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ANALYSIS OF INTERMODAL TERMINALS SERVICE QUALITY IN THE REPUBLIC OF CROATIA

ABSTRACT

The most common problem that the terminals face is inadequate infrastructure, long waiting times, delays, malfunctions, and unexpected problems due to which terminals are often congested for a long time, high costs, lack of expansion, etc. All this leads to reduced quality of services and the price increase for the user service. These problems do not occur only at the terminal of one type, but at all terminals. At present, the delays and uneconomical operations are unacceptable. Intermodal terminals are not immune to any of the above. In order to increase the service quality and to reduce the cost of transportation and transmission, all the bottlenecks in the process are detected and analyzed in the work. The identification and removal of the bottlenecks in the processes of transport and transfer from the initial to the final terminal increases the quality of services provided to customers. The quality of services includes shorter time of transport and transfer by using shorter routes as well as the acceptable price of the service itself.

KEY WORDS

intermodal transport, service quality, quality indicators, performance indicators, business excellence

1. INTRODUCTION

The competition requires competitiveness, which means that in the conditions of competition the markets need to be competitive. According to the standard HRN EN ISO 8402 the definition of quality is: the quality is the totality of properties of certain entities that make it able to meet the needs which may be stated or implied. After auditing the year 2000, the official definition of quality according to ISO standard 9000: quality

is the degree to which a set of inherent characteristics fulfills their requirements. The issue of quality is a key problem for intermodal transport. Delays in the chain of intermodal transport are often the major obstacle to the possibility of defining an international comparison of competitiveness on the transport market. Given that road transport is often more flexible and serves a particular segment of the market in time-defined products, intermodal transport services are characterized by unreliability.

Naturally, this does not apply to all intermodal services. The main problem in intermodal transportation is the interface or the reloading in the terminals or ports. The processes and operations at the terminals are therefore the most susceptible segment of the total transport chain. External factors often influence the inefficiency of the intermodal transport system. Therefore, the first step is defining the indicators of service quality of intermodal transport of intermodal transportation and the whole intermodal chain. Quality and price are key criteria in choosing the transport mode for freight transport. The most important indicators in relation to quality include: reliability, timing, frequency and flexibility. The success and effectiveness of processes within the intermodal transport chain greatly influence their quality and costs, and the whole service from sender to receiver. Intermodal transportation requires cooperation between many actors, who provide different services within a large geographical area. Intermodal terminals and transfer points are interface between related fields of transport (railways, roads, inland waterways, short sea shipping). The quality of services at terminals and efficiency of the process (i.e. input-output procedures, transshipment, storage, load-

ing/unloading) directly determine the quality and cost of the whole intermodal transport chain.

The users and potential users (shippers, logistics service providers, intermodal service providers etc.) of intermodal transport and also the operators (terminal operator, pre-and end haulage transport companies, railway and shipping companies) have big interest in high-quality service at low costs. The development of intermodal transport in Croatia depends directly or indirectly on several factors, such as: development per industrial branches and regions, macro-economic policy, level of attracting foreign investments, competitiveness of products and quality services on the market, etc. [1].

The purpose of the research presented in this paper is to identify the indicators of performance, quality and excellence of intermodal transport with the aim of quantifying the characteristics of the competitiveness of intermodal transport in the Republic of Croatia. Defining performance indicators, quality and excellence of intermodal transportation is a requirement of strategic consideration and planning, investment planning which is a precondition for the development of intermodal transport and the basis for future development of the Croatian traffic system. In the process of preparing for the Croatian membership in the European Union it is necessary to identify, understand and quantitatively evaluate the potential for future economic development and transport systems and the development of environmentally friendly modes of transport (intermodal transport) as mandatory.

2. PERFORMANCE AND QUALITY INDICATORS OF INTERMODAL TERMINALS

Intermodal terminals and transfer points are important interfaces within intermodal transport chains. The quality of services at terminals and the efficiency of terminal processes have considerable influence on the quality and costs of the whole transport chain.

The main important studies for the analysis of relevant indicators of quality have been:

- OECD (2002): Benchmarking Intermodal Freight Transport. Paris. 2002.
- IQ Consortium (1998): Intermodal Quality Deliverable 1: Model for evaluation of terminal performance. Report Number 1.2.4. Brussels. 1998.
- ECMT (2000): Transport Benchmarking – Methodologies, Applications & Dana Needs. Paris. 2002.
- TfK Transport Research Institute (1999): Benchmarking container terminals. Gothenburg. 1999.
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Distinguishing between quality indicators and performance indicators was done in this paper. The quality indicators describe the service level of a terminal, whereas performance indicators describe directly the productivity of a terminal or terminal processes. By increasing the productivity a terminal can handle more intermodal transport units (ITUs) with less resource and therefore improve its profitability. The productivity is influenced by factors that also in other ways influence the profitability. This means that when a terminal strives to improve the profitability by altering these factors, the productivity might be affected.

Quality indicators have to describe the relevant services and processes at terminals relating to intermodal transport considering the main quality problems today [2]. The indicators should cover the following quality dimensions (IQ, ECMT and other studies dealing with quality):

- Time (waiting time for trucks in the terminal area, etc.);
- Reliability (incidence of train delay in departure, duration of train delays, etc.);
- Accessibility (opening times, loading closing times, rail accessibility time, etc.);
- Flexibility (reaction to short-term customer requirements, etc.);
- Safety, Security (% of cases with damage to goods, % of cases with loss of goods, etc.);
- Service in general,
- Frequency.

Whereas for customers (users like shippers or logistics service providers) the quality indicators are more of importance, for terminal operators the performance indicators are of more interest. Public authorities are interested in both, the quality and performance indicators. The terminal users want to know what quality level and services are served at a terminal, whereas terminal operators should be interested in benchmarking their own performance with competitors. For political authorities, quality and performance indicators are of interest because with high quality and efficient intermodal services the modal shift can be supported and they could base their funding for new terminals and terminal extensions on performance results and quality of services [3].

3. ANALYSIS OF INTERMODAL TERMINALS QUALITY INDICATORS IN CROATIA

While analysing transport in the Republic of Croatia and intermodal transport the main problems are related to: comparability of the indicator, availability and accessibility of data, collection effort (in case data are currently missing and have to be collected from operators' side) and measurability.

For research purposes a survey was conducted with major subject involving the work of intermodal terminals. The survey was conducted in land and maritime terminals. The method of survey was interviewing the decision makers (CEO, etc.) and middle management (managers at terminals) [3].

The current state of transport sector in the Republic of Croatia is characterized by:

1. Lack of a uniform set of statistical methods as a methodological starting point for the analysis of the transport sector: cargo and passenger transport;
2. Discrepancies between data on the transport/traffic are the result of non-implementation or poor implementation of quality control data and the lack of harmonization of business statistics of transport operators, ports, port authorities, carriers and others involved in the transport sector;
3. Content and methodological inconsistency of the methodology of data collection and processing in the RH data with EU member states (overlapping data);
4. Insufficient credibility and authenticity of data collected by the communication, navigation and control system (video recordings, sensors, GPS);
5. Obstacles in the preparation, signing and implementation of research and development projects in the field of transport caused by incoherent data on the cargo and passenger transport and the lack of specific data in Croatia that were standard in the EU and the starting point of research;
6. The need to introduce the fundamental principles of quality management data in the field of transport.

The availability of statistical data is often a bottleneck for transport system analysis and especially for intermodal terminal analysis. At international level, the data on certain transport modes, and especially for terminals, are not available. Therefore, the need and availability of data is also an important factor for the assessment of the indicators that can be suitable for a description of performance or quality of terminal processes. Also, statistical data exist but are not accessible. The terminal operators and intermodal operators consider certain data as confidential and do not disclose them.

Statistics for intermodal performance is well done in railway and maritime transport, for other modes there is no methodology for collecting statistics for intermodal data. In the future it will be necessary to make a common structure for collecting intermodal statistics regardless of the transports modes. Figure 1 shows twenty-foot equivalent unit (TEU) of transport performance for railway and maritime transport in the Republic of Croatia from 1999 to 2009.

In case of performance-related indicators used for comparison, relative values are more suitable than absolute values. To some extent also the relative values are better for a quality comparison (for example: damages per loading unit or energy consumption per loading unit). The quality and performance indicators should also address the problems identified by analysing the terminal processes and services to initiate solutions for the main problems [4].

Analysis of intermodal terminals quality indicators in Croatia was done by the analysis of the sea ports, inland waterways ports and land terminals.

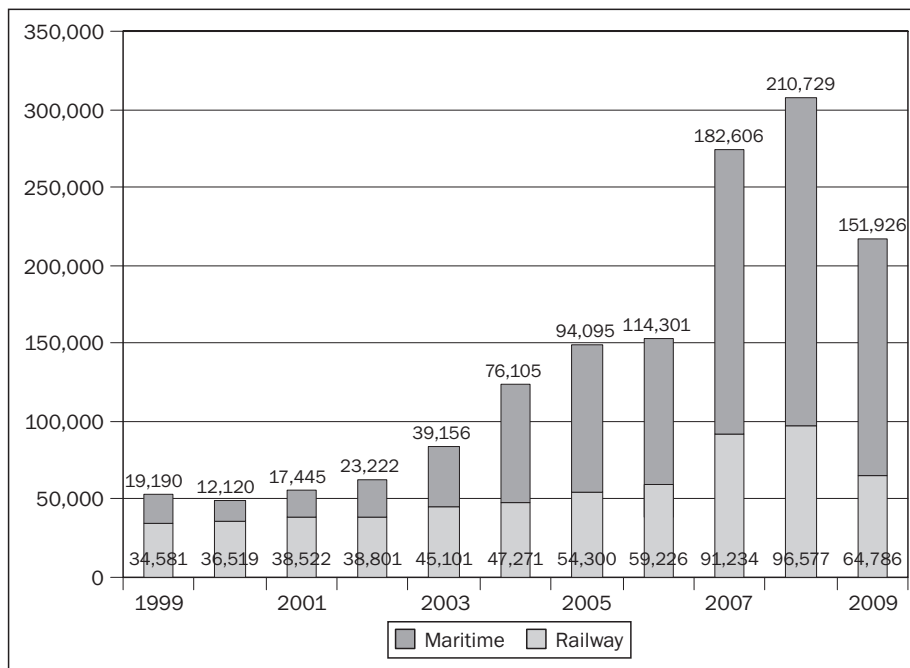


Figure 1 - TEU performance in the Republic of Croatia

3.1 Sea ports

The Croatian coast is 1,777.7km long, and the total length including island coast is 4,012.4 kilometres. The former political and economic circumstances were favourable to the creation of a considerable number of ports and small harbours on the Croatian coast. Out of 350 ports and small harbours on the coast and islands, seven can accommodate large ocean-going ships, all of them located along the mainland coast. Among them are also the following seaports: Pula, Rijeka, Zadar, Šibenik, Split, Ploče and Dubrovnik, which are considered to be the main Croatian public ports. The above-mentioned seaports are variously positioned in relation to the macro regional and geographical status in general. That determines also their operational focus and position with respect to the targeted areas on the mainland.

The following problems are specific and were identified for sea port terminals in Croatia as of medium or high importance:

- Long vessel waiting times re-scheduling due to port congestion: In peak times, vessels have to wait offshore before they are unloaded, which is related to capacity bottlenecks;
- Low level of information integration among port community: a port encloses a high number of stakeholders;
- Insufficient mooring space: a capacity bottleneck that has to be eased by (costly) extensions or through shortening of berth time;
- Not flexible infrastructure to increasing ship size;
- Much longer development lead time of terminals than vessel dimensions and containerisation of traffic.

3.2 Inland waterways ports

The Croatian river transport is an integral part of the European transport system. River transport is among other modes the most cost-efficient and ecological one. So it is an acceptable mode of transport and for the commodity flows, notably of bulk cargo, these are being redirected to inland waterways. Four Croatian inland waterway ports are studied: Sisak, Slavonski Brod, Osijek and Vukovar. As a result of this research the following problems have been detected.

Organizational problems:

- Difference between operational concept of rail transport and terminal design: a terminal that had been initially designed to be served by wagon groups is now served by full trains, with different requirements, e.g. relating to track length and transshipment times.

- Low influence of terminal operator on train arrival and departure: during scheduling of rail services, the terminal operator only has little influence. If the terminal operator is the combined transport operator at the same time, it is possible to negotiate the departure and arrival times.
- Missing cooperation between terminal operators and logistic service providers (information exchange, time planning, etc). Missing cooperation results in inefficiencies in physical processes as well as in information and communication flows.
- Missing added value services at terminals: Added value services such as container repair, hiring and selling of containers, energy for refrigerated units, etc.

Management and operational problems:

- Restricted terminal opening times: the customer service is limited by too short or unsuitable opening times, which might not comply with the consignor's logistics concept. The customer can also be additionally charged for the restricted opening times.
- Inefficient internal administrative processes: this problem includes all document handling, customs clearance and checks and controls. These processes can be often optimised. Inefficiencies here directly result in higher costs for labour and a sub-optimal usage of infrastructure.
- Insufficient security management systems: demands for the protection of transport units against theft, sabotage and terrorist activities increase. The security provided by terminals is often lagging behind.
- Poor real-time monitoring of operations: in case of operational incidents, reaction times are too long and no measures can be taken in case of unrecognised delay or problem.

Infrastructure-related problems:

- Insufficient crane/handling capacity;
- Incompatible transport means / load units / terminal equipment: problem occurs when necessary investments and adjustments to new developments in demand failed to be done;
- Poor railway connection between main line and terminal/port: possible bottleneck in the rail side accessibility of the terminal;
- Lack of space for storage area (port of Vukovar);
- Lack of exclusive parking area: generally insufficient parking space for trucks at the gate and within terminal area (port of Vukovar).

3.3 Land terminals

Land terminals are essential links in transportation chains between surface modes and connection to end

user (recipient/sender). Therefore, it is necessary that land terminals have rail and road sub terminal. Due to the lack of transport planning today there are still many land terminals only with road connections. And if they want to survive on the market they need to become rail terminals as well.

The following problems are specific for rail/road land terminals and were identified as of medium or high importance in Croatia:

- Unsatisfactory infrastructure in gateway terminals: rail-to-rail transshipment has specific requirements concerning infrastructure and operations. When a terminal function is extended towards a gateway, adjustments might be necessary.
- Not suitable terminal location: The location of terminals is not always suitable or will become less suitable over time. From a superior point of view the development of goods flows may come to a point where a terminal location has to be changed.

4. BUSINESS EXCELLENCE – DEVELOPMENT STRATEGY OF INTERMODAL TRANSPORT STAKEHOLDERS

The issue of “quality” has become evident in the transport industry, whereas the influences of quality on the customer’s perception and customer behaviour have become the main factors that affect the final customer’s decision regarding the selection of the transport mode and traffic concept. The quality can be considered the main factor of long-term competitive success and of customer’s satisfaction. The total quality management (TQM) is a product of complex combination of strategic business components and management practice.

In the field of traffic technology, quality has been considered lately with increasing attention. Qualitative and/or quantitative results related to the development and management approaches to the stakeholders of the traffic system have been defined. The business excellence has been accepted as a possibility of redefining the development strategy of the stakeholders.

Achieving business excellence should be implemented by the stakeholders. Business excellence must be a development strategy which includes three aspects:

1. technical aspects and efficiency,
2. time harmony and reliability, and
3. safety.

The total quality management of the transport service is defined by means of the following criteria:

1. Frequency, minimal size of delivery, collection and delivery according to “door-to-door” principle, safety and reliability;

2. Possibility of using transport means whose technical characteristics correspond to the physical requirements of freight and traffic flow parameters;
3. Availability of correct and reliable information on the freight status during transport and usage of the freight tracking system;
4. Presence of the market approach to determining (negotiating) the price-quality relation of the service;
5. Possibility of resolving border-crossing procedures.

4.1 Intermodal transport management activities for achieving intermodal transport excellence

To define the activities that need to be undertaken in order to achieve business excellence the double approach has been implemented: A) analysis of External Quality Assessment (EQA) criteria context, and B) literature on intermodal transport. The research results are presented in *Table 1*. The first column of the table shows EQA criteria, and the second one presents the elements for the realization of excellence in intermodal transport industry. More precisely, the qualitative analysis of EQA criteria leads to a set of activities, policies and strategies that have to be taken into consideration as basic culture and practice of quality management in performing the business excellence model in intermodal transport total quality.

The literature on management is oriented mainly to functions, logistic chains and resource management, rather than technological processes and stakeholder-customer relation. Only a few authors mention the issue of total quality management in the transport industry [4].

The development of human resources is among the most important priorities of intermodal transport development processes. There are approaches that consider that human resources and knowledge management, rather than technology and capital, are the key elements for successful development. Education regarding health protection and safety at work, as well as ergonomic improvement of freight equipment meets the labour requirements [4].

Due to the functionality of intermodal transport, the focus of researching business excellence in the area of traffic technology lies on the research of the intermodal terminals. The main “position” of the port towards the supply chain offers to big ports the possibility of developing logistics with added value, whereas horizontal and vertical integration and networked port operation can reorganize seaports into important hubs within the logistics system. The existing common initiatives between the private sector and the port authorities regarding the development of information systems are oriented to serving of common interests

Table 1 - Activities in order to achieve business excellence in intermodal transport industry based on the analysis of EQA criteria

EQA criterion	ACTIVITIES OF INTERMODAL TRANSPORT MANAGEMENT IN ORDER TO ACHIEVE BUSINESS EXCELLENCE: DIMENSIONS OF THE TRAFFIC SUBSYSTEM WITH TOTAL QUALITY
1. Management ENABLER	<p>Long-term dedication to TQM and distribution of resources for quality organization.</p> <p>Management culture at the level of the traffic subsystem (involved in management, teamwork, process control, education, etc.)</p> <p>Engagement of employees in realizing specific goals, authorizations and motivation of employees.</p> <p>Focusing on the change in management techniques and improvements.</p> <p>Determining the vision and mission for a company and implanting of excellence values.</p>
2. Policy and strategy ENABLER	<p>Definition of stakeholders and their expectations from means providers, regulatory bodies, community, competition, users, employees, suppliers, shareholders, partners, communities – alliances of transport operators, networks, development of horizontal and vertical partnership.</p> <p>Information management (<i>information on the structure of subsystem of stakeholders for the needs of strategic thinking</i>).</p> <p>Development of strategic business plan (<i>using techniques such as balanced scorecard</i>) based on the vision and mission (<i>division, analysis and updating of plans</i>).</p> <p>Development of management and support process (<i>quality and safety management, human resources management, communication with stakeholders, information system, financial processes</i>).</p>
3. People ENABLER	<p>Explicit definition of subsystem personnel (<i>employees who have full employment, who work part-time, auxiliary workers, workers with limited work contract, volunteers</i>).</p> <p>Development of human resources management plan.</p> <p>Development of assessment process (<i>prizes and awards for employees</i>).</p> <p>Development of employees – education – authorization of employees (<i>development of teams dedicated to excellence</i>).</p> <p>Feedback on the employees' satisfaction – management process.</p>
4. Partnerships and resources ENABLER	<p>Defining of double strategy and culture for resource management: a) within the organization, and b) outside the organization (<i>partnerships and suppliers for public sector, competitive businesses within the transport industry</i>).</p> <p>Defining of partnerships between (<i>organization, enterprises, etc.</i>) all those who are related to the technological subsystem activities, that create additional value for the users (in some examples, <i>competitors can be partners</i>).</p> <p>Defining and management of "internal" resources through 4-fold analysis: a) finances, b) buildings, technology and equipment, c) technology, d) information and knowledge.</p> <p>Partnership of the private sector and management in developing the information systems.</p> <p>Interactive information exchange between subsystems and its users through formal processes.</p>
5. Processes ENABLER	<p>The development of management culture based on the processes rather than functions.</p> <p>Development of the process model: <i>determining and construction of key and auxiliary processes as part of the strategic plan, in order to satisfy the needs of stakeholders</i>.</p> <p>Connecting of processes with specific measuring factors (<i>inclusion of horizontal and vertical integration of ports as element in the transport chain</i>).</p>
6. Users results RESULTS	<p>Users are all those who receive products and/or services.</p> <p>Every traffic subsystem functions as a user-oriented organization measuring the satisfaction of the external users.</p> <p>Key business indicators are the users' satisfaction, users' fidelity and their values.</p> <p>Segmentation of users leads to specific measures, i.e. special terminals intended for and available to the most important users.</p>
7. Results of people (employees) RESULTS	<p>The employees should be considered important stakeholders.</p> <p>The employees' perception is measured by their satisfaction and motivation.</p> <p>Development of internal specific measures for employees' performance.</p> <p>Special strategy is developed to inform all the employees about the results of the port and employees.</p>
8. Social results RESULTS	<p>Defining of the position of the traffic subsystem using the elements of cooperative civil strategy and influence in relation to the "Society" in the sense of individuals or groups affected by technological activities, apart from personnel, external customers and suppliers.</p> <p>Cooperative civil action in the traffic subsystem refers to at least five policies: a) individual safety, b) long service life of the port, c) resources preservation, d) harmony with the local community, and e) contribution to the public interest.</p> <p>To a certain extent this 5-fold strategy of cooperative action can be measured.</p> <p>Defining of communication strategy of the traffic subsystem regarding social results.</p>
9. Key effects – results RESULTS	<p>Defining of key results of business regarding strategy of the traffic subsystem, quality, plans and customers' experiences.</p> <p>Presentation of key business results according to key results (both financial and non-financial) and according to measures and indicators of key results (tonne, time of service, time necessary to handle freight, environmental standards, revenues from using berth per tonne of cargo).</p> <p>Business results have to be clearly related to the ownership status.</p> <p>Building up of control and/or management culture based on the measurement results.</p>

Source: Jolić, N., Kavran, Z., Lazibat, T.: *Business excellence in the field of traffic and transport technology, Business Excellence*

and providing the necessary information. Therefore, the process criteria refer to the development of the management culture based on the processes.

Efficient action of the environmental management system (EMS) and continuous monitoring of the internal conditions and the conditions on the market require inputs through a formal procedure. Rising environmental awareness allows stronger cooperation with the local authorities regarding the implementation of EMS. Furthermore, the initiatives of "corporate management" have very high priority oriented to the building up of trust and credibility of intellectual capital, development of social responsibility towards the local authorities, regulatory bodies, etc.

5. CONCLUSION

For efficient operation of intermodal transport system, cooperation between all the subjects involved in the system is necessary. The efficiency and effectiveness of the processes within a system of intermodal transport affects the quality of service due to its size and complexity.

The paper is an analysis of land and water intermodal terminals in Croatia. Furthermore, the specific problems for individual terminals have been analyzed. As the main observed problems are the organizational problems in the management, operational problems, and problems related to infrastructure. By identifying these problems [3, 4] a list of quality and performance indicators was made. The sample of indicators can be used for further development of the indicator and the system of quality assessment. Given that the organizational problem has been seen in all types of intermodal terminals and identified as one of the key issues, the paper proposes actions to achieve excellence in the management of intermodal transportation system using the EQA criteria.

According to the research, the paper has defined the elements for the realization of excellence in intermodal transport industry according to the EQA criteria. That clearly defines the activities, policies and strategies that have to be taken into consideration as basic practice of quality management in intermodal transport chain, which is best reflected in the competitiveness and quality of work in intermodal terminals.

Intermodal terminals must introduce the EQA criteria in business. That means that there are enablers (management, policy and strategy, employees, partnerships and resource) and results (use, employees and social) and connection between these two is a process. The process is the base stone for the development of excellence of intermodal terminals. The process connects the factor of horizontal and vertical elements in the terminal. The key effects are financial and non-financial results. To establish the results it is

necessary to establish the measuring criteria for evaluating the business excellence in intermodal terminals. The next step is establishing the statistics methodology for collecting the EQA criteria.

Intermodal terminals are to be oriented to achieving business results through improvement of quality indicators that refer to the infrastructure and equipment, productivity and investments. The increase in productivity is achieved mainly by connecting logistics of transport with the modernization of the transport chain and dynamic optimization of activities in the traffic flow.

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SAŽETAK

ANALIZA KONKURENTNOSTI I KVALITETE USLUGA INTERMODALNOG TRANSPORTA

Najčešći problem s kojim se terminali susreću je nedovoljno razvijena infrastruktura, duga vremena čekanja, kašnjenja, neočekivani problemi i kvarovi zbog kojih terminali nerijetko ostaju blokirani dulje vrijeme, visoki troškovi, nemogućnost proširenja, itd. Sve to dovodi do smanjena pružene kvalitete i povećanja cijena pruženih usluga korisnicima. Ti problemi se ne javljaju samo kod terminala jedne vrste, već kod svih. U današnje vrijeme kašnjenja i neekonomično poslovanje je potpuno neprihvatljivo. Kako bi se povećala kvaliteta usluga, te smanjila cijene prijevoza i prijenosa, u radu su detektirane i analizirane slabe točke u procesima. Detekcijom i uklanjanjem slabih točaka u procesima prijevoza i prijenosa od početnog do završnog terminala povećava se kvaliteta usluge koja se pruža korisnicima. Kvaliteta usluge obuhvaća manje vrijeme prijnosa i prijevoza korištenjem kraćih puteva kao i prihvatljiva cijena same usluge.

KLJUČNE RIJEČI

konkurentnost, kvaliteta, intermodalni transport

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