INTERFERENCE AVOIDANCE IN INTERMODAL SUPPLY CHAIN OF SOUTH-EASTERN FINNISH PORTS

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Abstract:

The maritime and port activities have had a growing tendency in the Eastern Part of the Gulf of Finland. Ports of the area have acted as important nodal points for the transit traffic between EU and Russia. Largest ports of the area, Kotka and Hamina have also been the main export ports of the forestry industry of Finland. It has been estimated, that the changes of the operational environment will increase both the usage of intermodal sea transportations and air freight. By these transport systems the new challenges caused by economic development, logistic demands and globalisation will be encountered. Freight transport should be faster, more precise and more reliable.

This paper discusses the disturbance management of intermodal supply chain in port related companies in the South-Eastern Finnish ports. The focus has been directed on the avoidance of various disturbances, identification of disturbances, fast countermeasures and reduction of the negative impacts of perturbations. Current strong drivers affecting the aerial logistics have also been highlighted such as the significant reduction of the forestry, pulp & paper capacity in Finland and new custom tariffs for timber in Russia and the impacts for transport planning and requirements. Finally, the current economic depression and its impacts, for example for transit traffic, has been discussed.

Keywords: intermodalism, ports, disturbance avoidance, transit, maritime transport, short sea shipping.

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1. INTRODUCTION

Intermodal transport is one of the key transport modes for the South-Eastern Ports of Finland. Close vicinity of the Russian border with the close situation of the large Russian cities, such as St Petersburg and Moscow, have contributed to the strong development of transit traffic through the Finnish ports to the Russian markets.

Kymenlaakso University of Applied Sciences (www.kyamk.fi) participated in an EU funded research project (www.merikotka.fi/safgof/) where the focus was on maritime transport development in the Gulf of Finland waters in 2007-2015. One of the tasks of this research project has been to define various disturbances and interferences affecting the intermodal supply chain. Base line studies were conducted in 2008-2009 (Rytkönen & Ulmanen, 2009), after a more detailed study on disturbances was made and reported in 2010 (Ulmanen & Rytkönen, 2010). Due to the fact that the target area is the South-Eastern part of Finland it has been quite natural to select main ports of that area for studies. Thus, two ports, Hamina and Kotka have been selected to represent case ports of this study.

1.1. Briefly on statistics

In 2009 Finnish seaborne export and import volume was close to 90 Million tons, including 6.2 Million tons of transit. Seaborne transport volumes were lower in 2009 than in 2008 (see Figure 1) due to the global economic regression. The economic depression especially hit transit traffic in Finland, and monthly transport rates dropped down temporarily even by 60%. Transit volumes of Kotka and Hamina in 2009 were 1,912 Million tons and 1,159 Million tons , respectively. Container transit figures of Kotka and Hamina in 2009 was almost 190,000 TEU jointly, while a year before in 2008 the same figure was almost 380,000 TEU. The same decreasing trend in 2009 was reflected in the total container transport rates of Kotka and Hamina being 108,000 and 346,000 TEU respectively. The total container traffic of Finland in 2009 was 1,125,000 TEU, around 30% less than in 2008. The situation now, in the moment writing this article, is again showing significant growth of both maritime and transit cargoes, illustrating the economic regression is over and much better expectations for the business is foreseen.

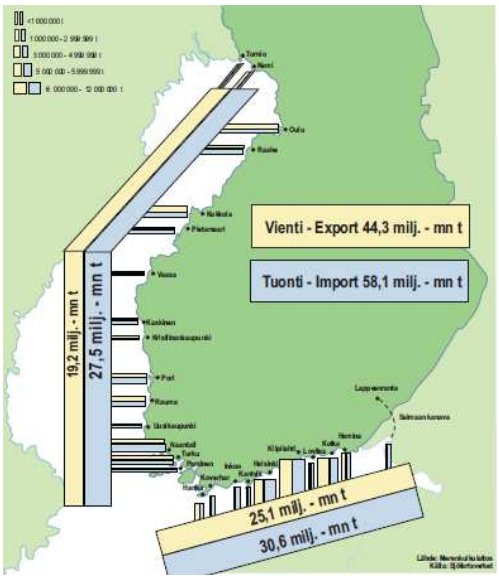

Figure 1. Seaborne foreign transport in 2008 (Finnish Maritime Administration 2009).

1.2 Port of Hamina

The Port of Hamina, shown in Figure 2, is located in the eastern part of the Gulf of Finland, close to the Russian border. The depth of the approach channel is 10 m. The port also has more than 540 hectares of water areas and close to 500 hectares land areas. Total lengths of the quays are 3,000 m for the bulk, general cargo, containers, oil and LNG. The port has warehouses with various functions and more than 100 industrial areas. Regular shipping lines in 2010 are mainly to EU ports such as St Petersburg, Lubeck, Gdynia, Bremerhaven, Hamburg, Vlissingen, Efesos, Heraklion, Saloniki and Tilbury. There are also regular lines to Baltimore USA.

Figure 2. Layout of the Port of Hamina (www.portofhamina.fi)

1.3 Port of Kotka

The Port of Kotka is located around 20 km west of the Port of Hamina. It has several terminals and also constant daily shipping lines to Europe. Regular liner services are for example to the ports of Gothenburg, Tallinn, Sillamäe, Lübeck, Hamburg, Bremen, Bremenhaven, Felistowe, Amsterdam, Rotterdam and Antwerp.

The Port of Kotka is the leading export port of the Finnish wood processing industry. It is also the most significant transit cargo handler in Finland. The locations of the main terminals of the Port of Kotka are shown in Figure 3.

Figure 3. Terminal areas of the Kotka Port (www.portofkotka.fi).

Mussalo Terminal

In addition to the Container, Bulk and Liquid Terminals, Mussalo offers a large logistics area where various logistics and forwarding companies complement the services of the port itself.

The Mussalo port and logistics area currently encompasses 500 hectares. There is a total of 275,000 square metres of heated and unheated warehouses for the containerisation, handling and intermediate storage of export and transit goods. Many of the warehouses in the area have a direct rail connection.

Hietanen RoRo and Car terminal

The Hietanen Terminal has gone through many changes since it was originally built in 1971. Initially constructed as a RoRo terminal, Hietanen also handled container traffic which arrived in Kotka in line with new traffic trends. The actual Container Terminal in Kotka was completed at Mussalo in 2001, which opened new perspectives for the development of RoRo traffic at Hietanen.

The car terminal business was launched at Hietanen in 2003. Car compounds have been built in stages, and presently there are 90 hectares of areas for the storage of cars. In 2006, a total of 205,500 passenger cars were transported through Kotka, primarily for the Russian market. The cars are mainly carried by road, but the Hietanen Car Terminal also now has a ramp for loading cars into car transporter wagons, enabling rail carriage of cars to the destination.

Hietanen houses a warehouse of approximately 8,000 square metres for the containerisation of SECUs (Stora Enso Cargo Unit). The SECUs are shipped from Kotka to Gothenburg in Sweden, which serves as the hub for SECU traffic.

City Terminal
The City Terminal, the oldest part of the Port of Kotka, has gained a new appearance. The City Terminal is divided into two parts, a cultural harbour and a commercial harbour. The commercial harbour encompasses cargo and passenger traffic. Cargo traffic continues to consist of Finnish pulp, paper and sawn goods.

The authors of this article also like to inform the audience on the new situation between the Hamina and Kotka maritime ports, which in the end of 2010 made the decision to start the new life under a joint management, thus joining the forces and getting more efficiency to the operations and service concepts.

2. RISKS RELATED TO INTERMODAL SUPPLY CHAIN

2.1. Methodology used for identifying risks

A questionnaire survey was conducted by the Kymenlaakso University of Applied Sciences between late autumn 2008 and spring 2009. The target audience of the survey was the port-related companies in the ports of Kotka and Hamina. These ports were selected due to their importance in the transit traffic between Finland and Russia and their growing role in the intermodal transport development.

A set of questions to define risks were prepared for the following group of stakeholders:
- port owners
- customs
- stevedoring companies
- forwarders
- shipping companies
- terminal operators
- transport companies (trucking) and
- railroad provider, VR Cargo

The internet based ZEF-tool (Z scored electronic feedback) was used in the questionnaire with the possibility also to leave comments and answers in free format. In this study the answers were sorted by an absolute reporting way where the mean value of each answer is printed based on a given number of the value (0...3).

Both the frequency of the pre-defined disturbances as well as their consequence level was asked to be defined. Answers were then grouped and printed shown in Figure 4, where the horizontal axis corresponds to the consequence level. Vertical axis is the frequency, thus the shown location of a certain number of question gives the expected risk (defined: risk is frequency x consequence). The ellipse drawn round each number shown corresponds to the standard deviation of the particular answer.

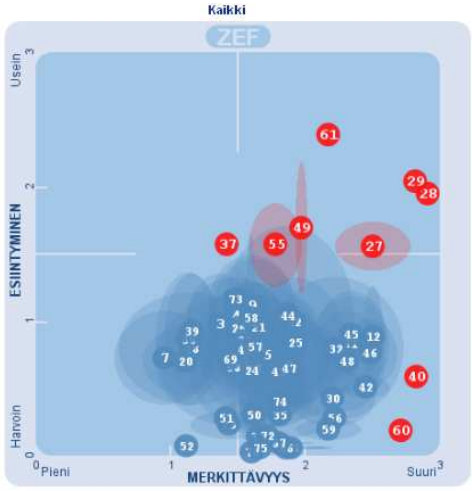

Figure 4. Example of the ZEF output. Horizontal axis corresponds to consequence level and vertical corresponds to the frequency.

For analysing and reporting, the risk matrix shown in Figure 5 was used. Each processed group of answers was analyzed using the grouping principle of the matrix. The principle here follows the general ALARP (as low as reasonable practicable) definition, where the consequence of certain disturbance increases when going from the bottom left-hand corner up towards the right. The frequency level in turn grows upwards from the unlikely event up to the probable and regular event.

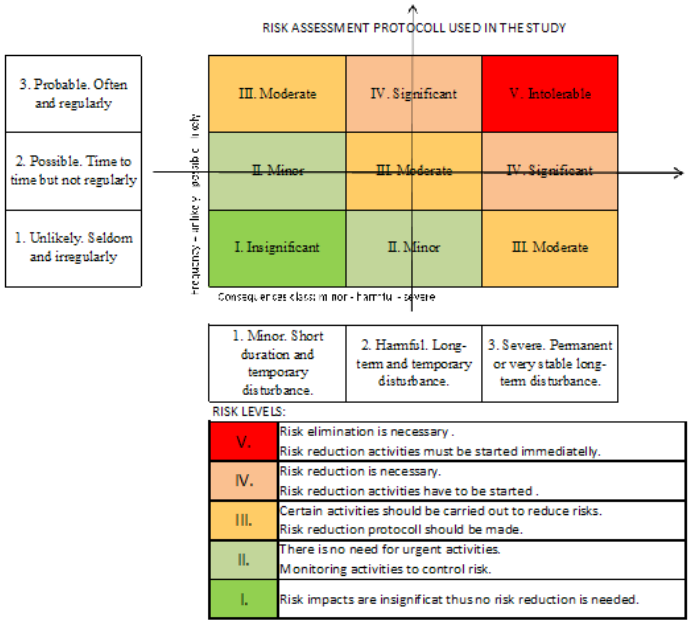

Figure 5. The risk matrix.

3. RESULTS

3.1. Port owner's view on the interferences

All answers have been analysed and presented in (Ulmanen & Rytkönen 2010). Here only the principle of ZEF type visualisation is shown as an example. More detailed presentation with the graphics is shown in the oral presentation of this paper.

The intolerable interferences defined by the port owners are:

- the lack of field and storage capacity for empty containers
- the lack of space for cargo containers and
- interference related to the weighing systems for trucks

Significant risks in turn were identified among the lifting capacity of cranes and various accidents and near miss situations in ports. Lifting capacity of containers in these ports was earlier defined to be not well exploited (Niiranen et al 2007), which could be one reason for this evaluation. The possible risk control options to solve the lifting capacity problems is one of the findings to be studied later in this project.

Moderate risks were identified related especially to loading and unloading phases, safety and security items. The frequency of these risks was estimated to take place rather seldom, while their importance in consequence level is significant. Other typical moderate risks were:

- crane services and problems related to SECU storage areas
- bilge water reception facilities
- IMDG markings
- labour safety aspects
- lack of workmanship, training
- human error
- ICT network
- gate monitoring and
- fire warning systems

3.2. Customs viewpoint

Answers given by the Customs showed no intolerable risks related to the supply chain management or operations. However, terminal related activities were identified to have significant risk for certain duties. The frequency of these events, however, was estimated to be rather rare thus these risks were not kept significant in reality. One of the interesting definitions was problems and risks related to dangerous goods transportation, thus this item was later selected for further studies (Maijanen S. 2010). Here the focus was directed to the proper documentation practices and experiences gained from the field.

Risks belonging to the moderate level were all in relation with custom declaration processes. Customs also pointed out some importance of the disturbances in gate processes with an adequate information sharing service.

Moderate risks were also identified among dangerous goods transportations, in proper labels with RID containers as well as in deviations of the IMGD-documentations.

Finally, failures and short cuts of the ICT systems were noted to have moderate risk for the customs daily work. A special item defined here is the interface between the customs ICT system and other stakeholders. As a curiosity, the fire warning system was also identified by Customs as a moderate risk for operations. The fire warning system came up in every group of answers, which obviously is a case to be studied at first hand.

3.3 Stevedoring viewpoint

Only two significant risk items were identified by stevedoring companies: deviations in the transport documents and problems related to operative systems. However the deviation among

the answers point out that some of the stevedoring companies have suffered more problems and disturbances than others.

Moderate risks identified were the lack of advance information or problems related to information sharing, missing documentation and the lack of workmanship and training. All these identified disturbances had a rather low frequency. Bad workmanship and the need for training were subjects defined by all the stakeholders. These subjects have been selected to be developed at Kymenlaakso University of Applied Sciences: In Finland the staff of the stevedoring companies are all trained by an 'on-the-job' principle. Thus, already in 2010, special refresher lectures and virtual training sessions will be arranged for this group.

Moderate risks were also identified related to ICT systems, causing delays and confusion especially regarding container and truck handling in the area. The occurrence of these problems has been small indicating quite high reliability of the operational and management systems. Weather related problems were also identified here to have moderate risks for the operations. Port related companies are usually well protected against the weather and seasonal changes. The sudden change of weather however, usually causes delays and problems for cargo handling and trucking. Cleaning of roads, snow blowing etc operations are often run by outsourced service providers with predefined content of the contract having a limited space for extraordinary weather situations. Preparedness against major weather related deviations may differ a lot in different ports.

3.4 Forwarder viewpoint

Answers of the forwarding companies are shown in Figure 6. The general view of the figure shows a lot of identified risks close to the significant level. Most part of the risks however, can be listed in the moderate category. All answers also show significant deviations in most of the answers, especially in horizontal level.

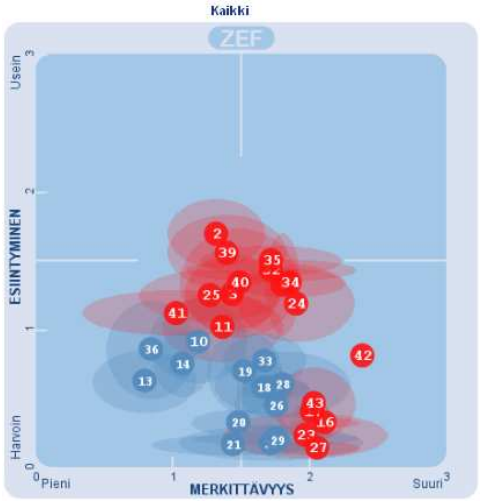

Figure 6. Operative risks identified by forwarders. Note there are a lot of events having rather high occurrency frequency with a significant consequency.

Moderate risks identified here were, for example:

- weather related interferences to ICT, container handling, gate control etc
- delays in services and/or deliveries
- capacity problems of parking areas

- railroad forwarding
- lack of training and qualification
- operative and management systems
- deviations within cargo/failures in car transportations
- dangerous goods etc

Failures related to vehicle transportation was one of the cases selected for further analyses (Hanhela, A.2009) due to its importance especially for the Port of Kotka.

3.5 Ship Owners viewpoint

Ship owners identified in total five significant interferences which may endanger their business activities in the intermodal supply chain management. These items were:

- weather related delays for loading and unloading in ports
- insufficiently prepared cargo documents
- dangerous goods transportation
- fastening of cargo onboard generally
- human impact, near miss situations and accidents

Among the above listed disturbances causing significant risk there were a large group of moderate interferences. Although weather or seasonal variations do not play a significant role for shipping companies they may have negative impacts on the economics of the transport chain: strong winds and waves may increase the fuel oil consumption of a ship, causing delays for schedules. Winter navigation with ice may also require special arrangements with fairways and ice breaker support incurring extra costs.

Moderate level disturbances were identified with bilge water reception facilities (services), forwarding, fastening of containers onboard a ship, improper workmanship and lack of training.

3.6 Terminal operators viewpoint

Terminal operators defined two significant interferences, i.e. the use of outsourced labour and the lack of training or bad workmanship. These findings strengthen the author's opinion of the need for refresher courses and the creation of virtual educational material for the staff of the terminals.

Terminal operators also defined a lot of moderate interferences such as capacity problems of the terminal, disappearance of cargo documents, labour safety, disturbance in the warehouse management system, fire warning system etc.

3.7 Transport companies viewpoint

Answers of the transport companies (trucking) highlighted almost only insignificant problems. Only moderate "pain" was defined related to the reception (gate) services and the lack of information. Information related problems will further have their influence on schedules and delays. Mobile terminals of the cockpits do not often have a good enough interface between the terminal operators ICT system.

3.8 Railroad company viewpoint

Almost all respondents identified only minor disturbances in their work. Only interference classified to have moderate risks was related to unclear markings in RID containers (dangerous goods) and weather related problems for locomotives. Railroad experts generally considered weather problems to very seldom exist, typically caused by snow and ice. Icing of switches of the rails is a typical problem related to the winter, and can be a problem during heavy snow or rainfall. Experience from the last snowy winter however, showed the vulnerability of the rail system at many levels. Snow caused a lot of problems and delays for passenger trains, and a lot of extra man-hours were used for keeping rails and switches free of snow and ice. There was a lack of manpower for carrying out cleaning and maintenance operations in time.

4. DISCUSSIONS

The main aim of the study, briefly reported in this paper, was to find out interfering parameters affecting the intermodal supply chain management in ports. The target ports selected for the study were the main ports of the South-Eastern part of Finland, i.e. Kotka and Hamina. Both ports are important export ports of the Finnish Forestry Industry having also a growing importance in container and transit traffic. Kotka port has also been the largest transit port of new vehicles to Russian markets. Dangerous goods also form an important factor for the throughput of these ports.

In order to define different disturbances in ports a questionnaire survey was made for the stakeholders. Both electronic questionnaire format and free format questionnaire were used. The survey was carried out between autumn 2008 and spring 2009, when the economical regression also strongly hit the maritime business of the target area: both export and import figures in 2009 were around 20% smaller than the previous year, and transit figures even lower. Thus some of the risks identified in this survey perhaps reflect more the situation just before the crisis.

However, the survey clearly identified a group of risks related to the intermodal transport chain. Both frequencies and consequences of interferences were estimated and classified into different risk classes. Some findings made were further selected to be studied in more detail to define suitable risk control options or best practices to avoid unwanted events.

The aim of the authors of this study is to continue to find out better risk control options to be used in the target ports of this study. Thus a set of small projects and studies will be carried out to produce tailor-made solutions to avoid risks identified in operational procedures. The focus is also directed on finding out best practices and lessons learned for other ports than the target ports of this study with tailor-made courses for the stakeholders. The next step is trying to evaluate the impacts of global changes and restructuring the development of the area

5 CONCLUSIONS

This paper was focusing on the disturbance management of the intermodal supply chain in selected South-Eastern ports of Finland. The base line idea has been to define risks related to operational procedures and to look at suitable risk control options for stakeholders.

After the risk identification phase risk control options will be defined by brainstorming sessions with the stakeholders and also by small-scale studies conducted by students of the University. An important part of the study has also been to define best practices and lessons

learned and to assist all the stakeholders to better understand the need of other players related to the supply chain management and to develop a proper interface with certain harmonised procedures and reliable practices.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to all stakeholders related to this study. Stakeholders here represent almost all main players of the ports of Kotka and Hamina with experts from stevedoring companies, forwarders, terminal operators, customs, truck companies, ship owners and port owners. Identified risks will also form a valuable platform for further development of the University's plans to offer further education for stakeholders in the form of tailor-made refresher courses and virtual education material on the Internet.

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