvola (Finland). The basic logistics concept is a regular block train from Vostochny (Russia) port to Kouvola shunting yard (Finland) in less than two weeks delivery lead-time. TSR is accordingly connecting rea-rail in the east and rail-truck-sea in the west. Another railway link from China (Beijing) to TSR is also developed.

Kouvola shunting yard connects rail, truck and sea modes with TSR. Linking EU markets and international ports and markets are connected by the Motorway of the Baltic Sea. (Figure 1)

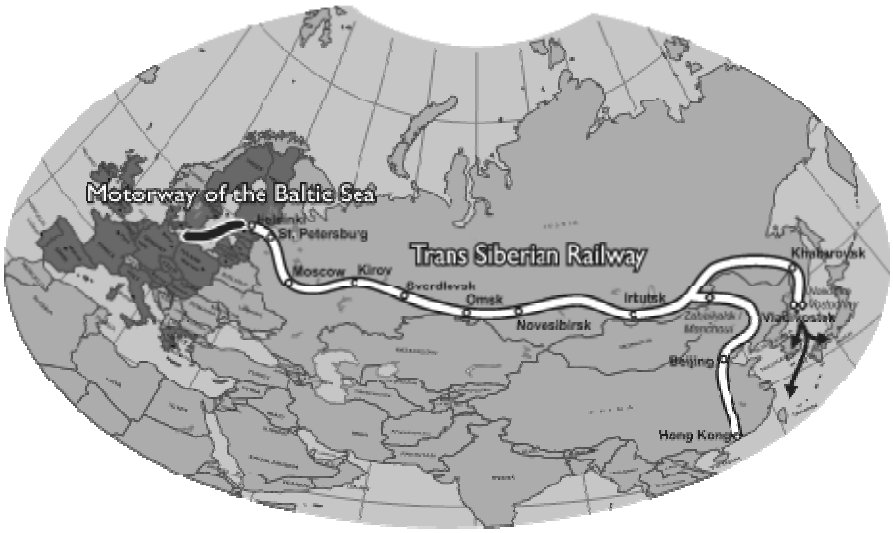

Figure 1. TSR and Motorway of the Baltic Sea connecting Asia and EU.

The Baltic Sea is linking ports in Scandinavia, Baltic countries, Kaliningrad, Poland, Germany, Benelux, UK and other international ports. Trans-European Transport Network (TEN) is linking TSR with western markets. There are two alternatives: Corridor 9 A (via Finland) and Corridor 2 (via Belorussia and Poland). Both corridors are operative in the international east-west trade despite many practical problems. Most operative alternative has been Corridor 9. It is commonly used in deliveries of home electronics and valuable goods from South Korea to Russia (St. Petersburg and Moscow region). Competitive advantage is supply chain management in the Finnish logistic centres, flexibility, reliability and overnight deliveries to Russia by trucks. Corridor 2 is shorter than corridor 9 but it has three border crossings and one reloading of cargo in Brest (Poland).

The Nordic Triangle is linking three Scandinavian capitals (Stockholm, Oslo, and Copenhagen) with the TEN-Corridor 9 and TSR. This connection between Scandinavia and Russia is optional. The Motorway of the Baltic Sea is the backbone in the international trade and short-sea-shipping. Most TSR-cargo has turned via Finland to Russia. International contacts are available as Kouvola could be in the future a dry port linking rail, truck, sea and air traffic modes. Closest harbours are Kotka and Hamina ports. (Figure 2).

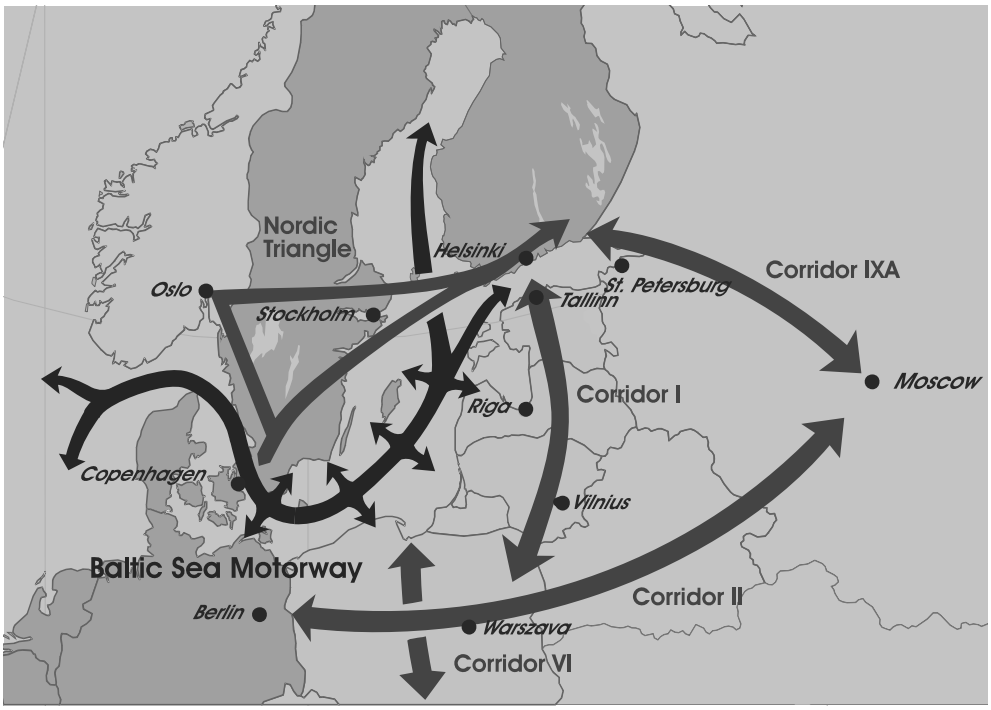

Figure 2. EU-Trans-European Transport Network (TEN)

Border-crossing between EU and Russia has been a key issue in the east-west trade. Finland has a long experience of a fluent border crossing on rail and road. There are numerous development programs in infrastructure, transportation technology, Information Technology, customs clearance. Negotiations on political level and economic issues are regular as well as long lasting concerning both corridors.

4. TSR cargo flows in the international container traffic

TSR container traffic has been low before the block train concept. Regular deliveries were not possible due to low volumes. Information of the volumes during the past thirty years tell that there are severe fluctuations after a long period. Researcher has identified six periods of which the third

and the sixth periods are most interesting. Concept period proved that logistics is competitive as regular block train is possible to both directions. Reorientation period tells that customers and logistic operators are price sensitive and hesitant for the future prospects. Six periods in the TSR traffic are following:

- ***Slowdown period*:** Container traffic was nominal in 1970-1999
- ***Growth period**:* Growth started in 2000 with two South Korean customers
- ***Concept period:*** Peak year 2004 totalled 125 000 TEUs (2-3 bloctrains daily)
- ***Operative problem period***: Slow down 2005, 100 000 TEU (lack of railcar platforms in Vostochny)
- ***Crash down period***: Collapse 2006, 8130 TEU (tariff increase)
- ***Reorientation period***: Slow down 2007 (four months), 850 TEU (tariff decrease)

Trade volumes have been high in the 2000, but future is still dependent on many political and commercial challenges (Figure 3).

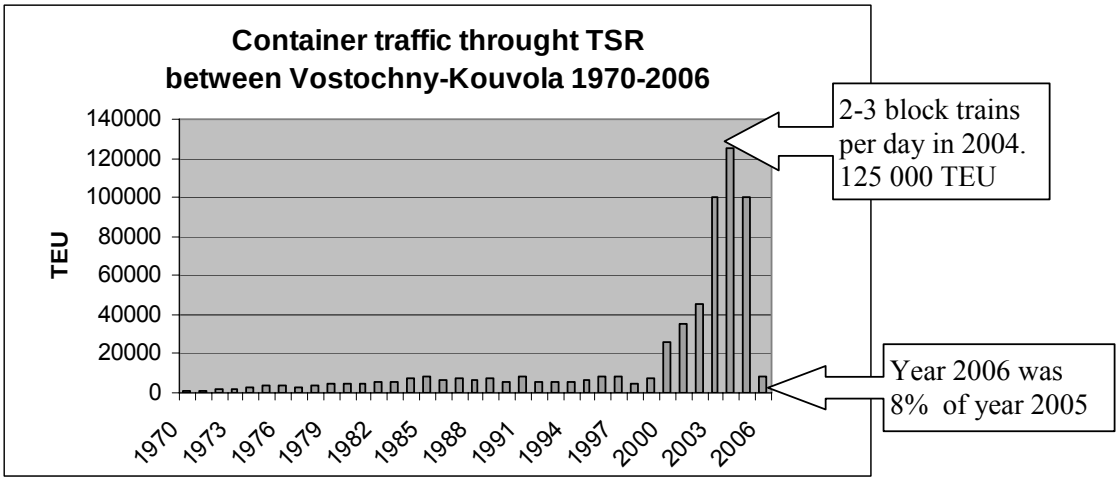

Figure 3. TSR-Container traffic to Finland 1970 - 2006 (TEU): Vostochny – Kouvola (VR Cargo 2007)

TSR has a possibility to combine many logistics centres and ports in the Asian countries. For the time being most cargo flows are coming from South Korea and China. They are first arriving by sea to Vostochny port and further by rail about 10 000 km to Kouvola-Finland. Japan has been active on TRS-transportation in the early days. There were full containers in the eastbound and westbound traffic. Japanese companies turned almost totally to deep sea transportation due to unsatisfactory TSR operation. One of the man problems was security during transportation.

Customers lost their confidence on the TSR and have been reluctant to return on TSR (Hämäläinen & Biswas, 2005).

5. Development of railway tariffs

TSR railway tariff is only one part of the total transportation cost. The Russian railway operator, RZD, has a key role in the fluency of the logistic operation. RZD is responsible of the locomotive services along the whole TSR-track. RZD gives also other operative services: planning of transportation, reservation of rail car platforms, security services during the transportation etc. TSR tariffs are dependant on the transportation distance, type of goods and quantity of goods. A block train is guaranteed to have a continuous transportation with short change of locomotives and regular information of the present location of the delivery.

Logistics operators have been concerned of the regular price increase in tariffs and services. RZD tended to increase their railway tariffs annually +12% in order to cover cost increase. Customers' requirement for safety during transportation is arranged by safety guards. This ensured safe delivery but accordingly also additional fee/container (Hämäläinen & Biswas, 2005).

Tariff increase 1.1.2006 turned total prices to a level, which made customers and logistic operators restless: Tariff increase in Russia for a full container was +30% and for an empty container 3-4 times higher than in 2005. In the imports to Russia the tariff increase was +32.9% including VAT (RZD Partner, 2006-02-09). This increase turned to cost push, which was too high in Finland: some customers claimed about double price/container and started redesigning of their logistical concepts.

Volumes in the TSR trade collapsed almost immediately in the first months of 2006. Slowdown period continued the whole year. Trade with Russia was increasing constantly. Containers traffic switched from rail to sea and truck. This development continued the whole year and Russia decided to lower tariffs by 30% 1.1.2007. This was a positive sign for the future. Enquires, however tell that other costs have increased and there is not yet any sign of a recovery (Hämäläinen 2007).

6. Results from the survey

Question 1: What has been the impact of the TSR-tariff increase for our logistic operation and transportation?

Results (see Figure 4) indicate that tariff increase has a clear impact on the transportation systems and related firms. Majority of the firms (65%) tell that the impact has been substantial or clear. It is interesting to note that 42% of respondents that the impact has dominant consequences. Main concern of the firms has been deterioration of their competitive advantage, redesign of logistic cargo flows from rail to sea and from rail to new logistic centres. There seems to be clear evidence that TSR-cargo is almost totally turned to deep sea routes and finally to Kotka and Hamina ports.

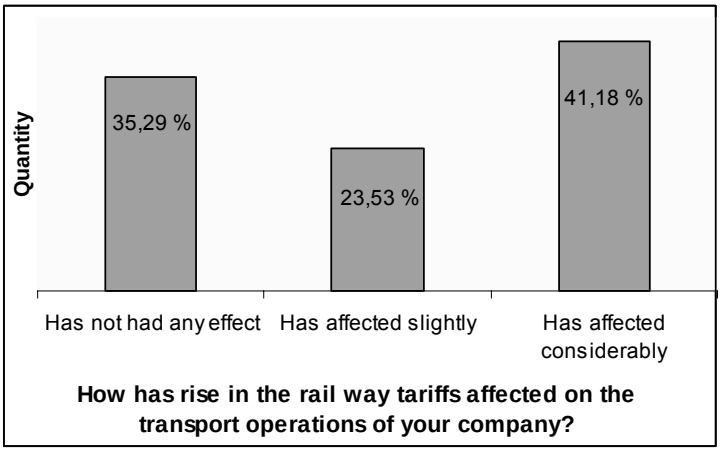

Figure 4. Responses on question 1.

Transition to another traffic mode means also redesign of local services in new logistic centres and dealing with new operators. It seems that the logistic role of south-eastern Finland has been competitive and logistic operators are flexible enough to redesign their operations.

Question 2: If you answered that there has been substantial or some impact, could you specify it?
Transition from rail to sea has generated new logistic centres and warehousing facilities. This is an opportunity for those operators with a close location of a port or good truck or transportation connection or areas with wide operative space. On the other side the logistic service providers in the railway traffic have suffered substantially. Some claim that business disappeared almost totally during a short overlapping period.

Respondents specified following comments:

- Competitive advantage disappeared as trade flows moved to other traffic modes.
- Warehousing in Kouvola region is not anymore competitive. It is nowadays more difficult to have new customers to Kouvola.

- Transportation of containers has decreased on site, but road traffic and number of truck drivers has increased.
- TSR had a high image among customers. There was a clear tendency to increase trade in the future. This could mean more business for us. Due to tariff increase the traffic almost totally stopped.
- We closed down our TSR-traffic.
- Competition has increased. Our business moved on the roads.
- Production and assembly in Finland has lost its competitiveness; not especially transportation.

Question 3: Has sea transportation increased due to TSR- railway tariffs?

Majority of the respondents (65%) tell that traffic has moved from rail to sea. Present freight figures in Kotka and Hamina ports indicate that they have received most of TSR cargo flows. Also truck traffic between the port and border has been a constant problem. Some companies tell about immediate stoppage of TSR-traffic. There are both winners and loosers of the business.

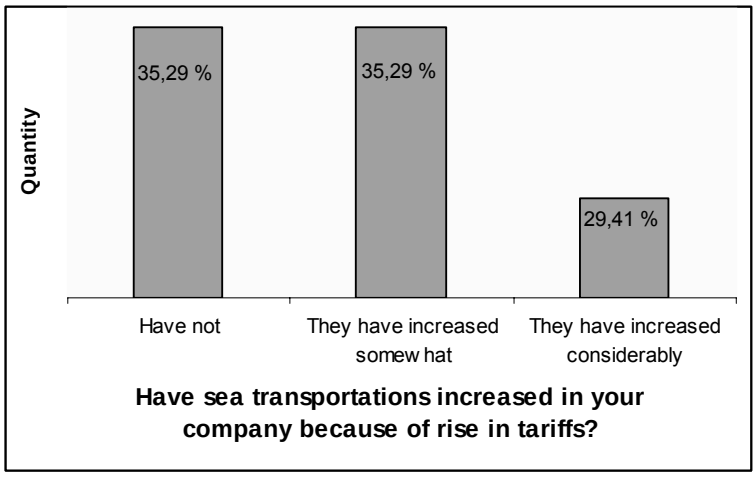

Figure 5. Responses on question 3.

Question 6: How your customers have reacted to the tariff increase?

Tariff increase has meant redesign of the supply chain management. This has put logistics operators and their customers to renegotiate their business relationship and rising costs. There has been urgent need to identify new and competitive alternatives. This has undoubtedly been a

challenge to both parties. More than third of respondents feel that there has been a significant meaning (see Figure 6). Customer relationship has continued in a new situation.

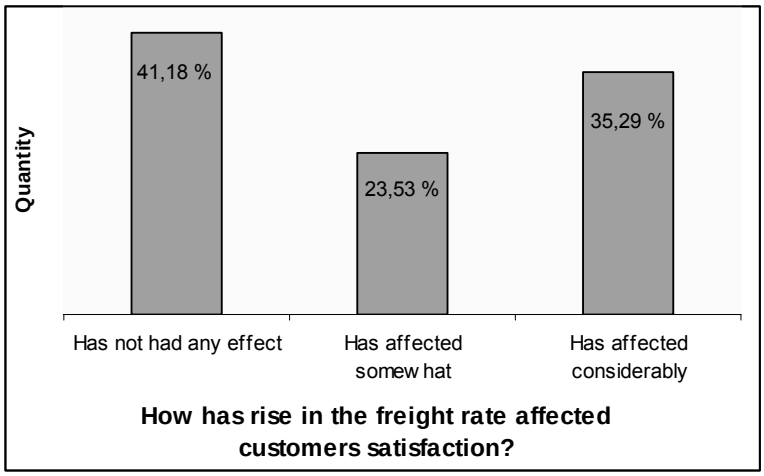

Figure 6. Responses on question 6.

Major problem has been price increase. Logistic operation is guaranteed in a new situation but customers are not willing to pay higher price. Negotiators are compelled to find solutions in the price.

One of the main concerns was confidence in the future. Customers and logistic operators are hesitant for future operation. They plan their operation on reliability and long term operation with partners. This concern was openly expressed by some respondents.

Question 7: Could you specify customer reaction?

- TSR has a severe "lack of trust". All participants are going on their toes and are suspicious, how Russia shall charge from their services on TSR.
- It was evident that container traffic stopped in Kouvola almost totally. We have developed road traffic between port and Kouvola with a new technique. High container volumes enable this.
- There are difficulties to arrange transportation as costs are increasing. This has decreased slightly are services in warehousing and containers.
- Customers were compelled to take secondary alternatives. They are not as competitive and flexible as the railway.
- Our customers are deeply disappointed with Russia. Confidence on TSR and the Russians has collapsed.

- Regular and daily connections in 2005 were able to give a higher service level (= customer satisfaction) than sea transportation could offer.
- We have regular negotiations with our customers, who could pay the extra cost; no one is willing to pay.

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About the author:

Dr. Sc.(Econ.) Erkki Hämäläinen, Research director, Kymenlaakso University of Applied Sciences, Kouvola, Finland

Transit Traffic Route Selection – Comparison of Transit Routes to Russia from Company Viewpoint

Jari Jumpponen & Maija Märkälä

Northern Dimension Research Centre, Lappeenranta University of Technology, Finland

Abstract

In this paper we aim at investigating the criteria contributing to the selection of transit route to Russia through Finland, Russia's own ports, the Baltic Countries and Poland. Special emphasis is laid to decision making process of transit routes. In this context, analytic hierarchy process (AHP) is utilized in order to measure the decision making criteria affecting to the route selection in transit traffic. The survey respondents include supply chain managers working in international car, electronics and cosmetics manufacturing companies.

The value of transit traffic through Finland to Russia has doubled in the last five years. The total import to Russia through Finland in 2006 was 30.9 billion euros which was about 30% of Russia's total import. Almost 80% out of the total import to Russia through Finland was transit traffic and the remaining 6.2 billion euros was Finland's own export.

On the basis of the results it is visible that transit route criteria are not unambiguous but rather company dependent. Results indicate that experiences and expectations on certain routes differ. Every route has its strengths and weaknesses.

Keywords: transit traffic, route selection, analytic hierarchy process

1. Transit traffic development trends

The existence of transit traffic is due to inadequate capacity in Russia's own ports. In addition incompatibility between transport modes in Russia's export and import transports creates inefficiency in Russia's logistics sector. The import is based on container, truck or trailer transports whereas export consist mainly of transports of raw materials.

Even though Russian ports' cargo handling capacity is not sufficient, it has been tremendously developing. In 2006 total amount of transported cargo through Russia's ports in the Gulf of Finland was around 140 million tons, while in 2003 it was less than half of it. Although cargo transports through Finland to Russia have been growing, the share of Finnish harbors has decreased.

Transit traffic means transportation of goods through another country to the destination country. Transit goods are not purchased into the transit country, they are not cleared in the transit country's customs and they do not appear in the foreign trade statistics of the transit country (Widgren et al. 2000). Transit traffic is significant to Finland's logistics sector, especially to the harbors. In 2005 the total incomes of transit traffic in Finland were around

280 million euros and the total costs were around 50 million euros. In addition roughly 4000 people were working on transit traffic (Ollus & Simola, 2006).

Route via Finland to Russia is the main transit route for valuable goods transported from EU to Russia (Lautso et al. 2005). The largest share of the eastbound transit traffic via Finland is transported to Russia, but some of it is transported further to the other former CIS-countries. The largest share of the eastbound transit traffic is transported on road. The share of rail transportation in the eastbound transit traffic in 2005 was less than 7% (Statistics Finland 2006a, 2006b). Unfortunately, there is no accurate information available on the rail transit traffic. In 2005 around 70% of the eastbound rail transportations were electronic appliances and the remaining was mostly sawn timber, special chemicals and special metals. Electronic appliances transported on rail were not valuable electronic appliances, but rather domestic appliances (Mäkinen, 2006). Consequently, the rail transportations' share of the eastbound transit traffics value was even lower than the share of the volume. Because the effect of the rail transportations to the eastbound transit traffics value is very low, it is possible to assume the value development of the road transit traffic as the value development of the whole eastbound transit traffic.

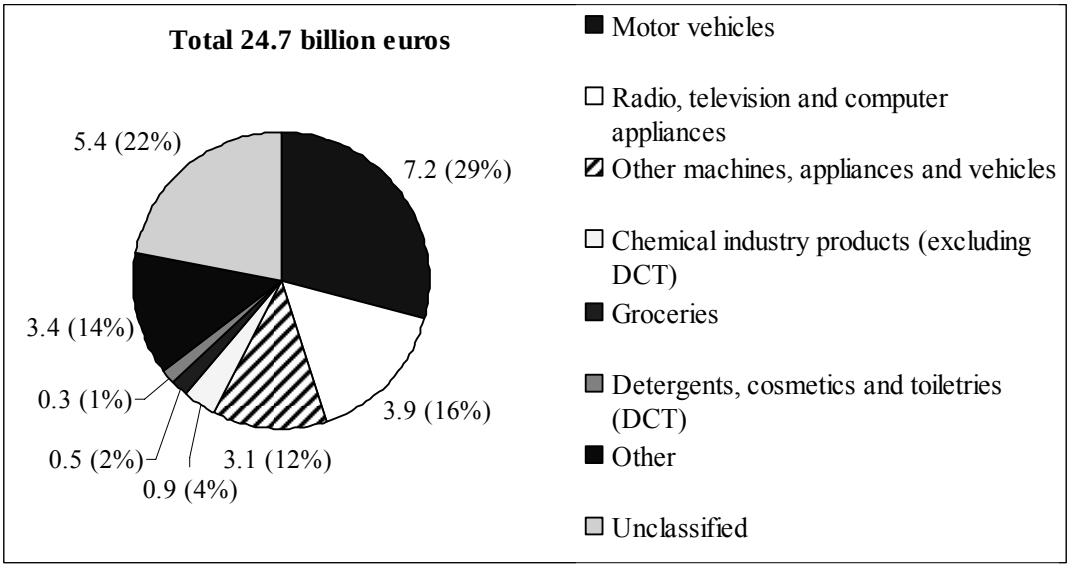

Figure 1. Value of Eastbound road transit traffic via Finland in 2006 (billion euros) (National Board of Customs 2007a)

The total import to Russia through Finland in 2006 was 30.9 billion euros, which was about 30% of Russia's total import (National Board of Customs 2007a, 2007c; Federal Customs Service, 2007). The eastbound road transit traffic via Finland was 24.7 billion euros (2.9

million tonnes) and the remaining 6.2 billion euros was Finland's export (National Board of Customs 2007a, 2007c). The largest groups in the eastbound transit traffic by value were motor vehicles (29%), radio, television and computer appliances (16%) and other machines, appliances and vehicles (12%) (see Figure 1). The largest groups by volume were motor vehicles (27%), other machines, appliances and vehicles (10%) and groceries (8%). The large share of unclassified goods is due to problems in compiling statistics. In the information gathering there has had to been made simplifications which have led to the situation in, which large amount of containers and trucks especially in consumer product transportations have remained unclassified (Heiniemi, 2006).

Compared to the year 2005 the eastbound transit traffics value of motor vehicles increased almost 50% and the value of radio, television and computer products decreased over 20%. In addition although the volume of groceries in eastbound transit traffic decreased in 2006, the value of it quadrupled. (National Board of Customs 2006a, 2007a) The decrease in radio, television and computer appliances' transit traffic may have arisen from falling of mobile phones' transportations in Finland's route. In 2005 Finland's export of mobile phones, radio and television appliances to Russia was 1.7 billion euros of which mobile phones' export was around 1.2 billion euros (National Board of Customs 2006b, 2007b). While in 2006 Finland's export of mobile phones, radio and television appliances to Russia was only 1.1 billion euros (National Board of Customs, 2007c). At the same year Russia's total import of mobile phones almost tripled to 3.4 billion euros (Cellular News, 2007). Based on which may be concluded that Finland's competing routes have increased their share as import routes of mobile phones to Russia in 2006.

2. Decision-making criteria

To route selection affect among others the characteristics, value and quantity of the transported goods. First of all to route selection affect the characteristics of the goods, if it is liquid, dry bulk or general cargo (Cullinane & Toy 2000; Hernesniemi et al. 2005; Hokkanen et al. 2002; Widgren et al. 2000). In addition some goods may demand for certain transportation and warehousing conditions e.g. temperature which has to be considered while choosing both the transport mode and the route. Another goods related factor affecting the route decision is the value of the goods (Hilska et al. 2003; Hokkanen et al. 2002; Lautso et al. 2005). If the goods are high in value, those have to be transported in a secure manner and also

the air transportation may be considered. Thirdly, the quantity of the goods affects the route and transport mode selection (Hernesniemi et al. 2005; Hokkanen et al. 2002).

Based on the earlier studies time and costs are ones of the most mentioned route decision-making criteria. Especially if the goods are valuable and restrict large share of equity, the importance of transit time will emphasize (Cullinane & Toy 2000; Hernesniemi et al. 2005; Hilska et al. 2003; Kajander & Tervo 1999; Lautso et al. 2005; Nieminen et al. 2005). The transit time does not indicate only the transportation time, but also forwarding, handling and border crossing time. In addition to transit time the predictability of transit time will have an effect to the route selection (Cullinane & Toy 2000; Hilska et al. 2003; Kajander & Tervo 1999). Thirdly, the total costs of the route or more like the total price of the route for its user affects the route selection (Cullinane & Toy 2000; Hernesniemi et al. 2005; Hilska et al. 2003; Hokkanen et al. 2002; Kajander & Tervo 1999; Lautso et al. 2005; Nieminen et al. 2005; Widgren et al. 2000). The price of the route is divided between transportations, forwarding, handling and warehousing prices.

To the route selection affects also the availability of services on the route (Cullinane & Toy 2000). Availability of suitable storage services combined with fast transport route to the destination area enable delivery transportations. For instance, it is possible to arrange deliveries in less than one day from Finland to St. Petersburg and Moscow (Lautso et al. 2005). In addition to storage opportunities the availability of value added services and the quality of available services have an effect to the route selection (Lautso et al. 2005; Nieminen et al. 2005; Widgren et al. 2000). The value added services indicate e.g. assembling, packing and regrouping services. Thirdly, the flexibility of services and the easiness to purchase the services affect to route selection (Kajander & Tervo 1999; Nieminen et al. 2005; Widgren et al. 2000). The flexibility of services means mainly the flexibility of working hours, but as well other flexibility in the service process. Easiness to purchase indicates that service packages or even all transportations and services in the whole supply chain could be purchased directly from one operator.

Besides, the safety of the route especially the damages to goods and theft may affect route selection (Hernesniemi et al. 2005; Hilska et al. 2003; Kajander & Tervo 1999; Lautso et al. 2005; Nieminen et al. 2005). If goods continually damage or disappear during the transportation, the route will be judged as unsafe.

To route selection affect also infrastructure and handling and transportation equipment. Infrastructure is divided to transportation network and its condition, frequency of liner traffic, functionality of harbors and smoothness of information flow between different operators in

the supply chain (Hilska et al. 2003; Kajander & Tervo 1999; Lautso et al. 2005; Nieminen et al. 2005). Handling and transportation equipment indicates the availability of handling and transportation equipment as well as their condition (Hokkanen et al. 2002; Kajander & Tervo 1999; Nieminen et al. 2005). Criteria related to infrastructure and handling and transportation equipment are mainly criteria with which some route may be excluded from the group of alternative routes.

Labor force and society related criteria may also have an effect to the route selection. Criteria related to labor force are divided to know-how, availability and the level of organized actions of employees (Nieminen et al. 2005). For instance, as a consequence of strikes transportations may temporarily or even permanently transfer to some alternative route. Society related criteria indicate legislation and its execution as well as changes in routes' competitive positions caused by international investments (Hokkanen et al. 2002).

Other criteria contributing to route selection are smoothness of border crossing, marketing acts and environmental effects (Lautso et al. 2005; Widgren et al. 2000). Environmental effects are divided e.g. to pollution, noise emissions and changes in the environment (Kajander & Tervo 1999). In addition although long trade relations may cause utilization of certain routes, also marketing acts affect the route selection (Kajander & Tervo 1999; Widgren et al. 2000).

Table 1. Summary of the literature findings on route-selection criteria.

	Literature sources							
Factors	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Time				x				
- Elapsed time	x	x	x		x	x	x	
- Predictability of time	x		x		x	x		x
Costs	x	x	x	x	x	x	x	x
Services	x						x	
- Availability of storage services						x		x
- Value added services		x				x	x	x
- Overall service of the route					x			
- Flexibility					x		x	x
Security						x		
- Damage to shipped items		x	x		x		x	
- Stealing/lost shipment		x	x					
Product	x							x
- Quality of product		x		x				
- Value of product			x	x		x		
- Quantity of products		x		x				
Infrastructure		x		x				x
- Traffic network						x		
- Condition of inrastructure								
- Frequency of maritime traffic			x					
- Harbour services						x		
- Information flow fluency					x		x	
Handling equipment				x	x		x	
- Condition							x	
- Availability							x	
Workforce							x	
- Skills, availability, unionization of workforce								
Society								
- Law and implementation of law				x				
Other factors								
- Border crossing practices		x				x		x
- Environmental affects					x			
- Marketing					x			x

1) Cullinane & Toy 2000, 2) Hernesniemi et al. 2005, 3) Hilska et al. 2003, 4) Hokkanen et al. 2002, 5) Kajander & Tervo 1999, 6) Lautso et al. 2005, 7) Nieminen et al. 2005, 8) Widgren et al. 2000.

3. Analytic hierarchy process in route selection

Analytic hierarchy process (AHP) is a multi-attribute decision-making methodology widely used by both practitioners and researchers (Leung & Cao, 2001). In addition to decision-making AHP has been utilized in different fields such as selection, evaluation, cost-benefit analysis, resource allocation, planning and development, priority and ranking, optimization and resolving conflict (Vaidya & Kumar, 2006).

Lirn et al. (2003) used AHP to determine the importance of various criteria in the transshipment port selection decision-making process from a container carrier's perspective. The aim was to identify the criteria affecting to the selection of transshipment ports and to

evaluate the performance of three major ports in Taiwan. The results indicated that in the port selection the order of importance of the criteria affecting to the selection is the following: port geographical location, carrier's cost perspective, port management and port basic physical characteristics.

AHP process involves the following phases: hierarchy structuring, weights defining and synthesis (Lirn et al. 2003; Saaty 1999). Structuring hierarchy means formulating the hierarchy in terms of objectives, criteria in different levels of hierarchy, rating scale used for the evaluation of decision-alternatives and formulating the alternatives to be evaluated. Defining weights means collecting data in order to obtain the weights for the criteria. And the synthesis indicates the final evaluation of the decision-alternatives performance on the basis of the lowest level criteria in the hierarchy. (Lirn et al. 2003) The method uses pair-wise comparisons and it has its own scale for the evaluations. The scale ranges from 1/9 for "least valued than", to 1 for "equal" and to 9 for "absolutely more important than" covering the entire spectrum of the comparison. (Vaidya & Kumar, 2006)

A major criticism has arisen from the fact that rank reversal exists in AHP (Leung & Cao 2001; Lehtonen 1999; Gass 2005). The comparisons of different alternatives and criteria in AHP are firmly bound up in the group of alternatives and criteria and if the group will be changed the comparisons have to be renewed (Lehtonen 1999). Secondly, it is argued that the pair-wise judgments in AHP are ambiguous (Leung & Cao 2001; Lehtonen 1999), because the question how much A is better than B does not describe the point of comparison. On the other hand in many practical applications the decision-makers have not considered the questions unpleasant to answer (Lehtonen 1999).

Thirdly, there has appeared critique towards the scale 1-9 in AHP, because the scale limits the relations of the weightings. For example, if the factor A was five times as important as factor B, and B was five times as important as factor C, then factor A should be 25 times as important as criterion C. However, this outcome does not fit to the AHP scale. (Lehtonen, 1999) There are also problems in transforming verbal expressions into numbers (De Vreese et al. 2003; Lehtonen 1999), because people may have very different interpretations of verbal expressions. (Lehtonen, 1999)

Based on literature by Hernesniemi et al. (2005), Lautso et al. (2005), Nieminen et al. (2005), Hilska et al. (2003), Hokkanen et al. (2002), Cullinane & Toy (2000), Widgren et al. (2000), Kajander & Tervo (1999) and interviews of logistic operators and logistics experts in Finland, the Baltic States and Russia the hierarchy of the decision-making criteria affecting to the transit route selection to Russia was structured in the following Figure 2. On the first level

of the hierarchy there is the goal: the selection of the best route. On the second level there are the major criteria affecting the route selection: time, price, service and safety. And on the third level there are five sub-criteria. Time is divided between elapsed time and predicted time. Respectively, services include the existence of adequate storage space in the transit country, value adding, packing and regrouping include the existence of adequate services in the transit country and the tracking and electronic data interchange mean the possibilities of using these kind of electronic information channels on the whole route from Western Europe to Moscow in order to make the information flow easier in the transit chain.

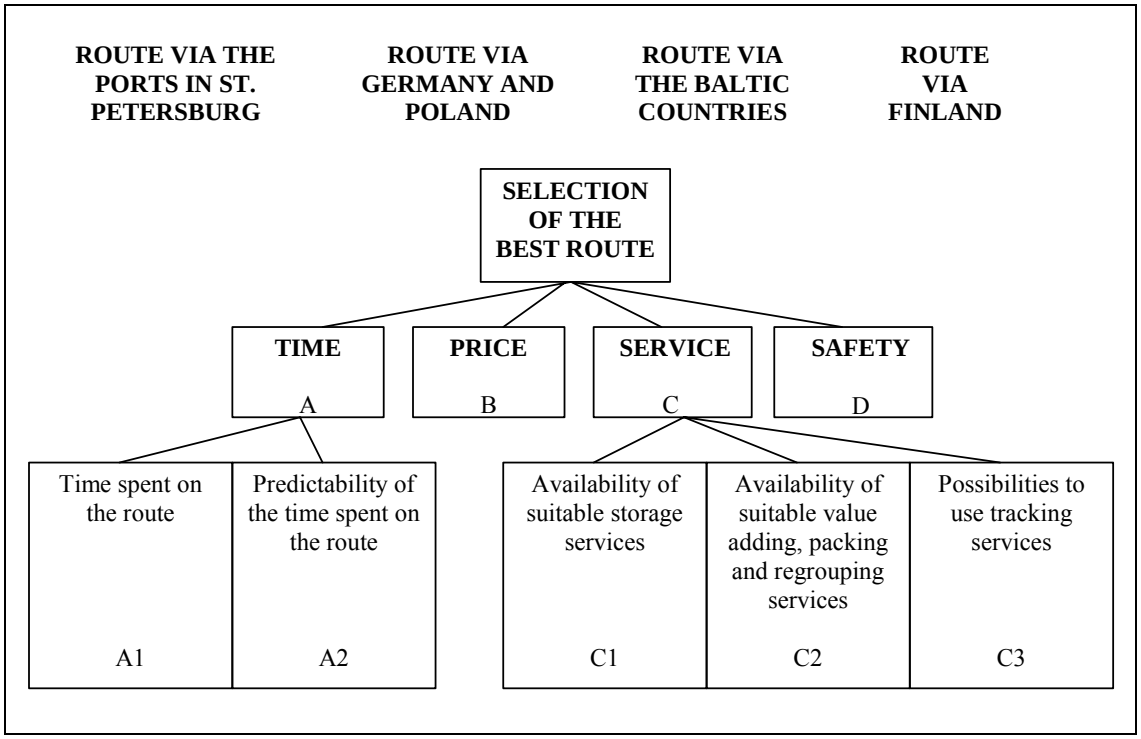

Figure 2. Hierarchy of AHP in route selection problem

For the evaluation of the performance of the studied routes the same scale as used in Lirn et al. (2003) has thought to be the most appropriate for this kind of decision-problem.

In the hierarchy structuring there have been utilized several sources of information in chasing up the criteria affecting the route selection decision in transit traffic to Russia. In real life, it is rather complicated to find out, which routes the transit goods are transported to Russia. Besides, finding out who are the persons to know, which criteria affect the selection between different routes, was challenging. We aimed to identify the route decision-makers in companies operating in car manufacturing, electronics and cosmetics industries. When

monitoring the transit traffic to Russia via Finland in value terms, motor vehicles and electronics (radio, television and computer appliances) constituted 45% of all transit traffic value in 2006 (National Board of Customs 2007a). Value of cosmetics, in turn, has remained stable over the past years and forms just 1% of the transit traffic, while the value of cosmetics markets in Russia has increased rapidly during the recent years and was 7 billion USD in 2005 (Dycheva, 2006). We decided to concentrate on 10 foreign companies in each of these three fields of business, and selected the market leaders to be respondents of the survey.

In order to find the route decision-makers in these 30 companies, over 150 people were contacted via email and telephone. Out of the targeted 30 companies we received usable answers from 7 car manufacturing, 4 electronics and 4 cosmetics companies, i.e. altogether 15 companies participated in the survey.

On the basis of the survey results it seems like the price would be the most important factor and the time secondly important factor affecting the route selection. The safety and services were stated to have equal importance. However, the outcome is not so unambiguous. In the pair-wise comparisons safety was evaluated more important than both price and time. Respondents commented that cheaper prices are not decisive, if consequently the safety level drops.

In earlier studies safety and storage possibilities have been mentioned as competitive advantages of the route via Finland. These combined with the favorable location have enabled delivery transportations in less than one day from Finland to St. Petersburg and Moscow. Moreover, Finnish competitive advantages have consisted of logistic knowledge, value added services, predictability of time and infrastructure. There is frequent liner traffic between Central European and Finnish ports. Also the road and railway connections between Finland and Russia are in good condition.

The most frequently mentioned factor decreasing Finnish route's competitiveness is high cost level. Discussions have arisen especially on salary levels, gasoline prices and waterway costs. In addition to salary levels, inflexible labour market policy has been stated to be problematic.

Our survey results support previous researches in determining Finnish route's competitiveness. In comparison with routes via the Baltic Sates, Poland and Germany and Russian own ports in St. Petersburg, the route via Finland is equipped with higher level of security, availability of storage services, value adding, packing and regrouping services, as well as predictability of the time spent on the route. Surprisingly, in cost comparison the Finnish route was evaluated to be as expensive as the routes via the Baltic States and

Germany and Poland, while route via St. Petersburg was notably cheaper. Thus, Finnish route appears to be less expensive than assumed.

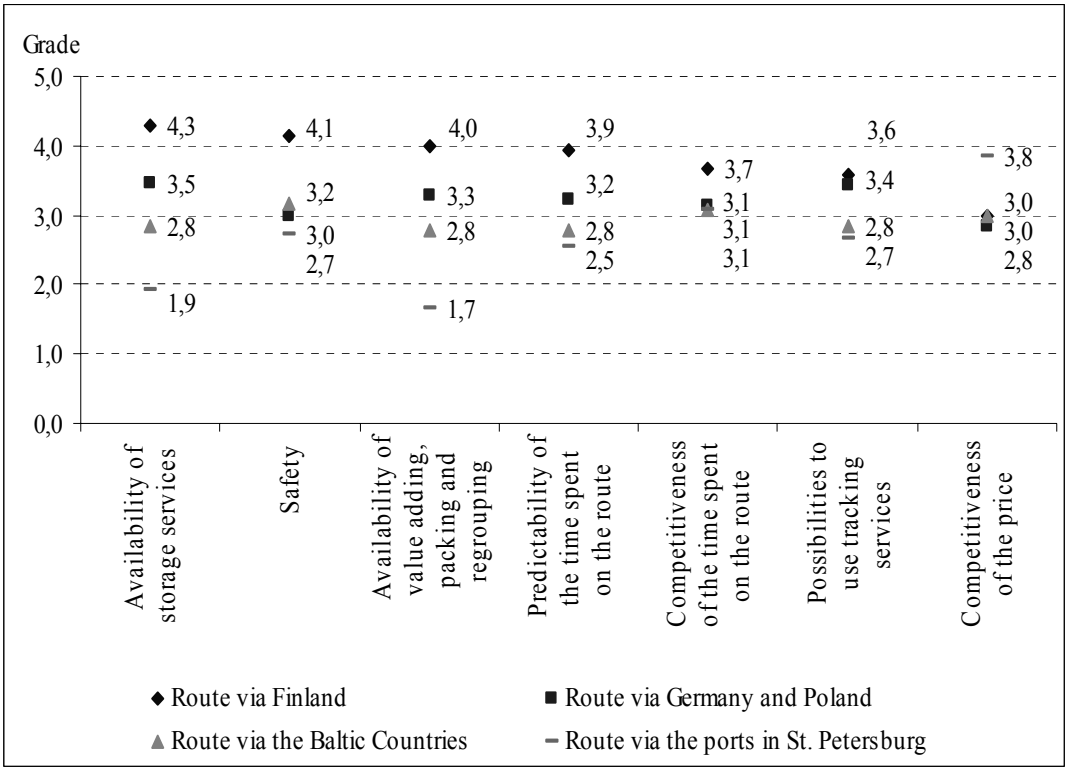

Figure 3. Evaluation of the routes by route selection criteria.

Out of the 15 received replies only one included consistent answers to AHP in all levels. Despite the fact that in the questionnaire there were rather detailed instructions, it could be concluded that for respondents without previous experience on AHP, it was challenging to reply. Besides, one should keep on mind that AHP is most and foremost designed for decision-making process; thus, it might be difficult to clarify decision-making afterwards, if the decision has been made based on different factors. This argument was supported by some open-ended answers, where the companies described, how their transit traffic to Russia had begun. For example, one car manufacturing company stated their shipments via Finland to Russia were launched over fifteen years ago by utilizing frequent maritime traffic between Germany and Finland. Frequent maritime connections to St. Petersburg were rare in those days, so cars going to Russian market were simply shipped to the cargo boat going to Finland, if there was some available extra space. The company stated not to have been re-considering the transit traffic routes afterwards.

4. Discussion and Conclusion

On the basis of the answers given by 15 logistics managers in car manufacturing, electronics and cosmetics industries, the route via Finland to Russia is used in the most of the cases. However, it is worth of noting that 6 companies utilized also some other route(s). Even though some one third of Russia's all imports is transported to Russia via Finland, it is not the only option. Recent development has proved that remarkable changes may occur, as described in the case of electronics: in 2006 their value in transit traffic decreased by 22% and their volume by 32% when compared to the previous year (National Board of Customs, 2007a).

Secondly, experience in route using appears to lead to more positive ratings. Respondents with experience using the routes via ports in St. Petersburg and route via Germany and Poland have evaluated those routes more positively than other respondents. Thirdly, there appears to be differences in answers of companies operating in different industries, e.g. respondents of cosmetics industry have evaluated the route via Germany and Poland as fastest, respondents of car manufacturing industry route via St. Petersburg and electronics industry route via Finland as fastest.

In this paper it was discussed, if the analytic hierarchy process could be used in analyzing the route selection criteria concerned the transit traffic to Russia via Finland, the Baltic States, Poland and the Russian own ports. As a consequence the hierarchy of AHP was structured and the survey directed to large international companies operating in Russian markets in the fields of car manufacturing, electronics and cosmetics industries. On the basis of responses, the most criticized disadvantages of AHP found in previous researches (related to rank reversal, pair-wise judgments and the comparison scale) were visible also among the replies we received.

Based on Baltic Maritime Outlook (2006), the sea cargo in the Baltic Sea Rim is expected to increase by 64% by year 2020 (when compared with the level in 2003), i.e. from 700 million tons to 1.2 billion tons. On the other hand, competition with Baltic and Russian ports may provide valuable opportunities, if it leads to intensifying operations.

Meanwhile, several foreign car manufacturers have either launched or announced to start manufacturing cars in Russia. In 2005, foreign car manufacturers produced some 150,000 cars, which was 10% of all new cars sold in Russia. In the future, transporting components for car manufacturers operating in Russia is expected to become important business for the route via Finland. For the time being, Russian own ports have increased their

capacity – but not as much as the cargo volumes have increased. Thus, the future of transit traffic to Russia remains as interesting and challenging topic for future research.

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About the author(s)

Corresponding author:
Jari Jumpponen, email: jari.jumpponen@lut.fi, Tel.: +358 5 621 2673, fax: +358 5 621 2644.

Wagon Manufacturing Industry in Russia: Current Status and Challenges for Tomorrow

Oksana Ivanova

Lappeenranta University of Technology, Finland

Abstract

According to the felicitous remark of Masahito Mizoguchi, rolling stock acts as the railways' face to the customer and could be described as the main "actor" on the railway transport "stage". Indeed, as the case with transit transportation on Trans-Siberian mainline of Russia shows, shortage or insufficient quality of rolling stock may deter shippers from the use of potentially very attractive railway services. The successful implementation of the Structural reform on railway transport in Russia, which has started in 2001, resulted in significant increase in efficiency of rail sector - in 2006 it showed the best economic results in last 15 years. However, the fact that average deterioration of the rolling stock operated on the Russian railways has reached 80% and over 18% of this stock exceeded their service life challenges further development of the railway transport in Russia. This paper examines current and future demand for rolling stock in Russia. It studies the situation in Russian wagon manufacturing industry and analyzes its capability to meet growing customer demand. The study is based on the second-hand information such as Russian Railways statistics, industry reports and companies' data. It takes into account also the experience of wagon manufacturing industries in Europe and the US. The paper reveals that the Russian wagon manufacturing industry has good prospects, but its development is hampered by sufficient depreciation of productive assets and technological inferiority of 15-20 years. The study concludes that one of the possible solutions for the Russian wagon manufacturers could be the establishment of joint-ventures with technologically advanced foreign companies. Another engagement in more effective cooperation with the Russian rolling stock owners as nowadays their relations could be characterised as the "loose-loose" type, where short-time contracts favoured by operators do not let manufacturers to invest into modernization and thus to increase the efficiency and quality of production.

Keywords: railways, rolling stock owners, wagon manufacturer, development strategy, Russia

1. Introduction

The dissolution of the Soviet Union and the followed recession of Russian economy determined the reduction in the demand for the railway transport services in Russia. In 1998 the volume of the railway transportation was 2.5 times lower than in 1990. The surplus of wagons reached about 0.5 million (30% of the total freight fleet) and thus investments into the new rolling stock lowered significantly. Consequently, the production of wagons decreased from 29 thousand wagons in 1987 to 4 thousand - in 1998 (by 6.4 times). The recovery of Russian economy, which has started in 1999, revealed poor condition and thus inefficiency of the existing railway transportation system. The Russian railways were unable to provide the sufficient number of wagons to satisfy the growing demand in freight transportation.

It should be noted that for a long time the whole railway transport sector of Russia was completely in the ownership and under the control of the state represented by the RF Ministry

of Communications (MPS). Since the Soviet Union time it was so that an enterprise had only to indicate its need in the railway transportation and the full range of services was provided by MPS. However, since the inefficiency of MPS services (especially in part of wagons provision) became evident, big manufacturing export-oriented companies started to engage in logistics operations themselves - special transportation departments or captive companies were created and developed. The success of their venture was determined by two facts: 1) usually those companies had own wagons inherited from the Soviet Union time and there were no need in significant initial investments, and 2) the high export products' price let to compensate transportation costs even under non-optimal use of wagons (e.g. empty return run, loading/unloading downtime, etc.). At the same time, the majority of companies still had to rely on MPS (Voronin. A, 2005).

The situation has changed only in 2003, when in the process of the Structural reform on the railway transport in Russia (started in 2001) the new railway tariff system has been implemented. According to this system, the railway tariffs in Russia consist of three components, which weights remain roughly stable: 55% - infrastructure charges, 30% - locomotives use, and 15% - wagon use. Thus, a freight railway service customer supplying carrier with own wagons pays 85% of the tariff paid by a comparable customer who does not provide his own wagons. This 15% discount motivated the development of independent railcar operators in Russia and now private companies deprived the state monopoly of leadership in transportation of such products as oil, ores, coal, and steel.

This paper examines current and future demand for freight wagons in Russia. It studies the situation in Russian wagon manufacturing industry and analyzes its capability to meet growing customer demand. The study is based on the Russian Railways statistics information, industry reports and companies' data. It takes into account also the experience of wagon manufacturing industries in Europe and the US.

The paper is structured as follows. Section 2 gives an overview of the Russian railway transportation market and defines the main groups of rolling stock owners creating demand for freight wagons. Section 3 analyses current situation and future prospects for freight wagon fleet in Russia. The following Section 4 and Section 5 describe the situation on freight wagon market and in wagon manufacturing industry. As lack of financing is found among the major barriers to the development of freight wagon market, Section 6 analyses the main financial options for suppliers and consumers of freight wagons. The paper ends with the discussion on the existing problems on freight wagon market and their possible solutions.

2. The structure and the main players of railway transportation market in Russia

Russian Railways OJSC (often referred to as RZD) is the state-owned railway company of Russia. It is the sole owner and operator of the railway infrastructure in Russia. Its assets include track, depots, stations, switching facilities and dispatch centres. RZD is also the largest owner, operator and leaser of freight rolling stock, the exclusive owner and operator of all passenger service rail assets and the largest owner of locomotives. In the process of the railway reform and with the aim of assets unbundling, two Russian Railways' subsidiaries, namely TransContainer OJSC and Refservice OJSC, were founded to serve container and refrigerator transportation correspondingly. Refservice OJSC got from parent company refrigerator rolling stock, while TransContainer OJSC received containers and flat cars. In the near future RZD plans to establish one more subsidiary Cargo Company to provide transportation of the rest types of cargo. According to estimations of the RF Federal Antimonopoly Service, that subsidiary will possess about 60% of the total rolling stock operated on the Russian railways.

Private participation in the industry is currently limited to the ownership, leasing and operation of rail cars and limited ownership of locomotives; and is restricted to the freight segment only. The total number of private freight rolling stock owners in Russia is about 2.5 thousand. However, the major part of that rolling stock belongs to 80 private rail operators. Rail operator is a company that has concluded an agreement with RZD on the use of the railway infrastructure and provides cargo transportation using own or rented rolling stock. There are two main groups of private rail operators: transportation subdivisions of raw material companies, i.e. captive operators (e.g. Fintrans, LUKoil-Trans) and independent operators (e.g. Severstaltrans, Eurosib SPB, DVTGroup, Transgarant). Separate group of private rail operators is presented by companies created with participation of both private and state capital (e.g. Russian Troika). The interaction between the participants of the railway transportation in Russia is shown on Figure 2.1.

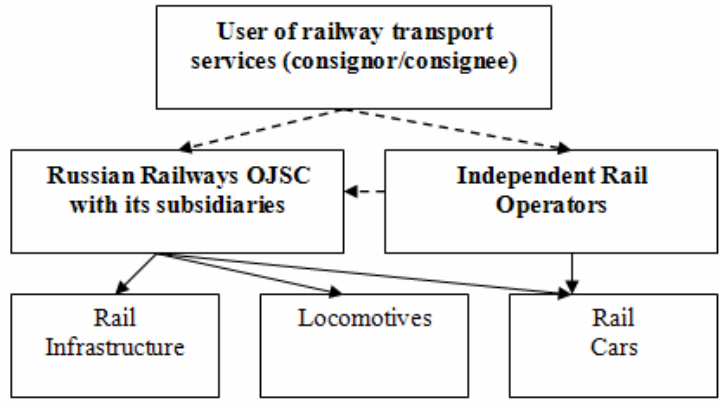

Figure 1. Interaction between participants of railway transportation in Russia

As Figure 1 shows, the necessary condition for rail transportation service is availability of wagons, locomotives and access to rail infrastructure. The user of rail transportation service has two options: to contact RZD with its subsidiaries or to address Independent Operator. In first case, RZD that is the sole owner and operator of the railway infrastructure as well as the largest owner of wagons and locomotives in Russia provides the full range of services. In second case, Independent Operator that owns wagons (and in a very rare case locomotives) takes responsibility to agree with RZD on provision of locomotives and access to infrastructure. In both cases RZD is the necessary participant of rail transportation process.

3. Freight wagons fleet: current situation and future prospects

By the beginning of 2006 the total number of freights wagons operated on the Russian railways has reached 902 thousand, from which 628.4 thousand (or 69.7%) belong to RZD and 273.6 thousand (or 30.3%) – to independent rail operators. At the same time, since 2001 the private freight wagons fleet has been demonstrating an impressive growth rate (see Table 1).

Table 1. Number of wagons owned by RZD and private companies in 2000-2006. Source: RZD

Wagons owned by:	2000	2001	2002	2003	2004	2005	IQ 2006	IIQ 2006
RZD, thousand	639.8	639.7	625.2	621.3	634.5	624.1	628.4	629.7
-annual growth rate	-	-0.1	-14.5	-3.9	13.2	-10.4	4.3	1.3
Independent operators, thousand	162.9	161.0	173.6	195.3	222.5	252.3	273.6	280.7
-annual growth rate	-	-1.9	12.6	21.7	27.2	29.8	21.3	7.1

As it can be seen from Table 1, lately the demand for the new wagons is mainly created by private companies. It is expected that by 2010 Russian freight wagons stock will be equally distributed between RZD and independent operators. The structure of freight wagons stock operated on the Russian railways is shown in Table 2.

Table 2. Structure of freight wagons stock in Russia as of 01.04.2005. Source: RZD

Wagons	Altogether, thousand	Including those belonging to:			
		RZD		Independent operators	
		thousand	%	thousand	%
Altogether	*884.5*	*622.7*	*70.4*	*261.8*	*29.6*
Open-top wagons	295.3	251.6	85.2	43.7	14.8
Tank cars	221.9	80.1	30.7	141.8	69.3
Box cars	86.2	78.7	91.3	7.5	8.7
Flat cars	72.7	63.9	87.9	8.8	12.1
Other	196.9	139.4	70.8	57.5	29.2

Table 2 shows difference in the structures of freight wagons stocks belonging to RZD and independent operators. RZD controls the significant shares of open-top wagons, box cars and flat cars, while private companies own the major share of tank cars. It means that to win in competition with RZD for transportation of other than liquid freight independent operators should make significant investments into the purchase of non-tank wagons. Flat cars could be one of the valuable alternatives. The current level of containerization in Russia is low – 30 %, compared to 60-70 % of the world average. It means that Russia's container market has significant growth potential. Already now its annual growth rate is more than 20%, compared to 8-10% of the world average. Rail operators should be ready to respond to the growing demand in container transportation.

It should be noted that freight wagons operated by RZD are fairly old (see Figure 3.1). In 2005 the wear factor for those wagons has reached 85.9%. The average age of freight wagons belonging to RZD is 20.9 years. About 18.7% of them have passed their service life.

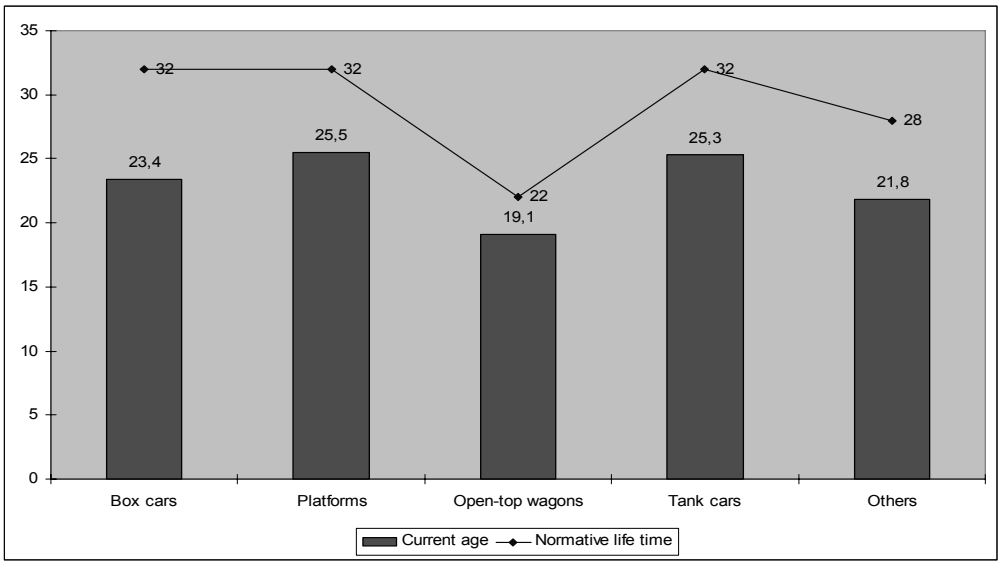

Figure 2. Average age of RZD freight wagons in Russia, years. Source: VKM Leasing

The line on Figure 2 shows, the normative life time for freight wagons and it varies from 22 to 32 years. The average age for wagons in use varies from 19.1 to 25.5 years and especially the average age of open-top wagons seems to be almost as high as their normative age. Similarly, flat cars have passed 76% of their service life, tank cars – 72%, and box cars – 70%.

According to RZD, the number of wagons taken out of service in 2006 – 2010 will exceed 143 thousand and in 2011-2015 – 158 thousand. It means that to keep the current size of its freight fleet RZD should annually purchase about 30 thousand wagons. However, the reality is somewhat different (see Figure 3).

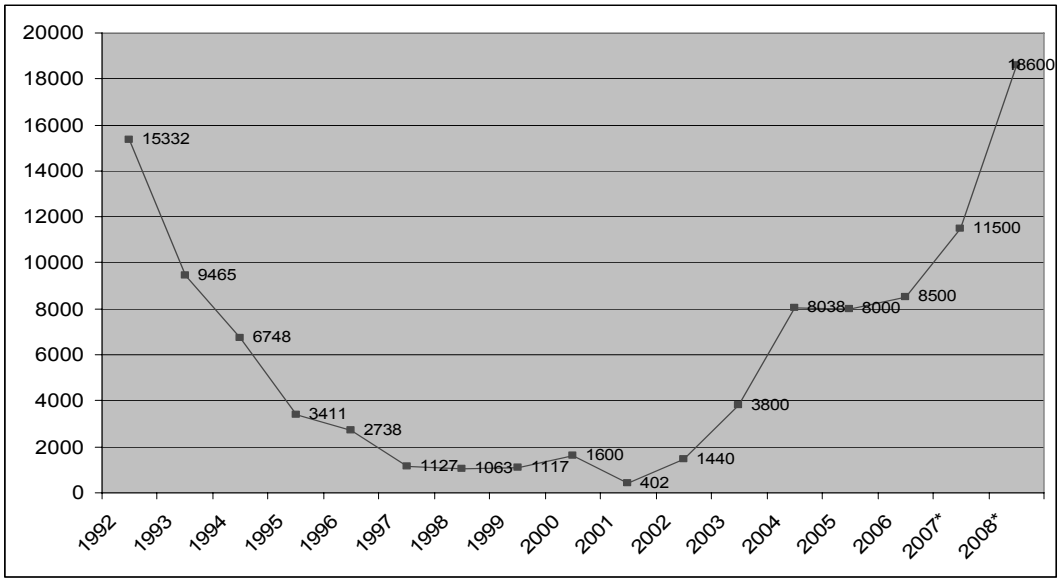

Figure 3. RZD purchases of new wagons in 1992-2008, items. Source: RZD

Figure 3 shows that since 1992 RZD purchases of new wagons were constantly declining up to 2001, when they reached the lowest level of 402. Beginning from 2002 RZD investments into new wagons have been growing. However even the highest level of purchases planned for 2008 is only 62% of the amount needed to replace the retired wagons.

The rolling stock deficit will be partly compensated by the growth in a number of wagons belonging to independent operators. The average age of freight wagons belonging to their fleet is about 14 years. Unlike RZD, they do not need to invest heavily in the replacement of retired wagons and thus have more possibilities for the new wagons purchasing. According to statistics, nowadays about 75% of freight wagon produced in Russia is consumed by independent operators. However, those purchases are not sufficient enough to cover the differed demand having roots in 1990s coupled with the new demand created by annual increase in the volume of the railway transportation (in the nearest 5 years it is expected to grow more than 6% annually). Therefore, most probably the deficit in rolling stock will remain at least until 2010 (see Figure 4).

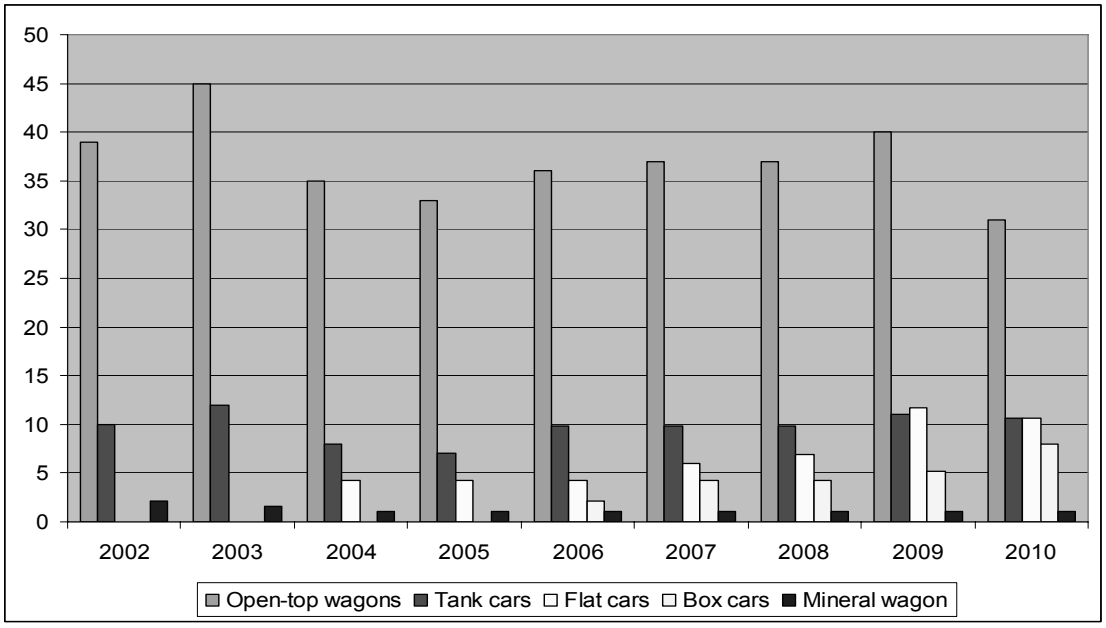

Figure 4. Deficit for different kind of wagons in Russia, thousand. Source: VKM Leasing

Figure 4 shows that in the following 5 years the railway transportation market in Russia will experience the growing deficit in all types of wagons, and especially in open-top wagons. The decrease in that deficit is expected only in 2010.

4. Freight wagon market in Russia

In Russia freight wagons can be acquired on either primary or secondary market. *Primary market* is represented by the small number of wagon manufacturing plants, the product range of which is partly overlapping. Prices differ significantly depending on the type of wagons. The average cost of open-top wagon is about EUR 35 000 including VAT, tank car – EUR 28 000, 80-feet flat car – EUR 44 000. Although certain profitable enterprises place large orders on manufacturing plants, the overall demand on this market is low due to the high prices of products compared to the secondary market.

The *secondary* market is mainly populated by middlemen selling and buying used wagons. Usually wagons are purchased in economically weaker CIS countries. Wagons from those countries share the same standards with Russian wagons, but their price is somewhat lower. Prices on the secondary market are significantly lower than on the primary market and depend on the demand for the model, extent of its wear, car-mileage, conducted and needed repairs. To compare, the price of 10 year old open-top wagon is about 1/2 of the new wagon price and the price of 20 year old wagon – 1/3 of it. So, the secondary market price of the used freight wagon in good condition is about EUR 11 000 – 17 000. Low prices define significant demand on the secondary market. At the same time, this market is characterized by speculative demand for certain models of wagons as well as by the deficit of certain models. For example, flat cars can be hardly bought on secondary market even for EUR 34 000 (Voronin. A, 2005).

5. Wagon manufacturing industry

The railway manufacturing industry in Russia is characterised by the high concentration of production. Freight wagon manufacturing is not that monopolistic as locomotive manufacturing or passenger wagons manufacturing. Still, the share of three leading plants (Uralvagonzavod SUE, Altaivagon JSC and Ruzkhimmash JSC) is about 90 % of the total freight wagon production. The share of Uralvagonzavod SUE exceeds 60% - in 2004 it produced 21 168 wagons. In 2004 Altaivagon JSC and Ruzkhimmash JSC produced 6 084 and 60 072 respectively. Earlier there was forth big player – Abakanzavodmash JSC with annual capacity of 2 000 wagons, but in 2004 its production decreased significantly. Three

leaders control the production of box cars, open-top wagons, tank cars and flat cars. The only sector, which is out of their control, is the production of self-unloading cars and hopper cars, which are mainly produced by Bryansk wagon manufacturing plant belonging to Transmashholding CJSC group. The production of freight wagons in Russia in 2001-2004 is shown in Table 3.

Table 3. Production of freight wagons in Russia in 2001-2004. Source: Rosstat, companies' data

	2001		2002		2003		2004	
	items	%	items	%	items	%	items	%
Altogether	6 578	100.0	10 887	100.0	26 973	100.0	35 358	100.0
Tank cars	2 496	37.9	5 823	53.5	15 579	57.7	11 174	31.6
Open-top wagons	2 609	39.7	2 638	24.2	5 250	19.5	13 706	38.8
Box cars	1 112	16.9	1 469	13.5	1 248	4.6	4 704	13.3
Flat cars	301	4.6	810	7.4	4 654	17.2	5 022	14.2
Dump cars & hoppers	60	0.9	147	1.4	258	1.0	752	2.1

As Table 3 shows, the total production of wagons is growing at a high rate. The most significant growth was evident in 2003, when the total output of freight wagons production was about 2.5 times higher than in previous 2002 year. It was a result of the huge increase in the demand from private companies created by introduction of 15% tariff discount for transportation in private wagons. However, already in 2004 the growth of production was significantly lower - 31%. According to the RF Ministry of Industry and Energy, in the following 2005 and 2006 the decrease of 7.6% and 4.8% in the volume of freight wagon production could be observed. This situation is partly explained by the fact that independent operators place their orders on Ukrainian plants, production of which is about 10-20% cheaper.

If we analyse the general situation in the railway manufacturing in Russia, it can be noticed that Russia is a net importer of the railway manufacturing production and Ukraine is the main exporter to the Russian market (see Figures 5 and 6).

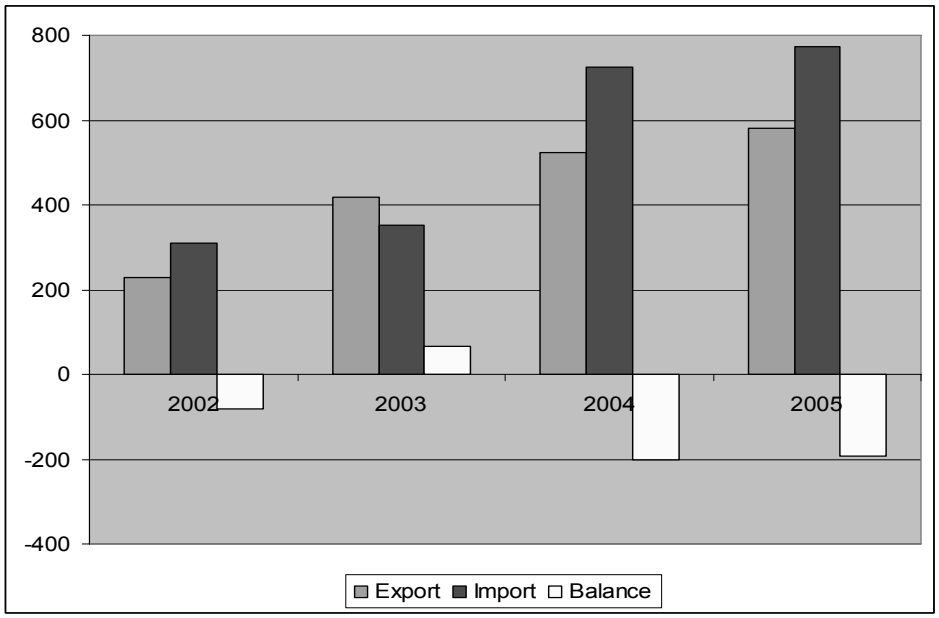

Figure 5. Balance of Russia's foreign trade of railway manufacturing production, USD million. Source: Rosstat, Minpromenergo

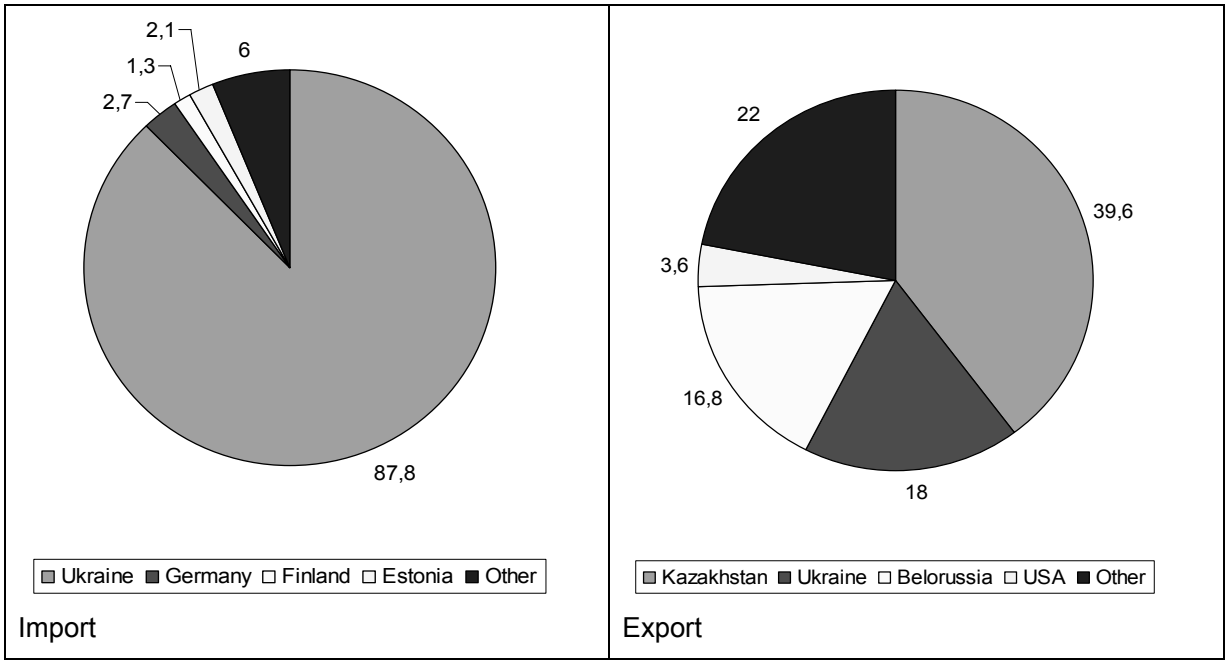

Figure 6. Main partners of Russia in railway manufacturing trade. Source: Rosstat, Minpromenergo

Figure 5 shows that in 2002-2005 Russia had the trade deficit in the railway manufacturing production. Only in 2003 small trade surplus could be observed. During that period import from Ukraine has grown from USD 190.5 million in 2002 to 679.1 million in 2005. Freight

wagons take about 50% of that import. The share of Ukrainian wagons in Russian freight wagon market is about 25% (Zaiko, A., 2006).

To a certain extant it could be explained by historical reasons. In Soviet Union time (in 1980s) Ukrainian wagon manufacturing plants annually produced 72 000 of freight wagons satisfying 60% of the total demand of all Soviet Republics (Verner N., 2006). Immediately after the dissolution of the Soviet Union and the division of Soviet assets Russia could satisfy only 50% of the internal demand for the railway manufacturing production. The followed sharp drop in transportation volumes and thus in the demand for new wagons decreased investment possibilities of Russian manufacturers. As a result, by the start of economy revival the Russian railway manufacturing plants have lost 30% of their production capacities. Remaining capacities are characterized by 65-70% depreciation and technological inferiority of 15-20 years. That is why existing production capacities of the Russian railway manufacturers cannot be fully utilized to meet the growing demand (see Figure 7).

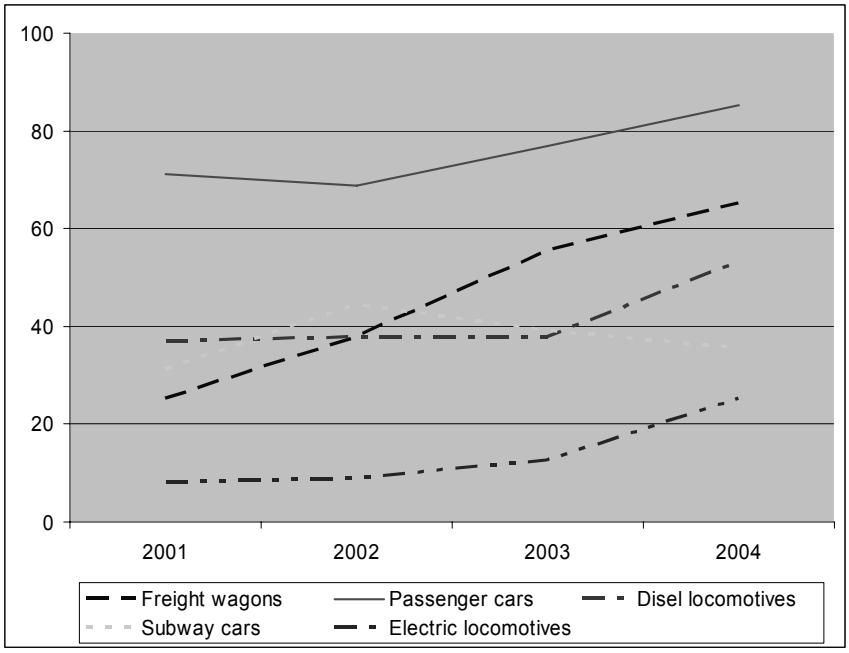

Figure 7. Utilization of production capacities in Russian wagon manufacturing in 2001-2004, %. Source: Minpromenergo

As it can be seen from Figure 7, the situation in the railway manufacturing sector is improving. In 2001 the average utilization rate of production capacities was about 35% and in 2004 it increased to almost 55%. However, it is not enough to satisfy the growing demand. The utilization of freight wagon manufacturing capacities in 2004 was on the level of about

65%. It is no wonder that Russian manufacturers are unable to cut prices for their products and win the competition with Ukrainian manufacturers. Moreover, it becomes evident that in case Russian companies to find money to cover the existing deficit in freight wagons, Russian manufacturers will be hardly able to produce the necessary amount of wagons. According to experts estimations, in 2005-2010 Russian companies will need 230 000 wagons (differed demand is not included). If nothing is changed, Russian manufacturers are able to produce 200 000 maximum.

Experts from the RF Ministry of Industry and Energy analysed the performance of Russian transport manufacturing market, compared to the world leaders (see Table 4).

Table 4. Performance of Russian transport manufacturing production market, compared to the world leaders. Source: Minpromenergo

		2005	2006	Target	Leading countries					
					Group average	USA	Japan	Germany	France	Great Britain
Share of Russia on the world market	%	10,00	12,00	20,00	12,40	13,60	8,90	16,30	15,40	7,80
	USD billion	3,50	4,50		5,02	5,20	3,70	7,20	6,50	2,50
R&D expenditures/sales ratio, %		0,01	0,25	10,00	11,92	13,30	14,60	12,10	10,70	8,90
Exports, USD billion		16,50	19,00		4,12	4,60	3,30	5,80	5,10	1,80
Fixed capital investments/sales ratio, %		2,60	4,80	14,00	11,88	13,30	11,40	10,70	11,90	12,10

Table 4 shows that in general Russian transport manufacturing plants have unacceptably low level of R&D expenditures and fixed capital investments. While the average level of R&D expenditures in leading countries is 11.92%, in Russia it is only 0.25%. Similarly, the level of fixed capital investments in leading countries is 11.8%, in Russia – 4.8%. To improve the situation in the industry, the level of R&D expenditures in Russia should be at least at the level of 10%, fixed capital investments – 14%.

The necessity in modernization of wagon manufacturing capacities as well as the need in the rolling stock innovation is evident. However, according to Viktor Litvinov, expert of the Institute of Natural Monopolies Research (INMR), wagon manufacturers find the massive implementation of new technologies to be disadvantages (Zaiko, A., 2006). The leaders of

freight wagon manufacturing – Uralvagonzavod SUE, Altaivagon JSC, Ruzkhimmash JSC, Transmashholding JSC – are not ready to the sharp change of the technology due to the deficit of financial resources for modernization of production capacities and lack of sufficient solvent demand. According to another expert of INMR Vladimir Savchuk, neither independent operators, nor RZD make long-term agreements with manufacturers (Zaiko, A., 2006). Moreover, RZD usually pays its own price for rolling stock, which is equal to the cost of production (manufacture provides the detailed information about it to the RZD) plus premium. According to Valentin Gapanovich, Engineering Manager of RZD, premium paid to the manufacture is very small. RZD does not let prices to increase higher than inflation rate (Barsukova, A., 2006).

6. Financial options

Wagon manufacturers

Lack of working capital is the common problem of all enterprises representing the real sector of Russian economy. Taking into account that the majority of the Russian railway manufacturing assets are undervalued, one possible way for manufacture to attract financing is to initiate the additional stock issue and enter stock market. In such a way a company may also attract strategic investor. However, today no single wagon manufacturing company is present on the stock market.

The other possibility is external debt financing. However, the number of banks ready to provide long-term loans to the railway manufacturers is rather small. Sberbank is the main financial partner of the wagon manufacturers. Manufacturers use bill of exchange procedures as one of the possible solutions to the problem. As another financing option a number of the railway manufacturers, such as Transmashholding JSC, Tverskoi wagon manufacturing plant JSC, Uralvagonzavod SUE, Ruzkhimmash JSC and Vagonmash JSC, use issue of corporate bonds. The activity of the Russian railway manufacturing companies on rouble bond market is shown in Table 5.

Table 5. Bond issues of Russian transport manufacturing companies in 2002-2005, RUR million. Source: Cbonds.ru, companies' data

	2002	2003	2004	Jan-Nov. 2005
Total volume	2 911	5 350	13 200	21 350
- including railway manufacturing companies' bonds	-	750	3 500	4 300
Share, %	-	14.0	26.5	20.1

As it can be seen from Table 5, the presence of transport manufacturing companies in general and railway manufacturers in particular is growing. It implies improvement in investment possibilities of the industry.

Rolling stock operators

Rolling stock operators (except RZD) are more restricted in their financing possibilities than manufacturers. Captive companies have advantage over independent operators as they can use financial support and guarantees of parent companies. It is much more difficult for independent operator to prove its investment attractiveness and credibility. One reason is that rolling stock operating market in general lacks transparency and thus it is extremely difficult to get information about the operating and financial performance of its players. The other reason is that Russian accounting system allows rolling stock operators to use different systems of gain recognition that often leads to the false reflection of the operators' financial situation.

To illustrate the rare success of rolling stock operators in attraction of debt financing the following companies could be mentioned: Severstaltrans JSC (loan notes), MMK-Trans LLC (corporate bonds), Novaya Perevozochnaya Kompaniya JSC (corporate bonds).

RZD should be mentioned separately as the rolling stock operating is not its primary activity and in the near future it will be completely outsourced to RZD subsidiaries. RZD had several issues of corporate bonds in 2004 and 2005. No new issues are planned as RZD is getting ready to enter stock market by selling stocks of its subsidiaries – Transcontainer OJSC and Cargo Company OJSC.

Leasing

Leasing represents one more financial option benefiting both wagon manufacturers and rolling stock operators. Leasing provides operator with possibility to acquire freight wagons without significant initial investments. The advantages of leasing comparing to bank loans are summarized in Table 6.

Table 6. Comparative analysis of bank loans mechanism and leasing in financing of rolling stock purchases

Bank loan	**Leasing**
1. The maximum term of a bank credit on the market for banking services is 12-36 months.	1. Financing for 60-96 months.
2. The principal on a credit is paid from new profit.	2. Leasing payments are listed as costs, reducing the taxable base for profit tax.
3. Liquid collateral and a current account history are required by the creditor bank.	3. It is sufficient to have maximum 20% of the cost of the equipment to make an advance payment, no collateral required.
4. The mechanism of accelerated amortization with a coefficient of 3 is not applied.	4. By applying accelerated amortization with a coefficient of 3, savings are made on property tax.
5. As a rule, banks make additional demands before providing a credit (the opening of an account, transfer of turnover, etc.).	5. Generally no additional requirements are made, and projects are dealt with quickly.

As can be seen from the Table 6.2, the main advantages of leasing are: savings on property tax, redistribution in time and reduction of profit tax, which easily compensate the difference between more high leasing rate and bank rate.

Assisting operators in rolling stock purchasing leasing companies also bring benefits to wagon manufacturers increasing their sales and thus improving their investment possibilities. In addition leasing companies contribute to the development of secondary rolling stock market as earlier RZD was almost the only supplier of used wagons. The development of the railway leasing in Russia is reflected in table 7.

Table 7. Development of railway leasing in Russia. Source: Gazman, V. (2006)

	2000	2001	2002	2003	2004	2005
Total value of leasing agreements, USD million	1 415	1 960	2 320	3 640	6 750	8 510
Annual growth (%)	-	38.5	18.4	56.9	85.4	26.1
Value of railway leasing agreements, USD million	7	26	77	346	1 539	1 678
Annual growth (%)	-	271.4	196.2	349.4	344.8	9.0

Table 7 shows that the railway leasing in Russia becomes more popular. Since 2000 the leasing market is constantly growing at a high rate. The most significant growth in the sector of the railway leasing was evident in 2003-2004. The reason for that is in changes in Russian legislation introduced in 2003: 1) 15% tariff discount for rolling stock owners; 2) increased depreciation rates and thus decreased depreciation terms for railway rolling stock. In 2005 the

market growth has slowed down. However, railway leasing still has very good prospects considering the level of rolling stock depreciation in Russia.

RZD is the major lessee (63.3% of all leasing operations) among rolling stock operators. Since 2003 it actively uses leasing for its rolling stock renovation. The volume of leasing agreements made by RZD in 2003-2005 reached RUR 44.3 billion. According to those agreements 8 000 freight wagons, 500 passenger wagons and 250 commuter cars were bought. In 2006 alone the volume of RZD leasing operations was RUR 30 billion; in 2007 it expected to grow to RUR 34 billion.

7. Discussion & Conclusions

The study has revealed that existing freight wagon fleet in Russia is insufficient in terms of both quantity and quality to meet the growing demand for the railway transportation services. This problem is multifaceted. From the one side, rolling stock operators are unable to create the sufficient solvent demand for freight wagons. The biggest rolling stock owner RZD does not invest heavily into the new freight wagons because of the necessity to finance the modernization of infrastructure, locomotives and passenger wagons. The financial possibilities of smaller independent operators are limited by the low level of profitability and restricted access to the debt financing. Thus bigger independent operators are the main consumers of wagon manufacturing enterprises, but their financial possibilities are also limited. From the other side, currently wagon manufacturers can hardly satisfy even existing demand due to the sufficient depreciation of the productive assets and the technological inferiority of 15-20 years. The price paid by RZD contains minimum premium for wagon manufacturers. Independent operators usually pay a higher price, but do not engage in long-term cooperation with manufactures. As a result, the average profitability of railway manufacturing enterprises is only about 5.4%. It is not enough even to increase significantly the production of existing product range, not to mention the new generation of wagons. According to Minpromenergo, the cost of R&D, tests, certification and production engineering of the new wagon is EUR 230 - 290 thousand.

The leading positions of wagon manufacturing companies from the EU, the US, Canada and Japan are to a great extent determined by significant (about USD 4-9 billion annually) state investments into development of the new railway technologies (Grigoriev, L., 2007). Russian governmental officials still cannot decide on the appropriate form of state support for

railway manufacturing industry. Large-scale direct investments are considered to be inappropriate as they carry a high risk of unauthorized use of budgetary funds. Tax privileges, state loan guarantees, credit interest rate subsidies, etc. are also rejected. The RF Minister of Economics and Trade German Gref believes that all those financial tools mislead railway manufacturers and create unjustified expectations. According to him, no one smart manager would invest own money today if tomorrow those investments will be made with state money (Lavrov, A., 2007). In these circumstances wagons manufacturers can hardly expect large-scale state support and thus have to rely on their own resources.

After the review of foreign experiences and the analysis of the situation on the Russian railway market, the study concludes that Russian wagon manufacturers could use *consolidation* as one of the possible solutions to the problem. The need in consolidation is determined by the specifics of wagon manufacturing production, which is characterized by high capital and research intensity. In the early 1990s massive mergers and acquisitions occurred among rolling stock manufacturers in North America and Western Europe making them international businesses with little regard to national boundaries. Later the same processes took place in Japan, South Korea and China (Sato, Y., 2005). As a result, currently the world railway manufacturing market is dominated by about 10 transnational groups, which include large R&D subdivisions with significant budgets for the new technology development. The leading world manufacturers are Bombardier (Canada), Alstom (France), Siemens (Germany), Loric (China), Kawasaki/Hitachi (Japan), and General Electric (the US), which share in the total world production of railway equipment exceeds 75-80%. At the same time, it should be noted that even fully consolidated Russian railway manufacturing industry will unlikely be able to solve the problem of technology inferiority quickly relying only on own resources.

Another possible solution for the Russian wagon manufacturers could be the *establishment of joint-ventures* with technologically advanced foreign companies. The efficiency of this solution is proved by the case of Chinese railway manufacturing industry. There are two main reasons determining the interest of transnational corporation in cooperation with Russian companies. First, the domestic markets of those corporations are close to saturation (the annual growth is about 3-4%) and thus they are forced to explore the new markets to avoid stagnation of production. From this point of view, the Russian market is very attractive as its annual growth rate exceeds 30%. Second, the production of transnational corporation is not competitive on the Russian market due to the high prices (on average prices for European products are 2-3 times higher than for Russian) and the differences in technical

standards. Establishment of joint-ventures with Russian companies could help transnational corporation to overcome those barriers. For the Russian side the most appropriate form of cooperation with foreign companies would be the joint venture with obligatory technology transfer and maximum localization of production.

As a forthcoming research, it would be interesting to interview representatives of Western European and Russian wagon manufacturing companies in order to clarify their attitude and expectations from potential cooperation. It would help to define the most efficient and mutually beneficial form of international co-operation of wagon manufacturing enterprises.

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About the author(s)

Oksana Ivanova
P.O. Box 20 FIN 53851, LAPPEENRANTA, Finland
Tel. +358 5 621 6627, fax +358 5 621 2699, e-mail: oksana.ivanova@lut.fi

A Method for Estimating the Maximum Number of Trains Arriving to a Railway Station with a Connection to a Sea Port

Petr Rybin & Victor Fomenko

St. Petersburg State Transport University, Russia

Abstract

The time of cargo supply per railway depends on the number of tracks available at the stations positioned along the transportation route. On the other hand, the number of tracks attending to arriving and leaving trains is determined by the maximum number of trains simultaneously staying at the station. This fact is especially important for railway stations, which supply goods to sea ports since the turnover of a port depends on the volume and intensity of cargo transportation by railway. In this paper, a method is suggested to estimate the maximum number of trains which are expected to arrive within a given time interval. The method does not require knowledge of the probability distribution describing statistical data. It enables one to make reliable predictions taking into account changes in the variation coefficient and traffic intensity.

Keywords: distribution, railway station, train moving, sea port

1. Introduction: Formulation of the problem

For successfully carrying out in future cargo transports by railway to sea ports it is necessary to further improve technical equipment and process technologies of the railway stations. To solve this technical task it is important to assess the volume of traffic and make predictions of it for future. For instance, these characteristics are used in order to determine the necessary number of tracks at stations. Recently, statistical simulation is widely utilized to solve problems similar to those mentioned above. Such methods are based on probability distributions regulating various particular processes which form the functioning of a railway station as a whole. The corresponding distributions are derived from statistical data by fitting empirical distributions.

However, there can arise some serious problems when such approach is implemented in practice. Firstly, intensity of processes involved in simulation can vary in time. As a result, actual distributions change as well and the distributions used in modeling become inadequate. Secondly, often the interesting parameters need to be determined with confidence probability 0.95 – 0.99. But there is an appreciable scattering of values in this range caused by deterministic factors what prevents one to solve the problem with satisfactory accuracy.

To some extent the abovementioned difficulty may be overcome by using in statistical simulation more realistic distributions rather than the standard ones like gamma or normal

distribution. But then the results concern a particular station only and cannot be applied to another one. It is due to the fact that statistical data may differ appreciably, that being true even for stations of similar type. Yet, no predictions are possible in this case if traffic intensity changes.

It is clear from what said above that it is desirable to determine necessary parameters with satisfactory accuracy without implying a particular probability distribution. This paper deals with one of these quantities, the maximum number of trains which are expected to arrive within a given time. This characteristic is crucial for planning an efficient development of railway stations. We base our approach on most general properties of probability distribution for inter-train intervals. More specifically, the only characteristics we use are traffic intensity and variation, skewness and excess coefficients of the inter-train interval distribution.

2. Derivation of the probability estimate.

First, the used notations are introduced. Let $f(x)$ be the distribution density of inter-train intervals, $\Lambda_n(x)$ the probability density of the chance that exactly n trains arrive within time interval $(0, x)$, the last train getting in at moment x. Note that a random number with the $\Lambda_n(x)$ distribution can be treated as the least possible length of the time interval containing the arrival moments of n trains. We will denote such a random quantity as ξ_n in the following. Let $\varphi(p)$ and $L_n(p)$ be the Laplace transforms of the functions $f(x)$ and $\Lambda_n(x)$:

$$\begin{aligned} \varphi(p) &= \int_0^\infty \exp(-px) f(x) dx \\ L_n(p) &= \int_0^\infty \exp(-px) \Lambda_n(x) dx \end{aligned} \tag{1}$$

One immediately gets from these equations

$$\begin{aligned} &\varphi(0) = 1; \quad m_k = (-1)^k \varphi^{(k)}(0) \\ &L_n(0) = 1; \quad M_k = (-1)^k L_n^k(0) \end{aligned} \tag{2}$$

where m_k and $M_k^{(n)}$ stand for initial moments of the k th order of the $f(x)$ and $\Lambda_n(x)$ distributions, respectively.

As was shown by us earlier in paper Rybin and Fomenko 2006, the Laplace transforms under consideration are related to each other as follows

$$L_n(p) = \frac{I}{p}(1-\varphi(p))\cdot\varphi^{n-1}(p) \tag{3}$$

where I denotes the traffic intensity. Thus, $I = m_1^{-1}$. After having expanded $\varphi(p)$ in powers of p, one obtains from Eqs. (2) and (3)

$$L_n(p) = \left(1 - \frac{m_2}{2m_1}p + \frac{m_3}{6m_1}p^2 + \mathrm{O}(p^3)\right)\varphi^{n-1}(p). \tag{4}$$

We arrive at the following expressions utilizing Eqs. (2) and (4)

$$\begin{aligned}
M_1^{(n)} &= -L_n'(0) = \frac{m_2}{2m_1} + m_1(n-1) \\
M_2^{(n)} &= L_n''(0) = \frac{m_3}{3m_1} + 2m_2(n-1) + m_1^2(n-1)(n-2) \\
M_3^{(n)} &= -L_n'''(0) = \frac{m_4}{4m_1} + 2(n-1)m_3 + \frac{9}{2}(n-1)(n-2)m_1m_2 + \\
&+ \frac{3}{2}(n-1)\frac{m_2^2}{m_1} + (n-1)(n-2)(n-3)m_1^3
\end{aligned} \tag{5}$$

Let us introduce the variation, skewness and excess coefficients in the conventional way

$$\nu = \frac{\sigma}{m_1};\ \ a = \frac{\mu_3}{\sigma^3};\ \ e = \frac{\mu_4}{\sigma^4} - 3, \tag{6}$$

the quantities σ, μ_3 and μ_4 being standard deviation and central moments of the third and fourth order of the $f(x)$ distribution. Then the following relations can be easily derived

$$\begin{aligned}
&m_2 = m_1^2(1+\nu^2);\quad m_3 = m_1^3(1+3\nu^2+a\nu^3); \\
&m_4 = m_1^4\left[(e+3)\nu^4 + 4a\nu^3 + 6\nu^2 + 1\right]
\end{aligned} \tag{7}$$

The following expressions are obtained for the three first moments and variance of the $\Lambda_n(x)$ distribution from Eqs. (5) and (7)

$$
\begin{aligned}
M_1^{(n)} &= m_1\left(n-\frac{1}{2}+\frac{1}{2}\nu^2\right)\\
M_2^{(n)} &= m_1^2\left[n(n-1)+\frac{1}{3}+(2n-1)\nu^2+\frac{1}{3}a\nu^3\right]\\
D\xi_n &= m_1^2\left[\frac{1}{12}+\left(n-\frac{1}{2}\right)\nu^2+\frac{1}{3}a\nu^3-\frac{1}{4}\nu^4\right]\\
M_3^{(n)} &= m_1^3\left[\frac{1}{4}(4n^3-6n^2+4n-1)+\nu^2\frac{3}{2}(3n^2-3n+1)+\right.\\
&\left.+\nu^4\frac{3}{4}(2n-1)+a\nu^3(2n-1)+\frac{1}{4}e\nu^4\right]
\end{aligned}
\tag{8}
$$

To determine the maximum number of trains which are expected to arrive within time interval T with confidence probability P_0, we search for the minimum value of n which satisfies the following inequality

$$P(\xi_n > T) \geq P_0 \tag{9}$$

To this end, we use the probability bound suggested by Chebyshev (1948).

$$P(\xi_n > T) \geq Q(M_1^{(n)}, M_2^{(n)}, M_3^{(n)}) \tag{10}$$

Chebyshev (1948) has proved that the probability $P(\xi > x)$ where ξ is an arbitrary random number bounded from above takes on its lower and upper bounds for point-like distributions. They can be determined from the distribution moments. The function Q in the right-hand side of Eq. (10) is rather complicated since its analytical form depends on particular values of the moments involved. For this reason it is more practical to use a computer code implementing the Chebyshev idea to find the Q values. It is just the way we followed in this paper.

3. Some applications of the estimates considered

A bulk of statistical data has been accumulated which concern a number of railway stations attending to Russian sea ports on the Gulf of Finland. These data contain information on arrived trains for a period of several months.

We investigated four railway stations. The histograms of Figures 1 and 2 summarize the statistical data for two of them: Novy Port and Avtovo. Both empirical and theoretical frequencies are given, the latter ones being calculated proposed a gamma distribution holds for inter-train intervals. The scale and shape parameters inherent in this distribution were found for each station by the maximum likelihood method. The gamma distribution hypothesis has passed Pearson's χ^2 test for three (all but Avtovo) stations. There are several reasons for the Avtovo test failure. In particular, this station has a rather poor track structure and, as a result, there are permanent problems in sending trains from neighboring stations to the port. Additionally, express freight trains dominate the railway traffic for this station.

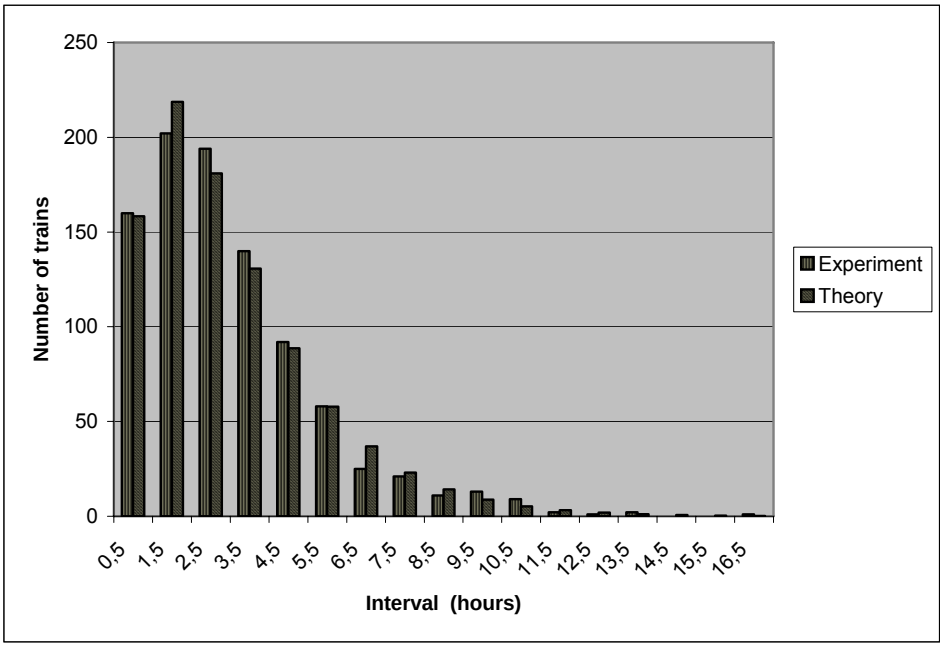

Figure 1. Inter-train interval distribution at the Novy Port station.

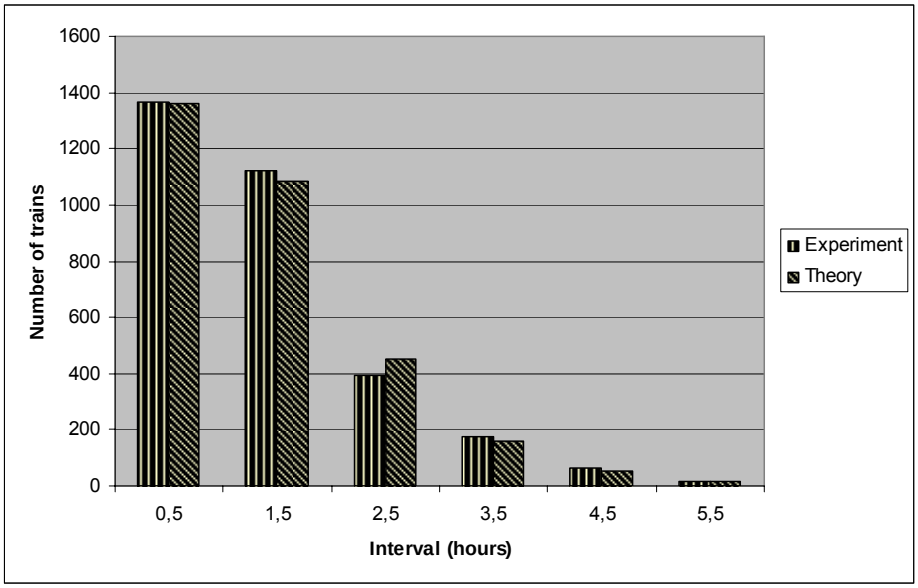

Figure 2. Inter-train interval distribution at the Avtovo station.

It should also be noted that the work organization at the stations under consideration have many features in common. Therefore a unified approach is required when assessing the number of trains arriving at these stations in order to draw well-grounded conclusions on development of these stations in future.

In this paper we estimate the maximum number of arriving trains for four abovementioned port stations in different ways. The results are presented in Table 1. In all cases considered confidence probability was taken equal to 0.95, duration of time interval 24 hours. In the second line of this table the figures are given that have been obtained assuming the gamma distribution for inter-train intervals. The next line contains the results obtained by a method very similar to that discussed in this paper but exploring two rather than three distribution moments $M_i^{(n)}$ (see Eq.(10)). The method was discussed in Rybin and Fomenko (2006). In the paper we have shown how the method can be improved by taking into account symmetry reasons. The second line from below contains the results obtained in that improved version. At last, the bottom line shows the figures calculated by means of the method outlined in this paper.

Table 1. Estimates calculated by various methods.

Port station	Avtovo	Novy Port	Vyborg	Vysock
Gamma distribution	23	12	38	5
Two moments estimate	38	26	58	16
Two moments (modified)	31	19	48	11
Three moments (present paper)	30	18	47	10

As is seen from Table 1, the most exact estimate values are attained if a specific distribution is implied (here, the gamma distribution). Though the gamma distribution often proves to be compatible with statistical data when assessed by Pearson's χ^2 test (see above), a distribution independent estimating procedure would be more reliable in general and more convenient in practice. The results given in the last three lines do not imply any particular distribution and are based on several first moments. Clearly, the more moments are involved, the more precise the estimates. The figures in the last but one line demonstrate obviously better estimates as compared to the preceding line. However, it should be noted that these results, strictly speaking, do not present a proper estimation because some symmetry of distribution curve is assumed (see paper Rybin and Fomenko 2006). At last, still better results are obtained if three moments are taken into account by the method suggested in this paper.

The number of tracks at a station needed to receive that many trains as indicated in Table 1 has been determined according to Regulations (2001). They are given in Table 2.

Table 2. Number of tracks needed to receive getting in trains.

Port station	Avtovo	New Port	Vyborg	Vysock
Gamma distribution	2	1	3	1
Two moments estimate	3	2	5	2
Two moments (modified)	3	2	4	1
Three moments (present paper)	3	2	4	1

It is an important practical task to assess the number of trains which will arrive at a station in future when the properties of train circulation change (for example, the traffic intensity). The results obtained by the method outlined in this paper for the Novy Port station are presented in Appendix. These results show the dependence of the maximum number of trains to arrive at the station within a day on the traffic intensity (I) and variation coefficient ν (see Eq. (6)).

Each curve corresponds to the values of ν equal to 0.25, 0.5, 1, and 1.25 times the basic value extracted from statistical data.

4. Concluding remarks

The present investigation enables one to draw the following conclusions. Though the estimates of the maximum number of arriving trains which have been done by various methods differ, this fact is not essential for determining the number of tracks needed to receive the trains as one sees from Table 2. That is why these methods may be utilized in practice, especially owing to the fact that in doing so there is no need to explicitly construct the distribution function. Moreover, this approach may turn to be helpful to make predictions of the maximum number of trains to arrive within a given time interval provided the average traffic intensity in future is known.

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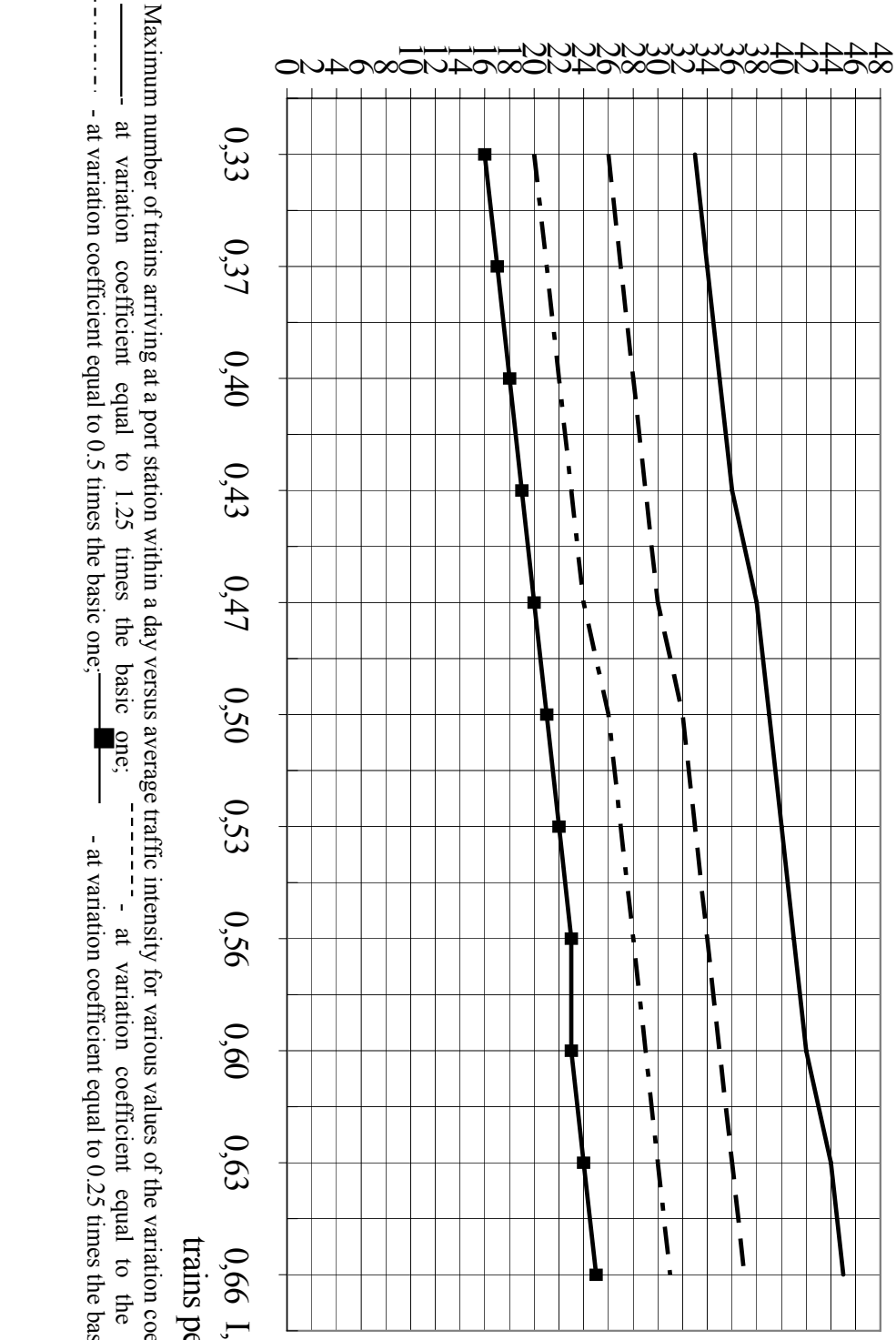
About the author(s) (s)

Petr Rybin, candidate of technical sciences, professor of the Railway stations and junctions Department, Dean of the Operation of transportation processes faculty of Petersburg State Transport University, the author of 60 scientific works.
tel. +7 (812) 3106575, E-mail: gdsu@mail.ru

Victor Fomenko, doctor of science, professor of the Higher mathematics Department of Petersburg State Transport University, the author of 80 scientific works.
tel. +7(812) 7688172, E-mail: vfomenko@webplus.net

Appendix 1. Maximum number of trains arriving at a port station.



Maximum number of trains arriving at a port station within a day versus average traffic intensity for various values of the variation coefficient *v*:
——— - at variation coefficient equal to 1.25 times the basic one; - - - - - - - - - at variation coefficient equal to the basic one;
- . - . - . - . - at variation coefficient equal to 0.5 times the basic one; ——■—— - at variation coefficient equal to 0.25 times the basic one.

The Training Center of Transport Control

Alexey Bessolitsyn

St. Petersburg State Transport University, Russia

Abstract

The safety of railway traffic always has been the major object of railway operation. The safety conditions are achieved owing to professional knowledge and skills of personnel working in standard and non-typical situations. The Training Center of Transport Control (TCTC, in Russian "UCUP") of Railway Operation department of Saint-Petersburg State Transport University prepares the specialists for railway transport organization and control. At the training center students obtain the experience concerning railway safety and acquire basic skills of functioning at workplaces. During this period students make mistakes, so training of basic principles of their work are mastered with the help of models to avoid the violence of safety.

Obtaining experience in non-typical situations is the second task of the training center. There are possibilities both to simulate non-typical operation emergency situations arising at the railway stations here. These allow students to get an experience of working in non-typical situations observing the railway traffic safety. Nowadays TCTC introduces students to the work of an assistant station-master and a train dispatcher, functioning of the reference station with a hump yard, the existent structure of railway transport control, functioning of the railway department in standard and non-typical situations.

The third important problem is the usage of the acquainted knowledge, which makes one control the railway traffic and plans the future transportation procedure. The obtained habits allow not only to perform necessary actions to control railway traffic, but also to forecast and plan further operations. Training facilities of TCTC is the base for research activity in railway transportation area. Equipping TCTC with the advanced automated facilities and IT-framework creates opportunities for students and young researches to perform research and scientific work.

Keywords: training, railways, safety, Russia

1. Introduction

The safety of railway traffic always has been the major object of railway operation. The safety conditions are achieved owing to professional knowledge and skills of personnel working in standard and non-typical situations. The Training Center of Transport Control (TCTC - УЦУП) Railway Operation department Saint-Petersburg State Transport University prepares the specialists for railway transport organization and control. At the training center students obtain the experience concerning railway safety and acquire basic skills of functioning at workplaces. During this period students make mistakes, so training of basic principles of their work are mastered with the help of models to avoid the violence of safety.

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work of an assistant station-master and a train dispatcher, functioning of the reference station with a hump yard, the existent structure of railway transport control, functioning of the railway department in standard and non-typical situations.

The third important problem is the usage of the acquainted knowledge, which makes one control the railway traffic and plans the future transportation procedure. The obtained habits allow not only performing necessary actions to control railway traffic, but also to forecast and plan further operations. Training facilities of TCTC is the base for research activity in railway transportation area. Equipping the training center with the advanced automated facilities and IT-framework creates opportunities for students and young researches to perform research and scientific work.

Table 1. Students of Railway Operation Department of the State Saint-Petersburg Transport University are trained in TCTC centre as future employees.

	Semesters						
Speciality	3	4	5	6	7	8	9
Railway Operation			10 h	34 h	16 h	16 h	16 h
Business management	18 h	17 h					
Information science and information security					16 h		

Courses of qualification improvement consist of:

For assistant station-master:

- Studying of the advanced information technologies on transport (a breadboard model of the railway), 4 h.
- Working as an assistant station-master at a telephone communication facility (a breadboard model of the railway) 2 h.
- Working as an assistant station-master in non-typical situations (a breadboard model of the railway) 2 h.
- Testing for knowledge of the basic instructions.

For train dispatcher:

- Studying of the advanced information technologies on transport (a breadboard

model of the railway) 2 h.

- Working out the schedule of the train dispatcher document under messages of assistant station-master (the program for the personal computer) 2 h.
- The miss of trains on a site with the maximal loading (the virtual railway) 2 h.
- Testing for knowledge of the basic instructions.

For station master:

- History of TCTC development 1 h.
- Studying the advanced information technologies on transport (a breadboard model of the railway) 2 ч.
- Testing for knowledge of the basic instructions.
- Scientific work in TCTC.

Students and post-graduate students are involved into the research with use of programs established in TCTC. For example: AS RPFP (automated calculation system of the train branches). The breadboard model of the railway together with the time-table were made for that purpose.

2. TCTC Description

For today TCTC consists of railway operation laboratory with the breadboard model of the railway copying 10 stations, connected single-track railroad or double-track railroad (auditorium 7-336, 7-338, 7-340), dispatching circles (auditorium 7-336, 7-442) and a computer class (7-440, 7-336).

The breadboard model of the railway is 73 meters long. It is executed on the basis of railway transportation models of standard size H0 (scale 1:87, 16 mm track width) and has decorations (Figure 1). On the breadboard model 10 stations are connected into the track railroad. They have various imitations of maintenance by means of the signal system and communication.

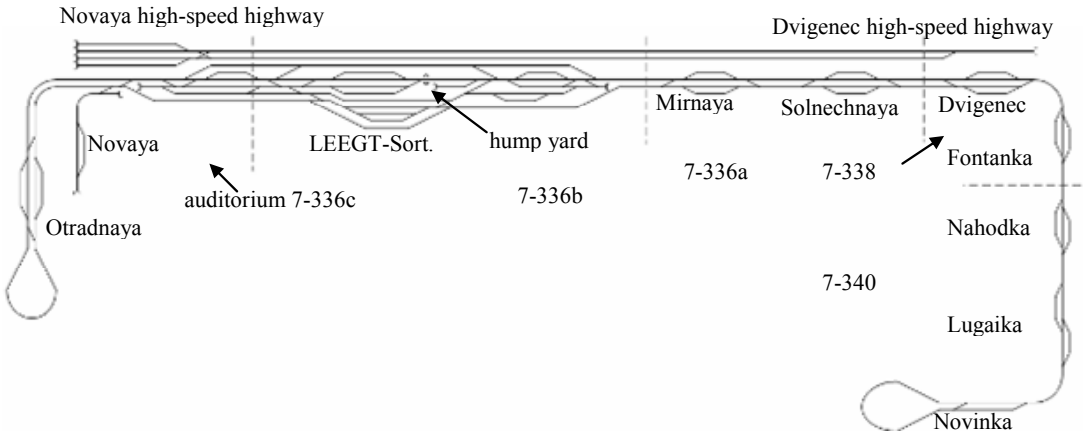

Figure 1. Plan breadboard model of the railway

Stations are equipped with centralized electric traffic computer control of switch and signals. Hardware of all automated operation work places is based on IBM compatible class Pentium of a non-standard configuration. For coordination with local automatic devices and realization of management functions special centralized traffic control systems are used.

On the stations "LEEGT-Sort.", "Novaya" and "Otradnaya", centralized traffic control equipment with an opportunity of management preservation through boards is established (Figure 2). Centralized traffic control is executed as a two-level structure where the top level of devices represents the automated workplaces of the assistant station-master and the train dispatcher.

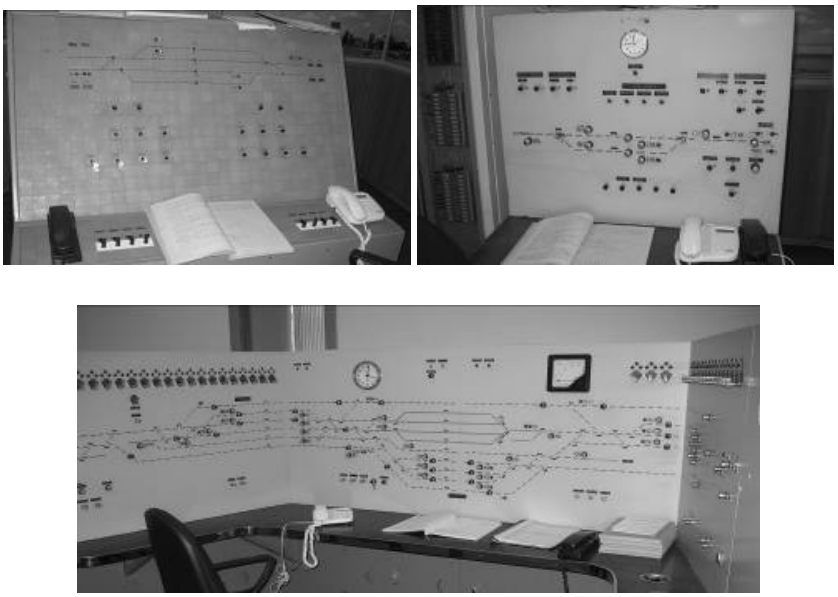

Figure 2. Centralized traffic control "Otradnaya", "Novaya", "LEEGT-Sort."

Two personal computers enter the structure of the automated workplace (the basic and reserve). Thus the reserve computer displays the help information on station:

- The technical certificate of station,
- The instruction on the signal system on railways of the Russian Federation,
- The instruction on train movements and shunting work on railways in the Russian Federation,
- Rules of technical operation of railways of the Russian Federation,
- Samples of document filling and the forms used on the railway.

The basis displays movement conditions as a whole at station with track railroad and provides following modes:

- Choice of station (automated workplace train dispatcher);
- A general plan;
- Scrolling station and scaling;
- Movement;
- Viewing data from the channel, etc.

The controllable item of a dispatching circle, which includes realization of electric centralization functions and stations of a dispatching circle, concerns to the second level. On the breadboard model three dispatching circles and a workplace of the main dispatcher are created. All workplaces are equipped by telephones and selector communications.

The breadboard model of a hump is located at “LEEGT-Sort” station (Figure 1). The hump yard is non-mechanized. The problems of organization of structure dissolution on a breadboard model of a hill (regulation of speed cars in a car yard, automatic come uncoupled cars, weak traveling development) have not been resolved and modernized of a breadboard model.

Breadboard model VSM (high-speed highway), established in 7-336, 7-338 also represents two stations (technical station and station of a turn), and connected to double-track railroad. Movement on a breadboard model is carried out by two high-speed trains which are simultaneously sent from stations.

The computer class consists of 18 computers based on Pentium IV (1500). Computers are connected to a local university network and a workplace of teacher, Pentium IV (1500) and server Pentium III. The following programs are established:

- Calculation of “car-hours”: idle time of cars on station;
- Calculation of the train branches;
- Calculation of decomposition of structures, for reception of initial data to course designing;
- The audio “GUIDE”, working out the schedule of the train dispatcher document under messages of assistant station-master;
- The automated preparation system for operation personnel (ASPO) works in normal and non-standard situations;
- The automated calculation system of the train branches;
- Access to resources of university.

By now a part of TCTC equipment, the breadboard model, has gone physically and morally obsolete:

- It is removed from manufacturing and replaced;
- The system of electric supply demands reconstruction;
- The necessity of the new generation of computer technologies has ripened;
- Necessity of system, service and control development.

I offer following directions of TCTC development:

1) Development of a breadboard model of the railway
2) Development of a computer class
3) Realization of innovative projects

3. Development of a breadboard model of the railway

Application of a digital control system

The analog control system realized on a breadboard model demands modernization. It is necessary to carry out a transition to a modern digital control system. A digital control system with electromechanical devices on breadboard models is needed. It will allow to work without a big number of wires. The additional microcircuits connected with the realistic maneuver modelling at stations and track railroad are needed. Differently, several locomotives can be operated on any sites by the means of only two wires. The leading manufacturer of such systems is the “Roco” company, which uses NMRA DCC format, The National Railroad

Model Association of Digital Command Control (North American association of railway models, a digital control system of a direct current). The Control systems supporting the NMRA DCC format are issued by the following companies: “Lenz”, “TRIX”, “Uhlenbrock”, “ESU”, “Zimo”. Each of three working systems of different manufacturers has the distinctive features: essentially all are arranged equally, distinctions exist only in electric parameters and ways of coding.

The decoders of the last generation have smooth adjustment of a course and a three-stage synchronization of the pressure, submitted on the engine depending on loading of the last, for there were no jerks at movement of the locomotive in a hill or at work with greater structure. As locomotives can submit signals about arrival and departure, the coming uncoupled cars can be operated automatically.

Imitation of the work of automatic identification system of a rolling stock

The identification system of a rolling stock is automatically realized at installation of digital management by movement on a breadboard model of the railway. For acquaintance with principles of the work of the system it is necessary to establish breadboard models of the reading out equipment in mouths of stations. Automated workplaces of a station-master assistant and a train dispatcher for imitation and display of automatic identification work are prepared.

The use of an analog control system addition of a floor part of a breadboard model with dot gauges of the control of a rolling stock is necessary.

Automated workplace of a station-master assistant and train dispatcher

For transition it is necessary to introduce modern computers with LCD displays. The opportunity of refusal of reserve management at stations will allow to release a place for the organization of other laboratory works. It is necessary to replace the used operation system OS ½. The basic requirement to operation system is the opportunity of constant development of the software that allows to develop the automated workplaces on a breadboard model of the railway on its base.

As on the stations of a breadboard model, “LEEGT-Sort.”, “Novaya” and “Otradnaya”, the electronic model of transportation is not supported, it is necessary to establish the reserve automated workplaces of a station-master assistant with LCD displays.

Automation of a hump yard

On a railway breadboard model, at use of digital management, it is possible to simulate work of a hill and thus to solve problems of hump yard. Imitation of the automated hump yard allows students to get acquainted with its work. For this purpose, it is necessary to establish electromagnetic delay with digital management and to equip a breadboard model with models' devices (delay, speedometer, devices of the account of cars, etc).

For the imitation of the process of structures dissolution, and also for training and developing the skills of an assistant hump-master, it is necessary to add a breadboard model of a hump yard electromagnetic delay with digital management.

For training and developing the skills of the station-master assistant on a hill, it is necessary to use a virtual hump yard simulator, for example: "SGUPS".

For an effective utilization of a virtual hump yard simulator, it is meaningful to establish it in the first number of a podium and to connect it to a projector. It will allow to show the screen of a computer virtual hump yard, a simulator and evidently to acquaint the students with its work, (Figure 3).

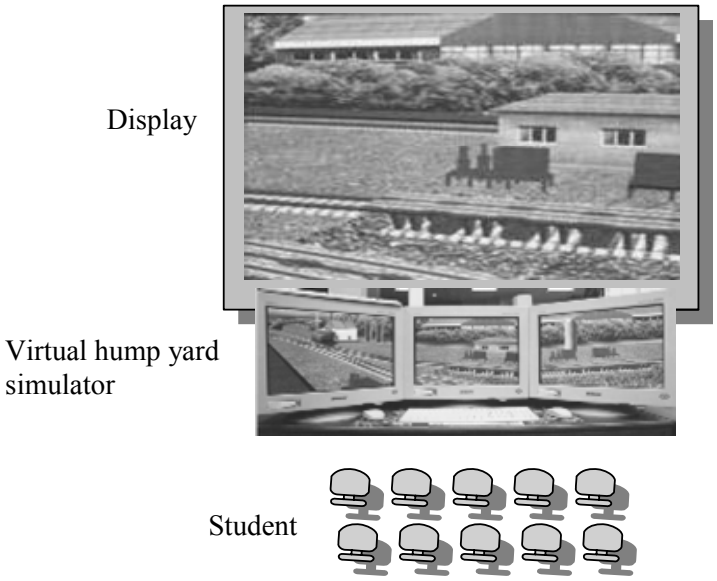

Figure 3. Virtual hump yard simulator

High-speed highway

It is necessary to equip the breadboard model with a high-speed highway (VSM) management (automated workplace assistant station-master VSM) from stations "Novaya" and "Dvigenec". It will allow to keep the employees connected with the organization of the high-

speed movement, consisting of the operation working off on reception/departure of high-speed trains, and to get them acquainted with the features of the high-speed movement organization, etc.

Working out of skills in the field of high-speed movement organization is the necessary requirement in modern conditions of management and technological development of the railway transportation.

Installation of video control in TCTC

For today all audiences of the Educational center are equipped by the signal system and there is a video supervision over the audiences where the breadboard model is established. The video recordings are stored on a hard disk of the video registrar. To raise the quality of a picture and to increase the period of storage of record it is necessary to establish the new digital video registrar.

Its connection to a university network will allow to view the process in a mode of real time in audiences. Thus, at carrying out the employment, the teacher from an audience 7-442 (the workplace of superintendent) can supervise performance with instructions on laboratory work (Figure 4). That realizes the idea of industrial "digital" TV which is actual work at the organization at large railway stations (for example: Petersburg-sorting Moscow).

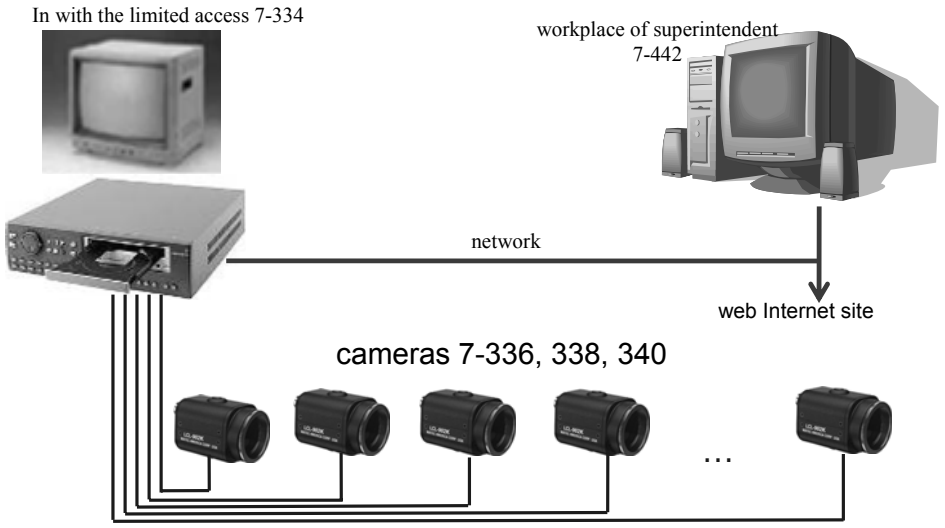

Figure 4. Installation of video control in TCTC.

Besides, the audiences, 7-336,338,340 are equipped by loud communication for the notification from an audience 7-442.

4. Development of a computer class

The computer program of the control of knowledge

In a computer class (7-440) and on all computers having connection to a university network of data transmission, it is necessary to establish the program of the control of knowledge. The program on the basis of testing should meet following requirements:

- Use of one base;
- An opportunity of any quantity of simultaneous testing;
- A reuse of once entered base of questionnaires;
- The division of multilevel access to data in the program;
- An opportunity of preservation of full statistics under the executed test tasks;
- To have various and multivariate analysis of the lead testing;
- An opportunity to support the operating modes: training and testing.

The basic maintenance of test tasks should consist from:

- The instruction on the signal system on railways of the Russian Federation,
- The instruction on movement of trains and shunting work on railways of the Russian Federation,
- Rules of technical operation on railways of the Russian Federation,
- And also from additional instructions on a safety of movement and rates in subjects.

Imitation of work of "Okt. railway"

The imitation of the work of "Okt. railway" branch will allow to train students and listeners on really operating branch. For example, it is possible to take a direction from "Vitbskij-pass" station up to "Vyritsa" station. On this direction, there is switchyard "Shushari", and the direction is sated by passenger suburban movement. This problem can be solved if to bring the imitation as much close to the basic functions of the automated systems used on a railway transportation, for example, "GID-URAL VNIIGT" and "ASUSS", "ASOUP", and as

"Express-3"as it's possible, and the system of selling the suburban tickets. The received model can be used in educational process, and for carrying out the research works of students and young scientists.

Creation of a computer class « Express -3»

Since 2008 the department will start to prepare the passenger complex for the experts. To achieve the corresponding skills and acquaintance to operating information technologies in sphere of passenger transportations it is necessary to create the "Express-3"computer class on the basis of TCTC. To create an access to the analytical database in class workplaces it's necessary to have:

- The Analysis of arrival and the correspondence of passengers
- An automated workplace of an overall performance of a train
- The Information on trains
- Agrarian and industrial complex « Monitoring of the Train »
- Operative density of population
- The Analysis of transportations on belts of range
- Emulator "Express-3".

5. Innovative projects of development TCTC

The Internet site on the TCTC work

For getting acquainted with the TCTC work performance of remote training, the Internet publication of educational and scientific achievements of Railway Operation department is needed as well as the TCTC internet site. Internet site will involve investors and sponsors (suppliers of the equipment and program) for TCTC development.

It will be possible to display the schedule of the executed movements (movements of locomotives and trains on a breadboard model) in real time. And also it is possible to establish some web-camera (or to use a video observation system) on a breadboard model and to transfer the image in Internet (Figure 4).

Installation of help terminal "Express-3"

For the students to get acquainted with modern information technologies on transport, it is expedient to establish an operating help terminal "Express-3". It will allow all students and workers of university to receive the information on a transit and presence of tickets in passenger trains.

Creation of educational films

For use of modern information technologies it is necessary to acquaint students with work of a railway transportation in a complex. For this purpose it is necessary both to buy films about the railway, and to create necessary films at corresponding rates independently. Also probably to make numbering saved up video of a material and various carriers.

The breadboard model of the railway allows creating these or other situations (arrival, departure of trains) with the description of processes on station. Students and post-graduate students can get involved in film creation. These films can be offered in other high schools and in educational classes of railways.

Excursions

The breadboard model in TCTC of transportations is a unique construction. It is the greatest educational decorated breadboard model of scale H0 in the world. It is used for solving the problems of the miss of trains and a safety of movement. Thus the breadboard model in TCTC can become an attractive place for fans of railway transportation.

Seminars and round tables

It is expedient to provide TCTC with an opportunity of carrying out of seminars, round tables, scientific conferences and lectures. For carrying out these ideas, it is possible to use an audience 7-336 as a computer class 7-440 (12 landing places). For this purpose it is necessary to change educational tables established on a podium that will allow to raise number of landing places.

To acquaint the visitors with TCTC work, the information LCD display (the plasma panel) has to be established in the class 7-336. The display is required for translation of the films created in educational centre and for the information on employment spent at present. Such display is necessary for creation of round tables, and also carrying out of scientific conferences and seminars.

Installation of glass pack

It's necessary to equip the audience with a breadboard model 7-336,338,340, with glass pack doors. It will allow monitoring the condition of audiences constantly. The control over students and visitors of the Educational center will raise. It will allow the visitors to estimate the scale of a breadboard model of the railway.

Advertising in TCTC

Figure 5. An example picture to be used in advertising.

It is expedient to invite the railway companies for participation in development and maintenance of working capacity of breadboard model TCTC (the future employers for graduates), with accommodation on a rolling stock (models of cars, overpasses and buildings of stations) corresponding symbols of the companies (Figure 5).

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About the author(s)

Alexander Bessolitsyn – candidate of technical sciences, senior lecturer of Railway Operations department of St.Petersburg State Transport University. Author of 10 scientific works, e-mail: steklo@hotmail.ru, tel. +7 812 768 85 25

Freight Wagon Manufactures in Russia and Ukraine

Tero Toikka

Lappeenranta University of Technology, Finland

Abstract

This paper studies the development and the current economical status of railway machine building in Russia and in the Ukraine. It analyses the largest companies involved in this business field in both these countries in order to determine the prospects for railway machine building especially in Russia. The main goal of the research is to determine the possibilities for Finnish companies to utilize this branch as client or supplier.

The research results reveal that the Ukrainian companies are also often owned by Russians. This partly explains their success in the Russian market. Ukrainian companies are exporting almost all of their production due to the poor situation in the domestic market. National Railways are there performing very poorly and funding for investments is hard to find. Hence the rolling stock has been in so bad condition that EU has prohibited Ukrainian wagons entering countries belonging to EU.

In Russia the situation is somewhat different. RZD is performing quite well and along with private it is investing in rolling stock. Foreign investments are scarce also in this business field in Russia and in the near future it is not obvious that the situation will change.

Keywords: freight wagons, railway machine building, Russia, Ukraine

1. Introduction

Prior to the reign of Nicholas I, very little consideration had been given to railroads in Russia. A few mines and factories in the Urals used tramways already in the 18th century to move ore or products but they used horses or men to pull the carts over short distances. Several proposals were made to build railways, but none were accepted until the Austrian engineer Franz Anton von Gerstner pushed through his proposal to build the St. Petersburg-Tsarskoe Selo Railway in spring 1836. The railroad was built quite quickly and the first locomotive was tested on it already in November that year. This was the first public railway and already also in that year a first railroad for industrial use was taken in use. This inaugurated the start of railways in Russia, and set the pattern for subsequent government attitudes about and policies on railway development. (Fink 1991)

Railway machine building has even a bit longer history in Russia and in the Soviet Union than the railways intended for steam locomotives have. The locomotive building started already in 1833, when father and son Cherepanov, having previously built steam engines for pumping water in the mines, started to build the first locomotive in Russia.

After 150 years, a period including WWI, the change from monarchy to communism and planned economy, WWII and the territorial expansion of the Soviet Union, the railway

machine building in the Soviet Union was doing fine and the planned economy guaranteed the orders of locomotives, freight wagons, passenger wagons etc. Although, the orders from the state were declining already during the 1980's, the break-up of the Soviet Union into 15 independent states brought a crisis to this industry. During the Soviet period different production plants were specialized in different products. The break-up resulted in a situation where the new or newly independent states were in a situation that they were not able to produce all the type of wagons they needed and were forced to import and export of wagons.

The once so mighty former Soviet railway machine building was in trouble. Orders almost disappeared through the whole industry. Concerning the whole Russian economy, investments in fixed assets declined each year from 1990 to 1998. The devaluation of the Russian rouble in the second half of 1998 was a turning point in Russian economy. Investments in fixed assets started to rise and they have been rising since that (Nikolayev 2007).

Nowadays railway machine building can be divided in four different categories (Transkreditbank 2005):

- building of freight wagons
- building of passenger wagons
- building of locomotives
- production of track equipment

In this text the focus will be in freight wagons and companies producing them. In quantity of produced units freight wagons outdate locomotives and passenger wagons by far. In Russia and in the Ukraine the passenger transport is mostly managed by state-owned railway companies, Russian Railways (later referred as RZD) and Ukrainian Railroads (later Ukrzaliznytsia). The passenger transport is unprofitable and heavily subsidised in both countries and mostly because of that passenger transport has not attracted large investments and orders as freight wagons do. The situation can be changed in the future as there are plans to divide passenger transport from the state-owned giants through railway deregulation, especially in Russia.

2. Russian freight wagon manufactures

Federal state unitary enterprise Uralvagonzavod

The largest wagon manufacturer in Russia, FSUE Uralvagonzavod (UVZ) produces freight wagons in Nizhny Tagil, Sverdlovsk region. Apart from freight wagons, the company produces also various products, such as furniture and tanks, for which it has been famous since the WWII. Concerning railway machine building FSUE UVZ produces tank cars, hoppers, flat cars, open-top cars and bogies.

FSUE UVZ entered already in 2002 the territory of the EU by establishing a joint Russian – Estonian company UVZ&AVR Ltd with Estonian transport company AVR Transservice Ltd. Their production plant is located in Ahtme, in north-eastern Estonia utilizing the proximity of the Russian border. This company is specialised mostly in railway wagon assembly and repairs & painting of different wagon types. Company is also willing to get more orders from other EU-countries, but this hope is hampered due to the fact that the Russian wagons are not accepted in most of the 25 EU-countries. They are allowed in some countries, but only in transport from/to Russia (Uralvagonzavod 2007)

JSC Altaivagon

The history of the plant began on October 7, 1941, at the very beginning of the Great Patriotic War when Dneprodzerzhinsk Wagon Works, located in that time in Ukrainian SSR, was evacuated to the Altai Region.

Today JSC Altaivagon is one of the main national and the only one over the Urals company manufacturing freight wagons. For several years in row the company has been among the most rapidly developing Russian enterprises.

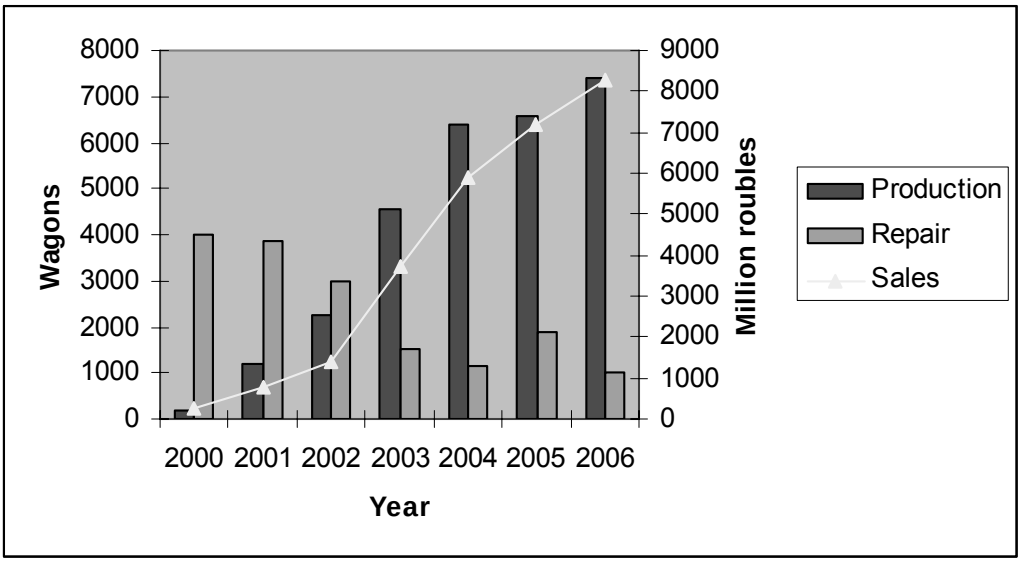

Figure 1. JSC Altaivagon. Number of wagons repaired and produced and the amount of sales 2000–2006 (JSC Altaivagon 2007).

Sales of the company were very low when the upturn in the railway machine building in Russia started in 2000. Last year the company produced about 40 times the amount of wagons that were produced in 2000. The sales of the company exceeded more than 8 billion roubles in 2006.

Main products of Altaivagon include around 20 models of wagons (flat cars, tank cars, gondola wagons and covered wagons) designed to carry large scale of freights (JSC Altaivagon 2007).

JSC Ruzkhimmash

JSC Ruzkhimmash (usually called also as OJSC Car manufacturing company of Mordovia) was established in 1961 in the city of Ruzaevka, Republic of Mordovia. Nowadays it is one of the key plants of chemical and petroleum machine building. Concerning railway machine building the company produces several types of tank cars for petroleum products, hydro carbonate gases, acids etc. (JSC Ruzkhimmash 2007).

OJSC Bryansk wagon manufacturing plant

OJSC Bryansk wagon manufacturing plant, established already in 1873, is nowadays part of the CJSC Transmashholding, which was established in 2002. In the course of its activity the holding has carried out large investment projects aimed at the development, reconstruction and modernization of its enterprises as a result of which favourable conditions have been

created for their stable and efficient operation. Two major shareholders of the company are OJSC HC Kuzbassrazrezugol and TransGroup AC, one of the leading Russian railway operators (OJSC Bryansk wagon manufacturing plant 2007).

In 2006 the sales products and services of the Transmashholding were 55 billion rubles (approximately 2 billion USD). Investment programs by CJSC Transmashholding in the areas of R&D and technical re-equipment were 3 billions of roubles. Transmashholding has altogether 55 thousand employees. Apart from OJSC Bryansk wagon manufacturing plant, CJSC Transmashholding includes production plants such as Novocherkassk Electric Locomotive Plant, Kolomensky zavod, Bryansk Engineering Plant, Bezhitsk Steel Foundry, Metrowagonmash, Tver Carriage Works, Demikhovsky Engineering Plant, Penzadieselmash, Oktyabrsky Electric Railway Car Repair Plant, Industrial Group KMT, Transconverter and Tsentrosvarmash.

CJSC Transmashholding, like Uralvagonzavod, has already invested in EU by buying a German company, FTD Fahrzeugtechnik Dessau AG, a company producing vehicles and subsystems in Dessau. (CJSC Transmashholding 2007).

Also a German company Knorr-Bremse and CJSC Transmashholding have signed a letter of intent for the setting up of a joint venture in Russia. The plan is for the new company, which will be responsible for the manufacture, sale and servicing of complete braking systems for rail vehicles in Russia and the CIS states, to be based in central Russia (www.news-ticker.org 2007).

OJSC Kaliningrad wagon manufacturing plant

Kaliningrad (formerly Konigsberg) was the capital of the German province of East Prussia. During the WWII Soviet Union occupied this area and since the collapse of Soviet Union Kaliningrad has been an exclave of the Russia, now totally surrounded by the enlarged EU. The OJSC Kaliningrad has produced railway wagons there since 1946**.** Nowadays company is producing different types of dump cars (OJSC Kaliningrad wagon manufacturing plant 2007).

3. Ukrainian freight wagon manufactures

OJSC Azovmash

The history of OJSC AzovMash dates back to the mechanical engineering origination at the metallurgical plants Nicopol and Russian Providens built with an attraction of foreign capital

in Mariupol at the end of the 19th century. Large-scale mechanical engineering complex had been derived from the metallurgical plant named for llyich and was separated from the plant under the name Zhdanov heavy engineering industry works in 1958.

The production of the railway wagons dates back to 1945, when at the metallurgical plant named by Ilyich, on decision of State Committee of Defence, were manufactured the first 25 two-axles tank cars of 25 t load carrying capacity for transportation of petroleum products (OJSC AzovMash 2007).

Nowadays OJSC AzovMash is a large Ukrainian machine building enterprise. The company is a CIS leader by tank car production. Besides that, the plant produces box cars, hopper wagons and flat cars and a large scale other products of machine building. The main customer countries of the enterprise are Russia, Iran, Kazakhstan, and Uzbekistan.

OJSC AzovMash includes joint stock companies such as Mariupol Plant of Heavy Machine Building, AzovObscheMash, Mariupol Thermal Plant and AzovElectroStal. OJSC AzovMash has also become a partner and stockholder of Armavir Plant of Heavy Machine Building in southern Russia. According to expert data, the enterprise's output in 2005 embraced 3,900 tanks 4,200 open-top cars, 200 box cars, 5 hoppers, and 2 flat cars.

Present day JSC AzovMash supplies its products to more than 20 countries of the world, among them traditionally the CIS countries - Russia, Kazakhstan, Uzbekistan, and Hungary, India, Yugoslavia, Pakistan, Algeria, Egypt, Turkey among the others (National Exhibition of Ukraine in the USA 2006).

OJSC AzovMash is state-controlled with 50 % + 1 stake belonging to state. 25 % of the stakes belongs to companies affiliated to System Capital Management, which is controlled by a famous Donetsk-born businessman Rinat Akhmetov (Verner 2006).

JSC Kriukov Car Building Works

The history of the JSC Kriukov Car Building Works (often named also as Kryukovskiy Wagon-Building Plant, later in this text JSC KCBW) started in the 1874 with the small car repair shops of the Kharkov - Nikolayev railway, specializing in the freight-car repairs. With the industrial manufacture development since 1924, some repair works of the railway field, including the Kriukov car repair shops, had changed their profile into the railway technical equipment release. At that very time the staff of the enterprise had received an important production assignment – to adjust the output of 16-ton covered cars with the metal frame. During the years of the WWII the plant was evacuated to Perm, where the manufacture of the defensive production (demolition air bombs) was arranged.

Later the plant was moved back to Ukraine and nowadays JSC KCBW is second largest enterprise in Ukraine by the number of wagons produced. The plant is the only company in the CIS to engineer passenger and cargo wagons (open-top cars, hopper cars, tank cars, flat cars, combined railway cars, wide assortment of spare parts and component parts for freight cars). The plant manufactures more than 30 types and models of cargo wagons. The output is shipped to more than 20 countries worldwide. Ukrzaliznytsia is the main client of the plant concerning freight wagons **(**JSC Kriukov Car Building Works 2007).

JSC KWBC is owned 27 % by Estonian company Skinest Finance (controlled by Russian Steel giant Severstal), 24,9 % by Transbuilding Service Limited from UK, 20 % by TEKO-Dneprometiz and 20 % by private investors (14 % owned by the management of the company) (Verner 2006).

JSC Dneprovagonmash

OJSC Dneprovagonmash is one of the leading Ukrainian and CIS enterprises in projecting and producing of cargo wagons for main railways and various industrial segments employing over 4 000 people. 75 % of Dneprovagonmash output is heading for exports. The largest exporter is Russia. The wagons are also shipped to other CIS countries, Baltic States, China, India, Pakistan, Iran, Bulgaria, Slovakia, Yugoslavia, Cuba, Egypt, Algeria, Guinea, and Nigeria. Engineering licenses were sold to China, Germany, and South African Republic.

Besides to export sales, the enterprise is searching for other forms of cooperation with foreign customers. Thus, Dneprovagonmash has recently bought the Plant of Metal Structures (located in Engels, Saratov region, Russia) facilities of which will serve for production of Dneprovagonmash range cars (JSC Dneprovagonmash 2007).

Dneprovagonmash is owned by the group Privat – 25 %, group TAS – 38 % and LLC Bearn – 19, 8 % (Verner 2006).

JSC Stakhanov Wagon Works

In June 1965 the 1st phase of the plant was put into operation producing metal constructions for tower cranes, walking excavators, cat-heads and other kinds of equipment. In December 1969, the works was repurposed to produce freight main-line railway cars. Already in the beginning of 1970 the Works gates left the first railway flat-car with 63 tons, mastered production of the wheel sets and railway bogies. In 1976 the works has started manufacture of cars for mineral fertilizers.

In subsequent years the design office of the plant developed technical documentation for railway cars of different purposes and specialized transport means with carrying capacity 63-400 tons. Producing hopper cars, open-top cars, tank cars, flat cars, railway carriers, pneumatic discharge cars, dump cars, undercarriages of cars. The company is owned by holding company AvtoKraz (JSC Stakhanov Wagon Works 2007, Verner 2006).

4. Peculiarities of the railway machine building in Russia and in the Ukraine

Although Soviet Union collapsed almost 15 years ago, these two countries are tied together in railway machine building. The demand of freight wagons is huge in Russia (see Figure 2).

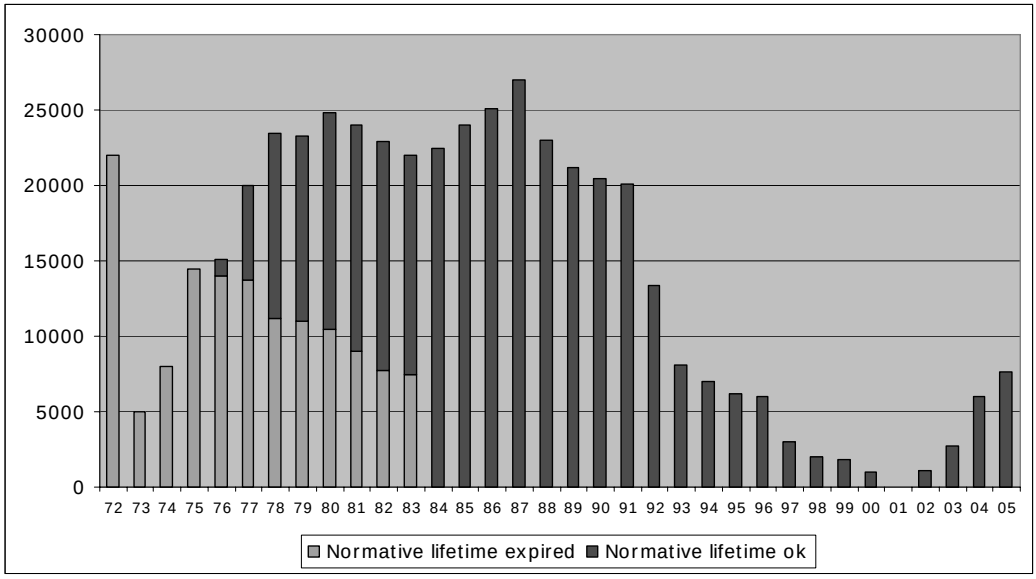

Figure 2. Russian freight wagons by their year of manufacturing.

The age structure of the freight wagon fleet in Russia is not a healthy one. Large part of the fleet has expired the normative life time and these should be replaced with new ones. The economic situation in Russia is much better than it was 10 years ago. If the state-owned RZD will not increase their orders from freight wagon manufacturers (as RZD has already done, but not enough yet), the private operators will continue buying and renting or leasing more and more wagons. This situation is reflected also in the Ukraine with large orders from Russia and in the Baltic States, where the amount of freight wagons has increased during the last few years strongly. Many Russian companies have invested in Baltic countries buying rolling

stock and registering them to Baltic companies. The Baltic countries are very important route for the Russian transit although the political relations between and Russia are not the best ones. This situation will not change in the near future.

Although, the Russian and Ukrainian companies are gathering speed, they are still relatively small at global scale. In Table 1 there are shown the turnovers of the railway machine building in the largest enterprises in this field. It must be noticed that the total turnover of e.g. Siemens is approximately 100 billion USD. Railway machine building is relatively small fragment in their business.

Table 1. Largest companies involved in railway machine building and their turnover of the railway machine building (Dementiev 2007)

Rank	Company	USD billion
1	Bombardier (Canada)	7,6
2	Alstom (France)	6,8
3	Siemens (Germany)	5,9
4	LORIC (China)	4,0
5	Hitachi/Kawasaki (Japan)	3,7
6	GE (USA)	3,2
7	EMD (former part of GM)	2,1
8	Transmashholding (Russia)	1,5
9	Vossloh (Germany)	1,4
10	Finmeccanica TS (Italy)	1,4
…	Uralvagonzavod (Russia)	0,8

Ukrainian transport machine building is dependent in orders from Russia: 87,9 % of the import of transport machine building to Russia is coming from the Ukraine. Germany is the next important importer with 2,7 %, followed by Estonia, 2,1 % and Finland, 1,3 %. (Statistics of Russia 2007). The gross structure of the Ukrainian railway machine building can be seen from the following Figure 3.

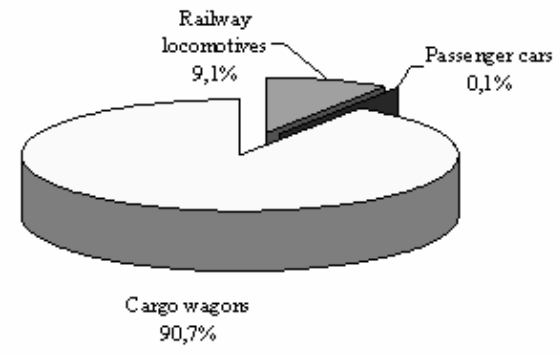

Figure 3. Gross structure of export supplies of Ukrainian railway machine building (National Exhibition of Ukraine in the USA 2006)

In total, 14 enterprises operate in this segment in the Ukraine including the four companies described before. Most of the companies are located in the eastern Ukraine, which is the most industrialized part of the country. The largest enterprise of the industry apart from the freight wagon manufactures is the LuganskTeplovoz Holding Company producing locomotives

Ukrzaliznytsia has drafted a financial plan for Ukrainian railroads, which extends to 2017 Transportation & Communication Minister Viktor Bondar disclosed that 2006, he said, will witness the onset of implementation of what will be Ukraine's biggest-ever investment project for Ukrainian railroads. In particular, in the next year 5,000 freight cars, 156 new passenger carriages will be bought, along with 25 new locomotives and 15 diesel trainsets. Acquisition of rolling stock in such numbers will allow keeping Ukrainian manufacturers busy. The Ukrzaliznytsia financial plan also provides for outlays to modernize Ukrainian railroads' infrastructures. The plan provides for drawing credits. The scheme provides for the credits' repayment in such a way that even at its peak in 2011 railroads will be able to bring profit (National Radio Company of the Ukraine 2007).

4. Concluding remarks

The Ukrainian manufacturers seem to have multiplied their sales from 2001 to 2005. Earnings before tax and interest (EBIT) have increased in average, but they are still rather small except in JSC KWBC. The sales and EBIT are shown in following Figure 4.

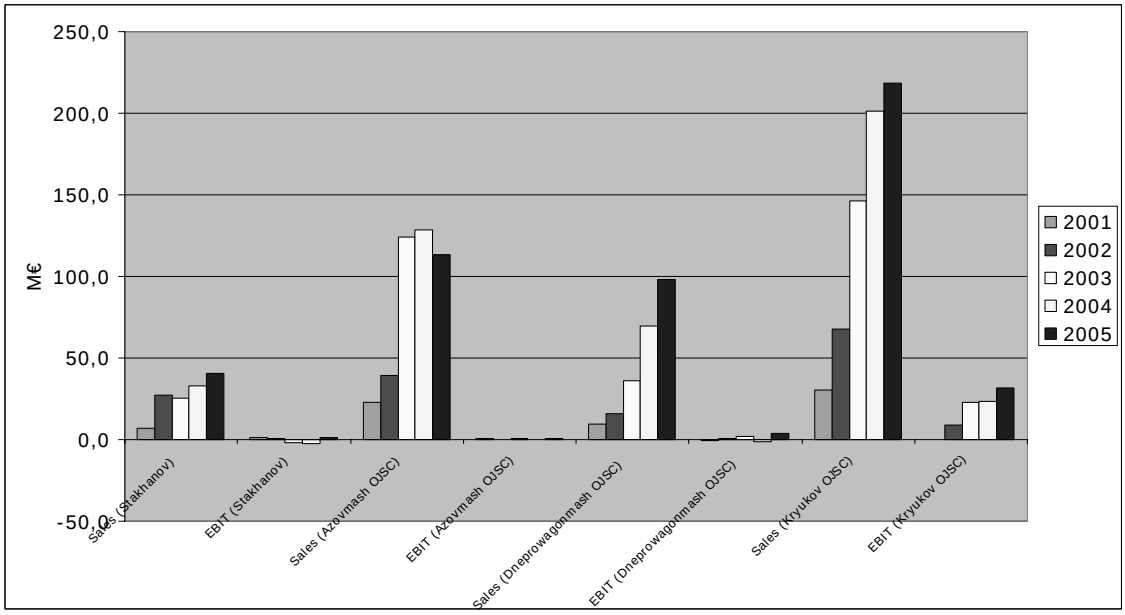

Figure 4. Sales and EBIT of the largest Ukrainian freight wagon manufactures from 2001 to 2005 (Агентство з розвитку інфраструктури фондового ринку України 2007).

The research results revealed that the Ukrainian companies are also often owned by Russians and vice versa. This partly explains their success in the Russian market. Ukrainian companies are exporting almost all of their production due to the poor situation in the domestic market. National Railways are there performing very poorly and funding for investments is hard to find.

In Russia the situation is somewhat different. RZD is performing quite well and along with private operators it is investing in rolling stock. Foreign investments are quite scarce also in this business field in Russia and in the near future it is not obvious that the situation will change.

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About the author(s)

Tero Toikka is working as a project manager in NORA project at Lappeenranta University of Technology. His research involves the study of a new railcar model, which can be used in transporting e.g. raw materials to the factories and products to customers with reduced total transportation costs.

Food Manufacturing Facility Location Geography in Russia

Harri Lorentz[1], Peeter Vahtra[2], Teemu Järvinen[3]

[1] *Logistics, Department of Marketing, Turku School of Economics, Finland*
[2] *Pan-European Institute, Turku School of Economics, Finland*
[3] *Allego Oy, Finland*

Abstract

The strategic planning of the company's supply-demand network may involve decisions on customers, products, manufacturing processes, and importantly decisions on the establishment or closure of manufacturing and other facilities. These decisions have a major long-term impact on the profitability and competitive position of the company, but must often be based on limited knowledge on the current and projected conditions on the ground, especially when entering new and emerging markets. This paper attempts to contribute to the greater understanding of Russia as an environment for food manufacturing operations, by determining the potential of 27 European side Russian regions for manufacturing facility location, through the application of an AHP-model (PEI, 2006) that reflects the views of the Finnish food industry. The applied model includes variables on regional investment potential and risk, as well as food industry specific variables. The results show interesting juxtaposition between the most favourably ranked locations, namely Moscow region and the locations in the south: Krasnodar and Rostov regions. Also regions in the Volga district, namely Tatarstan and Bashkortostan, fare well in the comparison. The paper presents the differences between these three geographic groups in a cross-case analysis, with discussion on the implications for the internationalising Finnish food industry.

Keywords: **f**acility location, AHP, food manufacturing, Russia

1. Introduction

The strategic planning of the company's supply-demand network may involve decisions on customers, products, manufacturing processes, and importantly decisions on the establishment or closure of manufacturing and other facilities. These decisions have major long-term impact on the profitability and competitive position of the company, but must often be done based on limited knowledge on the current and projected conditions on the ground, especially when entering new markets (Current et al., 1997; Goetschalckx, 2002).

Depending on the manufacturing facility's role in the general network of facilities that the company operates, the emphasis of supply chain related criteria in the location decision may vary. However, be the chain global, international or predominantly local (e.g. sourcing locally and serving the vast and expanding Russian market), the design of the functional supply chain may be essential in the firm's line of business and must be reflected in the location decision, especially in certain industries where supply chain functionality and management are keys to competitiveness. Examples of such industries are for example

agribusiness, food retailing, automotive, and fashion/apparel (Fearne & Hughes, 1999; Bourlakis & Bourlakis, 2001; Doran, 2004; Barnes & Lea-Greenwood, 2006).

This paper aims to increase understanding on the facility location geography in Russia from the food industry point of view. The paper draws on the previously presented AHP model (Lorentz, 200X), by weighting the criteria values on 27 European side Russian regions accordingly. The applied model includes variables on regional investment potential and risk, as well as food industry specific variables. True to our supply chain oriented approach to locations decisions, supply chain functionality and management variables are included in the model. In short the paper addresses the following research questions:

RQ1. What are the most favourable regions for food manufacturing activity in the European part of Russia?

RQ2. How the most favourable regions in the sample compare in terms of food industry specific location criteria?

RQ3. What are the implications of the previous considerations to decision making in the internationalising Finnish food industry?

The paper first presents a literature review on location decision making, and proceeds to elaborate on the utilised model and the specifics of the presented application (methodology). The results of the application follow, with cross-case analysis on the five most favourable regions. Concluding remarks elaborate on the managerial implications and further research opportunities.

2. Location decision making

The consequences of facility location decisions form a core link in the supply chain, as for example the distribution pattern and associated characteristics, such as time, cost and efficiency are determined by it (Sule, 2001). Smykay et al. (1961) provide an excursion to the foundations of facility location research, which lies in the early 20th century economic theorising by predominantly German and American scholars. They argue that different scale economies have a significant effect on plant location, and proceed to identify location factors and specifications for site selection procedure. As a conclusion, a theoretical goal for facility location is identified: *every plant should be located at the point of profit maximisation* (Smykay et al., 1961, 175). Bowersox (1978) also provides a treatise of plant location factors (grouping those to least-cost factors, profit-maximising factors and intangible factors), and

site selection procedure and checklist. In more recent terms, Owen and Daskin (1998) present a comprehensive literature review of location modelling, and direct future research to provide heuristics for large scale and realistic problems, utilising for example scenario planning techniques. Relevant to the research presented here in terms of methodology, is the facility location model presented by Yang and Lee (1997), as it develops location factors for the analysis of site alternatives through the analytic hierarchy process (AHP). The model incorporates four dimensions in the first hierarchy level, namely market, transportation, labour and community. For example the market dimension consists of market growth potential, proximity to market and proximity to raw materials.

In the international dimension, the following literature has contributed to the present knowledge base on location decisions. Meixell and Gargeya (2005) provide a literature review of the decision support models for the location related design of global supply chains, and conclude that only a few models address required practical issues adequately, while location specific variables such as tariffs/duties, non-tariff trade barriers, currency exchange rates and corporate income tax rates are often incorporated. Canel and Das (2002) present a twenty-year perspective on global location modeling, and present a model with integrated manufacturing and marketing decision variables. By a way of an example, Bhatnagar and Sohal (2005) establish the relationship of diverse location, uncertainty and manufacturing practice related factors to the supply chain competitiveness. Such factors as labour, infrastructure, business environment, political stability, proximity to markets, proximity to suppliers, key competitor's location, supply chain uncertainty as well as manufacturing practices affected the operational measures of supply chain competitiveness. Further, Bhutta et al. (2003) propose an integrated model for location, production, distribution and investment of the multinational corporation (MNC) and consider scenarios based on varying facility configurations and foreign exchange rates and tariff levels. Relevant location factors are considered to be the following: cost of utilities, government incentives, taxes, environmental regulations, climate, soft issues, population density, transportation, labour, logistics, proximity to markets, access to supplies, future expansion, and R&D / technology. Further Karakaya and Canel (1998) identify six key factors on international facility location: cost, living, accessibility, resources, business environment, and existing buildings. Fraering and Prasad (1999) identify policy measures through which authorities may increase country's attractiveness in terms of manufacturing and logistics operations. Countries with high tariffs, volatile currency, poor infrastructure, and poor setting for SCM should be approached with caution in terms of location decisions.

3. Methodology

The paper is based on the AHP methodology by (Saaty, 1980). The specific model utilized in this paper is depicted in Figure 1. Criteria weights, as well as consistency ratios are presented also. For more detailed description of model creation, see PEI (2006). The operationalisations of criteria for this application have been presented in Appendix 1.

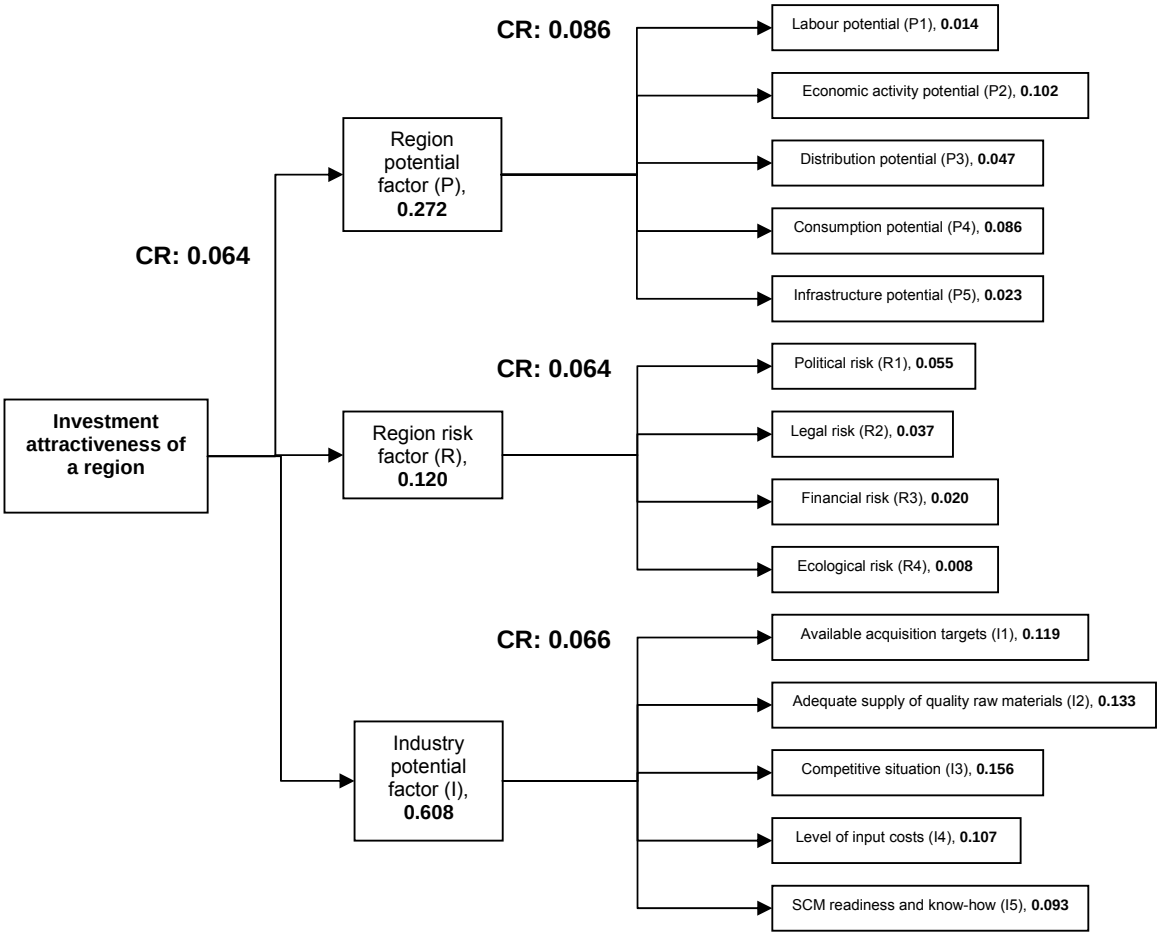

Figure 1. Food manufacturing location decision model (PEI, 2006)

In order to keep the application in sensible dimensions, a sample of Russian regions was taken, with a food industry point of view. Russian regions in the European part, i.e. from four federal districts (Central, North-West, South, Volga), were ranked in terms of food industry supply conditions. A composite index of agricultural production growth during 2000-2005 (1/3 weight), plant (grain etc.) production volume (1/3 weight), and livestock production volume (1/3 weight) was formed for the purpose. The 27 most attractive regions (out of 52)

were selected, comprising of the 25 most attractive plus two (Tver, Novgorod) regions covering the area between the cities Moscow and St. Petersburg, which are the most populous and affluent cities in Russia. The geographical coverage of the selected regions can be observed in Figure 2.

Figure 2. Geographical coverage of the sample regions

In order to obtain values per each location criteria, several procedures had to be taken, which are summarized in Appendix 1. Most of the region potential and risk values were based on the ExpertRA region ranking data for year 2005, which may be considered the best source of such data, providing a synthesis of quantitative and qualitative data, statistical data sources and subjective foreign and domestic expert panel judgment (see http://www.raexpert.ru/ratings/). Distribution potential for each sample region was determined by using the transportation method of Bowersox (1978). For complete coverage of the application, see Lorentz (2007).

The industry potential factors proved to be challenging task to operationalise, as the model was originally designed for expert judgments in this dimension. However, in the case of multiple regions, values for the criteria had to be obtained by other means. In the case of available acquisition targets (I1), data from the Federal State Statistics Service (FSSS) was used, namely the *share of food industry of total industrial production in a region* (FSSS, 2005). The reasoning in this case is such that, with a more pronounced status of food industry in the region, the more viable the food producers in this region are, with access to the best resources. Their number can also reasoned to be greater.

For adequate supply of raw materials (I2), the same FSSS data and index was used as in the sampling procedure elaborated on earlier. The index of *plant and livestock production volumes and agricultural production growth average* thus were taken as indicator of raw material availability (FSSS, 2005). For competitive situation (I3), the Amadeus database was utilized in determining the *average profitability of food processing in the region*. Profit margins for dairy (3115), meat (3116) and bakery (3118) industries were determined using the NAICS 2002 industry classifications, and were consequently averaged for each region. It is reasoned that the lower the margins, the lower the entry barriers (Porter, 1980), the more competition in the region. While not entirely satisfactory, the indicator can be considered the best available indicator of competition levels in the Russian regions.

For the level of input costs (I4), FSSS data was again utilized, namely the *index calculated by equally weighting real estate prices (housing used as proxy), wage levels and geometric mean of producer price indices of agricultural produce for 2000-2004* (FSSS, 2005). The index can be considered to bring out the differences in input factor prices and their development reasonably well. For SCM readiness and know-how (I5) operationalisation, considerable difficulties were again experienced. FSSS data was finally utilized (FSSS, 2005), namely the *use of information technology in its various forms in the region's companies*. This indicator was not food industry specific, but can be considered directional in indicating the general sophistication in terms of SCM readiness, as IT is quite important in SCM implementation (Forman & Lippert, 2005).

The values per criteria per each sample region are presented in tables in Appendix 2. The synthesis of criteria weights and regional values are presented in the following as results, and a cross regional analysis of the most favourable locations is also given.

4. Results

The most favourable regions for food manufacturing activity

The results of the applied AHP-procedure are presented in Table 1, with total scores and score gaps to the previous. The most favourable location is the Krasnodarskiy region in the South district with only a slight margin to the next best, the Moskovskay region surrounding the capital in Central district. The third region, Rostovskaya is also in the South district, while the last two (Bashkortostan, Tatarstan) of the top five are located in the Volga district.

Table 1. Regional ranking in terms of food manufacturing activity potential.

Rank	*Region*	*Total score*	*Gap*
1	**Krasnodarskiy**	**0.064**	**0.001**
2	**Moskovskaya**	**0.063**	**0.011**
3	**Rostovskaya**	**0.052**	**0.006**
4	**Bashkortostan**	**0.046**	**0.001**
5	**Tatarstan**	**0.045**	**0.000**
6	Nizhegorodskaya	0.045	0.003
7	Leningradskaya	0.042	0.000
8	Samarskaya	0.042	0.001
9	Voronezhskaya	0.041	0.001
10	Lipetskaya	0.040	0.001
11	Stavropolskiy	0.039	0.003
12	Saratovskaya	0.036	0.001
13	Penzenskaya	0.035	0.001
14	Orlovskaya	0.035	0.000
15	Kirovskaya	0.034	0.001
16	Belgorodskaya	0.034	0.000
17	Udmurtskaya	0.034	0.001
18	Permskiy	0.033	0.001
19	Novgorodskaya	0.032	0.000
20	Tverskaya	0.032	0.000
21	Volgogradskaya	0.031	0.000
22	Tulskaya	0.031	0.000
23	Ryazanskaya	0.031	0.001
24	Ulyanovskaya	0.030	0.005

It is apparent that three major super regions are present in the top five: the South, the North, and the Volga (Figure 3). Especially interesting is the juxtaposition between the locations in the South and the North. Moscow enjoys a strong central position in almost all aspects of Russian society, and seems to be also a favourable food manufacturing location. The position of North is further accentuated if we expand our view and consider also the Nizhegorodskaya (6^{th}) and Leningradskaya (7^{th}) regions. South is generally considered the food garden of Russia, a position that is supported also by this study. In order to understand more thoroughly the differences in the five most favourable locations, a cross-case analysis is presented in the following.

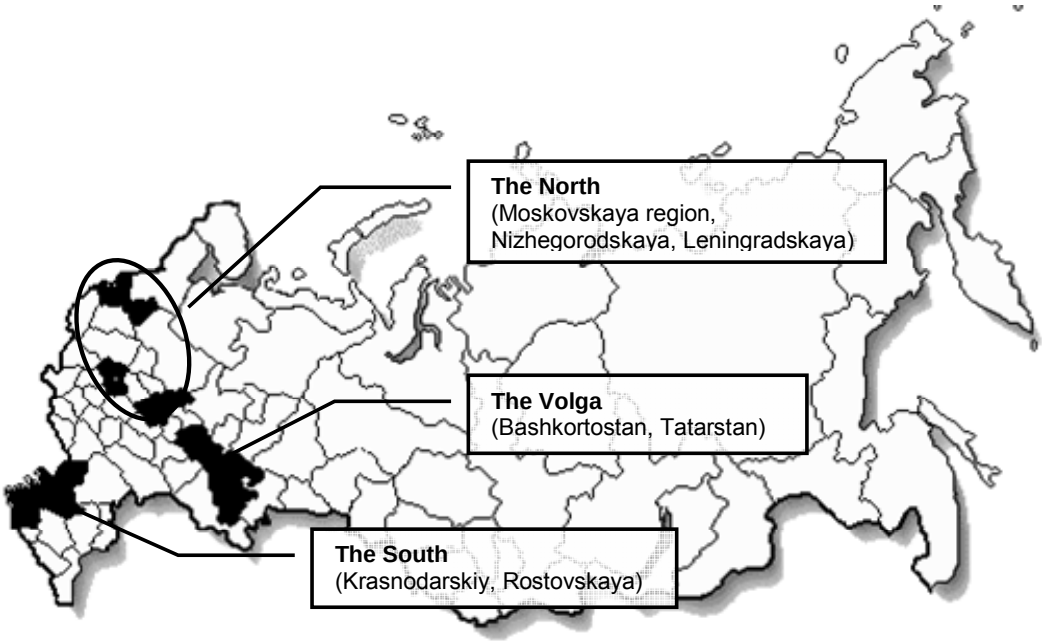

Figure 3. The most favourable regions for food manufacturing

Cross-case analysis of the five most favourable locations

We analyse the indicated regions in terms of (1) region investment potential, (2) region investment risk, and (3) region industry potential. Firstly the investment potential differences by region are depicted in the Figure 4. It is clear that in this respect the Moskovskay region stands out in every dimension. The locations in the South present slight advantages in terms of labour (P1) and infrastructure (P5) in comparison to the Volga, while Volga is ahead of South in terms economic activity potential (P2, i.e. manufacturing). Distribution potential (P3) superiority between the Volga and South regions is unclear, maybe slightly inclined towards the Volga, which enjoys close proximity to several large cities. South and Volga are almost equal in terms of consumption potential (P4).

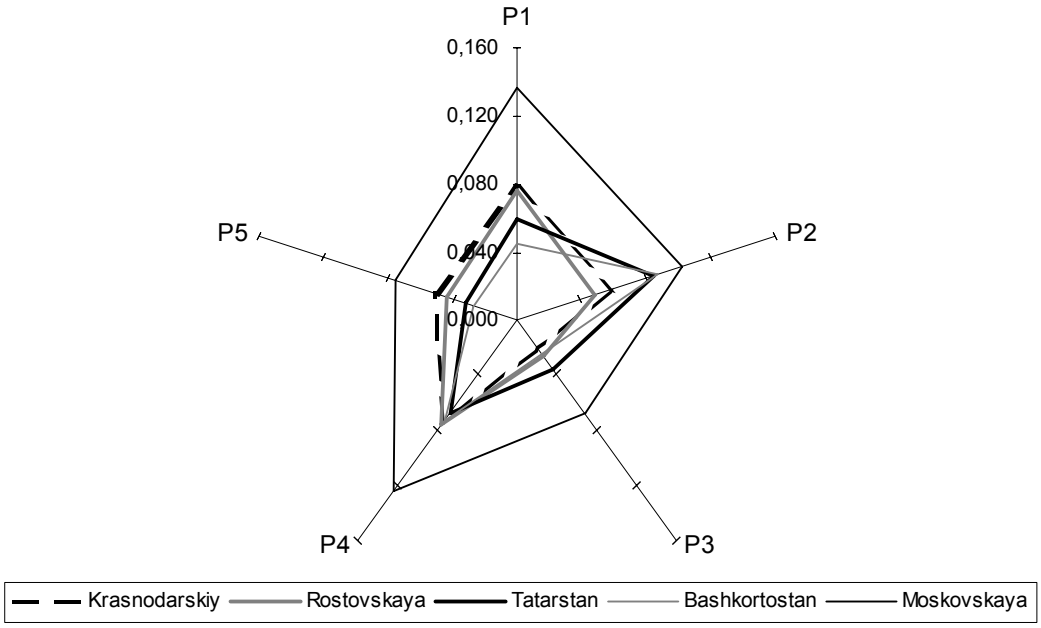

Figure 4. Most favourable regions in terms of investment potential (P)

The investment risks are on somewhat equal levels in all the regions. Tatarstan stands out in the political risk (R1) dimension with very favourable levels. This reflects the political autonomy that Russian regions still enjoy in setting conditions for domestic and foreign investment. Otherwise the risks have only slight variation.

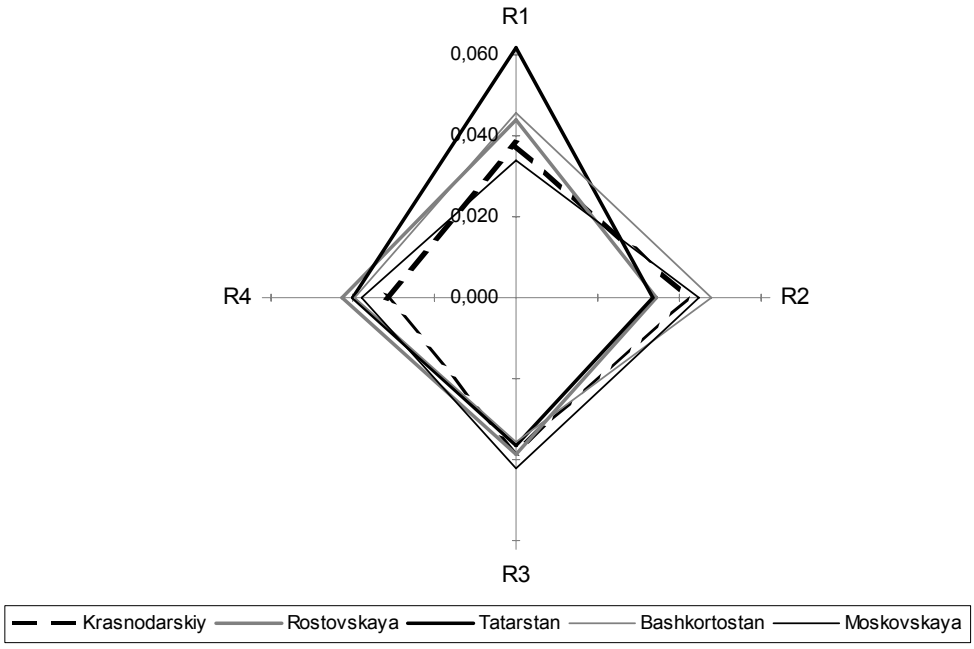

Figure 5. Most favourable regions in terms of investment risk (R)

Food industry potential however generates plenty of food for thought, with clear variations between regions. Krasnodarskiy is clearly ahead of the others in terms of availability of acquisition targets (I1) and supply of raw materials (I2). The region has a long heritage in the food sector, and has attracted agribusiness related foreign direct investment in recent years (PEI, 2006). Moskovskaya region fares quite well in every respect, except in terms raw materials (I2), where other more rural and southwardly locations stand out as superior. Lowest potential for available acquisition (I1) targets are in the Volga area, which has traditionally been home for heavy industry. In terms of input cost levels (I4) and SCM readiness and know-how (I5) the regions are somewhat similar, although for example Moskovskaya region is a bit more costly location for production, but enjoys greater level of IT usage diffusion among companies. The highest profit margins are in the South and the Capital, while Tatarstan is the worst in this sense. Whether this really is an indication of competition levels (I3) is a good question, or is the low profit margin just indicative of for example poor management and financial structures.

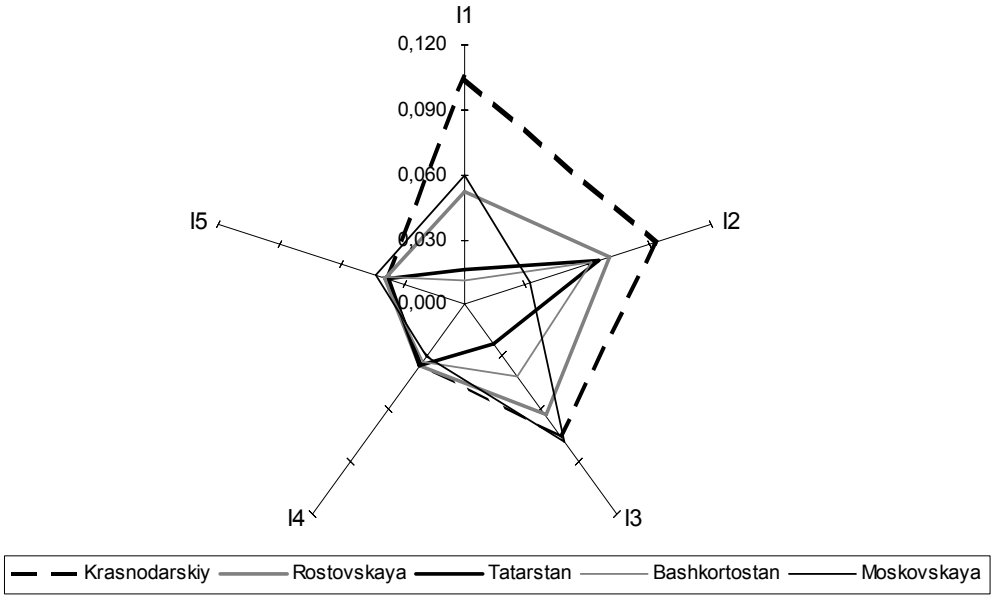

Figure 6. Most favourable regions in terms of industry potential (I)

In summary of the model application results, it seems that Moskovskaya region is clear winner in terms region investment potential in general business terms, while Krasnodarskiy

(and the South in general) dominates in terms of food industry specific criteria. Volga area is maybe slightly ahead of the others in terms of risk.

5. Concluding remarks

The results revealed an interesting juxtaposition between the regions of the south and the capital area of Moscow (or more generally the North). In terms of the internationalising Finnish food industry the findings are quite interesting, as on the other hand the industry is focused on grasping the Baltic Sea Region (BSR) market potential, which includes north-western parts of Russia, and on the other, the vast potential of the total Russian market seems ever more lucrative. As financial resources largely determine the boundaries for expansion, risk-averse players are not likely to venture further with facility investment than the undisputed growth centres of St. Petersburg and Moscow (the North). Growth strategies that encompass the whole of Russia or at least the European side of it are mostly vocalized by managers in the Russian subsidiaries, who experience the retail chain's demands for Russian wide presence and distribution. In cases where financial performance of the headquarters shows signs of weakness and decline, the pressure form the owners may shift focus from foreign expansion (e.g. in Russia) to putting the house in order back home. It is a pity if such a shift in focus coincides with the most critical time for expansion and restructuring in the Russian agribusiness and food retail industry. The results of this paper show that in some cases it would be warranted to look beyond Moscow, and onwards to the very periphery of Russia, namely the South. However, several issues must be taken into account in such considerations. In reality, many Finnish companies have quite tight budget constraints for expansion, appreciate close proximity of international operations, and value the advice of knowledgeable expatriates. This is simply to manage the perceived risks (in some cases inflated) and maintain the comfortable level of control over operations. Allowing for these assumptions, the Finnish food companies are unlikely to attempt broad production network establishment in Russia.

Naturally, individual company strategies determine the location considerations that are actually applied and their geographic scope, and whether general business conditions or the previously identified food industry specifics weigh more in the scales. The presented ranking of regions reflect a view where the latter dominate, thus putting the South strongly on the map. In a case where general business conditions weigh more, it may be expected that

Moscow and its adjacent region would be favoured over the others. The presented approach is also very much rigged towards a situation where a company strongly favours local (regional) sourcing (relevant in meat and dairy processing). The heterogeneous nature of the food industry warrants these kinds of considerations. In cases where raw material for production processes can be economically transported across regions or even imported, the model should be adjusted in order to include this type of sourcing related logistics (e.g. margarine production). In addition to sourcing, economical distribution radiuses are relevant in facility location consideration, particularly in industry branches where delivery lead times must be short and distribution considerations thus dominate (e.g. bakery). If the Russian market is planned to be served more comprehensively, production bases may have to be established in a number of locations, for example in any of the three super regions identified in this paper. More information on these areas, and what is their potential in developing for example food industry clusters, should be investigated. However, allowing for realistic budget constraints, the current expansion strategy that is limited in the North, is probably wise.

While expansion further than the North may not be realistic for Finnish companies, an important implication for the Finnish food industry is that the identified areas (especially the South) will eventually provide a base for some companies to grow in more relatively more favourable conditions, in comparison to for example the Leningradskaya region, resulting in a potential competitive advantage. Industry specifics (i.e. economics of distribution) will determine whether these companies will be able to undermine the market positions of companies that have based their operations in the vicinity of Moscow or St. Petersburg. As a side note, it can be said that on the average the bakery industry is much more profitable than the other surveyed industries (dairy, meat) in terms of the I3 criteria: bakery profit margin was 5.34%, while for dairy the indicator was 0.5% and for meat processing 0.19%. Whether this is due to the variation in capital intensity or short economical distribution radiuses effectively blocking out foreign and national competition in the case of bakeries, is a good question warranting further study. Detailed results such as these require some unearthing, and thus sustained research in this area may provide valuable input for company expansion and location decision making.

Acknowledgements

The authors would like to express their gratitude to the Paulo foundation (www.paulo.fi) for financially supporting this research project.

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About the author(s)s

Corresponding author:
Harri Lorentz, Logistics, Turku School of Economics, e-mail: harri.lorentz@tse.fi, tel.: +358 2 4814 244

Appendix 1. Operationalisations of decision factors/criteria

Variable	*Operationalsation*
Region potential factor (P)	
Labour potential (P1)	Based on number of indicators, e.g. amount of active people in the labour market, level of education (Expert RA, 2005)
Economic activity potential (P2)	Measured as the total result of economic activity in the region (Expert RA, 2005)
Distribution potential (P3)	Regional capitals total potential distribution costs to 20 demand locations. Transportation method of Bowersox (1978), see Lorentz (2007)
Consumption potential (P4)	Total ability of the population to purchase goods and services (Expert RA 2005)
Infrastructure potential (P5)	Based on the considerations on economic-geographical attributes, as well as the density and condition of basic infrastructure (Expert RA, 2005)
Region risk factor (R)	
Political risk (R1)	Measures the strength and stability of regional authority and the political polarisation of the population (Expert RA, 2005)
Legal risk (R2)	The general situation in legal norms that regulate economic exchange in the region: local taxes, tariffs, and restrictions (Expert RA, 2005)
Financial risk (R3)	Describes the strain in regional budget as well as the financial results and situation in the companies (Expert RA, 2005)
Ecological risk (R4)	Measured as the combination of factors embodying the pollution level in the environment (Expert RA, 2005)
Supply chain potential factor (I)	
Available acquisition targets (I1)	Share of food industry of total industrial production in a region (FSSS, 2005)
Adequate supply of quality raw materials (I2)	Index of plant and livestock production volumes and agricultural production growth average (FSSS, 2005)
Competitive situation (I3)	Average profitability of food processing in the region (Amadeus)
Favourable level of input costs (I4)	Index calculated by equally weighting real estate prices (housing used as proxy), wage levels and geometric mean of producer price indices of agricultural produce for 2000-2004 (FSSS, 2005)
SCM readiness and know-how (I5)	Use of information technology in its various forms in the region's companies (FSSS, 2005)

Appendix 2. Criteria weights and regional values

No	Region	P1 Value	P1 Weight	P2 Value	P2 Weight	P3 Value	P3 Weight	P4 Value	P4 Weight	P5 Value	P5 Weight	SCORE	RANK
1	Краснодарский край	0,078	0,014	0,059	0,102	0,021	0,047	0,075	0,086	0,050	0,023	0,016	5
2	Ростовская область	0,076	0,014	0,048	0,102	0,026	0,047	0,076	0,086	0,043	0,023	0,015	6
3	Республика Татарстан	0,059	0,014	0,085	0,102	0,036	0,047	0,067	0,086	0,031	0,023	0,018	3
4	Республика Башкортостан	0,045	0,014	0,087	0,102	0,025	0,047	0,072	0,086	0,027	0,023	0,017	4
5	Ставропольский край	0,041	0,014	0,026	0,102	0,021	0,047	0,039	0,086	0,025	0,023	0,008	15
6	Саратовская область	0,039	0,014	0,029	0,102	0,036	0,047	0,033	0,086	0,035	0,023	0,009	11
7	Оренбургская область	0,026	0,014	0,036	0,102	0,024	0,047	0,026	0,086	0,029	0,023	0,008	16
8	Волгоградская область	0,038	0,014	0,035	0,102	0,030	0,047	0,042	0,086	0,029	0,023	0,010	9
9	Воронежская область	0,038	0,014	0,024	0,102	0,041	0,047	0,032	0,086	0,041	0,023	0,009	14
10	Белгородская область	0,020	0,014	0,030	0,102	0,019	0,047	0,021	0,086	0,048	0,023	0,007	17
11	Нижегородская область	0,050	0,014	0,052	0,102	0,049	0,047	0,055	0,086	0,032	0,023	0,014	7
12	Ленинградская область	0,026	0,014	0,038	0,102	0,033	0,047	0,019	0,086	0,057	0,023	0,009	12
13	Московская область	0,137	0,014	0,102	0,102	0,068	0,047	0,125	0,086	0,074	0,023	0,028	1
14	Самарская область	0,064	0,014	0,083	0,102	0,031	0,047	0,077	0,086	0,038	0,023	0,018	2
15	Курская область	0,022	0,014	0,018	0,102	0,038	0,047	0,016	0,086	0,050	0,023	0,006	19
16	Липецкая область	0,017	0,014	0,039	0,102	0,046	0,047	0,019	0,086	0,043	0,023	0,009	10
17	Орловская область	0,016	0,014	0,010	0,102	0,044	0,047	0,011	0,086	0,036	0,023	0,005	27
18	Пермский край	0,037	0,014	0,051	0,102	0,024	0,047	0,050	0,086	0,021	0,023	0,012	8
19	Тамбовская область	0,015	0,014	0,010	0,102	0,046	0,047	0,016	0,086	0,032	0,023	0,006	23
20	Удмуртская Республика	0,021	0,014	0,023	0,102	0,027	0,047	0,017	0,086	0,029	0,023	0,006	21
21	Кировская область	0,020	0,014	0,015	0,102	0,031	0,047	0,016	0,086	0,019	0,023	0,005	26
22	Пензенская область	0,022	0,014	0,012	0,102	0,042	0,047	0,016	0,086	0,030	0,023	0,006	22
23	Тульская область	0,023	0,014	0,029	0,102	0,054	0,047	0,021	0,086	0,048	0,023	0,009	13
24	Рязанская область	0,021	0,014	0,016	0,102	0,058	0,047	0,015	0,086	0,036	0,023	0,007	18
25	Ульяновская область	0,020	0,014	0,014	0,102	0,036	0,047	0,016	0,086	0,029	0,023	0,005	24
26	Тверская область	0,020	0,014	0,018	0,102	0,038	0,047	0,019	0,086	0,034	0,023	0,006	20
27	Новгородская область	0,010	0,014	0,011	0,102	0,054	0,047	0,009	0,086	0,033	0,023	0,005	25
		1		1		1		1		1			

		R1		R2		R3		R4			
No	**Region**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**SCORE**	**RANK**
1	Краснодарский край	0,038	0,055	0,042	0,037	0,038	0,020	0,032	0,008	0,005	8
2	Ростовская область	0,044	0,055	0,034	0,037	0,039	0,020	0,043	0,008	0,005	5
3	Республика Татарстан	0,062	0,055	0,033	0,037	0,036	0,020	0,040	0,008	0,006	1
4	Республика Башкортостан	0,046	0,055	0,048	0,037	0,035	0,020	0,039	0,008	0,005	4
5	Ставропольский край	0,027	0,055	0,035	0,037	0,030	0,020	0,045	0,008	0,004	24
6	Саратовская область	0,046	0,055	0,032	0,037	0,026	0,020	0,036	0,008	0,004	11
7	Оренбургская область	0,034	0,055	0,038	0,037	0,044	0,020	0,030	0,008	0,004	14
8	Волгоградская область	0,029	0,055	0,032	0,037	0,043	0,020	0,039	0,008	0,004	23
9	Воронежская область	0,028	0,055	0,038	0,037	0,036	0,020	0,041	0,008	0,004	22
10	Белгородская область	0,035	0,055	0,030	0,037	0,046	0,020	0,046	0,008	0,004	15
11	Нижегородская область	0,033	0,055	0,061	0,037	0,046	0,020	0,045	0,008	0,005	3
12	Ленинградская область	0,032	0,055	0,040	0,037	0,050	0,020	0,027	0,008	0,004	12
13	Московская область	0,034	0,055	0,045	0,037	0,042	0,020	0,038	0,008	0,005	7
14	Самарская область	0,030	0,055	0,037	0,037	0,061	0,020	0,030	0,008	0,004	10
15	Курская область	0,034	0,055	0,024	0,037	0,030	0,020	0,041	0,008	0,004	26
16	Липецкая область	0,035	0,055	0,035	0,037	0,050	0,020	0,028	0,008	0,004	13
17	Орловская область	0,062	0,055	0,036	0,037	0,032	0,020	0,027	0,008	0,006	2
18	Пермский край	0,039	0,055	0,038	0,037	0,041	0,020	0,033	0,008	0,005	9
19	Тамбовская область	0,037	0,055	0,037	0,037	0,025	0,020	0,034	0,008	0,004	19
20	Удмуртская Республика	0,038	0,055	0,032	0,037	0,035	0,020	0,037	0,008	0,004	18
21	Кировская область	0,033	0,055	0,045	0,037	0,026	0,020	0,040	0,008	0,004	17
22	Пензенская область	0,037	0,055	0,039	0,037	0,026	0,020	0,041	0,008	0,004	16
23	Тульская область	0,036	0,055	0,033	0,037	0,034	0,020	0,019	0,008	0,004	20
24	Рязанская область	0,032	0,055	0,028	0,037	0,035	0,020	0,028	0,008	0,004	25
25	Ульяновская область	0,033	0,055	0,027	0,037	0,023	0,020	0,046	0,008	0,004	27
26	Тверская область	0,033	0,055	0,035	0,037	0,027	0,020	0,051	0,008	0,004	21
27	Новгородская область	0,033	0,055	0,045	0,037	0,043	0,020	0,044	0,008	0,005	6
		1		1		1		1			

		I1		I2		I3		I4		I5			
No	**Region**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**Value**	**Weight**	**SCORE**	**RANK**
1	Краснодарский край	0,105	0,119	0,094	0,133	0,075	0,156	0,035	0,107	0,038	0,093	0,044	1
2	Ростовская область	0,052	0,119	0,070	0,133	0,064	0,156	0,036	0,107	0,038	0,093	0,033	2
3	Республика Татарстан	0,016	0,119	0,066	0,133	0,023	0,156	0,035	0,107	0,037	0,093	0,021	17
4	Республика Башкортостан	0,011	0,119	0,062	0,133	0,042	0,156	0,033	0,107	0,039	0,093	0,023	12
5	Ставропольский край	0,053	0,119	0,062	0,133	0,030	0,156	0,041	0,107	0,037	0,093	0,027	6
6	Саратовская область	0,034	0,119	0,051	0,133	0,025	0,156	0,039	0,107	0,035	0,093	0,022	15
7	Оренбургская область	0,009	0,119	0,044	0,133	-0,058	0,156	0,040	0,107	0,034	0,093	0,005	26
8	Волгоградская область	0,025	0,119	0,042	0,133	0,008	0,156	0,038	0,107	0,038	0,093	0,017	23
9	Воронежская область	0,062	0,119	0,040	0,133	0,048	0,156	0,040	0,107	0,043	0,093	0,028	5
10	Белгородская область	0,043	0,119	0,034	0,133	0,034	0,156	0,038	0,107	0,036	0,093	0,022	14
11	Нижегородская область	0,023	0,119	0,034	0,133	0,072	0,156	0,035	0,107	0,035	0,093	0,026	8
12	Ленинградская область	0,056	0,119	0,033	0,133	0,067	0,156	0,033	0,107	0,039	0,093	0,029	4
13	Московская область	0,059	0,119	0,032	0,133	0,079	0,156	0,030	0,107	0,043	0,093	0,031	3
14	Самарская область	0,017	0,119	0,029	0,133	0,039	0,156	0,033	0,107	0,037	0,093	0,019	21
15	Курская область	0,026	0,119	0,029	0,133	0,005	0,156	0,040	0,107	0,033	0,093	0,015	25
16	Липецкая область	0,025	0,119	0,028	0,133	0,080	0,156	0,035	0,107	0,033	0,093	0,026	7
17	Орловская область	0,050	0,119	0,027	0,133	0,043	0,156	0,040	0,107	0,035	0,093	0,024	11
18	Пермский край	0,014	0,119	0,027	0,133	0,025	0,156	0,036	0,107	0,042	0,093	0,017	24
19	Тамбовская область	0,047	0,119	0,026	0,133	-0,097	0,156	0,043	0,107	0,033	0,093	0,002	27
20	Удмуртская Республика	0,019	0,119	0,025	0,133	0,067	0,156	0,036	0,107	0,038	0,093	0,023	13
21	Кировская область	0,032	0,119	0,024	0,133	0,068	0,156	0,039	0,107	0,034	0,093	0,025	10
22	Пензенская область	0,055	0,119	0,023	0,133	0,050	0,156	0,042	0,107	0,036	0,093	0,025	9
23	Тульская область	0,041	0,119	0,023	0,133	0,023	0,156	0,036	0,107	0,032	0,093	0,018	22
24	Рязанская область	0,030	0,119	0,022	0,133	0,040	0,156	0,035	0,107	0,043	0,093	0,021	20
25	Ульяновская область	0,030	0,119	0,022	0,133	0,046	0,156	0,042	0,107	0,029	0,093	0,021	19
26	Тверская область	0,030	0,119	0,017	0,133	0,049	0,156	0,035	0,107	0,043	0,093	0,021	18
27	Новгородская область	0,038	0,119	0,011	0,133	0,053	0,156	0,036	0,107	0,042	0,093	0,022	16
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Research Note: Maintenance and Repair of Passenger Trains Operating between Russia and Finland

Vladimir Romanov

JSC «LENGIPROTRANS», Russia

At the beginning of 21st century the volumes of freight and passenger transportations in railway transportation between Russia and Finland have increased greatly. It was promoted by long-term and fruitful collaboration of these countries and accommodations of perspective business - projects on development of transit container operating between Finland and the countries of Southeast Asia.

The major role in development of high-speed train service is organization of passenger trains with use of high-speed Italian trains, *Pendolinos*. These trains have an inclined body of cars. It allows increasing the speed up to 200 km per hour on existing curve sites of railroad lines. At the first stage these trains will be operated on the line Helsinki - Saint Petersburg with their subsequent reference up to Moscow.

Now the line Saint Petersburg - Moscow is practically prepared for movement of passenger trains ЭР-200 and « the Neva express train » with speed up to 200 km per hour, therefore for the Russian side a priority is a preparation of a railroad line Saint Petersburg – Border with Finland to provide speed of movement of trains Pendolino up to 200 km per hour on this site.

Solving this problem experts of JSC LENGIPROTRANS consider various variants of the passing of cargo trains from the St.-Petersburg to new port complexes in Vysotsk and Primorsk, because volumes of transportation of coal and bulk-oil cargoes in these complexes grow strongly.

Results of calculations have shown that better to pass these freight traffic on northeast detour of site Ruchyi (Ручьи) – Zelenogorsk- Vyborg. It creates favorable conditions for preparation of this line for high-speed passenger trains and the cargo routes with containers.

This decision demands significant expenses for amplification of throughput stages and stations. Development of a high-speed passenger line between Helsinki and Saint Petersburg and then up to Moscow demands a substantiation of accommodation of bases of maintenance, repair and equipment of the trains. Nowadays there are three types of trains operate between

Russia and Finland "Sibelius" on Helsinki - Saint Petersburg line , "Repin" on Saint Petersburg - Helsinki line and "Tolstoy" on Moscow - Helsinki line .

Trains "Sibelius" are made up in Helsinki, trains "Repin" are made up in Saint Petersburg and trains "Tolstoy" are made up in Moscow. At stations of formation of trains their equipment, maintenance and repair of cars is being completed. In items of maintenance and accumulation of trains pending departures in the opposite direction is provided.

New high-speed passenger trains Pendolinos can use maintenance, equipment and repair of a rolling stock both in Finland and in Russia. However, taking into account, that Finnish will use these trains not only in Russia but also on internal lines, the Russian and Finnish experts came to a common opinion that the basic base of maintenance, repair and equipment of trains Pendolino will be placed in Helsinki, and at Saint Petersburg - Finljandskiy station and then at Moscow - passenger station the October railway, where it is expedient to carry out maintenance, clearing of toilets of these trains and a accumulation of rolling stock waiting departure. It is required to construct new branch tracks or to equip existing branch tracks for performance of all necessary operations for this purpose.

In the St.-Petersburg railway junction final high-speed trains from Helsinki will arrive at passenger Saint Petersburg – Finljandskiy station, and transit trains of Helsinki - Moscow will be passed through the Ladozhskiy station with a stop for boarding and alighting of passengers.

About the author(s)

Vladimir Romanov, author of 10 scientific works, tel: +7 812 388 8620, e-mail: vromanov@lgt.ru

Trust Modelling in Supply Chain Management

Joanicjusz Nazarko, Maciej Dobrzyński & Urszula Ryciuk

Bialystok Technical University, Poland

Abstract

A lack of trust among supply chain partners often increases the transaction costs to an undesirably high level. Decision makers have to spend their time on analysing partner's credibility, reliability and trustworthiness. That is why successful supply chain performance should be based on a high level of trust among supply chain partners. The aim of this paper is to analyse of factors affecting the level of trust in supply chain management. It is widely acknowledged that the level of trust is highly associated with partner's reputation, information sharing, partner's asset specificity, behavioural uncertainty or potential opportunism. Moreover, the level of trust is strongly related to the level of commitment. The paper includes the review of existing models of trust and commitment in supply chain management as well as the presentation of the result of our own research on modelling trust in supply chain in Polish environment.

Keywords: trust, commitment, modelling trust, supply chain

1. Introduction

Nowadays, the crucial issue for many companies is a necessity to fulfil growing customers' expectations. One solution is to increase profitability is supply chain integration. It gives a possibility to create competitive advantage (due to higher efficiency, effectiveness and cost reduction). That is the reason why developing and maintaining relationships is becoming more popular than short-term and centred on self-interest exchange.

However, close collaboration coexists together with some level of risk (for example integration requires sharing strategic information and expensive investments). That is the reason why supply chain should be based on a high level of trust among supply chain partners. It is known that the level of trust is highly associated with partner's reputation, information sharing, partner's asset specificity, behavioural uncertainty or potential opportunism. Trust reduces uncertainty, increases commitment and enhances longevity in relationships. High level of trust and a strong commitment among supply chain partners leads to successful supply chain performance.

2. The concept of trust and commitment

A wide variety of definitions of the term trust have been proposed in literature. Trust focuses on positive emotions like hope, benevolence, confidence, faith and assurance. Białaszewski and Giallourakis (1985) define trust as an attitude displayed in solutions where person is relaying on another person, a person is risking something value, and/or a person is attempting to achieve a desired goal. According to Anderson and. Narus (1990) trust is the firm's belief that another company will perform actions that will result in positive outcomes for the firm, as well as not take unexpected actions that would result in negative outcomes for the firm. Anderson and Weitz (1992) explain trust as one party's belief that its needs will be fulfilled in the future by actions undertaken by the other party. Moorman et al. (1992) define trust as willingness to rely on an exchange partner in whom one has confidence. Blois (1999) states that trust refers to the situation where the other party makes itself vulnerable to the other party's behaviour. Although the party is aware of the partner capability to do harm, it does not think that it is necessary to take action to safeguard against such a possibility.

Trust has been illustrated in literature as a concept, which plays a key role in supply chain relationship. According to Ellram's (1995) researches luck of trust was ranked by buyers as the third highest out of 19 factors leading to inefficient partnership, while the suppliers ranked lack of trust as the fourth highest factor. The high level of trust among business partners has the effect on reducing transaction costs. Luck of trust is one of the most important factors leading to inefficient partnership.

Trust can also be defined as a willingness to take risk (company is willing to take risk and expose itself in relation to another company). Risk is connected with assessment of probability of positive and negative consequences of cooperation. Lack of trust results in companies wasting time and money on protecting themselves against a possible harm (company have to spend time and energy on trading partners control and verification).

Various types and/or level of trust can be identified (Crotts, Turner, 1999):

- blind trust – based upon a luck of knowledge or other irrational basis,
- calculative trust – based upon the cost and benefits of cheating or staying in a relationship,
- verifiable trust – based upon the ability of one partner to verify the actions of another,
- earned trust – based upon some experimental basis,

- reciprocal trust – based upon the participants possessing mutual trust (party trust the other because the other party trust it).

Commitment may be defined as a convincement that existing relationship with business partner is so important that it is reasonable to make every possible effort to maintain it. Supply chain partners work in order to achieve mutual goals; therefore commitment is also a willingness to make some short-term sacrifices to maintain the long-term relationship. Figure 1 depicts that relationships development is a process that takes time to grow. Commitment exists only if there is trust between supply chain members (trust is an essential component of commitment) (Crotts, Turner, 1999). Commitment strengthens as a partnership evolves and the level of trust increases. Trust between parties usually develops over time and depends on experience and shared value and goals. Blind trust exposes the trustor to unnecessary risk.

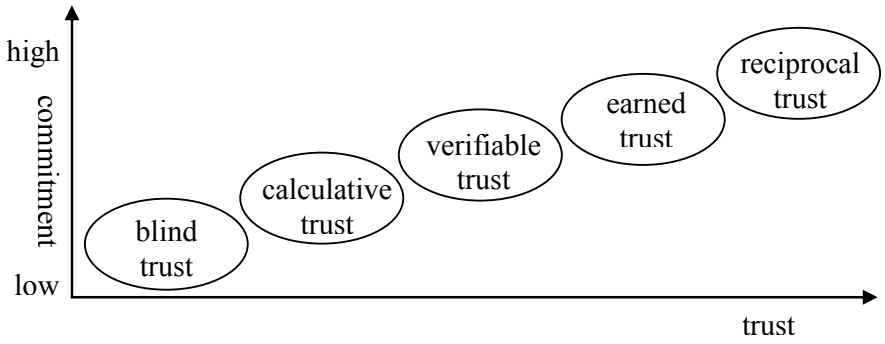

Figure. 1. Relationship between trust and commitment

The activity of creating systems and methods that allow relying parties to make assessments and decisions regarding the dependability of potential transactions involving risk, and that allow players and system owners to increase and correctly represent the reliability of themselves and their systems is trust management (Jøsang et al., 2005).

3. Antecedents of trust and commitment

A number of factors influence the level of trust among supply chain partners (Kwon, Suh, 2004, 2005; Sharif et al., 2005; Crotts, Turner, 1999):

- information sharing (communication, IT share),
- specific asset investments (partner's asset specificity, non-retrievable investments),
- behavioural uncertainty,
- potential opportunism,
- reputation,
- interdependence and power imbalance (coercive power),
- performance satisfaction (perceived satisfaction),
- skills,
- mutual goals,
- perceived personal conflict,
- flexibility.

Information sharing (communication) is defined as the formal and informal sharing of information between business partners (exchange of operational, financial, forecasting information). Information sharing lowers the degree of partner's behavioural uncertainty and potential opportunism as well as increases the level of trust among supply chain partners.

Partner's specific asset investments (non-retrievable investments) are investments in physical or human assets (capital improvements, training, equipment, R&D) that are dedicated to particular business partner. Specific investments do not have outside value and cannot be recovered if the relationship is terminated. Specific asset investments decrease the possibility of opportunistic behaviour and increase trust and commitment (expectation of continuance).

Behavioural uncertainty is connected with the difficulties to predict business partner behaviour. Low predictability of partner behaviour increases transactional cost and decreases the level of trust in supply chain.

Trust is an idea related to presumption that the business partner does not intentionally take actions which can cause negative financial consequences for the company. However, in every case the possibility of opportunistic behaviour exists. Opportunism is more probable if a business partner has other potential partners and the cost of changing present partner for another is quite low. Opportunistic behaviour has a negative impact on the level of trust in supply chain relationships.

A company reputation is a partner's perception of the firm's ability to create value in terms of concrete value creation attributes. If a company has not had direct experience with

the potential partner, the reputation can be the only factor which decides about possibility of cooperation. A good partner's reputation in the market has a positive impact on the trust.

Power imbalance is the ability of one partner to get the other partner to do something they would not normally do. It is directly related to the degree of one partner's dependence on the other partner. Dependence relation is possible when the level of substitutability is low (one party has not much possibility to change one partner for another). Power abuse is negatively related to trust.

The other factors which influence the level of trust among supply chain partners are: performance satisfaction (mutually satisfactory outcome increases trust among supply partners), mutual goals (defined as the degree to which partners share goals; mutual goals are a tough reason for trust and relationship continuance), skills (technical ability regarding products and production methods and knowledge of customer's organization, markets, competitors and industry), perceived personal conflict (trust increases if a partner is perceived as confrontational), flexibility (flexible conditions enable the creation of tolerance towards behavioural and environmental uncertainty and engender trust).

4. Conceptual model of trust

The aim of that study was the creation of trust and commitment model. In order to achieve this aim the authors have analyzed exciting models (especially Kwon & Suh 2004, 2005; Sharif et al., 2005; Crotts, Turner, 1999). The first model of Kwon and Suh suggests that trust is critical element to sustain commitment. The level of trust depends on transaction cost variables – the partner's asset specificity, behavioral uncertainty, information sharing (it also influences the level of behavioral uncertainty) and social exchange variables – perceived satisfaction, reputation and perceived personal conflict. In the second model Kwon and Suh (figure 2) take into account the following factors: the partner's asset specificity and information sharing as well as two mediating variables: behavioral uncertainty and potential opportunism.

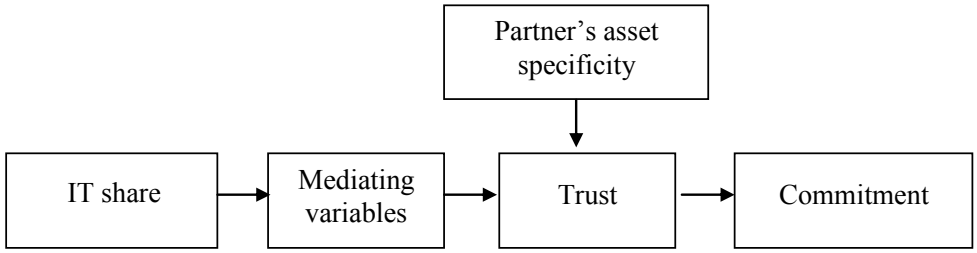

Figure. 2. Model of Kwon and Suh (2005).

The conclusions from the model verification are as follows:

- partner's asset specificity has considerable positive impact on trust,
- behavioral uncertainty has considerable negative impact on trust,
- the hypothesis that potential opportunism has negative impact on trust was not supported,
- information sharing decreases behavioral uncertainty and potential opportunism and indirectly increases the level of trust.
- there is a small positive relationship between trust and commitment.

Sharif et al. (2005) proposed the research model in small and medium-sized enterprises (figure 3). The authors suggested that trust is positively related to long term orientation.

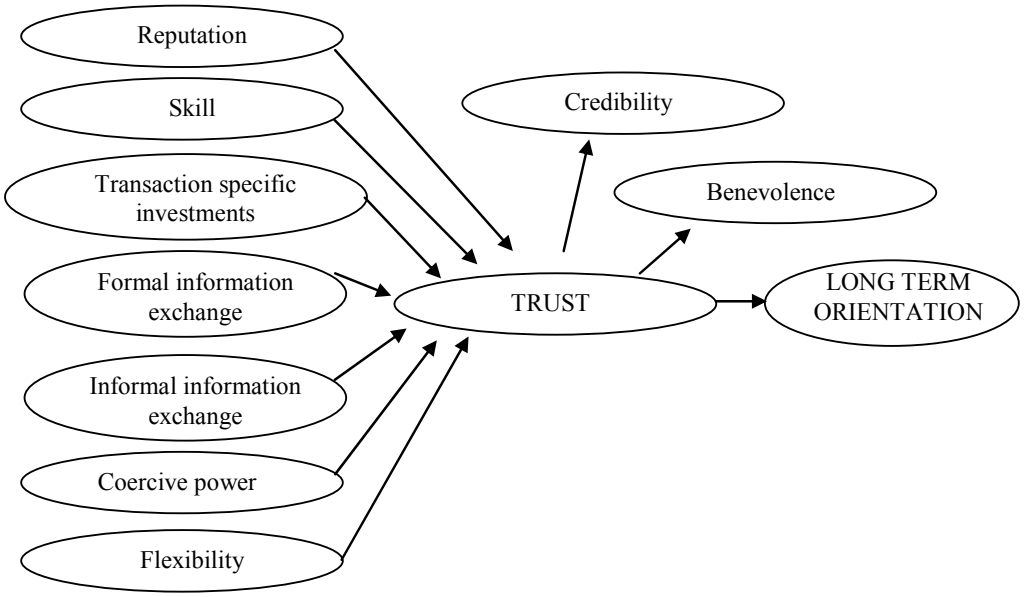

Figure 3. Model of Sharif et al., (2005)

The conclusions from the model verification are as follows:

- reputation has the greatest impact on the trust development,
- flexibility is the second most important determinant of trust,
- formal and informal information exchange has an impact on trust (informal information is even more important),
- transaction specific investments have positive impact on trust,
- coercive power has negative impact on trust,
- skill has significant impact on credibility and long term orientation but not on trust,
- positive relationship between trust and long term orientation has been supported.

Authors of that research presumed that successful supply chain implementation requires a commitment between supply chain partners, and trust is a critical element to sustain such commitment. Conceptually, as shown in figure 4, this study proposes that the partner's asset specificity (PAS), information sharing (IS) increase the level of trust between supply chain partners whereas behavioural uncertainty (BU) and potential opportunism (PO) reduces the level of trust.

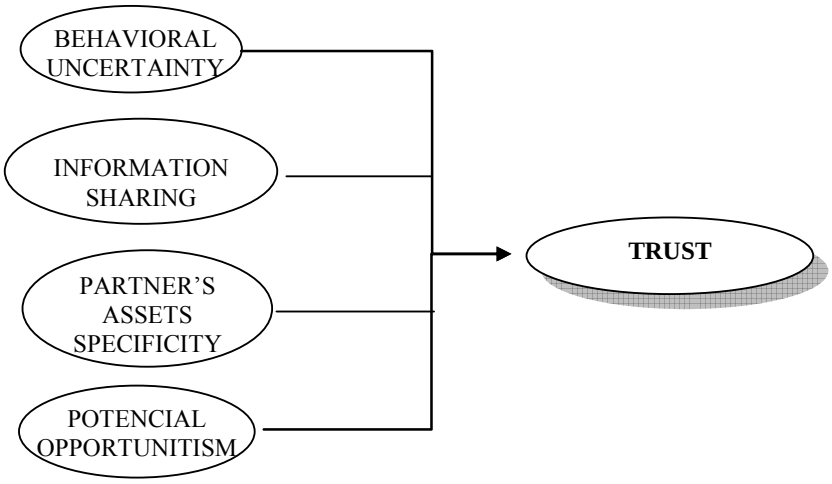

Figure 4. First proposed research model

The research was conducted by means of a questionnaire and carried out among companies experienced in supply chain management (all branches) in Polaskie voivodship. Data was collected in June 2006. When the organization had more than one supply chain partner, the respondent was asked to consider this one that has the highest impact on their

business. As a result, 384 returns were received. After verification, data from 320 surveys was used for further studies.

The model has been verified by means of artificial intelligence – neural networks (*Statistica)*. As a result of conducted numeric investigations the proposed model was verified negatively. The efficiency of the best net found was defined as poor (coefficient of regression 0,86, correlation 0,52).

As a result, a new conceptual model was proposed in which trust was treated as independent variable (figure 5). The new conception came into being under influence of repeated numeric experiences. Proposed model is new and authors have not come across any equivalents in the existing published work on this subject..

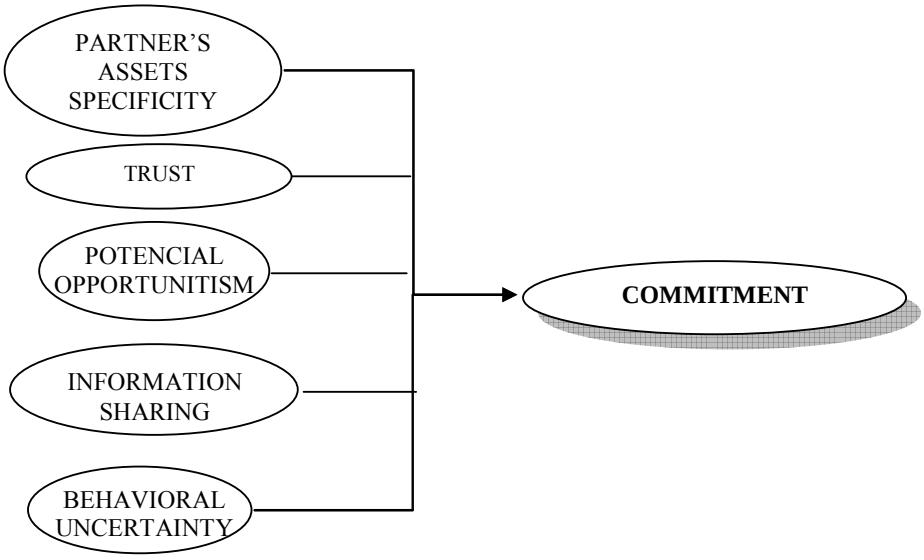

Figure 5. The second conceptual model

As a result of numeric experiences the model was verified positively (table 1). The efficiency of the best found network was defined as moderate (coefficient of regression 0,77, correlation 0,63). The usefulness of specific input variables was defined and ranked of their validity by means of sensibility analysis (variables occupied higher places in ranking show greater influence on output variable - commitment).

Table 1. Results of sensibility analyses for second conceptual model

Variable	TRUST	PAS	BU	IS
Rank	2	4	3	1
Error	0,6581456	0,6381232	0,6461671	0,6784141
Quotient	1,078352	1,045546	1,058726	1,111562

All variables are in positive correlation with dependent variable COMMITMENT. Figure 6 illustrates the influence of trust on commitment.

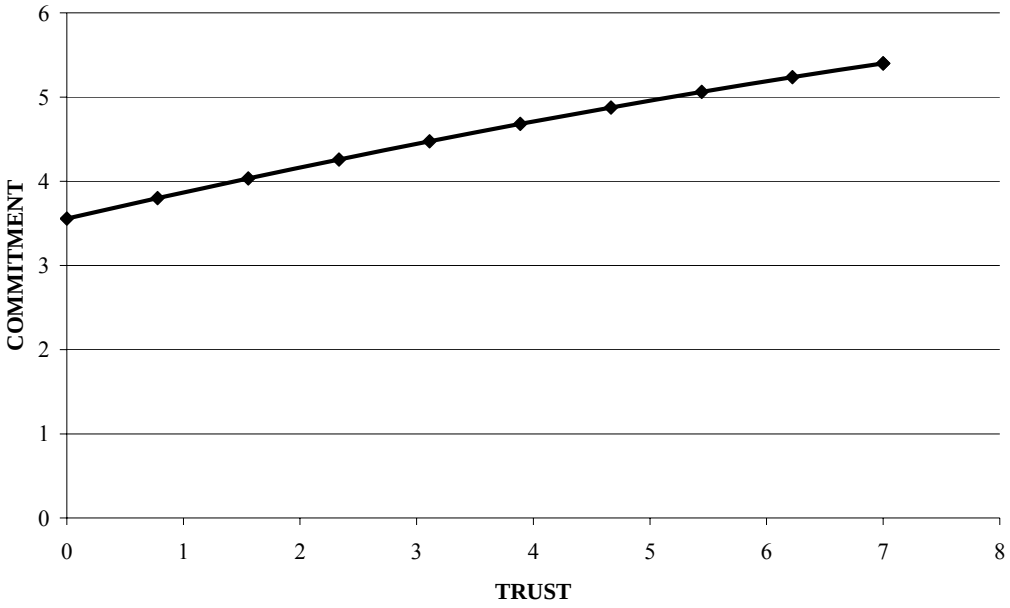

Figure 6. Dependence of trust and commitment in enterprises of Podlaskie voivodship

5. Conclusions

As a result of critical analysis of existed published work it could be stated that the received model of trust and commitment at present level of scientific investigations does not exist. In majority of cases researches (Kwon, Suh, 2004, 2005; Sharif et al., 2005; Crotts, Turner, 1999) accept, that the trust is the dependent variable, and the set of factors influencing trust is not defined. The existence of dependence between trust and commitment is admitted by the majority of researchers.

The aim of the presented research was to construct the model of trust and commitment in Podlaskie voivodship enterprises. The conducted by authors empirical investigations did not support hypothesis, that trust is independent variable. In proposed conceptual model, trust was treated as an independent variable, whereas commitment as dependent one. The model was verified in the course of numeric experiments carried out by means of artificial intelligence (neural networks). The analysis of sensibility allowed to choose a set of the variables which influence is the most significant.

We hope that this paper will, at least to some extent, contribute to the development of trust management in supply chains.

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About the author(s)s

Joanicjusz Nazarko, email: jnazarko@pb.edu.pl
Maciej Dobrzyński, email: izim@pb.edu.pl
Urszula Ryciuk, email: uryciuk@pb.edu.pl

Automation of Cargoes Placing and Fastening Scheme Design

Eugene Korovyakovsky

St. Petersburg State Transport University, Russia

Abstract

Consignor has to prepare technical documentation on placing and fastening cargo in wagons and containers, when cargo departs by rails. Safety of train moving, integrity of railway stock and cargoes directly depends on technical documentation quality. Selection of transportation mode and calculation of fastening takes a lot of resources from consignor. In this case there are many programs developed, helping to make calculations quick and quality for placing and fastening of cargoes. This paper describes directions of future development and solutions for technologies of rational placing and fastening of cargoes.

Keywords: over-sized cargoes, over-weight cargoes, project transportations, technical documentation

1. Introduction

Transportations of over-sized and over-weighted cargoes are very popular between Finland and Russia. Machinery and equipment are often over-sized and because of it all elements of their transportation should be planned very carefully beforehand. Great amount of over-sized equipment are transported for oil industry in Middle Asia and Siberia. For such transportation technical documentation should be developed with defining of placing and fastening of cargo and all needed calculations. All documents should be approved by JSC “RZD”. Cross-border transportation demands special responsibility, since at a border stations cargo goes through additional check with technical documents. There are many deliveries that are usual in Finnish-Russian trade. For example, level of harvesters’ transportation has been stable for last 10 years. But there are also big quantity of projects of single cargoes that should be moved through the border between Russia and Finland. Many Finnish and Russian forwarding companies are organizing deliveries of over-sized and over-weighted cargoes. Our countries have the same railway gauge so cargoes go through the border without any loading/unloading operation.

Comparing technology of over-sized deliveries in Russia and Finland one can admit some differences. In JSC “RZD” there are many “commerce inspectors”, who are controlling quality of technical documentation, but there is no structure for preparing this documentation. All documentation should be prepared by consignor. In VR-Cargo there is special structure

for preparing of technical documentation and controlling its quality. Second model is better, because level of personnel and quality of documentation is much higher.

There are many factors impacts on cargo's stability when it's transported. Let's determine and classify the main ones among them.

2. Determination of stability factors of cargoes at railway rolling stock

For solving task of cargo stability we have to find cargoes stability factors that could be managed. Structure and interaction of these factors are shown on Appendix 1. It was made on the basement of research review. Analysis of figure shows that it's possible to study cargoes stability in a wagon and measures for it's securing in lengthwise and transverse directions separately. Common factors in lengthwise and transverse directions are geometry of cargo, cohesion between cargo and floor of wagon and summary gross weight of cargoes in wagon.

All factors one can divide into four groups: parameters of wagon, parameters of cargo, transportation conditions of cargo in wagon, scheme and construction of cargo's fastening. Most of these factors independent and can not be accepted as managed ones with aim of stability cargo in the wagon. For example, parameters of wagon: type of wagon, type of wheels, construction and floor material, type of automatic coupler, cargo parameters (cargo dimensions, weight, shape and rigidity), and main factors of transportation conditions: speed of wagons hits in time of maneuvering, speed of trains moving and specific wind force on cargoes. All these factors one should take as constants for analyzing transportation conditions when estimating stability of any kind of cargo in a wagon.

Construction and scheme of fastening is most managed one. Another managed factor is rigidity of fastening. Research works of different authors show that the more amortization of cargo the less inertia's force and raise reserve of cargo stability from displacement and overturn in a wagon. In estimation of stability of cargoes particular attention is paid for conditions of cargo's interaction between each others, and this is defined by rigidity and shape of cargoes. Cargo's shape defines areas of force transmission between near adjacent cargoes in a case of their interaction, because of their forward and angular movement.

3. Methods for calculation of placing and fastening of cargoes with using of personal computer

When cargo departs by rails consignor has to prepare technical documentation on placing and fastening cargoes in wagons and containers. Safety of train moving, integrity of railway stock and cargoes directly depends on technical documentation quality. Choosing of transportation mode and calculation of fastening takes a lot of resources from consignor moreover it takes a lot of high-quality people resources. In this case there exists number of programs, which are developed, in order to make calculations quick and assure quality for placing and fastening of cargo.

First investigation in the field of reduction calculation work was made in 70's. One of methods was graphical. For example, in 1978 Pestremenko in Harkov's institute of railway transport has made graphical method of calculation of fastening of cargo with flat surface with different dimensions and weights for speed of the train 100 km per hour. This method includes a lot of nomograms for defining parameters of nailed and wire connections depending on weight of cargo, gross weight of cargoes in the wagon, length of cargo, ratio of height and length and ratio of height and width, allowed force for one element of fastening with taking into account all conditions of it's work. Main lack of this method is necessity of drawing of new nomograms with changing of allowed force for one element of fastening, complication of checking of results. This method was very simple and useful when calculation of fastening by using of ready nomograms, but drawing nomograms for different types of fastening – quite difficult task. Possibility because of it this method not became widely know at railway network. And in 80's using of graphical method continued and different methods were developed applying its principles.

After active implementation of information technologies in the end of 80's many researchers start to use resources of computers for making labour-intensive calculations in calculation of placing and fastening of cargoes on rolling stock.

At present time there are many programs functioning on Windows-oriented platform. Software "Packer 3D" was developed in Moscow State University. It's used for placing box-cargoes inside transport vehicles. Each transport vehicle has its own list of parameters. Average level of vehicle completion by cargo is about 80-90 percents. In this program one can choose containers, wagons, trailers or custom vehicles as transport vehicle. As a result program shows graphically loading sequence of boxes into vehicles, and it is mostly optimal with next properties:

- limitations for difference of pressure on square of floor for transport vehicles;
- limitations for pressures on cargo's side and permissions for placing cargo at side;
- limitations for amount of cargo layers.

Results of the program are shown in 3D and 2D models. There is possibility to scale and print it. Program is very comfortable and modern-looked, but at the same time has small disadvantages. One is narrow directivity for maximum dense packing of cargoes inside vehicle and fastening questions are out of users view. User should check the situation when there is free space in vehicle. Program gives no recommendations for fastening of dense packed cargoes.

Moscow software-company "ASV-Trans" has developed program "Trans TU". Specialist can prepare from templates loading scheme and prepare technical documentation by means of this program. For advantage of this program we can consider:

- data bank of common cargoes with main characteristics;
- possibility of entering new cargoes by user;
- inline text-editor for typing comments;
- semi-automated completion of table for calculating of weight of fastening;
- short electronic course with rules of creating loading schemes with examples of forms;
- additional files for calculation of "non-gabarit" points, minimal length of beams, calculation of common centre of gravity.

Program "CARGOS" was made by Moscow company "LOGIS" for evaluating of extents of box and cylinder cargoes. Standard gabarits (loading gage diagrams) are used in program "CARGOS", but program has disadvantages: lack of calculation of extents over-gabarit in a curve. Calculation of fastening cargo in wagon is not foreseen.

In Petersburg State Transport University software "Kreplenie (Fastening) – w2.2" was developed. Software can be used as main instrument in stress calculation of fastening for all cargoes, especially for "difficult" cargoes: oversized and over weighted. Control of gabarit is visualized. All documentation is exported in Word-file; some small schemes are exported in AutoCad 2000 file. Software automatically calculates:

- Centre of cargoes mass;
- Part of the cargo under wind-force;
- Pressure onto wheel bogies;
- Checks displacement of cargoes mass from geometry centre of wagon;

- Checks stability cargo with wagon;
- Extent of over-sized cargo on straight railway track and in a curve;
- Forces affect on cargo;
- Stress calculations of fastening elements
- Parameters of wire fastening.

All software programs have the same disadvantages:

- by using of these software programs one can not calculate group of cargoes;
- large quantity of calculations are made manually;
- automatic calculations are not integrated with AutoCAD or KOMPAS 3D.

4. Conclusions

In spite of amount of programs in placing and fastening of cargoes one can admit that there is a lack of functionality in such kind of programs. Already developed software alternatives have limitations for calculations of group of cargoes, it only calculates separate piece-goods; a lot of operations are hand-made and not automated still; there is lack of loading schemes data bank for quality-control everywhere etc. Future trend for these programs possibly will be integrating calculation modules with drawing modules: user will draw fastening and program will calculate everything needed.

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2. www.packer3d.ru
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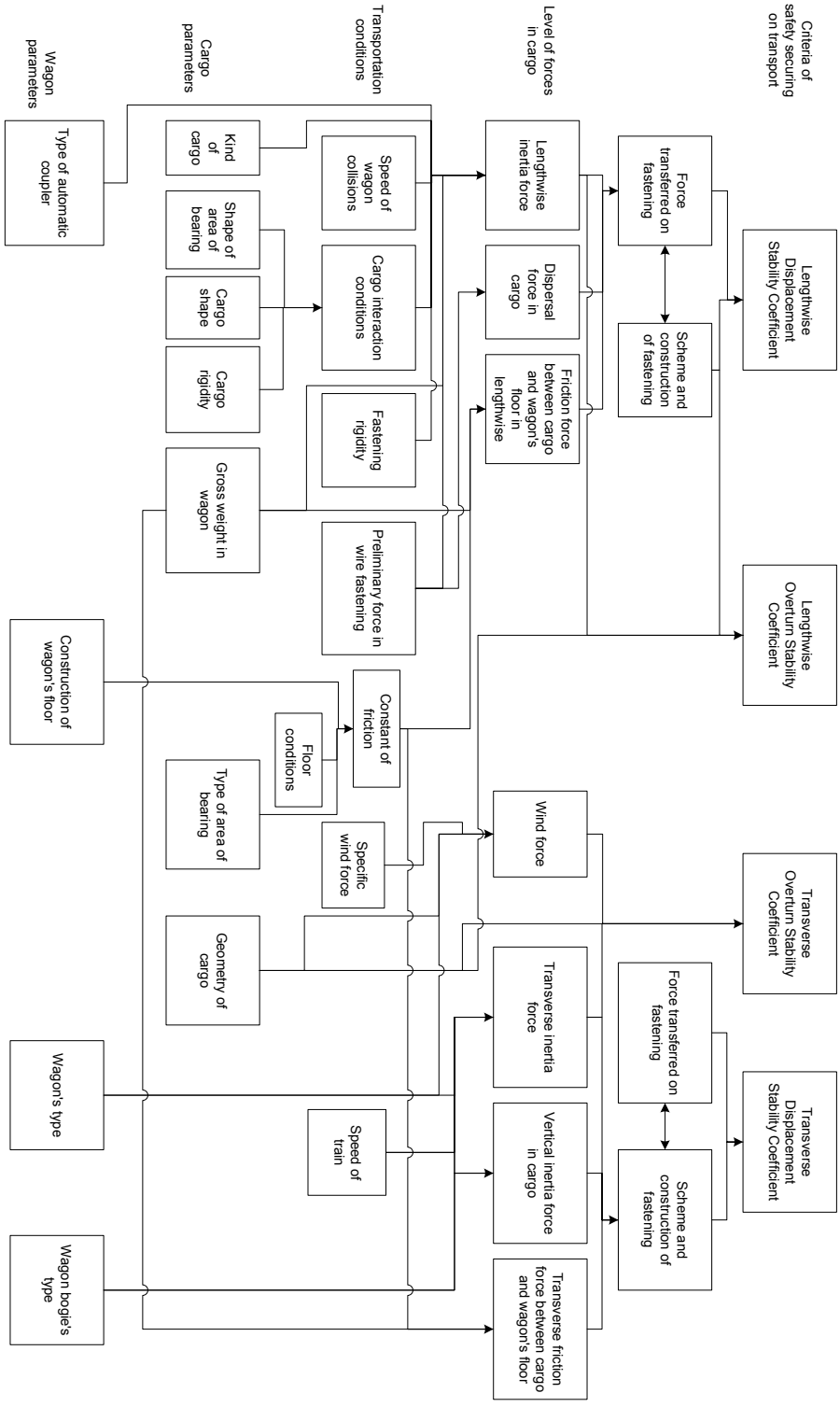
Appendix 1. Structure and interaction of stability factors of cargoes at railway rolling stock.



Research Note: Management Peopleware for Russian and Finland Logistics Centres

Vladimir A.Odintsov, Nikolay K. Rumiantsev & Olga.N. Kuranova

St. Petersburg State University, Russia

Abstracts

The main idea of this note consists in the development of the transport infrastructure in Russia, which could be brought required economic effect. This goal may be attained through such things as improvement of investment climate, including the involvement of private capital resources and creating centers of refresh courses for transport industry specialists. As the experience has shown, these centers must be based on transport university deep theoretical knowledge.

The goal of outrunning development of the transport infrastructure has been set by the President of the Russian Federation as one of the strategic priorities of the country's development. It is emphasized in the President's address to the Federal Assembly of the Russian Federation: "Development of the transport infrastructure is more than just an economic goal. Achieving it will directly influence both the state of affairs in the economy and the keeping of the country's unity…". However skills of the personnel of the transport companies get crucial importance in conditions of the market.

Such an accentuation implies a number of strict requirements in the field of the transportation policy pursued by the state, including:

- working out a system of long-term strategic priorities in the development of the transportation infrastructure;
- creating mechanisms for implementing infrastructure projects, including the involvement of private capital resources;
- working out accurate and transparent rules of game in the market, among other things, creating the required legal base and establishing long-term investment obligations of the state.
- preparing a list of investment projects that could be capable of creating new "points of growth" in the economy and that could be offered to the business and regions for joint implementation.

Unfortunately, until recently we have had only some fragments of such a system that could not individually bring the required social or economic effect. E.g., when the Federal

Target Programme "Transport System Updating" was adopted in 2001, the mechanisms of raising off-budget funds were not sufficiently disclosed. As a result, for the three years of Programme implementation, the volume of raised private investment was almost twice less than planned.

Another serious drawback was the formation of the programme measures according to the narrow branch principle. The effect of using such an approach has been that none of the 16 major seaports has a direct access to the federal network of roads, and 8 of 10 strategic federal airports have no access railway tracks.

As the experience of previous years has shown, the mechanisms of implementing the Programme are mainly aimed at reproducing the existing infrastructure. Meanwhile, developing a new, up-to-date infrastructure (including the infrastructure of international transport corridors) requires quite new approaches and implementation mechanisms. And, first of all, a more active participation of private capital both in funding such projects and in managing them.

For this purpose, Russia's Ministry of Transport has developed a concept of a new federal target programme "Development of Russia's Transportation Services Export (2006-2010)". One of the goals is to improve the competitive capacity of the Russian transportation system and to realize the transit potential of the country. The President noted "conversion of the geographic peculiarities of Russia into its competitive advantage" as one of the national priorities.

That may be attained only through improving the investment climate, by actively attracting financial and management resources of private capital and developing a market of concession projects, which is fundamentally new for Russia.

It is expected that the basic volume of investments will be allocated for implementing high-tech infrastructure projects - up-to-date multimodal logistical complexes, expressroads, creating a national network of airports - logistical centres (HUB), and developing the infrastructure of the major seaports of Russia.

A special role is assigned to developing and introducing up-to-date transport, logistical and information technologies capable of ensuring the provision of high-quality and competitive transportation services.

The very principle of forming the programme components should be changed by selecting projects that will yield the maximum synergy and system effect. It means that the strategic zones of the transport infrastructure located at intersections and in the places of the

maximum concentration of export, domestic and transit freight flows and coinciding with the routes of the basic international transport corridors should be developed first of all.

The insufficient realization of the transit potential of the RF and the low competitive capacity of domestic carriers in the world market of transportation services become especially inadmissible in the context of Russia's forthcoming entry into the World Trade Organization. A common strategy of big foreign 3PL companies is expansion to developing markets – opening offices in various countries of the world, increasing the number of terminals and expanding the fleets of up-to-date transport facilities. RF's joining the WTO may serve as a serious stimulus for expansion of western companies to Russia. The poor skills of domestic logistics operators and the absence of 3PL/third party logistic level operators (i.e., companies organizing the entire chain of deliveries for retailers, providing the complete range of logistical services and possessing transport facilities and warehouses) in our market may result in losing the Russian market for domestic players.

Therefore, it seems necessary to analyze the basic trends, which are more manifest in the logistical markets of the countries that are already members of the WTO. It is also important to form respective information instruments in order to bring the results of the analysis carried out by experts to managers of all levels working in the transport and transit complex (workshops, conferences).

A substantial distinguishing feature of the new Programme is abandoning the narrow branch principle and a transition to the functional inter-branch principle of infrastructure planning and management.

In the opinion of leading domestic logistics experts, no other segment of Russia's business lags behind the countries of Western Europe and the USA to such a catastrophic degree as logistics. However, further progress of Russia will, without doubt, be in the same direction and at a fast pace. Therefore, vast theoretical and practical expertise must be accumulated in the field of the development trends of the modern logistical and transport markets (an example is the development trend of the system of business participants belonging to the Fourth Party Logistics (4PL) и Fifth Party Logistics (5PL) categories). 4PL providers are still rare even in the West, while 5PL will appear only in the future, even if this future is already close. Taking into account that the development of the Russian business is a part of processes going on in the world, a system of conveying such expertise to the personnel employed in the transport and logistics process should be arranged right now.

Creating and developing HUB is the objective of the state, however, it should be tackled with the participation of private companies. This involves the following problems:

- independence of HUB on individual participants of transportation;
- commitment to fast delivery of goods as possible.

All carriage participants should have stimuli encouraging them to share information, be able to transmit and receive information (information technologies), and have personnel with appropriate knowledge and skills enabling them to work with such information efficiently. It means that training, further training and refresher courses for specialists should be organized accordingly.

The problems of HUB independence and the desire of transportation participants to share information are first of all problems of legislation, though they can be solved at the level of agreements between carriage participants or with the help of insurance companies. Other problems can and must be resolved by using the experience of European cities. Thus, management peopleware for Russia's logistical centers is one of the most urgent goals.

The St. Petersburg State Transport University is already tackling this. The key goal is to create and develop centers of refresher courses for transport industry specialists in Russia. First of all, this covers personnel for modern management in the field of logistics.

Modern interaction of the logistical companies of the Russian Federation and the countries of the near abroad and Finland is impossible without detailed acquaintance of the personnel of the companies to information systems, which uses Russian railways. These systems develop and modernized constantly. The personnel of the logistical companies should have an opportunity constantly to update the knowledge and skills on work with these information systems. What to make such retraining the personnel as much as possible effective and duly the October railway uses modern technologies e-learning for retraining the personnel. Now on the basis of products IBM WebSphere, LWCL, LS the system of remote training of workers of road is created. The system works in a local network of data transmission of Russian railways. Workers are trained on the workplaces using a standard browser. Similar technologies of preparation of workers of the Finnish logistical companies to use information to systems of Russian railway can be realized on the basis of the center of remote training (E-learning) the Petersburg State Transport University. E-learning Center the Petersburg State Transport University works with October railway to current of three years and is ready to offer the services on training the personnel of the Finnish logistical companies through a network the Internet, or a corporate network of Russian railways if they have access to it.

Besides, the portal implemented at WEBSHERE (IBM) has:

- a forum providing a space for participants of the project to discuss any subjects, proposals and issues arising in the course of project development;
- tools for up-to-date work with documents.

For instance, a library is one of such tools. It makes it possible to structure documents created in the framework of the project by subjects, authors, etc. Besides, all participants can jointly use documents and presentations and exchange files.

The third important area in the work of the virtual university is joint development of teaching courses for a system of distance learning of the refresher centers. Teachers may create training courses (in the international standard SCORM 1.2), publish them on the portal and organize distance training. One of the most important aspects is the possibility of teaching students of various refresher training centres through one virtual university.

All these measures are to significantly enhance competitive capacity of our domestic logistics operators and to facilitate the development of up-to-date logistical centres (HUB) in Russia.

About theAuthor(s)

Vladimir Odintsov, The deputy chief of the October railway on the staff and social questions, +7(812)768-6334, odintsov@spb.orw.ru, more then 30 publications

Nikolay Rumiantsev., The dean of faculty of economy and social management, +7(812)310-8366, nrumyantsev@mail.ru, more then 80 publications

Olga Kuranova., The head of the center of e-learning (The St. Petersburg State University of Communication Lines (PGUPS), +7(812)310-0020, olga_kuranova@mail.ru, more then 50 publications

Shaping Transportation Flows for City Development and Citizens Satisfaction

Jacek Szoltysek

Faculty of Management, Business Logistics Department, The Karol Adamiecki University of Economics, Katowice, Poland

Abstract

This paper presents the problems of urban transport and possible solutions in form of distribution schemes. Urban transport is discussed from both freight and passenger point of views. As a conclusion importance of traffic planning is emphasized in the whole city planning context.

Keywords: urban transport

1. Introduction

Modern societies depend heavily on mobility, but transport entails severe problems, such as congestion of road networks and urban areas, harmful effects on the environment and public health, waste of energy and, above all, accidents which cause fatalities, injuries and material damage. We define congestion as *the situation when the hourly traffic demand exceeds the maximum sustainable hourly throughput of the link.* Congestion is defined also as the impedance vehicles impose on each other, due to the speed-flow relationship, in conditions where the use of a transport system approaches its capacity. In the European Union, congestion costs amount to 50 billion € per year or 0.5 % of Community GDP, and by 2010 this figure could go up to 1% of EU GDP. The number of cars per thousand persons has increased from 232 in 1975 to 460 in 2002. The overall distance traveled by road vehicles has tripled in the last 30 years and, in the last decade, the volume of road freight grew by 35% contributing to 7 500 km or 10% of the network being affected daily by traffic jams[1]. Investigations show that up to 50% of fuel consumption is caused by congested traffic situations and non optimal driving behaviors. Safety is the one with the most serious impact on the daily lives of citizens. It also has a high impact on most of the socio-economic indicators. There are still over 40.000 fatalities on the Euro 25 roads every year, with 1.4 million accidents with a cost of around 200 billion €/year representing 2% of the EU GDP[2].

[1] Source: DG TREN
[2] Source: EUROSTAT

The city is a collective space which belongs to all those who live in it, who have the right to find there the conditions for their political, social and ecological fulfillment, at the same time assuming duties of solidarity. Thus citizens have right to live in cities with the highest possible satisfaction, measured as quality of life. The subject of quality of life is currently under constant re-definition. Though early studies in the area cited mere economic aspects (e.g. per capita income), current research includes the idea of quality of life as involving both physical and social aspects, that is, the development of human potential. Most recently, quality of life has appeared as a new category of sustainable development. Problems with mobility[3], including congestion in modern cities, influence on perceived quality of life, limiting cities development possibilities.

2. Transportation flows in modern cities and problems they cause

A safe and efficient transportation system is an essential component for development in any community. The system consists of two modes of transport – passengers and goods[4]. Both are moved using the same infrastructure (roads and points of in- and out- as passengers stops or points of loading, reloading and unloading trucks). Well known and having good theoretical background is public transport in cities. There are good examples of well organized passenger transport system with one fare, one ticket and one organizer. Private car movement and other ways of travelling within city is usually not organized and even not identified. What we know is the number of private cars registered in the city, a number of taxi and a capacity of car parks. There are no examples of successful combining both private and public passenger transport, nor trials of organizing new ways of travelling, as such par-and-ride, kiss-and-ride or car pooling. But the problems with this kind of transportation is rather understood and shared by citizens. In the opposite side there is urban traffic, connected with good transportation. This mean of transport is widely not accepted by citizens and is treated as not needed and disturbing normal activities in cities.

Urban freight transport has become an important component of urban planning. The

[3] Mobility has become an ever more important element of our world, essential for the growing integration and coherence of Europe, and vital for Europe's communication and exchanges with other parts of an ever globalized World. Increasing mobility, however, has to be embedded in sustainable development and respect environment.
[4] Delivery of consumer goods, not only by retail, but also by other sectors such as manufacturing, in city and suburban areas, including the reverse flow of used goods in terms of clean waste.

rationalization of urban freight transport is essential for sustainable economic growth. However, there are now many problems to overcome such as traffic congestion, environment and energy conservation. Freight carriers are expected to provide higher levels of service within the framework of Just-in-Time transport systems with lower costs.

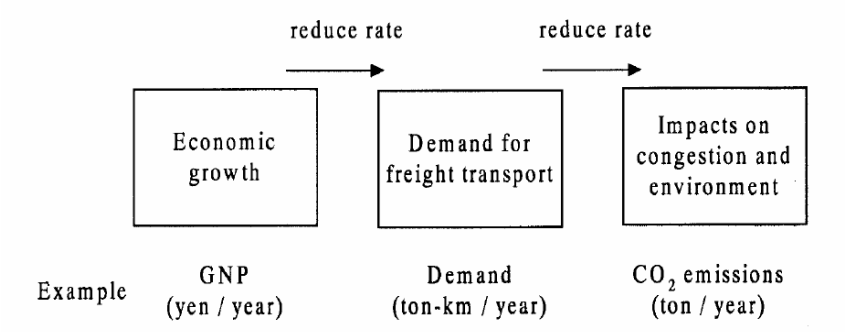


Figure 1. Three components relating to freight transport. Source: E. Taniguchi (2000).

There are three important components relating to freight transport, economic growth, demand for freight transport and impacts on congestion and environment (Figure 1). Industrial and business activity can have bad environmental effects, including noise and air pollution, damage and disruption to streets and pavements, and cause increased amounts of refuse and littering. Deprived communities are disproportionately affected by these problems. Research shows that those on low incomes are the most likely to live near polluting factories. The decline of heavy industry can leave a legacy of environmental degradation including derelict and polluted land.

3. Examples of solution transportation problems in modern cities

1. Hierarchy of streets and street users

Any city streets have a huge range of uses, from routes for movement to places for business and meeting, to places for relaxation and children's play. The extent to which each role should predominate depends of the location and function of the street. Reflecting this diversity, a hierarchy of streets can be proposed, giving guidance on the relative priorities to different uses and users. This hierarchy will help determine management and maintenance priorities.

2. Heavy traffic

Heavy traffic, associated with business activity, is recognized as having a poor effect on the environment, including air and noise pollution, reduced safety for pedestrians and cyclists, and a limiting effect on movement and public interaction. It can have cumulative effects by discouraging walking and cycling, further increasing car use (thereby undermining national transport policy), limiting exercise opportunities, and contributing to a less attractive neighbourhood which is prone to further environmental degradation. A number of initiatives have been used to tackle the causes of poor environmental quality and lack of open space. A combination of these is often required.

- Home Zones, which create safer environments by removal of vehicular traffic in residential areas, offering a new form of open space.
- Traffic calming measures to redress the balance between car users, cyclists and pedestrians, in areas where heavy traffic is a hazard.

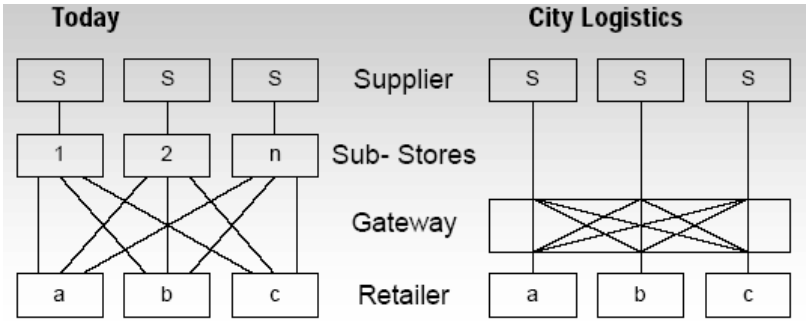


Figure 2. Reshaping deliveries in cities.

There are also examples of reshaping delivery systems in cities (Figure 2), which can give lots of benefits, such as:

- Improved productivity and efficiency of logistics service providers.
- Reduced number of transport movements and deliveries per retailer.
- Improved customer service.
- Improved traffic situation
- Reduced air pollution and noise emission.
- Higher land productivity

A successful strategy for freight transport policy depends on the ability to find a local and regional consensus between the relevant operators along the logistical chains at the federal, state, regional and local level.

3. Shaping transport chains

From the organizational point of view transport chains can be built up in the following way (Fig. 3)

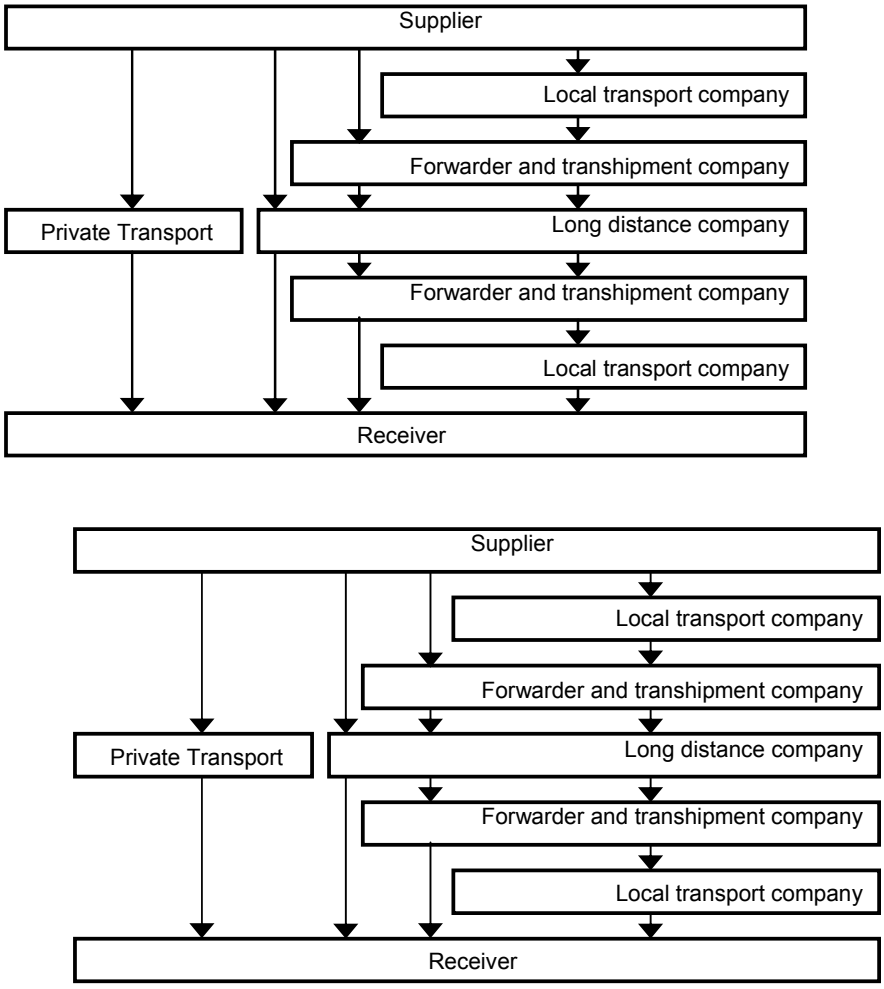


Figure 3. Organization of transport chains.

Transport chains can be built up as single-step and multi-step processes and are understood in this sense as multidimensional functions. In a *single-step transport chain,* only *a means of transport* is needed between the supplier and the receiver. Therefore, it is only a question between so-called *uninterrupted* or *direct* transport. In a *multi-step transport chain, a change*

of transport means takes place between supply and reception points. So-called *interrupted* or *combined (intermodal)* transports are thus spoken of in the broadest sense. Combined (intermodal) transport in the narrower sense means *no change of transport containers* takes place. Here, the transport vessel can be a container, a vehicle or a part of a semi-trailer (Fig.4)

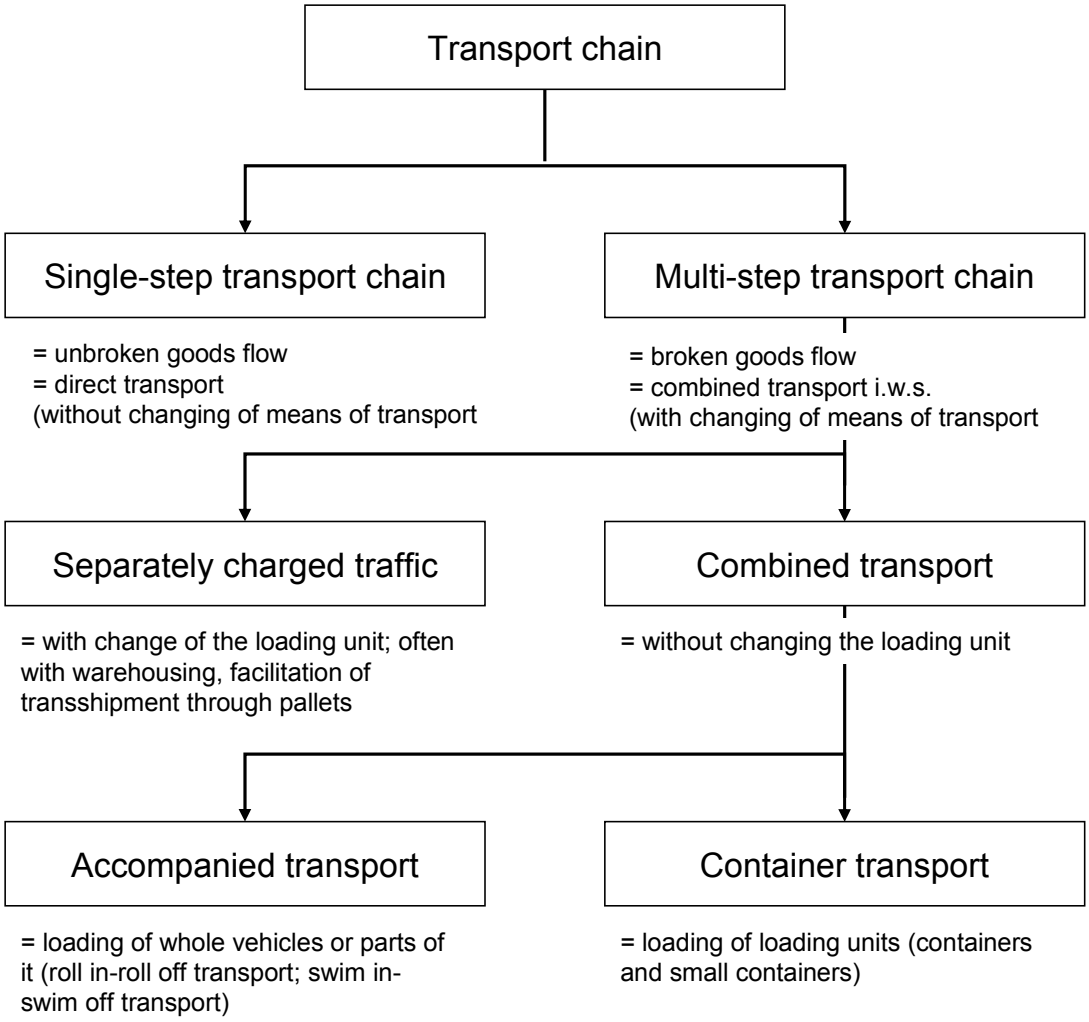


Figure 4. Structure of a transport chain. Source: SBB (1994).

In the city we can recognize four basic transport chains actors, which can play a substantial role in transport arrangements, shaping the flows:

- Manufacturers
- Distribution companies: freight forwarders, parcel services,
- Consumers/Receivers: retail shops, food supplier
- Authorities: because of the different perspectives of the distinct actors, the arrangements can come out very differently, depending on task divisions.

This enables us to create different transport arrangements in the city, shaping future flows (Figure 5)

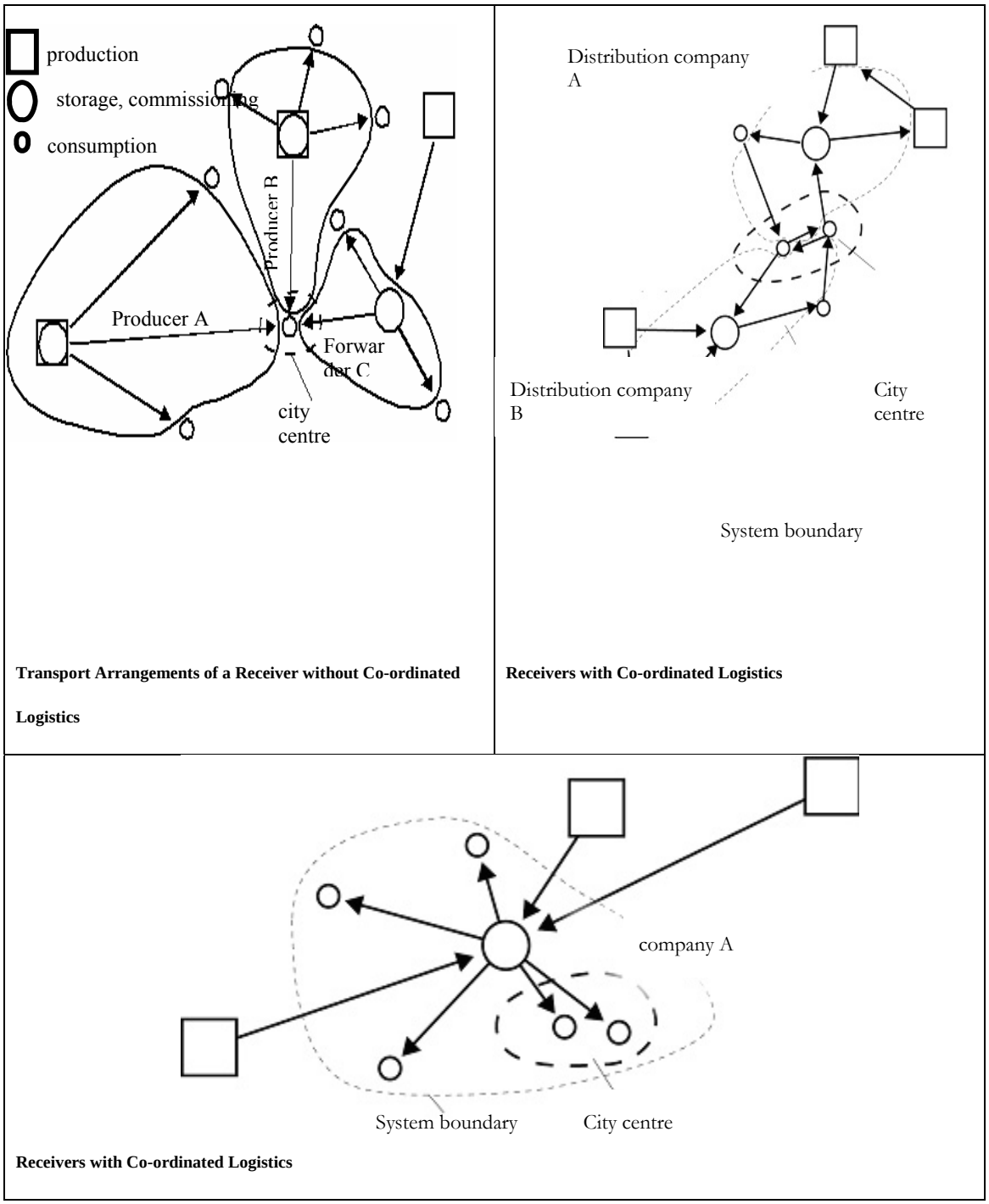


Figure 5. Transport arrangements in city (source: Inner urban fright transport and city logistics, www.eu-portal.net).

New organization can base on existing or planned city distribution centers, which gives us the hope that freight transport inside urban areas could be substantially reduced. Particularly the problem of the receiver, who has no co-ordinated logistics and causes many trips, could be diffused. Another possible fright scheme can contain fright villages. Freight villages (freight transport centers) are industry zones with the best connections to the transport network, where freight transport intensive enterprises, such as distribution companies and logistics service providers, are established. Ideally, they have the equipment for the transshipment between different transport modes (Fig. 6).

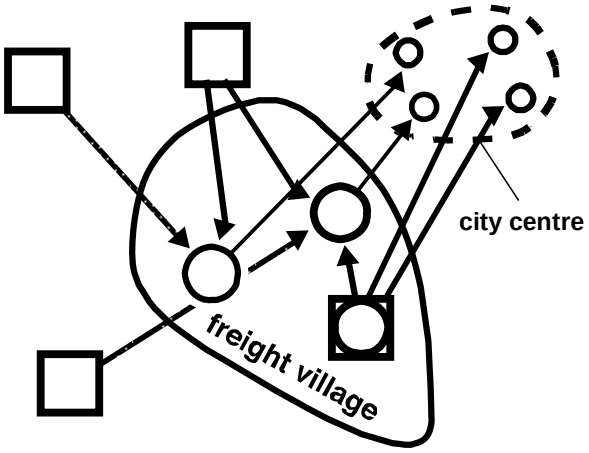


Figure 6. Fright village with a transshipment service (source: Inner urban fright transport and city logistics, www.eu-portal.net).

The idea of above mentioned solutions is based on the use of synergies between established transport services. Through this, the infrastructure organization can be optimally exploited and different general services can be offered cost-effectively. Thus, the traffic can be lowered, which has to increase the perceived level of citizens satisfaction.

4. Changes in the city organization

The city's actions have to be concentrate basically on five categories:

- Downtown improvement
- Traffic and Parking
- Maintenance
- Building improvements
- Building retention

After considering the city's layout and unique attractions, the program has to predict the following areas (districts):

- Pedestrian Core District – this district should be developed as the most pedestrian oriented portion of downtown and filled with specialty retail, food, art and entertainment in first floor storefronts with offices and apartments in upper floors.
- Office & Institutional District – contains significant anchors such as the City Hall, Post Office, public library and medical center. Should continue to concentrate on offices, health services and institutions.
- Leisure District – This district contains green lands, parks and amphitheaters, sport centers.

Access to these districts could be limited (or prohibited) for heavy transport and limited for private passenger cars, but it has to be easy reached by public means of transport (especially ecologically friendly buses, trams etc.).

5. Molding a user-friendly downtown

For downtown to be a destination, it must be accessible to its users. Downtown customers, clients, workers and residents want a smooth traffic flow and convenient parking. The task is to change traffic patterns downtown and to join sometimes existing trend in transforming one-way streets into two-way traffic. The city has to undergo a traffic study to review the downtown traffic flow system, and city officials hope to return to two-way traffic throughout the downtown area. Following the completion of the traffic and parking studies the city will begin a way-finding system that will help motorists find their way to and around downtown.

4. Conclusions

The role of transport authorities, and more widely – city logistics authorities is to integrate and balance the sometimes conflicting needs of motorists, public transport users, pedestrians and cyclists, while also promoting health and safety. That's no easy task but it's essential to keep our growing cities moving smoothly. There is also another aim, which can be implemented - recognizing the many roles that streets have for the community – as places in

which people live and work; as areas in which people meet, shop and relax; as a setting for the city's built heritage; as well as routes for movement whether by car, bus, bicycle or on foot. All these actions can as their results decrease traffic within cities, pollution and increase citizens service level. Everything this comes from reshaping existing flows.

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About the author(s)

Prof. Dr. Jacek Szoltysek
The Karol Adamiecki University of Economics, Katowice, Poland
Faculty of Management, Business logistics dep.

Logistics Centres in the Baltic Sea Region – Case Study in Latvia

Igor Kabashkin

Transport and Telecommunication Institute, Riga, Latvia

Abstract

In the situation where a large increase in trade and freight transport volumes in the Baltic Sea Region (BSR) is expected and in which the BSR is facing a major economic restructuring, efforts to achieve more integrated and sustainable transport and communication links within the BSR are needed. One of these efforts is the development of logistics centres (LCs) and their networking, which will continue to have an impact on improving communication links, spatial planning practices and approaches, logistics chain development and the promotion of sustainable transport modes.

The importance of logistics systems as a whole is not seen clearly enough. Logistics actors see that logistics operations are not appreciated as much as other fields of activity. In addition, logistics centres and the importance of logistics activities to the business life of areas and the employment rate should be brought up better.

In the paper main goal and tasks of national approach for LCs development are discussed. Strategic focus of new activities in this area is on the integration of various networks within and between logistics centres in order to improve and develop the quality of logistics networks as well as to spatially widen the networking activities.

The key objectives are to integrate the links between logistics centres, railway, ports and other logistics operators in a functional and sustainable way, to promote spatial integration by creating sustainable and integrated approaches to spatial planning of logistics centres and transport infrastructure, to improve ICT-based networking and communication practices of the fields of transport and logistics and to increase the competence of logistics centres and associated actors by organising educational and training events.

The current activities include, for example, the creation of measures for transport networking and railway network modernisation, multimodal transport network strategies, integrated networks between ports, logistics centres and other operators, the better involvement of LCs in spatial planning and knowledge of the land use needs of the LCs, territorial impact assessments on selected transport corridors where logistics centres are located, the establishment of a common vision of the future spatial and environmental development along the transport corridors and LC-areas, the elimination of bottlenecks in port-hinterland-LC connections, the integration of telematics supported logistics networks based on identification and analysis of networks.

Keywords: logistics centres, spatial planners, transport policy

1. Introduction

In the situation where a large increase in trade and freight transport volumes in the Baltic Sea Region (BSR) is expected and in which the BSR is facing a major economic restructuring, efforts to achieve more integrated and sustainable transport and communication links within the BSR are needed. One of these efforts is the development of logistics centres (LCs) and their networking, which will continue to have an impact on improving communication links, spatial planning practices and approaches, logistics chain development and the promotion of sustainable transport modes.

The importance of logistics systems as a whole is not seen clearly enough. Logistics actors see that logistics operations are not appreciated as much as other fields of activity. In

addition, logistics centres and the importance of logistics activities to the business life of areas and the employment rate should be brought up better.

The paper includes summary of interviews of transport policy makers, logistics operators, spatial planners in Latvia about the spatial planning need of logistics centres and about the state of co-operation between logistics operators and spatial planners in this question.

The main purpose of interview is collecting opinion on the logistics centres and concerning problems from the point of view of different actors (Figure1).

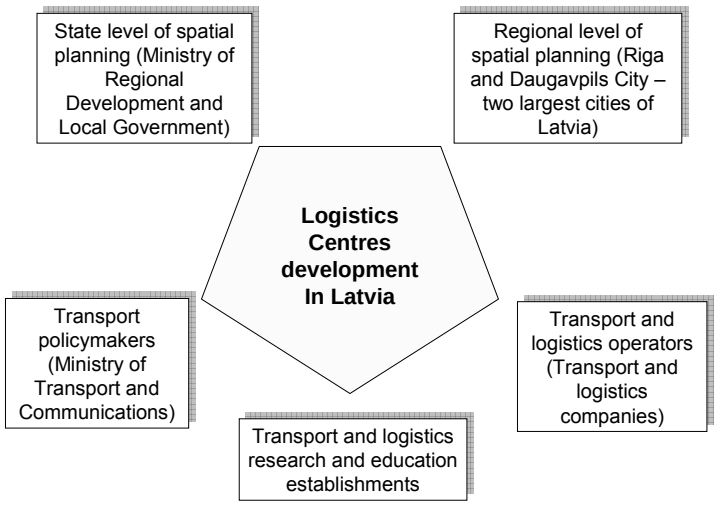

Figure 1. Actors of interview

2. Concepts and objectives of the Latvian national transport policy

Role of Logistics Centres in the National Transport Policy

The long-term objective of the Latvian transport development policy is to create an effective, safe, competitive, environmentally friendly, balanced and multi-modal transport system, which is fully integrated in the European transport system, and satisfies economic and social needs of Latvia for passenger and cargo transportation in domestic and international traffic. The improvement of the quality of the transport system is one of the main pre-conditions for re-industrialisation and for the development of an innovative economy in Latvia, since it encourages regional development and improves the competitiveness of Latvian companies at the European and international market.

The main directions of Latvian transport policy development are identified in the National Programme for Transport Development 1996-2010. The National Transport Development Programme is a medium term strategic planning document in the transport sector. Its implementation is of vital importance and indispensable for the purpose of the balanced development of the society and the national economy of Latvia. For the full implementation of the National Transport Development Programme there are a range of tasks to be accomplished. Among these tasks are: maintenance and development of environmentally friendly transport infrastructure, increasing of traffic safety, promoting and ensuring an increasing performance efficiency of national and international passenger- and freight transport operations, developing transit operations and transit corridors as well as ensuring the integration and competitiveness of the transport system of Latvia in the European transport system.

The National Transport Development Programme (1996-2010) is a most general document of plan character, which constitutes the activities (actions, tasks) of economic, organizational, and institutional nature. It is worked out for a 15 years period.

Unfortunately transport research as well as business, and transport policy do not have very close links in Latvia. Freight transit is the main part in Latvia's transport sector. There is a large internal competition between different transport enterprises (e.g., sea ports) and between different modes of transport (e.g., road and rail transport) in Latvia. The profit of transport companies, involved in this transit business, is mainly depending upon political decisions of neighbouring countries, but not upon optimisation and logistics decisions. Due to this situation the investments in research as well as correlations between research results and 'real-life' business are very small.

The idea of logistics centre is at early stage of development in Latvia and now is not included in any official documents.

3. Analysis of the questionnaire and interview

The development of freight terminals and warehouses should be promoted at crossings of transport corridors. In this process the development of logistics is of high importance. As a rule freight distribution centres are developing as joint ventures of private and respective municipal companies.

In the future it is planned to set up freight distribution centres in Riga, Ventspils, Liepaja, Rezekne, Daugavpils and at other principal transport junctions. It is regarded that one of the most important issues for peripheral regions development is the development of logistics and distribution centres focused on attracting freight from Asia and the Far East. Latvia can serve as a distribution centre for cargo from Asian countries (e.g. China, Korea) not only in the Baltic States but also with equally successful results in Russia and the CIS countries. But today the idea of logistics centre is at early stage of development in Latvia.

The main sentences concerning logistics centres, legislation and regulation, land use needs, co-operation between spatial and transport planners and logistics actors are summarised in the next section of the paper.

3.1 General vision

1. State spatial planners have not vision on development of logistics centres.
2. Seaport city-regions are key nodes in the global logistics freight transportation network. The maritime activities exploited at the seaport location may promote the regional economic growth of the surrounding, because of the circular and cumulative causation a central place is capable to give origin to. The most appropriate regions for logistics centres development are ports of Riga, Ventspils and Liepaja.
3. Transport policymakers and logistics operators both stress the necessity to build up an efficient transportation system by promoting the inter-modality patterns through the establishment of distribution and inter-modal centres. The seaport city-region should promote the settlement of such public logistics terminals at the local level in order to promote the local entrepreneurship, as well as to reduce the environmental impact of the freight transport within the urban area. The building of the inland logistics terminal at the more far hinterland locations should increase in efficiency the whole transport system, because of the promotion of the inter-modality.
4. The three main goals of co-operation between actors are supposed to achieve can be summarised as following: 1) to establish a more efficient logistics system; 2) to facilitate the implementation of advanced information systems; 3) to promote co-operative freight systems.
5. The LC has to be seen as a meeting point for both public and private logistics operators. The consolidation of the urban logistics activities can be realised at this freight transport

node of the transportation network by the application of the most advanced information systems.

6. An efficient co-operative freight transportation system can be implemented at the LC location. This co-operative system enables a large number of shippers or freight carriers to share a jointly freight vehicles system, jointly terminals, as well as common information systems in order to exploit the synergy effects the spatial agglomeration of the logistics operations spread out.
7. The individual economic agent should be able to reduce the costs for collecting and delivering goods due to the exploitation of the economics of space at the LC. The spatial agglomeration enables the co-operative performance of the logistics operations jointly with other entrepreneurs, as well as the supply to the customer of a level of services of better quality.
8. Through the establishment of a spatial multi-function cluster the entrepreneurship in the logistics transport sector may be promoted, and at the same time the negative externalities generated by the road transport modality may be reduced.
9. The establishment of public logistics terminals in the area surrounding a seaport city can be helpful for promoting the co-operative freight transport systems.
10. The general vision of different actors at the problem of logistics centres development is shown in the Table 1.

Table 1. The general vision of different actors at the problem of logistics centres development

Actors of interview	Relation to idea of logistics centre development	General problems
State level of spatial planning (Ministry of Regional Development and Local Government)	Have not vision on development of logistics centres.	▪No special legislation and regulations of LC. ▪No special rules for land use needs. ▪No principles of cooperation between stakeholders of LC. ▪No methodological and practical approach for LC establishment. ▪No cooperation between state level of transport policymakers and regional level of spatial planners.
Transport policymakers (Ministry of Transport and Communications)	There is a sensation of necessity of creation of the logistics centres, but there is no practical programme of their development.	
Regional level of spatial planning (Riga and Daugavpils City – two largest cities of Latvia)	There is a desire of creation of the logistics centres, but know-how of their design and the practical programme of their development are absent.	
Transport and logistics operators (Transport and logistics companies)	There is a need of creation of the logistics centres, but is absent know-how their creations. The mutual competition and mistrust of transport operators to each other essentially interferes with the decision of practical questions of LC creation.	▪No practical experience in pilot project of design and development of LC. ▪Transport transit much more outnumber of distribution at the state level.
Transport and logistics research and education establishments	There is a sensation of necessity of creation of the logistics centres; there is a general vision on development of logistics centres. There is no demand from the other actors.	

3.2 Main problems of the optimal geographical location and the optimal spatial physical size of the logistics centres

There are two main problems in the development of LC:

- the optimal geographical location and
- the optimal spatial physical size of the LC.

The location choice among different potential sites has to evaluate the trade-off between transportation cost and facility cost. The facility cost is defined by the sum of the construction, maintenance, land and truck operation costs at the LC site.

The land price plays a major role when the potential nodal location is settled nearby the urban agglomeration. In this case, the lower transport costs the logistic operators had to bear for the pick-up/delivery activities between the LC and the urban centres might compensate in such a way the more expensive fixed investments necessary to bin the land, as well as for building the infrastructure.

The public planner should have the role to perform a macroeconomic decision about the more suitable geographical location and dimension of the LC. His aim is to minimise the total cost of the LC. It follows that the accessibility patterns are absolutely relevant (Table 5).

Among all the potential proper places, the location choice of the public planner should be addressed in favour of the geographical site closer to the major inter-modal transport links, which connect the urban agglomerations that had to be served by the new settled LC. If any congestion problem already exists, then an inappropriate location decision of the traffic policy planner might induce a worsening in the road traffic conditions within the region.

The improvement in the efficiency of the road network can significantly help to mitigate the negative economic impact the spatial traffic congestion induces, which is reflected by the increase in the transportation costs.

The public planner has no influence at the microeconomic level of decision, when the distribution and assignment of the freight traffic is considered.

At a micro level, where the individual transport operator decides to use his own freight vehicle, the choice of making a stopping call at a certain LC rather than another is supposed to be determined by the behaviour of the single transport operator or company. At this level of choice, the goal is to minimise the transport costs (Table 2).

Table 2. The public logistics terminals and the two levels of decision

Level of Decision	Kind of Decision	Goals
Macro level: Public planner	Location choice, and optimal size of the LC	Min the total cost = Min (transport cost + facility cost)
Micro level: Every entrepreneur, each company and freight vehicle	Choice of the LC and optimal routing	Min the transport cost

The structure of the transportation sector has not to be forgotten. The freight transport is generally undertaken by individual entrepreneurs and private companies, which operate within a competitive market framework. Hence, the control and regulation measures put in force by the regional public planner should not excessively interfere with the activity of the transport sector.

Besides the transport policy instrument of the LC several other city logistics initiatives have been proposed in order to overcome at the best all the negative externalities the urban freight transport generates.

The freight transport carriers fire expected to provide economically efficient just-in-time services. This means that the minimising of the transport and logistics services should be achieved. At the same time, some urgent problems had to be solved, such as the traffic congestion, the environmental impact of the transport activity, as well as the problem of the energy conservation.

The crucial role played by the public-private partnership is always stressed when speaking about the city logistics initiatives. Besides the LC the implementation and diffusion of progressive information systems in order to organise the routing and scheduling of the consignments in advance, the promotion of co-operative freight transport systems, the control of the load factor for the pick up/delivery activities, as well as the planning of the must innovative underground freight transport systems are all potential instruments of transport policy the regional public planner had to consider and properly evaluate.

3.3 Advanced Information Systems

The improvement of advanced information systems is one of the most relevant instruments in order to achieve the rationalisation in the logistics activity. Planning in advance the routing and scheduling of the consignments may effectively improve the efficiency in the transport system.

The advance information systems enable both the drivers of the trucks and the control centre to communicate to each other, to provide the information on the traffic conditions in real time, as well as to store detailed historical data about the pickup/delivery truck operations. In particular the last function plays an important role for rationalising the logistics operations.

The most important findings beyond the particular ease are as follows:

- Large customers (shippers) require logistics partners (forwarders) to either accept paper input (primarily fax) or to subscribe to customer's choice of technology. Such customers are unlikely to reimburse their partners for related effort, the implementation thus have to bear sufficient saving potential for the forwarder;
- EDI data transmission and the relating process automation provide the basis for improvements of transport planning and execution. This results not only in commercial benefits but may eventually lead to a reduction in unnecessary transport (e.g. empty legging) and a better utilisation of public and commercial infrastructure (e.g. roads, floor space and terminal equipment);
- Port community systems provide the technical, managerial and business background to implement EDI systems. While they are normally successful in linking the majority of directly port related companies they are traditionally weak when it comes to hinterland companies;
- Linking only one additional exporter or importer in the hinterland may have very significant multiplication effects. The company may communicate with additional partners in the same and in other ports. Likewise the resident logistics partner has been enabled to also communicate with other hinterland partners;
- A success factor is the usage of standardised communication and messages. In transport EDIFACT has the largest user base.

Computer based information systems in transportation chains have several advantages:

- Increased management options through tracking and tracing and improved quality control of own services and those of subcontractors;
- Outsourcing of transport services, but staying in control of logistics performance;
- Increased production-to-order orientation and better transparency of market demand and supply.

3.4 Inter-regional level

At the inter-regional level, the programme instrument should enable the integration between seaport regions by following the broader issues of network connectivity and logistics. The

three fundamental network characteristics of (1) inter-modality, (2) interoperability and (3) interconnectivity should be achieved in order to add value to the seaport network.

A coherent collaboration programme between the seaport regions should particularly emphasise the benefits of its realisation, in order to attract as many potential private/public investors as possible. The regulatory and organisational framework represents a valid tool of transport policy, in particular when the negative externalities generated by the different transport modalities are not completely internalised into the market price of the transport service. The under-pricing in the transport sector occurs when a transport modality hides its full social cost. The structure of the transport sector is typically shaped as an imperfect competitive market system, which is assumed to allocate inefficiently the economic resources. Hence, the under-pricing in the transport service shows the lack in efficiency of the market instrument of allocation. The larger the share of the full social cost a transport mode is able to hide, the sharper the under-pricing it may form.

The new economic figure of the Multi-modal Transport Operator (MTO) is assumed to exploit the provision of the logistics services within a wholly integrated transport network. The Table 3 summarises the key issues and the critical patterns of success at the inter-regional level of decision.

Table 3. The inter-regional level of decision

Level of Decision	Key Issues	Critical Success Factors
Inter-regional Level: *Programme*	For each transport modality: •Inter-regional links •Inter-modality •Interconnectivity •Interoperability •Logistics and networking effects •Competitiveness •Environmental issuer •Information network •Economies of scale •Economies of time •Economies of scope •Economies of networking •Just-in-time requirements	•Functional collaboration and competition •Interchange of complementary functions •Co-ordination for developing the infrastructure transport network •Information and knowledge interchange •Inter-regional management •Multi-modal transport operator •Adding value to the inter-regional network and communications •Sustainable balanced growth between regions •Favourable conditions for promoting a new innovative space

3.5 The national level

At the national level, the programme of LC creation is once again a powerful instrument of transport integration and co-ordination. Logistic effects and networking effects have to be considered in order to exploit a sustainable national transport policy. The freight transport by road seems to fit better the new logistics requirements due to the restructuring process in the supply chain of production. The environmental and social impacts of the transport negative externalities are not completely internalised into its market price.

The under-estimation as well as the under-pricing of the road transport modality has a remarkable impact on the modal choice of the economic agents, due to the apparently higher efficiency this environmental unfriendly transport modality shows with respect to the others. A careful estimation of the real impact of the negative externalities on the national economic growth should be estimated in monetary terms to calculate the "green" GDP.

There are three possible approaches in order to estimate and/or internalise of the negative transport externalities: the consumer-pays approach, the taxpayer-pays approach, and the cost-benefit analysis.

Furthermore, the logistics companies look for a central location as basis for their logistics activities directed to their international clients, as well as a departure site in order to enlarge their commercial relationships. A relevant role is played by the technological changing in the loading/discharge operations, as well as the increasing availability of space within the neglected old port areas. At these locations, the logistics service companies may find an interesting supply of space to turn into their activities.

From a functional point of view the three Latvian main ports are involved in an international maritime competition. A complementary set of functions should be promoted at each seaport site in order to lead to a better integration in the transportation chain, as well as in the road and rail links between the three seaports.

In fact, the transport links from the seaport site towards the hinterland have to perform an increasing efficiency in order to attract the shipping companies, and moreover the specialist total logistics provider.

All actors stress the necessity to build up an efficient transportation system by promoting the inter-modality patterns through the establishment of distribution and inter-modal centres. The seaport city-region should promote the settlement of such public logistics terminals at the local level in order to promote the local entrepreneurship, as well as to reduce the environmental impact of the freight transport within the urban area. The building of the

inland logistics terminal at the more far hinterland locations should increase in efficiency the whole transport system because of the promotion of the inter-modality.

Many different and interdependent factors usually influence the location choice of an economic agent. Few decisional patterns may not be spatially relocated such as the transport infrastructure, the urban settlement, or the environment. Others are more flexible and may be subject to spatial relocation, e.g., the skilled labour force, the research centres, etc.

The accessibility to a seaport site is therefore strictly dependent on the optimal combination of all these elements. A seaport region might be consequently more or less attractive to the establishment of an economic activity or to the foreign investments in order to exploit its own local development potential.

In order to support the overall LC objectives a close co-operation with similar projects and programmes must be established:

- to strengthen the integration of spatial planning and regional transport development and develop a common regional approach to the issue of sustainable logistics solutions,
- to promote the use of transport corridors, modes and technologies which support a sustainable regional development providing the economic and social development of the regions in the south-east part of the Baltic. The trans-national co-operation aims at assessing trade and transport potentials and develops environmentally friendly transport solutions.

3.6 Framework for regional action

As it has been analysed it would be inadequate to recommend “one best way” for spatial planning within the context of port related interaction in general and in BSR in particular. The main reasons to be careful with strong recommendations may be summarised as follows:

1. The spatiality of transport and logistics activities has evolved from clearly delimited port areas to functional port regions and to port networks more recently. The functional interdependencies, creating the network, may consist on sequential relations (output of one node is the input for another, e.g., relation between port and in kind container depot), reciprocal relations (actors arc using each others output) and pooled relations (use of common resources). The term network suggests that these interdependencies may not be territorial and that modern port related activities have a strong tendency towards decentralisation.

- The trend of a spatial decentralisation of port related transport chains is accompanied by attempts of the main actors involved to achieve control over the segments of the chains. Though it is not clear whether one actor will be the most influential one in the future, the entrepreneurial strategic are not predictable in relation to their spatial outcome. But it is rather obvious that the crucial factor within the transport chain will be the customer orientation while the transport space will be organized as flexible as possible. This interpretation supports decentralized hub and concepts with, ”footless” or shifting nodes. Based on some standardized norms the question of appropriate IT support will depend on the dominant position of an actor within the transport chain. Or to put it in other words: the inventions and early adaptation of new IT depends on the necessities to optimise integrated transport and logistics chains and the economic power of private actor constellations.

Following these lines of argumentation the existing ports have to deal with territorial decentralisation of transport and logistics activities and tendencies of economic centralization of private actors involved. Therefore the frames of independent action become more and more narrow. In more general terms, existing ports do not only have to create and sustain competitive infrastructure including IT but have to be prepared to offer far reaching services for foreign trade, transport and communication in order to be able to react as flexible as possible to new challenges. Beside an effective node of physical interchange successful ports will become LC regions for transport and communication offering systemic knowledge for integrated transport and logistics chains.

This strategy is open only for the existing main ports and those medium-sized ports are able to promote a certain specialisation because it presupposes very high investments and probably only indirect returns on welfare and employment. Small and the majority of medium-sized ports will function as possible nodes in future transport chains. This implies the latent danger that many ports try to invest in expensive infrastructure in order to compete with each other without being able to realize returns. A crucial element is finding a certain harmony between public investments in infra- and private engagement in the superstructure. Anyway, problems of public disinvestments are already on the agenda and there is a latent danger for continuous planning failures. To reduce an overall port competition in this segment institutionalised forms of information and co-operation between private and public actors should be promoted in order to avoid unnecessary public investments and to improve power balance.

Faced with the imminent enlargement of the European Union and the integration of Latvia as well as further states of the Baltic Sea Region a general strategy of the modernization of the maritime infrastructure is to be recommended including IT. The expected increases of transport will not be manageable country-sided in spite of great infrastructure projects like Via Baltica. The expansion and improvement of sea-based mobility of goods and supporting infrastructures should be emphasized in initiatives of spatial planning within the Baltic Sea Region.

Also in the transport and logistics sector the major players are changing. Former State Enterprises are privatised and must prepare themselves for the sudden competition. Just as the governmental telecommunications monopoly was eliminated in previous years, the state monopoly on the transportation of letters and parcels will now be eliminated too. These modifications of the general conditions lead to hectic activities within the sector. Many re-evaluate their middle- and long-term strategies, reposition themselves, co-operate and merge, withdraw from some markets and set themselves up in other ones. Co-operation with, or the incorporation of, other companies is the most usual reaction to the new conditions, in the transport and logistics sector as well.

But according to opinion of the actors involved, both growths are important as quantitative so as qualitative. The new demands of the information society and the "New Economy" on the transport and logistics sector, make it necessary to increase the "know how" as quickly as possible in the field of IT, and develop information systems with which the logistics chain can be controlled and checked. IT departments of individual companies are no longer able manage such a task, so that big actors (e.g., the Latvian Association of Railway International Electronic Documents Circulation Operators) buy up software enterprises throughout the world that develop information systems for the transport and logistics sector, or will be able to do so in the future. All actors participating in the transportation chain are convinced that the future leader of the information system will also dominate the material transportation chain and thereby gain the largest part of the increased value created by transportation. Furthermore, the evolution of such technologies is extremely capital-intensive: markets, which are becoming more and more transparent, involve ever-increasing costs for marketing and distribution. Smaller enterprises, endowed with a more limited capital, arc no longer able to make the investments necessary to remain competitive.

3.7 The spatial impact of city logistics

Inside the port area of Riga, mainly trucks operate the freight movements from a terminal to another. Also road carriers mainly make the distribution of goods towards the metropolitan region. The explanation is given by the higher efficiency of this transport modality on the short distances both in terms of time and of transport flexibility. But the negative externalities in terms of congestion and pollution are social costs, which have absolutely to be taken in account.

The distribution centres play a remarkable role not only from an economic point of view because of the higher efficiency and optimisation in the transport chain they realise, hence the distribution and transport costs are reduced: but also from an ecological point of view because of loosening of the traffic intensity and therefore of the polluting emissions from the motor vehicles.

Early in history Riga developed as a transit centre between the ports of Western Europe and the Russian hinterland. Riga enjoyed continuous growth as a merchant port. Today Riga is the main administrative, financial, industrial and transportation centre in Latvia. Embassies and consulates, a significant number of international organizations, who work in the Baltic States, have their headquarters located in Riga. Riga is also a significant financial centre in the Baltic region.

As other cities Riga did not have specific strategies and theme plans concerning "urban networks". The member of group from Riga studied the following documents: The Riga Official Plan or Master Plan (1995-2005), The Riga Development Strategy (2005-2018), The Riga Transport System Development Programme (2005-2018), Concept of Riga City Intelligent Transport System (2002-2008) and others placed emphasis on implementation of the transportation planning and economic development.

There was not anything concrete about urban networks in these strategies. These plans also describe advantages of development of Riga, admit a favourable geographical location of the city, determine the importance of Riga in the Baltic Region and also in the BSR. Riga has a remarkable growth potential in the future. To develop Riga as a transit centre is one of the priorities of Latvians development strategy and it is being promoted by improving elements of infrastructure and services in the Riga area. The main transport elements that make Riga a transit centre are the port, the international airport, and the bus and railway connections. Besides one of the most important tasks is to promote more profound collaboration with cities

of the BSR. Finally Riga has to emphasise the environmental dimension of sustainable development.

3.8 Industrial and logistics projects in Latvia

Transport policymakers and logistics operators both stress the necessity to build up an efficient transportation system by promoting the inter-modality patterns through the establishment of distribution and inter-modal centres.

There are some major logistics and industrial parks' projects in Latvia[5] (Table 4).

Table 4. Major logistics and industrial park projects in Latvia.

Name	Location	Total area, m2	Commissioning date	Profile
Dominante Park	Kekava, county of Riga	35,000	March 2007	First Class A industrial park in Latvia
ELIPSE	Riga	60,000	October 2007	Logistics center
Wellman Logistics Center	Salaspils, county of Riga	19,000	January 2007	Logistics center
Riga Airport	Marupe, county of Riga	2,260	December 2006	Office center
Logiparks	Riga	40,000	February 2007	Logistics center
Commercial Center	Marupe, county of Riga	6,000	Q1 2007	Logistics center
PBLC Business Center	Riga	9,000	March 2007	Business center
Dommo Bussiness Park	Olaine, county of Riga	11,190	Q3 2007	Business park
Saliena Real	Babite, county of Riga	50,000	n/a	Trade park
Ritausmas Logistics Center	Riga	14,000	Q1 2007	Logistics center
Magnat	Riga port	40,000	July 2007	Office complex
Latgale Apparatus-Making Technology Center (LATC)	Daugavpils	3,000	n/a	Technology center
Ventspils Free Port territory	Ventspils	over 10,000	n/a	High-tech park etc.

Dominante Park in Kekava is the largest industrial park in the Baltic's is already coordinating lease agreements for the second and third phase, which will be put into commission in one years time.

As early as March 2007 work in Kekava was begun by one of the biggest Latvian food distribution companies Jungent, the distribution company Baltā Bura, as well as a large Estonian wholesale company. Currently, negotiations are underway with large international companies about Dominate Park's second and third phase that will go into commission in the beginning of 2008.

[5] Sources: Colliers International; LIAA, own information.
*The Baltic Course № 23, Autums 2006, p.16-18 By*S *Anzhela Rzhishcheva, Latvia*

The A class industrial park Dominante Park is a project, which provides for qualitative logistics and property management services, on a scale that's unprecedented in Latvia. This type of logistics infrastructure has no analogue, clients choose us for both the very high quality and because, as the clients business expands, we can secure even bigger spaces to lease - they won't need to look for other opportunities.

It was precisely Dominante Park's industrial space compatibility to business company operational specifics that was a deciding factor for attracting the attention of large tenants.

As the foreign media's business market data sums up, Dominante Park is an all-powerful newcomer in the Baltic's industrial space market. The project is being carried out just in time because the ever growing demand for storage facilities and also for modern manufacturing buildings has led to the situation where, at present, goods are stored wherever possible – including old hangars, former fruit and vegetable warehouses and other inappropriate places – both as an actuality and in conformity with European Union requirements. Dominante Park plans to not only fill this demand,

Already international investors are showing a big interest about Dominante Park's second and third phase (more than 80 000 m2 of manufacturing, storage and office space), which will be put into commission at the beginning of next year. Dominante Park has an ideal geographic placement only a few ten kilometres from Riga.

Facts:

- Dominante Park's foundation-stone was put in place on the 31st of August 2006.
- Dominante Park will be a leader amongst the industrial space leasers and logistics service providers.
- The projects total value is 130 million EUR, it takes up 65 ha.
- Manufacture and storage building space, 250 000 m2, including modern office building space, at least 10 000 m2.
- 1500 work places will be created here.
- Significant attention has been given to worker comfort, that's why stores, a café and a rest area will be built here, workers will be provided with transportation to Riga and a day-care will be put up.

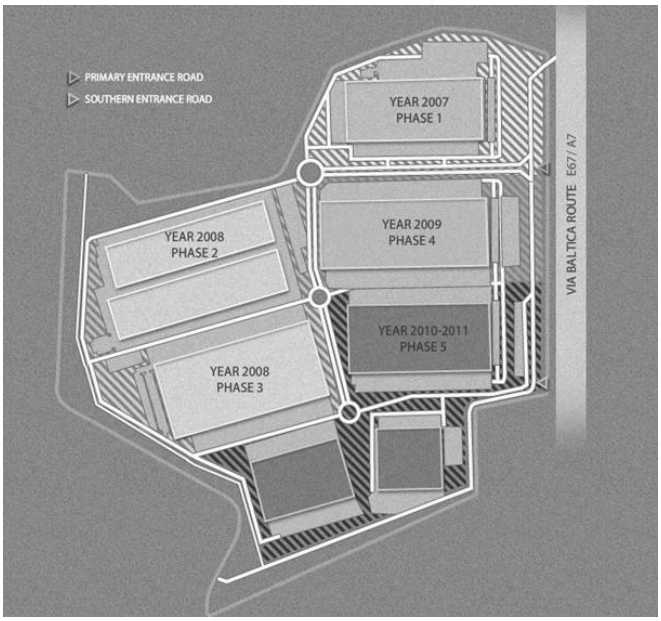

Figure 2. The planned layout of Dominante Park.

PHASE 1: 2007, March

- 35 000 sqm of class A industrial/warehouse premises
- 3 500 sqm of B class office premises

PHASE 2: YEAR 2007

- 48 000 sqm of class A industrial/warehouse premises and class B office premises
- Restaurant

PHASE 3

YEAR 2008

- 35 000 sqm of class A industrial/warehouse premises
- 3 500 sqm of B class office premises

The first phase of the park development delivers:

- 35 000 m² of A class industrial/warehouse spaces constructed according to the modern logistics standards.
- 3 500 m² of B class office premises.

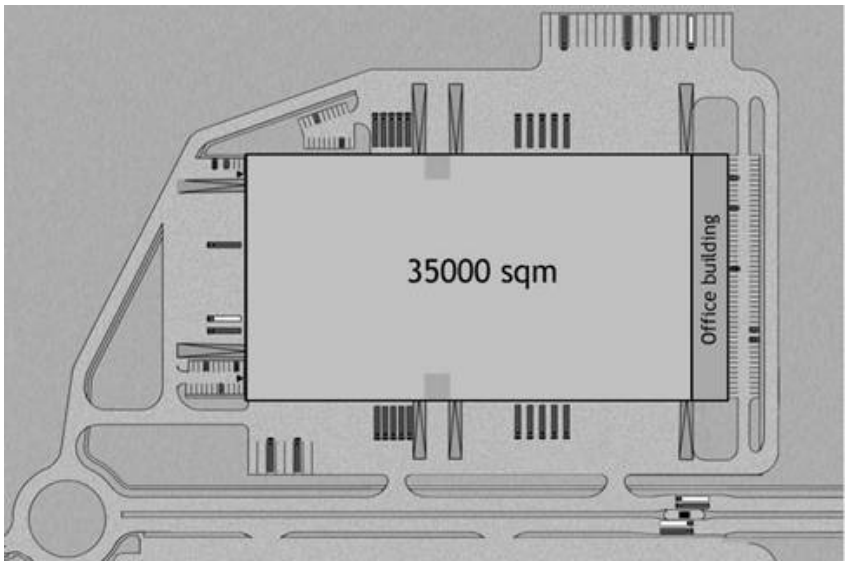

Figure 3. Phase 1 of Dominante Park

Putting into commission: March 2007

- Well-developed internal circulation scheme
- Future development of the road infrastructure close to the site
- Professional property management
- Flexible possibilities of space arrangement
- Ample parking for trucks and cars
- 24 h security system, video surveillance
- Canteen
- Bank branch, press point and other amenities
- Direct shuttle from Riga to Dominante Park

3.9. Transport infrastructure bottlenecks

A fundamental dimension of the Baltic Sea Region (BSR) projects is its Russian link as a fully integrated part of the concept as well as an extension on Russian ground to transport corridors heading for Central Asia and China. The investment in a center for Chinese trade on the European market is now launched with Chinese capital. It proves to be a very concrete illustration that the development of the BSR should not just be related to the macro-region as such and the strong economic growth to be expected in for instance the Russian economy, but

also focus on this region as a platform for a globally expanding Chinese industry with strong ambitions regarding business with Europe.

Figure 4. New dimension of BSR.

The overall objective was to analyse and report impact on opportunities and synergies for business activities in remote areas by improving access in the secondary networks to the main TEN-T transport corridors in the BSR - hereby to determine bottlenecks in the Baltic area.
The identified and analysed bottlenecks in Latvia are:

- Border crossing Latvia-Russia
- Riga Motorways
- Railway capacity

One of the main bottlenecks severely restricting the possibilities of transport development is the congestion on the Latvian - Russian border crossing points. As the border control on the Russian side does not work efficient enough, trucks, including the one working under TIR carnet, have to wait long - often ten or more - hours to cross the border. That results in less competitive transit corridor via Latvia, shifting Ro-Ro traffic and containers to other Baltic Sea eastern coast ports. Frequently changed requirements with regard to control documents on the Russian side, especially regarding sanitary and veterinary controls, are the next serious problem on the eastern boarders.

A specific bottleneck is the lack of high-speed transit main roads in the Riga region. The regional road system is also of poor quality and there is no junction (branches) between East-

West and "Via Baltica" corridor with most significant populated areas in the region. The lack of arched railway junctions constitutes also a bottleneck in the road infrastructure, as does the absence of a by-pass road of Riga to be used for freight transport. Conflicts occur accordingly between transit operators and individual drivers on the roads.

During last years the intensity of cargo and passenger traffic and accordingly the territory needed for transport infrastructure (roads, parking places, logistic centers, repairs shops, and gas filling stations) have increased rapidly, while the development of infrastructure is insufficient in relation to this increase of traffic load. A significant weak point is that the development of transport modes is not balanced and coordinated within the region. There is no coordination in the planning of the transport system between Riga and other part of Riga region.

The quality of the road net in the region is not satisfactory and is continuously worsened. The technical condition of carriageways and roads is unsatisfactory and there is an incompliance regarding dimensions (for the roads of the respective category) of the most significant carriageways. Almost half of the asphalt roads are in a bad or even critical condition, one third of gravel roads is in a bad condition as well. Critical situation takes place with bridges; just some of them are in a satisfactory technical condition. The condition of the roads is damaged by overloaded transport mostly. The Riga region does not differ in this respect from the general Latvian picture: Despite slight improvements, however, the road network still does not meet the growing requirements, with only around 600 km of highway throughout the Baltic countries.

Because of the insufficient financing of the road sector there is furthermore an amount of undone reconstruction works within the road net. The financing for road maintenance and development is not sufficient to prevent road destruction when transport intensity and proportion of trucks increases.

Railway capacity in Latvia is the third main bottleneck. The Baltic Sea Region is seen as one of the most interesting areas in the world regarding economic growth. One important transport flow direction is the East West axis through the Baltic area. In 2004 about 125 million tons of cargo with origins in Third Countries was transported by rail to ports in Estonia, Latvia and Lithuania. For each of these new EU Member States it is forecasted in the TEN-STAC study that rail freight flows will increase substantially until 2020 with 80 -150 %. To meet needs of long distance freight a well developed railway system is necessary. Railway traffic has been underinvested during the last 50 years, even though 22 of 30 prioritized projects are rail related (CER).

About 90 % of all the rail freight between EU and Third countries in the North East Europe region flows from the East to the West. These flows follow basically four East-West routes (The Trans-Siberian railway (Transsib) via Perm passing North of Moscow to St-Petersburg, the transsib via Moscow, Riga-Samara passing South of Moscow and Lvov/Kiev to Kazakhstan/China). Pan-European Corridor-III connects Poland via Lvov/Kiev to Kazakhstan/China. Pan-European Corridor-II forms the shortest connection between Moscow and Warsaw/Berlin and crosses the route Riga-Samara. Pan-European Corridor-IX crosses and interconnects the four East-West routes.

The importance of Transsib can already be seen in the increase in volume and in 2004 international container traffic from Asia to Europe along Transsib beat the 1983 record. As many as 155,400 twenty-foot containers were delivered from Primorye ports along the Asia-Europe-Asia route on this railway. A recent study also shows that the Russian Northwest Federal District can double or triple the international flows on links between Europe - Asia and Europe - Asia - America. Unfortunately today capacity of railway network is not enough for such volume of freight traffic.

4. Conclusions and Recommendations

As discussed earlier in this paper, it is important to remember the market forces, even when discussing the development of sustainable transport solutions from a spatial planning perspective. The demand for freight transport services is generated and formulated by individual entrepreneurs and private companies, which operate on highly competitive markets. This obviously limits the possibilities to guide the development in a specific geographical area. It puts high demands on planning to be flexible and on the foresight of the planners. On the other hand good public infrastructure, e.g. the road system, also helps to attract business and to improve efficiency.

An attractive and competitive port is often considered as a regional, if not a national objective supporting the economic development of the region or the nation. Traditionally, the consequence of this view was as follows – the port operation and the related infrastructure was a public responsibility. Today, port operation is no more considered as a suitable or even acceptable task for public services. Some regions are starting to question the need for any public involvement in port business. Why should a city own a port? It does not own the marshalling yard or the truck freight terminal.

Such ideas do not mean that the city should not plan for or care for its port, only that it must distinguish between public and business objectives. Local political opinions, competition with neighbouring regions and lack of overview might induce the city or the region to invest too much in relation to a realistic assessment of the commercial outcome.

Waterborne transport of high value goods needs to offer high frequency of regular services and stability over several years in order to be competitive to other modes and to really allow for the emergence of solid trade relations. A few well-served ports also make it easier to focus national investments in the hinterland infrastructure, which normally cannot be spread out to cater for too many alternatives. Competition between regions in this respect often delays the investment decisions. In addition, stable and big transport volumes also on land open for more attractive intermodal services.

In this context it might be worthwhile to question the benefit of transit traffic; through the port, the city or the region. The issue was raised in relation to the Russian transit traffic, but is also valid elsewhere. Investment needs and environmental impacts have to be assessed in relation to job opportunities and revenues against an appraisal of the stability of the traffic. Transit transport might help to develop new and highly needed services and skills, but it might also deviate resources better used elsewhere and might create e.g. environmental damages difficult to repair.

Co-operation between the parties in a transport chain, between ports, regions and authorities can give concrete improvements to everyday practical problems and thus contribute to the goals of cohesion and economic development in the Baltic Sea region. The results have been achieved in a highly competitive environment and indicate that there are areas for co-operation, which do not distort competition, but promote a sustainable transport system to the benefit for the society as well as the private players. Such areas are the following:

- Promotion of the use of IT among the port community and between the port and the world outside.
- Introducing IT in the business process is a complex issue affecting internal and external procedures, core business ideas and market positions. Building efficient IT relations between authorities and private organisations requires special attention. E-business development suggests that Internet will speed up the reorganisation of commercial relations and market behaviour. Apart from infrastructure, companies

need some basic agreements on standards. The public sector on a national, regional or local level can act as a catalyst in this process.

- Co-operation between customs and other authorities in specific transport corridors
- Goodwill and mutual trust is a good basis for solving practical problems within an existing regulatory framework. Regional authorities along a transport corridor sector can together create the platform for such facilitation work. They can bring in all parties and moderate the work of creating a common understanding of the problem and hopefully also have finding a practical solution.
- Regional co-operation between public bodies and private companies in order to understand spatial needs based on the assessment of long term commercial trends for waterborne transport and other factors affecting future transport demand.
- A port is acting and reacting on developments far beyond the region in which it is situated. Infrastructure investments in competing transport corridors have to be assessed as well as new commercial constellations and technical development. Spatial and economic planners have to understand the needs and prospects of the port in order to be able to assess the consequences for the region.
- Implementing new networks between transport companies, scientific organisations and port cities.

  A modern LC can be characterised as an important node in a learning region, which in addition implies the need for co-operation with other, similar regions. What has been said earlier also indicates that there are other reasons for networking. A "market watch" in a wide sense is required not only by the commercial players, but also by other institutions in the region in order to be able to assess planning and investment needs. Another need for networking is generated by the many practical problems of becoming a true European Union. Knowledge, trust and common objectives across former borders could be better developed through co-operation around concrete problems.

The port region logistics restructuring process moved towards the development of new economic functions inside the port region itself. The aim of the local authorities has now become to offer a set of value added logistics services in order to integrate the port site into the transport logistics chain. The port location is not to be only a container floodgate but is to be transformed also in a logistics service centre.

It is not surprising, that logistics centres tend to be located near the transport corridors. Access to all transport modes is vital for the success of logistics centres. The closeness to ports and sea transportation is natural for establishing a logistics centre in Latvia.

Many aspects of the operation environment need to be taken into account in the planning of logistics centres. Co-operation between the logistics centres and the actors responsible for the design and production of infrastructure is important especially in planning infrastructure projects to be carried out on routes near logistics centres.

Attention should be paid to environmental protection and legislation at the early stages of the planning of logistics operations and infrastructure. Land use conflicts based on environmental regulations may otherwise delay the logistics development projects considerably. This is one of the main challenges for the development of the logistics centres in the Latvia. The possibilities for co-operation at the municipal level for the promotion of logistics should be thoroughly analysed.

Based on corridor analysis, it seems there are many possibilities for new logistics centres:

- the railway hubs in Rezekne, Daugavpils and Jelgava,
- the important port cities of Riga, Ventspils and Liepaja.

The success of these ports and logistics development projects depends strongly on the development of transit traffic.

Using waterborne transport implies to also use other modes. This means that integrated transport concepts must be developed providing efficient interfaces between transportation means, organisations and authorities. Computer based communication and information systems must be used to provide the necessary management and business support.

The harbour will form a core area in a wider concept of activities in the adjacent area of the city. Such activities might be many kinds of international, national and local commercial activities, logistic firms, consulting and transport services etc. Together with the harbour itself, this will form a logistic centre in the region as well as a transport hub (multi modal centre).

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About the author(s)

Professor Igor Kabashkin
Transport and Telecommunication Institute, Riga, Latvia
Address: Lomonosov Str.1, LV-1019, Riga, Latvia
Tel.: (+371)-7100594, Fax: (+371)-7100535, E-mail: kiv@tsi.lv

Analysis from the Liberalization Process of Swiss, Japanese, Polish and Hungarian Railways

Bulcsu Szekely & Olli-Pekka Hilmola

Lappeenranta University of Technology, Kouvola Research Unit, Finland

Abstract

In the world context privatization and deregulation of railways is still in its progress – some of the early countries in this respect have been US, Sweden, UK and Japan. However, large number of developing, emerging and advanced economies are completing actions with this regard (or planning to). In this research work we will review, mostly through existing literature and second hand statistics, how privatization process has modified railway transportation sector in the selected four countries (Switzerland, Japan, Poland and Hungary). Generally we could argue that this process has resulted in massive layoffs (due to high amount of labour costs from total costs) in the longer-term whether the economy is emerging or advanced one, but on the positive side volume in either passenger or freight transportation or both has considerably improved (or constant decline is being diverted as levelled off scenario). Usually countries use *"divide and conquer"* approach in privatization process, where vertically integrated railway sector is split into smaller units, representing e.g. passenger operations, freight operations, property management, infrastructure ownership, engineering and information technology subunits. Based on our observations deregulation and privatization does not increase competition in the sector that much – in analyzed countries we found number of entirely privately owned railway companies, but the share of their volumes from the total market demand is still a small friction from older and usually governmentally controlled companies. Based on our observations from this research as well as from previous country studies we propose process model for railway privatization and deregulation, which illustrates different development phases in this sector, these typically take together longer time than expected (observation period should be decades instead of years).

Keywords: deregulation, railways, Switzerland, Japan, Poland, Hungary

1. Introduction

Privatization and deregulation wave of transportation sector, and especially railways started from US initiatives of late 70's. In early 1980 Stagger's act freed competition in US railways; roughly 40 largest class 1 operators owned basically whole track infrastructure, and built own operations around it (Gomez-Ibanez 2004). Although, ownership of tracks was important part of strategy for US railway companies – renting of tracks for other companies via agreed charges has been standard practice for long-time. This resulted in a situation, where unprofitable routes were removed or sold for class 2 or 3 operators (Johnson et al. 2004; smaller ones, classification applied in US). This country showed from early on that competition was not so intensive between operators, but instead they together tried to serve versatile customer needs in cost efficient manner in collaboration. US privatization resulted on massive layoffs from this sector, significant volume increases, mergers and acquisitions and eventually in profitable operations (Miljkovic 2001). During 2007 second richest person

in the earth, investor Warren Buffett, decided to invest more than 3 billion USD in leading US railway companies. His largest investment target, Burlington Northern Santa Fe, operates mostly in west coast (owns the infrastructure), and is most important player in the container transports originating from Asia and transported via intermodal linkage between US sea harbours and railways. Buffett (MSN 2007) commented that railways represent in US case good investment opportunity, since entry to this market is un-easy (due to reason that operators also own infrastructure) and control of prices is in hands of small number of companies (sudden discounts are improbable).

Although, US example is showing positive outcome, it should be remembered that privatization and deregulation is not following exactly the same principles elsewhere. For example, European Union has decided that operations should be diverted from infrastructure ownership – this resulted in UK privatization process e.g. into increasing number of accidents in railways, large scale of subcontracting, speculation in stock markets as well as rigid dividend policies, low schedule reliability, and abandonment of investments in infrastructure (Tyrrall 2003; Crompton and Jupe 2003). UK case resulted in positive outcomes in the longer-term, but governmental intervention to infrastructure operator was needed and Railtrack was delisted from stock markets as well as went into bankruptcy. European policy of railway privatization has been less-painful, but mostly as rewarding as in UK, only in Sweden, where process has been completed in taking only small steps at a time. Thus, questions still remain after these small number of examples: (1) How population rich countries should complete privatization (e.g. China, India and Pakistan)? (2) Should infrastructure ownership be diverted from operations?, (3) How largest railway sector employment countries should complete their privatization process (China, Russia and India)? and (4) How poor countries should complete their privatization process? We try to sketch an answer for these questions from analyzing four additional countries (as US, UK and Sweden (Hilmola et al. 2007) as well as Finland (Hilmola & Leino 2006) have been analyzed already before) – our analysis consist small countries and varying economic prosperity (Switzerland & Hungary) as well as large railway employment base countries (Poland & Japan) with similar inequality in wealth. Our observations are mostly based on contemporary literature analysis as well as on second hand data analysis.

This research work is structured as follows: In Section 2 we will review transportation sector privatization in a world context, but keeping our interest mostly in railways. Thus, other as important places exist, e.g. airports, sea harbours and operators of sea container transportation as well as airline industry. In Section 3 review of privatization process of

Switzerland and Japan is being introduced – these both are economically advanced countries, but differ in terms of amount of population as well as railway transportation sub-sector importance (in Japan passenger operations are more important, while Switzerland represents cross-border freight country in north-south corridor). Analysis of lower economic health countries, Poland and Hungary, is given in Section 4 – amount of population differs between these countries, and Poland is having significant position in European railway freight transportation. After completing these four analyses, we propose four phase privatization/deregulation framework for railways, and argue that process in general is time consuming, and being in different steps of process takes years instead of months. In Section 6 we conclude our research work, and propose avenues for further research.

2. Transportation sector privatization process in the world context

The most well-known example from privatization process of transportation sector is air (e.g. efficiency comparison in continent scale, see Inglada et al. 2006) – this process started in the late 70's, and resulted in high growth of industry, intensive competition between operators, cross-continental flights, new business models (low cost airlines, point-to-point) and customer benefits (in terms of large variety in service offering, and ever lower prices). Although, air transports could now show handsome profits, and other outcomes, this sector has been really unfavourable for shareholder creation in a longer time horizon (from 30's of last century). However, latest developments in this industry include privatization of airports (e.g. Gerber 2002; Oum et al. 2006), and eventually listing them into stock exchanges. For example, in Europe Copenhagen airport has improved its shareholder value from beginning of 2001 by over 400 %, while Zurich airport has reported over 300 % improvement; other remaining well-known privatized and listed airports are Wien and Frankfurt. Similarly with air transports, sea vessel operators and sea harbours have experienced similar development. For example, governmental control still exists in e.g. sea container transports, but private ownership among largest operators is nowadays increasing fact. Also sea harbours have experienced privatization (e.g. Baird 1999, Cullinane et al. 2005); in New Zealand, UK and Estonia could be found entirely privatized sea ports in larger scale. Lowering of governmental ownership in transportation sector is just side product of increasing world GDP; rapidly developing global economy insist increasingly more transportation, United Nations (2005) have estimated that every time GDP increases by 1 % merchandise of items increases by

factor of 2.5 % - we could assume that growth in transportation is showing similar rates with merchandise increase.

As sea and air share significant similarities in privatization process, oppositely railways have been extremely integrated in their nature, and business model from mid 19th century has been vertical integration. For example, Mexican, US and Japanese railways are owning the infrastructure as well as operating wagons/trains simultaneously (Gomez-Ibanez 2004) – this could be compared to sea vessel operator having own harbours as well as vessels. Although, this integrated operations and infrastructure ownership sounds like an age old business model; both US and Japan have shown most positive outcomes in this sector with demand increase, investments and profits. Of course, in Europe you may find Sweden and UK (e.g. Hilmola et al. 2007) from applying of disintegrated strategy (infrastructure and operations are separated), and producing successful outcomes in longer-term (short-term benefits of UK privatization are questionable). How should rest of the world do with its railway sector? Should operations be disintegrated from ownership of infrastructure? This is under interest of governments and private sector; India, China, Russia, Ukraine and Poland represent top 5 in terms of employment in railways in world-scale, but all of these are in the very beginning of privatization process or taking some early steps (maybe Poland is showing most active actions in these five as shown in this research work). If we take volume into account (like number of passengers and freight), and observe top 5 list thereafter, we could add Germany, Japan, US and Egypt into list. From these nine only four countries have truly tried to privatize railways.

Table 1. Largest railway countries in the world, measured with amount of employees, amount of freight handled and amount of passenger volume. Source: World Bank (1999) and UIC (2004)

	Year	Staff		Year	Freight Tons (000)		Year	Passengers (000)
India*	1998	1578802	China	2003	1998140	Japan (JR Group)	2003	8641842
China*	1999	1443400	USA:All Class I Railways	2003	1632077	India	2003	4970803
Russia	2002	1222200	Russia	2003	1160800	Germany (DB)	2003	1681734
Ukraine	2002	371648	India	2003	518737	Egypt*	1999	1398000
Germany	2003	249251	Ukraine	2003	445500	Russia	2003	1299300

* denotes World Bank (1999) database use

However, it should be emphasized that positive effect of privatization and deregulation of different transportation modes is not solely a by-product of one isolated transportation sector. For example, considering airline cargo and passengers as one entity and railway freight and passengers as another one. In US key for railway rebirth, among organizational changes, were

the sea ports, which were capable to provide high volume (but demanded low prices for freight leads; linkage between harbours and railways see Turner et al 2004). As railways were private businesses, and eager for order intake, trains became longer, and double-stack solutions were started to be used in container transportation. Thus, this kind of development in Europe is harder to find, since generally we have too "good" access for sea, and too many sea ports (e.g. Vassallo 2005). So, handling capacity and incoming as well as out-coming cargo flows are lower, and will favour more road transportation. This situation could be illustrated with fact from Finland: We have more than 10 container harbours, and they altogether handled around 1.3 million TEU (twenty feet equivalent units) during year 2006. Currently Russia's leading container harbour, St. Petersburg, handled similar amount alone, and leading Asian ports are handling nowadays 15-22 million TEU per year. In Europe, as well as in Finland, ownership of sea harbours is in the hands of local municipalities (indirectly governmental ownership), and this is one reason (among long coastal line) why Finland has so numerous harbours.

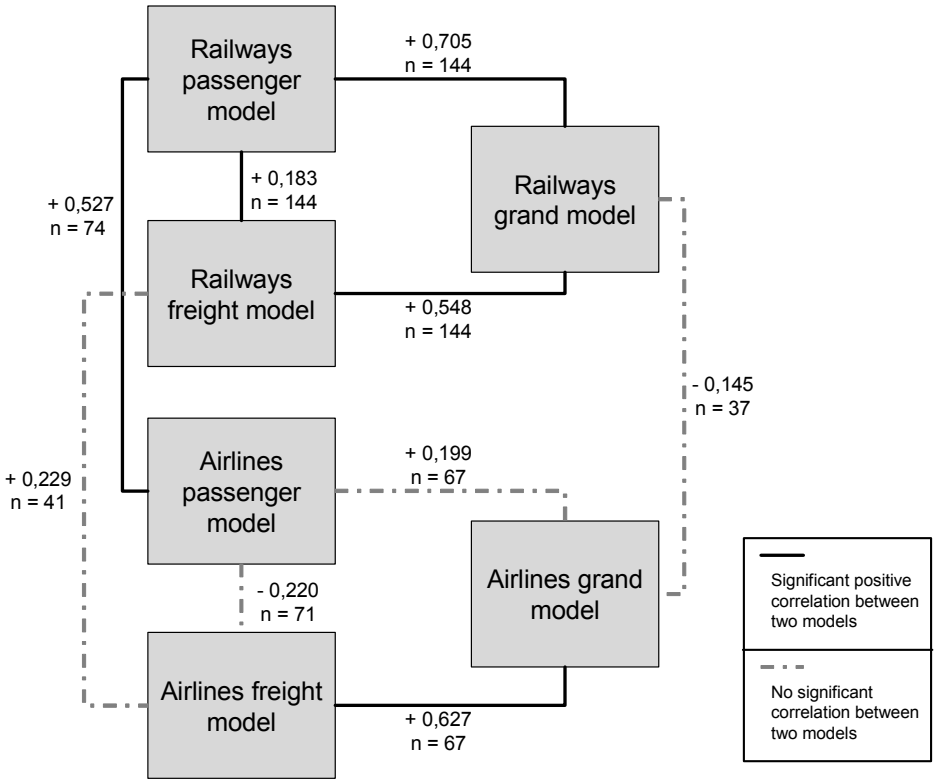

Figure 1. As complex efficiency models (using Data Envelopment Analysis) shows that European railway sector and airlines are connected to each other (railways and airlines of respective country), years 1996-2002 and analysis concerns larger Europe. Source: Savolainen (2007).

Although, as railway freight is connected to sea harbours, Savolainen (2007) found that the technical efficiency level of railway passenger operations is positively connected into airline passenger transportation. So, this means that as we improve the efficiency of railway passenger transportation, efficiency of airline passenger transportation will increase with high probability as well. However, as Figure 1 shows, this efficiency improvement of passenger operations in railways has high positive correlation with railways in total (as both sectors, freight and passengers, are concerned), and low, but still statistically significant, correlation with railway freight. It is rather interesting that in EU privatization of railways have started from freight side, even if this argumentation makes it justified in passenger side as well. This cautious movement in larger policy could mostly be put into poor short-term implications, and rapid deregulation process of UK railways. However, it should be remembered that in UK passenger and freight, but as well infrastructure were all privatized simultaneously, and all had clear sub-optimal profit goal in their mind.

3. Country analysis of well-developed economies, country examples from Switzerland and Japan

3.1 The latecomer: Privatization process of the Swiss Railways

In Switzerland actions have been taken since 1996, when the Swiss government announced the aims of the new transport policy: “from the road to the tracks”. The platform, in the mirror of which privatization effects are to be evaluated is controversial. The pressure for letting to grow the transit traffic is coming from outside, mainly from the EU, as the position of Switzerland is considered to be central in the old continent in terms of north-south transit traffic. The measures faced extensive opposition as a result of growing congestion of traffic on the roads in the urban regions and environmental destruction (Rudel et. al 2004, 4). Nevertheless the compromising novel strategy was managed to set out already in 1999. In the first phase an investment programme was launched, which focused on extending the capacities carried by rail. In the second stage a novel tax was introduced targeted at heavy trucks and a bilateral agreement was signed with the European Community. During the third period of this strategy the task is to liberalise freight services in order to introduce more intensive competition between carriers to force the market prices down as much as possible.

This third pillar requires in practice the privatisation of Swiss Federal Railways (SBB) in the longer term.

To enforce its plans the government imposed Railway Reform 1 that was to assure non-discriminatory access to railways network infrastructure. At the same time SBB was configured to be a corporation with profit oriented goals. The long distance passenger rail transport was not liberalized, but was left in the control of SBB. In contrast the freight transportation was completely revealed to competition in order to enhance cost efficient use of infrastructure. Railway Reforms 2 seeks to advance the achievement of the new strategy: a "train path allocation committee" were set up to solve possible competition disputes between the private firms involved. The passenger rail transport side has been imposed to simplified tendering proceedings. The first major actor in Switzerland is SBB and its subdivisions – namely SBB Cargo AG and SBB Alptransit AG. In addition there are branches of this corporation to handle freight services in Germany and Italy. The second big player is BLS Lötschbergbahn AG, which focuses on building infrastructure for rail transport. The subdivisions are BLS cargo AG and BLS Alptransit AG. Both SBB and BLS are independent from the state in terms of organisation, accounting and legal status. SBB is currently a joint-stock company the shares of which are owned by the Confederation, BLS is a joint stock company too, but ownership structure is rather different: the corporation is owned mainly by private actors by over 65 % (Kirchner 2004, 83). On the freight side the arrangement is the same: both SBB Cargo and BLS cargo are guaranteed independence and operate as joint stock companies.

The model taken by the industry is vertical integration, meaning literally no separation between infrastructure and operations. Subsidies were issued to regional passenger transport and infrastructure maintainers. Freight and long-distance passenger transport have been excluded. The central problem perceived seems to be the fact that the state creates itself a multidimensional role being simultaneously as owner of SBB, railway regulator, dispute solving and consolidating authority and as a client for the services (OECD 2005, 279). This state corporation operated the most profitable lines until the end of 1960s, and was successful in reaching the break even point till that point whereas the private rail companies were struggling (Steinmann & Kirchhofer 2006, 20). Governmental subsidies are perceived even today as essential by the most dominant inter-modal operators (Tonndorf 2006). The measure of "heavy vehicle fee" is seen as the central pillar of the Swiss transport development policy enforcing the "polluter pays" principle (Werder 2004). This fee is then conveyed to the

railway sector for financing infrastructure creating projects. Arguably one can consider this charge as a cross-subsidy from the road transport to the rail industry.

The Swiss government has found the right path for the privatization of the rail sector, but the progress is very slow: It has been 10 years since the start of the reform implementation. In particular there is little evidence that the passenger rail sector has been affected yet and the activities of the official regulatory bodies are not regarded as transparent enough (IBM 2006, 26). One possible explanation for this slow liberalisation is that it is clarified that free entry on to the market may lower productive efficiency as a result from the inability of rail operators to benefit from economies of density (Driessen et al. 2006, 7). In addition whilst the goals set by the new transport policy are well established, they still considered by some experts as far too ambitious (Rudel et. al, 2004, 2). Yet advancement has taken place: Switzerland managed to improve its performance with regard to one of the most typical problems associated with quality matters in freight traffic over rail: Delays resulting from congested network and from the fact that priority is given to passenger traffic (CER 2005). The punctuality rate achieved by SBB Cargo was 92 % already in 2004 (CER 2005). In 2005 the Trans-Alpine rail transport is envisaged to grow by 15 %. (The UN 2006, 14). The progress will be pushed forward in the near years to come as a consequence of road traffic congestions in the international transit corridor passing through the Alpine region and the environmental factors of increasing emissions. On Table 2 the arguments are summarized about the state of liberalization of Swiss railways system.

Table 2. Analysed articles concerning Swiss railway liberalization

Author & Title	Major arguments	Other information
Steinmann, Jonas & Kirchhofer, Andre (2006) Inefficient, unprofitable, but still on the track! An exploration of why the Swiss have hardly dismantled their railway system	The reasons for the railways sector difficulties are rooted in the private sector. Local interest groups made impossible for the National Assembly to reduce the networks operated under losses.	The system governing the railroad business is inefficient and the Swiss railways policy deals with the financial matters in an inappropriate way.
OECD DIRECTORATE FOR FINANCIAL AND ENTERPRISE AFFAIRS COMPETITION COMMITTEE (2005) Structural reform in the rail industry	The Swiss rail sector is privatised only to a limited extent and the effects on the economy are minimal. The Federal state has still a significant role to play.	An arbitration commission will be formed to solve competition related disputes. Railway Reform 2 will enhance the competitiveness of railway projects by granting access to the infrastructure of maintained by competitor companies.
Irmtraut, Tonndorf (2006) Railways liberalization is bearing fruit	Private companies will need in the future operating subsidies from the government to shift freight traffic from road to rail.	Switzerland is among the few places where heavy freight trains pay higher tariffs than the ones carrying people.
Kirchner, Christian (2004) Rail liberalization index 2004: Comparison of the Market Opening in the Rail Markets of the Member States of the European Union Switzerland and Norway	The rail passenger transport must still be considered as a closed one. The competition is limited in the freight sector too. The first Railway Reform has not yet posed positive influences on the rail passenger market in Switzerland.	Despite the two major operators SBB and BLS are competitors they do collaboration in terms of allocation of train paths. Rail regulation is in the hand of Federal Ministry of Transport, the Competition Commission and the Price Monitoring Body.
Dr. Werder, Hans (2004) The impact of the heavy vehicle fee – central pillar of the Swiss transport policy	The continuous growth of the freight transport in Switzerland can be secured only by an appropriate infrastructure charging system that functions in line with the ”polluter pays” principle.	The performance related Fee for Heavy Vehicles is the central part of the Swiss Transport Policy. It concerns heavy trucks with a total weight of more than 3.5 tons. The average fee is currently one cent per tonne-kilometre.

According to the literature analysis completed above it is evident that in the landscape of privatization of the railroad system in Switzerland is full of compromises and therefore the progress is slow. There is still extended political influence and the government is under great pressure that is deriving from the EU level. Despite the fact that there are clear policy

objectives in place, the private sector inhibits the fulfilment of the aims set by the national officers.

3.2 The pioneer: Privatization process of the Japanese Railways

Japan initiated its privatization process of railways sector in 1987, mainly for the same reasons as most of the countries all over Europe: An inefficient structure in place compounded with extensive intervention of political decisions makers, overwhelmed by huge debts and the operational deficit of Japan National Railways (JNR) grew year by year since 1964. It is common that in industries pertaining to the control of public authorities there is little motive to satisfy well customers and as there is no competitive pressure expenditures rise steadily (Fukui & Oda 2006, 16; Holvad 2002). In the end six passenger companies namely West Japan Railways, East Japan Railways, Central Japan Railways, Hokkaido, Shikoku and Kyushu and one freight transport provider - JR Cargo - were established. As far as performance is concerned the three mainland enterprises due to the intense traffic density do earn more and more profit as years go by, whereas the small operators in the islands suffer from declining income. These are the places where road transport is considered to be more convenient and swifter. Nevertheless all of the private rail operators have the same legal organisational format: joint stock company. At the same time it is interesting to notice that in terms of operation mode JR Cargo is a fully vertically separated entity whilst all other passenger companies took a structure of vertical integration based on regional separation (Obermauer 2001, 26). They enjoy an extensive ruling independence too being able to set fees for using infrastructure.

In this manner the role of government financing non-profitable development projects and rail operators become of primary importance: There were a special Investment Fund formed to give financial back up to the there non-mainland railways enterprises – Hokkaido, Shikoku, and Kyushu. The idea was to cross subsidy: Money was to be directed from revenues earning firms to loss producing businesses. The problem perceived according to the practitioners in Japan is that for the local lines there is no hope to be turned into an income generating platform (Fukui & Oda 2006, 17; Tamamura 2002). On the whole still it can be stated the privatization ended up with a success: Top management of these newly set private rail businesses are highly motivated in pushing profit oriented attitude forward and there is no need anymore to invest into everything, which are seen inevitable by politicians. The role of government is restricted solely to improve safety standards and safeguard that competition

remains in a fair framework. On the other hand there are signs that the official national authorities of Japan still have to work with implementation of safety regulations: Recent harsh accidents have topped news all over in this country (see The Daily Doro-Chiba 2005).

On the other hand if one considers the long-term perspective there is no way of arguing the success of privatization in Japan: For example, the overall amount of accidents since the privatization on the line of Tokaido Shinkansen has been decreased by 20 %, when comparing the figures to the ones during governmental ownership (Knutton 2004, 19). At the same time there is clear evidence that the most remarkable productivity enhancement were powered by massive lay-off in the industry of railways: In 1980 there were still 380096 people working for JNR whereas in 1997 this number decreased to 146828 employees - the reduction is 71%.(Holvad 2002). It is remarkable to notify the total investment per year: In the JNR era it was 40 billion Yen, as opposed to the private involvement when this sum reached 90 billion Yen (Knutton 2004, 19).

Therefore, one can argue that while the owners became richer, the overall impact on the society is not that positive. It makes sense to put forward that closing the gap of the “income divide” is the most urgent task of the governmental bodies in Japan: Actions have already been taken – for instance the permit for rail operators has been given to be involved in non – rail service activity. In the end still more powerful actions must be imposed by the official national regulatory bodies as market dynamics will make the “income divide” even more visible and constant. On Table 3 a summary is provided about the state of railways privatization in Japan.

Table 3. Analysed articles concerning Japanese railway liberalization

Author & Title	Major arguments	Other information
Morichi, Shigeru & Tetsuo, Shimizu (2003) A comparative study on recent railway development and operation policies in developed countries,	The method of regional separation was used in the split of JNR. After the privatization the role of the government is to set safety regulation, impose antimonopoly policy and provide subsidy for social needs.	During the initial phase of the privatization process only the bullet train infrastructure owned by the public corporation the resource of which was the rental fee to pay back the accumulated deficit of JNR.
Knutton, Mike (2004) Vertical Integration Proves To Be A Winner	In terms of figures the privatization was a success. The key for this was a vertically integrated management system.	In case JR Central workforce is reduced to 14.000 the productivity improvement in 2006 is 80 % over the initial objective. This goal is realistic.
Holvad, Torben (2002) Railways in Transition: A Review of Five Countries	The productivity of railways companies has significantly improved mainly due to actions in labour cost reduction.	Private rail operators do not have access almost to any subsidies provided by the government. There were private rail companies prior to the start of privatization.
Andrea, Obermauer (2001) National Railways Reform in Japan and the EU: evaluation of institutional changes	The privatization process in Japan is focused more on competition matters then ownership changes. Nevertheless the competitiveness of the rail sector has improved since the start of the privatization.	Inter-modal competition is in need of more intense state regulation. The reason why JR Cargo was left vertically separated was to take away the financial burden of maintaining infrastructure.
Yoshitaka, Fukui & Kyoji, Oda (2006) Who should take responsibility for unexpected interest changes? Lessons from the privatization of Japanese railroad system	The main issues related to the reform are: enforced unprofitable investments, absence of work discipline, and motivation of top management to make profits, inadequate organisational control model, and consolidation of profitability of local operators	The privatization process failed by now to turn into profit the results of regional railways businesses. However in terms of overall result, the privatization project was a successful one.

Based on the literature analysis one can firmly state that the privatization of the JNR was a success. This view can be supported by financial statements figures on the one hand and other quality measures on the other: in terms of overall picture the rail industry in Japan provides

operating revenue that is higher compared to the overall operating costs. Labour productivity/competitiveness showed constant improvement too: more profit by less amount of employees. As to the non-statistical measures the motivation to earn profit of management of the private rail companies can be referred as very high. Work discipline has been raised too as soon as top management were granted by independence of political influence.

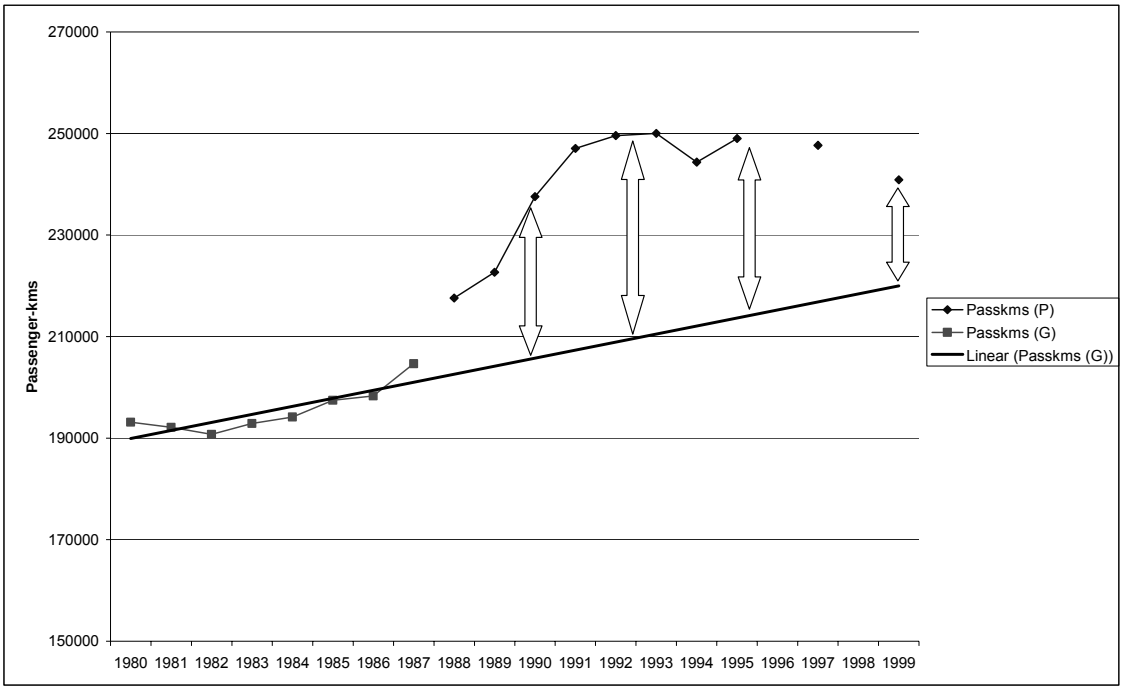

Figure 2. Volume of passenger transports in passenger kilometres (millions) in Japan during period of 1980 to 1999, where G denotes for governmental ownership period and P for deregulated and privatized railway operations. Source: World Bank

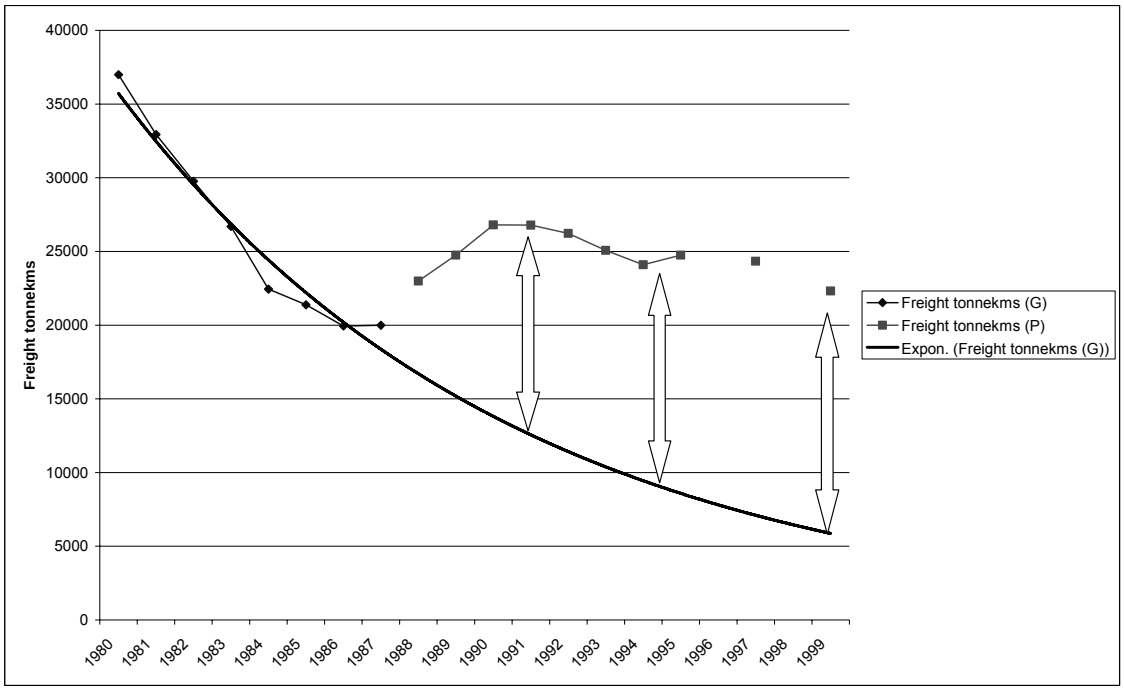

Figure 3. Volume of freight transports in tonne-kilometres (millions) in Japan during period of 1980 to 1999, where G denotes for governmental ownership period and P for deregulated and privatized railway operations. Source: World Bank

From the demand perspective, it could be concluded that within longer period of time both passenger as well as freight operations have benefited from deregulation and privatization. As Figure 2 shows, during early 1980's passenger volumes were constantly increasing in Japan, but free competition created suddenly lump of demand, which has been above of the predicted demand level for more than decade. However, in the recent years of observation period decline in passenger transports could be identified. We could not detect demand increase in Japanese freight operations, but continuing declining trend has been turned into levelled off development during roughly decade time after deregulation took off. As could be identified from Figure 3, exponential curve fits well into governmental control period, and results could have been disastrous, if development would have continued as could be predicted with a fitted curve. Therefore, we could rightly argue that deregulation and privatization provided positive impact also in freight volumes, but not in terms of direct growth, but avoiding constant decline.

3.3 Discussion

The World Bank has already issued a general framework for countries as a guideline on how to proceed with the privatization of transport infrastructure and services. There are five elements in this proposal, each of them being related in a tightly manner to the others: Inclosing political influence from the system management layer, taking a corporate management structure, adopting a competitive market form, creating powerful competitor organisations and deploying of regulatory bodies in line with the market form in place (World Bank 2006).

It is worthwhile to examine the state of rail sector liberalization in each of the counties analysed above against this lineout. Switzerland by now arguably could not find a way of separating politics and business. The majority of shares of SBB are still under the ownership of the Swiss government. Only recently is care devoted to the establishment of an independent arbitrary body ruling over abusage of monopoly power (IBM 2006). The SBB is now a competition oriented corporation, but the market form applicable to the railway sector has not been chosen. In addition to the former monopoly organisation on the Swiss rail market, there is only one powerful company, which has a relatively significant market share in the rail business: BLS. The role of the regulatory institutions is still confusing despite the clear objectives and instruments of the Swiss transport policy. Therefore, it can be proposed that the situation in Switzerland in many respects resembles to that of in Sweden.

Japan on the other hand can arguably be seen as well advanced on the path on which United States is. The shares of mainland rail operators are completely under the control of private sector though the ones of the rail service providers on the island are still in the hands of the government. It can be claimed that as long as the companies on the islands will produce huge losses, they will stay under the monitor of official authorities of the government of Japan. This strategy is in accordance with the principles of cross-financing. The Japanese National Railways has been split long ago into seven independent rail operators and thus it is right to say the Japanese Railways adopted a corporate form. The arrangement for market form adopted is arguably "*Affermage contract*", where operators cover some commercial risks and make most of the marketing decisions (World Bank 2006). The competition between the participating companies is fierce and some disastrous consequences are on the scheme already: Accidents constitute a sign that the situation is not optimal anymore. The regulatory institutions are in place, but are not strong enough to force railways enterprises to adopt consolidating measures to align profit orientation and social responsibility.

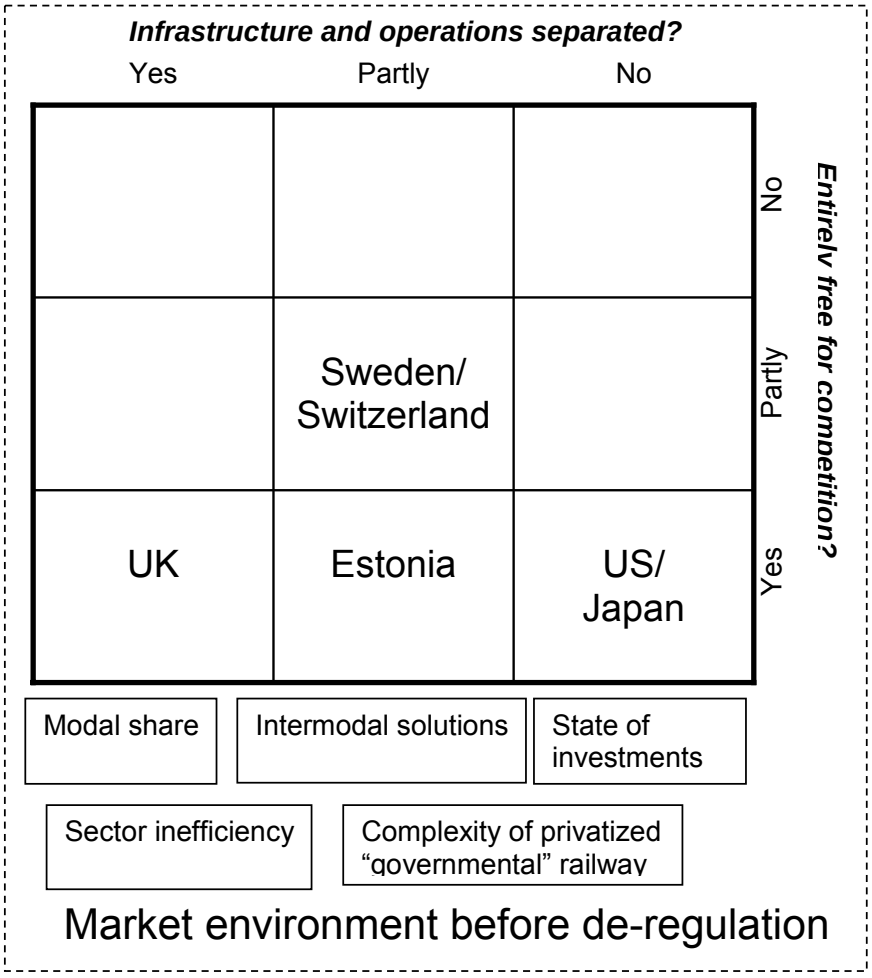

Figure 4. Deregulation framework, and placement of Swiss and Japanese railways with respect of other well-known railway liberalization countries.

One could suggest that Switzerland can be put to the field, which is next to Sweden but above US: The operation and infrastructure is not separated, but at the same time the competition by now is only allowed in the freight markets. At the same token one has to notice that on the markets there are many private rail enterprises that purchase "track usage" – rights from the SBB. In addition there are plans according to which the Swiss government would sell all existing infrastructures out to the private sector. Therefore, it is better to place Switzerland into the same box with Sweden.

Japan is a special case: In respect of freight, one can categorize Japan a country, where infrastructure and operations are separated whereas passenger wise it is a place of vertical integration. Thus, in the end one can claim that the right place for Japan would be between the UK and the US. On the other hand JR Cargo purchases the right to use the tracks from the

passenger rail operators: The situation is the same as in the US, where the governmentally owned corporation - Amtrak is given the rights to use tracks by the private freight rail companies (Rhoades et al. 2006). Thus it is more suitable to place Japan into the same bowl with the US.

4. Country analysis of Central and Eastern Europe, examples from Poland and Hungary

4.1. The adaptation of the UK model in a conservative manner - Privatization of the Polish Railways

The Polish State Railways JSC (PKP JSC) has been constantly a target for reconstruction for well over a decade. Nevertheless only in 2001 the original monopoly was split to several smaller sub-businesses to take an advanced step on the path of the line the EU requested. An umbrella organization was formed – PKP Group with a holding structure though the ownership of the shares is still pertaining to the state. Governmental plans still exist to reform this central share manager into a "Railway Possessions Fund" that would take to control the properties and would be responsible to assign these shares in a fair manner to the firms of the Group (Klimkiewitcz 2006, 30).

The mother company The Polish State Railway Joint-Stock Company (PKP JSC) is the central coordinative body of the PKP Group. Its task is to manage capital assets, real estate, carry out research and development related to railway industry, supervise the owners, monitor the privatization process and be the communication bridge toward the EU. The Polish Railway Lines JSC (PKP PLK) is the separated infrastructure manager of the PKP Group. The responsibilities involves ensuring the access for operators to railway lines, configure train time-tables, monitor the safety instructions are met on the lines, carry out investments needed to keep infrastructure in good condition and utilize land of railway lines for commercial purposes.

The passenger side of railway business is in the full control of the PKP Group. PKP Intercity Ltd. operates services between the largest cities of Poland, but there are also some international lines too on its disposal: for example the Berlin – Warsaw, Frankfurt - Warsaw, Praha - Krakow and Kiev – Krakow. They have 172 trains from all of which are ranked as

high quality: EuroCity, InterCity, and Express tains. In addition there are some low cost services available too: Over 40 including over night connections. (PKP Intercity 2007.)

PKP Przewozy Regionalne (PKP PR) – PKP Regional Services Ltd. is responsible for providing mostly regional, inter-regional services though it offers also international long distance traffic services including border traffic with Slovakia. PKP Szybka Kolej Miejska w Trojmiescie (PKP SKM) – PKP Rapid Urban Railway in Trojmiasto Ltd. manages the lines in Pomeranian region between Lebork Ilava and Elblag and line no. 250 Gdanks Glowny – Rumia (Klimkiewitcz 2006, 40).

Warsawa Kolej Dojazdowa (WKD) – Warsawa Commuter Railway Ltd. is obliged to carry out commuting services between Grodzisk Mazowiecky to Warsaw Downtown Station on a specified length of line: 35 km including 28 stations. This operator is in the hand of a consortium of those local governments where the WKD line is placed. (Klimkiewitcz 2006, 43.)

PKP Group is still a significant player on the freight side too: PKP Cargo JS - the incumbent operator of Poland is the third largest one in terms of absolute amount of transported items in Europe. The scale of activities where it is involved is large: domestic, international freight services including transshipment, as well as other logistics, forwarding and traction services. The company provides locomotives and drivers for PKP Intercity and PKP Regional Services. Out of the overall set of operations in 2005 domestic services represented 54 percent and international ones 45 percent. PKP Linia Hutnicza Szerokotorowa (PKP LHS) - Metallurgical Broad Gauge Railwa Ltd. specializes in broad gauge line infrastructure and operation for a 395 km long line located between the Ukrainian border to the Silesia industrial region in Slakow. The firm has the equipment for changing wheels from standard to broad gauge and vice versa (Klimkiewitcz 2006, 44).

In the conglomerate, electricity, information technology and telecommunications related activities are separated into individual business unit – PKP Power Engineering Ltd., PKP Information Technology Ltd., and Railway Telecommunications Ltd., - and actually the IT unit is one of the largest enterprises on the sector offering IT-services to all members of the PKP Group with the help of partners including Oracle Poland Ltd., Hewlett-Packard Poland Ltd., or SAP Poland Ltd (PKP Group Annual Report 2005, 85; PKP Informatyka homepage 2007).

Privatization here is only about to take off: Koleje Mazowieckie (KM) – the Mazovia Railway Ltd. is the first governmental – private joint venture in the rail sector of Poland: 51 percent is owned by the Mazovia local government and the rest 49 percent is in the control of

PKP Regional Railways. All the assets and employees are provided by the PKP Regional Railways. Currently 1775 people work for the firm. This company functioned well as in 2005 it reached positive financial results, though it received a substantial amount of subsidy from the local government: 25 million EUR. Passenger train km has improved by 40% and amounted to 12 million train km. (Klimkiewitcz 2006, 41.) Szybka Kolej Miejska w Warsawa (SKM Warsaw) – Rapid Urban Railway in Warsaw has a minor role in Warsaw regional transport. This is a recent attempt by the Warsaw municipal authorities to develop the existing public transport offering in the suburb area of Warsaw (Klimkiewitcz 2006, 44). The company was established in October 2005, and there is still no data available about its operations.

Private undertakings have an increasing share of the market: CTL Logistics Holding is the leading private freight operator in Poland. In addition it is the leading forwarder of bulk items in Poland offering its services to more then 500 companies. It has 660 km of tracks and railway sidings of its own. The company transported in 2005 9.15 million tones of freight and 1845 million tonne-km. (Klimkiewitcz 2006, 45.) There is no other related information available. The PTK Group is a small umbrella organization including four companies that were formly operating in the Silesia region carrying coal and sand. The two dominant players in here are PTKiGK Rybnik – rolling stock specialist firm with 664 million tonne-km in 2005 and PTKiGK Zabrze offering specific services to the sister firms of the Group such as forwarding bulk items, rolling stock repair and maintenance having moved 680 million tonne-km in 2005. (Klimkiewitcz 2006, 45.) There is no other relevant related information available. The origin of the PCC Rail Szczakowa S.A is the same as of the PTK Group – helping the mining industry in the Silesia region. It was purchased by the German PCC A.G. in 2004. It has a 150 km of rail network of its own and moved 1021 million tonne-km in 2005. (Klimkiewitcz 2006, 45.)

Financial and Employment level development

The financial health of the PKP Group companies is not satisfactory, but they are on they way to improve. The numbers as shown in Table 4, illustrate the situation. In 2003 only one single company of the group was able to show positive net profit whereas in 2005 the number was seven. The overall net result of the PKP Group improved at an impressive manner; by over 70 percent from -603 million EUR to -176 million EUR. This achievement is to be respected since the overall demand stayed practically in the same level.

Table 4. Major financial metrics of the companies of the PKP Group (in thousands EUR)

Organisational unit / Year	2003			2004			2005		
	Net R.	P./L. O.A.	Net P./L.	Net R..	P./L. O.A.	Net P./L.	Net R.	P./L. O.A.	Net P./L.
PKP S.A.	251086	109663	-184408	222561	-82364	47554	197477	-2902	29120
PKP Cargo S.A.	1586717	99024	-17836	1592315	34708	29083	1455916	18115	5317
PKP LHS Ltd.	60842	7638	5340	74116	7378	6223	54899	5487	4651
PKP Regional Services Ltd.	493822	N.A.	-328667	504207	-202	-202245	441632	-164	-171460
PKP Intercity Ltd.	195103	N.A.	-8373	207203	-12647	-13078	237634	1895	828
PKP SKM Ltd.	17778	N.A.	-1539	21106	N.A.	2659	23014	N.A.	224
PKP WKD Ltd.	3918	N.A.	-234143	4462	N.A.	21	4633	N.A.	-7
PKP PLK S.A.	783881	N.A.	-67825	795506	N.A.	-46824	772703	N.A.	-25166
PKP Power Engineering Ltd	395053	N.A.	-18142	387600	9543	5326	389623	8904	5609
PKP Information Technology Ltd.	20122	N.A.	-1524177	19663	4399	-84609	19007	153	321
PKP Railway Telecommunications Ltd.	70346	N.A.	-3127	68709	285	-1716	55489	-10922	11452
PKP Group (total)	2306275	-225537	-603694	2410486		146143	2318364		-175627

Denotation: "Net R./S." = Net Revenue/Sales, P/L O.A. = Profit / Loss on Operating Activity, Net P./L. = Net Profit /Loss.

In terms of employment the figures show (Table 5 in the below) that reducing the workforce is still the mainstream trend: from 2002 to 2005, seven out of the eleven group member companies reduced their amount of employees (Table 6 in the below). PKP Intercity was the outstanding firm in this respect as it increased it organization from 1534 to 2274 employees, i. e. by 48 percent. At the same time this is the company where the labor cost share out of turnover and net revenue diminished during the years from 2004 to 2005 and the company reinvested only 12 percent out of its generated net revenue back to its employees in 2005 (Table 7 in the below). Also it is interesting to see that while PKP Regionale Services Ltd. reduced its workforce considerably from 2002 till the end of 2005 by 23 percent, the share of costs of labor force from the turnover increased by ten percent from 29 to 39 percent. Companies have different policies in general with regard to reinvesting revenues to labor: PKP PLK S.A. firm in the sense that almost 2/3 of its generated net revenue (74 percent) is put into labor costs whereas this indicator is only 12 percent in the case of PKP Intercity Ltd., as mentioned above .

Table 5. The amount of employees working for companies of the PKP Group.

PKP Group company/Year	2002	2003	2004	2005
PKP S.A.	4540	3696	3555	3425
PKP Cargo S.A.	50733	49586	48265	26491
PKP LHS Ltd.	1140	1153	1176	1175
PKP Regional Services Ltd.	22539	21122	19980	17308
PKP Intercity Ltd.	1534	2039	2130	2274
PKP SKM Ltd.	740	750	766	806
PKP WKD Ltd.	218	218	220	222
PKP PLK S.A.	47567	45756	45120	43190
PKP Power Engineering Ltd	9380	9177	8809	8485
PKP Information Technology Ltd.	903	835	812	807
PKP Railway Telecommunications Ltd.	3999	3898	3532	2962
Total	145295	140233	136369	109150

Table 6. Comparing the amount of employees in percent (year 2002 = 100%).

PKP Group company/Year	2003	2004	2005
PKP S.A.	81 %	78 %	75 %
PKP Cargo S.A.	98 %	95 %	52 %
PKP LHS Ltd.	101 %	103 %	103 %
PKP Regional Services Ltd.	94 %	89 %	77 %
PKP Intercity Ltd.	133 %	139 %	148 %
PKP SKM Ltd.	101 %	104 %	109 %
PKP WKD Ltd.	100 %	101 %	102 %
PKP PLK S.A.	96 %	95 %	91 %
PKP Power Engineering Ltd	98 %	94 %	90 %
PKP Information Technology Ltd.	92 %	90 %	89 %
PKP Railway Telecommunications Ltd.	97 %	88 %	74 %
Total	97 %	94 %	75 %

Table 7. Estimated labor costs and their share from net revenue/sales as well as from turnover.

Organisational unit / Year	2004					2005				
	Turnover	Net R.	E.E.C.	E.E.C. / T %	E.E.C. / Net R%	Turnover	Net R.	E.E.C.	E.E.C. / T %	E.E.C. / Net R %
PKP S.A.	590741	222561	43894	7 %	20 %	588362	197477	44530	8 %	23 %
PKP Cargo S.A.	1634744	1592315	595937	36 %	37 %	1521700	1455916	604457	40 %	42 %
PKP LHS	74866	74116	14520	19 %	20 %	55634	54899	15277	27 %	28 %
PKP Regional Services Ltd.	847998	504207	246697	29 %	49 %	572412	441632	225032	39 %	51 %
PKP Intercity Ltd.	209735	207203	26300	13 %	13 %	239762	237634	29566	12 %	12 %
PKP SKM Ltd.	23346	21106	9458	41 %	45 %	26611	23014	10479	39 %	46 %
PKP WKD Ltd.	5602	4462	2716	48 %	61 %	5648	4633	2886	51 %	62 %
PKP PLK S.A.	814355	795506	557105	68 %	70 %	772703	772703	569340	74 %	74 %
PKP Power Engineering Ltd	409994	387600	108766	27 %	28 %	397041	389623	110319	28 %	28 %
PKP Information Technology Ltd.	20093	19663	10026	50 %	51 %	19343	19007	10492	54 %	55 %
PKP Railway Telecommunications Ltd.	73638	68709	43610	59 %	63 %	57784	55489	38511	67 %	69 %
Total:	4705112	2410486	1659031			4257001	2318364	1660889		

Denotation: "Net R." = Net Revenue, "E.E.C". = Estimated Employment Costs, "T "= Turnover. The estimation on labor costs was done as follows: The number for average costs of labor of a transport company was taken from the Statistical yearbook of Poland 2006 created by the The Central Statistical Office. The yearly increase of labour costs in the transport sector in Poland were taken from the study "Pay trends across Europe: labour costs and productivity" carried out by the Federation of European Employees (2006).

Table 8. Analyzed articles concerning the Polish railway deregulation.

Author & Title	Major arguments	Other information
Joanicjusz Nazarko, Maciej Dobrzyński & Urszula Ryciuk(2006) From Road to Rail: Polish Perspective	Rail and road transport should be seen as complementary to each other to produce effective inter - modal solutions. Prior 2006 the privatization efforts can be stated to be unsuccessful.	The size of the rail network in 2004 was 23500 km, but the subsidies by the government were over 30 times smaller than the ones given by the government in Italy. Track access charges are to be reduced by 15 %.
Jerzy Wronka (2006) Development of the railway transport in Poland	There is inefficient support by governmental bodies for radical new restructuring of the rail system. The main problem in Poland is the implementation of long term transport policy programs	The tonnes km share of PKP Cargo fell 35 % in between the period of 1990 and 2004.
OECD (2005) Structural Reform in the Rail Industry	There is still much work on this field: no comprehensive national transport policy is in place, the financial support for passenger and infrastructure operators are inadequate.	Subsidies for infrastructure project diminished by over 40% between the period of 2002-2005. Regional governments are to elaborate framework for basis of subsidies for the regional passenger companies.
Paul, Amos (2005) Reform, Commercialization and Private Sector Participation in Railways in Eastern Europe and Central Asia	It can be claimed that too much emphasis was put on the structural changes alone: there is need to adjust commercial culture and business processes. The privatization is still in "work – in – progress".	Labor was reduced nearly 60 % between 1990 – 2002, and the cost of reconstructing (250 million USD) was to be carried by the PKP itself.
United Nations Economic Commission for Europe (2006) Transport situation in Poland in 2005	Rail transport cannot meet the need of society: it absorbs immense amount of public subsidies and is still not competitive.	The quality of railway network is low: less than 10% out of the total length of the network allows trains to have a speed of 120 km/h or higher.

The central message of the summarized articles shown in Table 8 is that Poland has not done enough for enhancing privatization efforts. The sector is still uncompetitive despite the

immense amount of subsidies received by the operators from the government. The debt of the incumbent rail company is growing all the time, and the infrastructure is deteriorating. Despite these factors, the dominancy of the former monopoly operator has considerably weakened while at the same time recently record amount of licenses has been issued, and the legal basis for growth has been established.

Nevertheless but the process of privatization is in its infancy. There is still an empty field available for railway to grow in the form of complementing road transport i.e. inter-modal manner: Poland is far too big country in the European context and long distance transport is quicker and safer by rail than road. These issues can be utilized in international cross boarder transport, for example Poland can be a profitable corridor between Russia and the EU. Volume increases are essential prerequisite for healthy grow of railway transports, and can be realized when concentrating traffic towards the large, but few ports of Poland located at the North facing the Baltic Sea. On the other hand the former monopoly company is in need of extensive internal business process redesign and financial recovery programs to be able to become profitable. A comprehensive transport policy with effective implementation is needed in order to render the trend back to the positive track.

4.2. Carrying the shadow of the past - Privatization of the Hungarian Railways

The privatization process of the Hungarian Railways has been in progress since 1993 the year in which the Railway Act was adopted. Nevertheless only the pressures triggered by the EU membership fueled some efficient sparks on the jammed procedures. In 2006 the new version of the Railway Act entered force. It was really needed as in 2005 the railway freight transport continued to loose its share in the market by 2.85 percent (Böde 2006, 60).

Still the state controls the majority of shares in the two dominant rail company of Hungary: it has 100 % ownership of the Hungarian State Railways – MAV Ltd., which was split into five firms in the year of 2003: passenger, freight transport services, engineering, property and traction business units. The Győr-Sopron-Ebenfurt Railway Corporation (GYSEV Corp.) is a special undertaking that is rooted back to 1872, when it was commenced as an Austrian private company. Since then the state of Hungary gained back its control by entering as owner (61 percent). The Austrian state has nowadays 33 percent, the Port of Hamburg 5 percent of the shares, while 1 percent is at the disposal of private members.

During 2006 in addition to these previously mentioned firms, five other private enterprises hold licenses to right to operate on the rail network of Hungary: 1) Floyd Ltd, 2)

CER Central European Railway Ltd, 3) MAV-Hajdu Railway Construction Ltd., 4) MMV Hungarian Private Railway Ltd., and 5) Train Hungary Private Railway Ltd. However in CER Central European Railway Ltd., and in MAV-Hajdu Railway Construction Ltd. MAV possess significant amount of shares though less than 50 percent in both cases. The actual intensity of operations of these companies is very low however: MAV hinders the liberalization process as much as it can, with the result of having been fined in 2006 by the Competition Council of Hungary by 2 million EUR (Böde 2006, 60). At the same time it has to be noticed that on the 15 June 2006 MAV applied for an emergency loan of 20 million EUR to be able to finance the gap between its short term incomes and expenses (Napi Gazdasag 2006). In 2007 the government decided to double its financial support for the passenger operations of MAV that is in so going to be equal to 387 million EUR (Szabad Palya Egyesulet 2007).

These measures are reasonable as the whole company is in serious difficulties: as shown in Table 9, despite the growth of net revenue in 2005, MAV generated more loss by a significant manner: additional 124 million EUR with comparison to 2004. Table 10 below shows that despite the reductions in the workforce, labor costs rise, increasing their share from turnover and net revenue. At the same time it has to be noted that during the 90's MAV reduced its workforce by 60,000 and since the year 2000 till 2005, approximately 6,000 employee contracts were terminated.

Table 9 Major financial metrics of MAV.

Metrics/Year	**2004**	**2005**
Net Revenue	899	906
Profit/Loss on Operating Activity	437	478
Net Profit/Loss	-208	-322

Table 10. Estimated Labor Costs and their share from Net Revenue/Sales as well as from Turnover

Year/ Metrics	Turnover	Net R.	E.E.C.	E.E.C. / T %	E.E.C. / Net R%
2004	1103	899	651	59 %	72 %
2005	1097	906	673	61 %	74 %

Denotation: "Net R." = Net Revenue, "E.E.C". = Estimated Employment Costs, "T "= Turnover. Estimated Employment Costs were calculated relying on the information of the Hungarian Central Statistical Office and its

study in 2007: Employment and Earnings 1998 – 2005. In addition the amount of employees of MAV in 2005 was taken from the study "Employment, industrial relations and working conditions in the European rail transport sector" carried out by the European Monitoring Centre on Change in 2006. Since labour data about MAV was not available concerning the year of 2004, the increase of the amount of labour of MAV was estimated based on general nationwide trends depicted in the study of "Employment and Earnings 1998 – 2005" by the Hungarian Central Statistical Office.

Table 11. Analyzed articles concerning the Hungarian railway deregulation.

Author & Title	Major arguments	Other information
Tanczos, Katalin & György, Bessenyei (2005) Analysis of State Intervention Effectivity in the Railway Transport with Benchmarking Methods	The productivity of MAV is still lower when comparing the figures to the average in the EU. The quality of railway services is downward the most significant player of the sector is in the hand of debtors.	The Hungarian government subsidized the rail sector only 40 - 50 percent out of the level that in average was in Europe between the period of 1993 and 2002.
Hungarian Competition Authority (2005) Structural reform of the rail industry: Hungary	The extensive infrastructure available in Hungary is not in effective use: only 60 % is occupied. The regulatory framework does not help private operators to compete in a fair manner with MAV.	The non-competitive activities of MAV seem to impede to achieve the general objectives set for the rail industry. Rail services represent only 40 % of their level out of the whole platform in comparison to the 80s.
United Nations Economic Commission for Europe (2004) Transport situation in Hungary in 2003	The state takes far too little role in maintaining and developing the railway network: there are no state undertakings ensuring replacements resources or financial platform to this sector	About the third of the railway network is electrified and only 17 % is double track.
International Centre for Economic Growth of Europe (2005) Transportation and Logistics in Hungary: sectoral analysis	The value of logistics services will grow in the near future by 20%. At the same time it can be stated that the future of MAV cannot be secured in the long run.	MAV has not participated enough so far in inter-modal transport, which mode of transport will be a decisive factor whether this company will survive or not.
OECD (2006) Controversial issues and difficulties regarding access to essential transport infrastructure in Hungary	The new Railways Act (2005) together with the new Hungarian Railway Office might resolve the ambitious rules governing access and operating licensing. MAV is still operating as it would be in a monopoly position.	The four new train operating companies have been granted operating licenses already in 2004, the market shares of these new independent firms are less than 0.01 %.

In the articles above shown in Table 11 the common conclusion is that the privatization process in Hungary is taking only its first steps forwards. Operations and infrastructure are

managed still in integrated manner, the management of railway undertakings are not independent from political groupings, the financial status of most operators are not satisfactory and there are not enough access right granted for private railway businesses to guarantee fair circumstances to run activities. At the same time the quality of services has not improved due to the insufficient condition of the rail infrastructure. This fact poses more challenges to cope with growing demand for house to house transport especially as the government emphasizes building motorways favouring road transport. The incumbent carries still a major dept that is all the time on its way to grow. The attitude of the government is one of the main obstacles for the rail sector to gain back its lost share from the road.

4.3. Discussion

When taking a more detailed view on the official annual reports of the incumbent companies in Poland and Hungary, it can be noticed that in Hungary the situation is much worse compared to that of Poland. The loss produced by MAV has grown between the period of 2003 and 2005 by over 240 percent from 135 million EUR to 328 million EUR. At the same time human resource related costs have been increasing by over 27 percent from 477 million EUR to 608 million EUR. At the end of 2006 the government decided to take radical measures to stop the negative domino effect - See National Union of Rail, Maritime & Transport Workers (RMT) Bristol Rail Branch (2006) Economy minister announces rail cutbacks. On the other hand from February 2007 MAV took in use a new model of route scheduling system that is implemented in coordinative manner with the National Bus Company “Volan”: on some specified lines Volan took over the responsibility to carry out transport services. The main idea of this novel solution was to save resources by downsizing the actual networks of both rail and bus and offer shorter travel time for the passengers and freight bulk products. It took very long time to realize this goal (see for example Burian 2001, 53).

In Poland the development is already on the positive track. It has to be noted that the second and the third biggest employer of the PKP Group namely PKP PLK S.A and PKP Regional Services Ltd. did not manage to turn their net result into positive, despite the significant downsizing of the employee base between 2002 and 2005. On the overall scale the amount of personnel working for PKP Group has decreased by 23 percent from 140233 to 109150 during the three years specified above. However, the positive development will not last long unless significant investment into the rail network will not be carried out. The length

of the tracks is huge – in 2004 it was 23500 km – but despite the hiding potential, road transport dominates the scheme (Nazarko et al. 2006, 14, 18; Lukasiak 2001, 48). The process of incurring investment will continue, however, even without the support of government, as efficiency advancements on these networks are essential to take place in and the "invisible hand" of the market forces will push the development forward (Hilmola 2007, 222). The role of "visible hand" is hold by the EU, which has been recognized already that the bad situation is a consequence of mainly three factors that are tightly related to each other: the infrastructure manager PLP PLK shows losses year after year that is the outcome of its responsibility to maintain a super extensive network by exposing high track access charges that the members of PKP Group cannot really afford (United Nations Economic Commission for Europe 2006, 1; Kazatsay 2006). Holvad (2006) delineates some methods to remedy these problems in the European context.

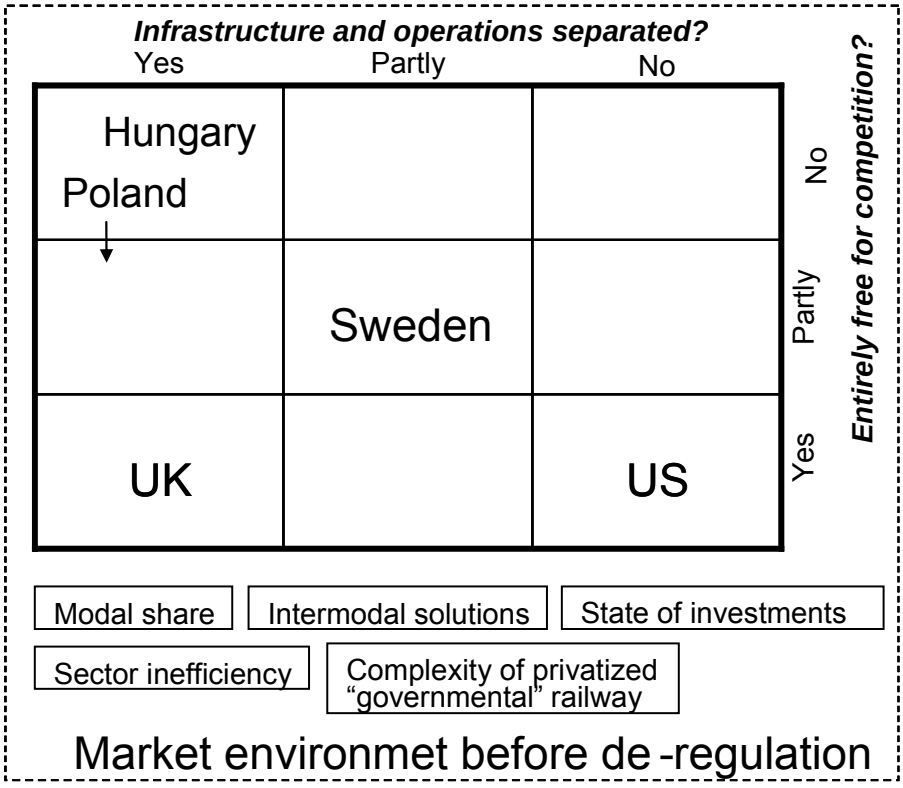

Figure 5. Deregulation framework and placement of Hungary and Poland in it.

The framework proposed by Hilmola et al. (2007) offer an appropriate platform to illustrate the process of privatization in a more visual way (Figure 5). In the table having divided into nine entities, Poland can be arguably set into the upper left corner as infrastructure has been

separated from operations in all required dimensions and an independent rail regulator has been established. Nevertheless the competition in the sector is nearly non existent as a result of the invisible power of influence of the former monopoly setting. Hungary can be put onto the same upper left corner though the process of liberalization exists mainly in theory: Over the last two decades only little significant progress has been recorded. In overall Hungary is behind Poland in terms of success of implementation of privatization of railway sector.

There have been many attempts to catch the general process of progress of liberalizing railways markets. One of the most notable one is presented by Carbajo & Sakatsume (2004), who undercover the underlying factors affecting the ability of any country to be able to progress on the path of restructuring:

1) Changes in the economy; from manufacturing to service orientation
2) The extent of influence of pressures induced by road transport on the rail sector
3) The commercial incentives elaborated for railway managers to reduce political dependency
4) The level of development of financial markets and enterprise structures
5) The adaptability of the "vertical model" bringing about growth to the rail business
6) The taken role of the private actors to solve the problem of maintenance tracks and financing of operations

In both Hungary and Poland the governments favor to build motorways as transport by tracks is much cheaper as currently the charges for the use of road are either non existent or at much lower level than on the rail lines. On the other hand, the state of development of financial markets and enterprises are not that much behind to that of Western European level and the role of private sector in maintaining and financing rail infrastructure is as prevalent as in the most developed European countries. At least in Poland most of the rail supply industry is privatized (Amos 2005, 14). There is another well established way of measuring the implementation of reform processes in which work seven criteria is set (Amos 2005, 3):

1) The amount of new railway laws elaborated and implemented
2) The organizational form adopted by the national rail operator
3) Management structures applied by the former incumbent company
4) The extent of competition and private sector participation
5) The taken model of subsidizing passenger services
6) Cultural and other business procedures enforced internally in the incumbent firm

It seems to be the case that according to this study the core difficulty in the process of liberalization is the right timing of actions and how to trigger investments from the private sector. Desired outcomes have not been achieved also as business processes internal to PKP member companies have not been accomplished. Financial imbalance between passenger and freight side of the railway business is clearly visible in the way of addressing track access charges: Freight operators pay three times more to UTK- the regulatory body - to have the right to use a particular track. Hungary is behind Poland with regard to these respects, and in particular this is so in relation to adapted management structures (Amos 2005, 14-16).

5. Discussion from analyzed four countries, and proposed privatization / deregulation process framework

The results of this analysis concerning four different countries as well as previous study of three other countries, we have developed process model for privatization development in this sector. As examples in this research show, railway deregulation process is long, concerns decades rather than years, and has clearly some distinctive phases on its route. Figure 6 shows our developed model concerning this process. It should be reminded that during the process profitability of this transportation alternative is not improving in a one night: (1) during the first phase railways are producing deficits and governmental support has been increasing for a long period of time, (2) in the second phase leading companies break-even, but governmental subsidiaries are still needed (but hopefully in smaller scale), (3) after these railway sector in general shows some minor profits, and profitability and (4) in the last phase, after years of slowly increasing profitability, also dividends increase, and eventually shareholders get interested in this sector. US and Japan are currently the leading countries, as we think about the progress in this model. However, Mexico and UK are showing signs of being in the third phase.

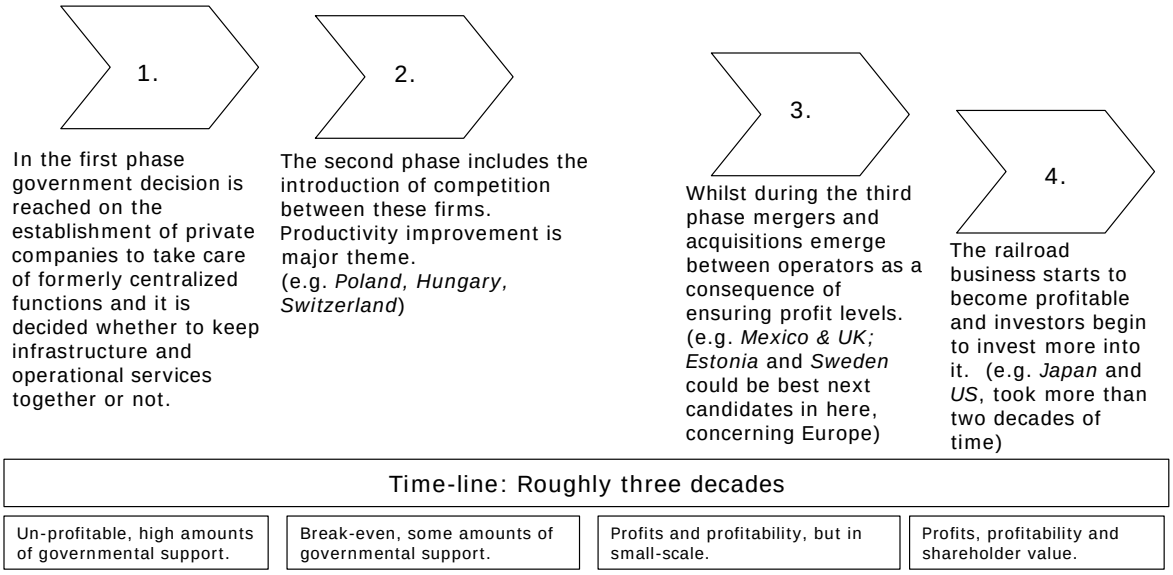

Figure 6. Railway privatization and deregulation process is decades long, and contains four different phases.

Although, in our research work Polish and Hungarian railways might have been seen in the poorer light, it should be remembered that in both of these countries there exist wholly privately owned operators, and this indicates that profitability of sector is about to appear in the near future. So, after governmentally owned companies have restructured themselves to sustain in this new environment, it could be assumed that these countries take a step towards the third phase in the process. In whole Europe this third step requires that either wholly privately owned companies gain significant share from the market, and merge with each other, or then governmentally controlled companies need to be merged within the country or between different European countries. This is the vital step towards sustainable profitability in this sector. And it could be the only step, if this sector is desired to have competitiveness with respect of other transportation modes. For example, air and road transportation are already deregulated and privatized, sea transportation is in its route for final phases. Why shouldn't railways be there too?

6. Conclusions

To summarise it is evident that the role of governments in the liberalization process of the railways industry is totally different when comparing the countries of this study. In Switzerland's case the emphasis is to trigger a more efficient shift to rail transport and to find

the optimal modal share, whereas e.g. in Japan privatization is about how to affect market dynamics to stop the "income divide" between regions and rail operators. The process in Japan has produced positive end-results already: the rail industry generates operating revenue and is not a loss providing sector of the economy. However, in Switzerland new transportation policy for turning volumes from road to rail will take some years still, and in the end we could assume the privatization of railways to have very attractive outcomes. Thus, this process takes as long time. It can be argued that while Hungary and Poland are both similar transition economies, they are at the moment very different stage in the privatization process: whilst in Hungary the process hardly started yet and the crises of rail sector is about to become serious, in Poland the progress has already been visible, showing positive results; PKP Group has the chance of being able to produce profit within the next decade. In Hungary the time might be right for radical move, such as merger or acquisition of MAV to a well established and successful foreign operator – ideally coming from the EU (alternatives are towards West European sea ports or towards Black Sea). At the same token it can be argued that for the PKP Group a merger to a Western European operator would be a viable option too though not an inevitable one.

In the further research work of railway privatization and deregulation, we would be motivated to continue within European landscape, and examine the business models of wholly privately owned operators. These could be found from UK, Sweden, Poland and Hungary. At the moment there does not exists a single study with this regard, and nearly all of the research works have been completed from the perspective of "painful" governmentally owned company transformation processes. Another side of the token is still unrevealed, and this should be taken into account, as governments are willing to make decades long process shorter. Another interesting avenue for further research would be the shareholder value creation of privatized companies in transportation systems; for example, European airports and US railways have shown really impressive returns for invested capital in long-term perspective (although, airline operators do not have that impressive long-term track record). Another fact is the risk factor; bankruptcies and total business failures are relatively uncommon in this sector, and mergers between operators have hedged investors from totally loosing their invested money. So, in the longer-term transportation sector might be one of the most attractive investment targets – moves of Warren Buffett are rarely identified as total failures, and most probably this will not happen in this time either.

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About the author(s)

Bulcsu Szekely
Project Researcher, Lappeenranta University of Technology, Kouvola Research Unit, Prikaatintie 9, FIN-45100 Kouvola, Finland, Fax: +358 5 344 4009, E-mail: bulcsu.szekely@lut.fi

Dr. Olli-Pekka Hilmola
Prof. (act.), Lappeenranta University of Technology, Kouvola Research Unit, Prikaatintie 9, FIN-45100 Kouvola, Finland, Fax: +358 5 344 4009, E-mail: olli-pekka.hilmola@lut.fi

Lappeenrannan teknillinen yliopisto
Digipaino 2007
ISBN 978-952-214-395-2 (paperback)
ISBN 978-952-214-396-9 (PDF)
ISSN 1459-3173