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QUALITY INDICATORS OF RAIL FREIGHT TRANSPORT

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Investigations show a growth of requirements for goods transportation quality by rail. There is a need to analyse in details goods transportation system by rail to meet requirements of market and give extra boost to development transportation service quality. The purpose of the current article is to give a partial overview about the experts, freight forwarders and customers' survey results. The analysis of customers' answers showed that they are not fully satisfied with quality of the service. It was identified that freight forwarders and other transportation service providers must carry out regular self-assessment of performance against defined criteria of service. Clear and united criteria of cargo transportation quality by rail will make easier to choose transport mode, transport means and route. The survey data and literature analysis showed that there is a vast range of criteria to be proposed for rail service quality evaluation, but no one of the models is prevailing. The analysis showed that most often the mentioned criteria are linked with the information, rolling stock, reliability and punctuality.

Keywords: rail freight, quality indicators, forwarders

1. Introduction

The main problems encountered in the carriage of goods by rail are the reliability, flexibility, punctuality, information management, and the average traffic speed. All these factors affect the prospective customers in the determination of the mode of transportation of goods. However, new opportunities unclose: after liberalization of the transport market by the European Union, the freight rail transport is becoming increasingly competitive because of the growing volume of trade exchange, traffic jams on the roads, rising prices of fuel and concerns about environmental protection. Carriage of containers, in combination of sea and rail transport, is becoming more and more popular.

At the same time, in the railway transport, in contradistinction to other modes of transport, remain the problem of service quality – there are no united compulsory service quality standards for all railway companies in the country, region or the international route and therefore, first of all, it is necessary to identify and indicate main quality indicators.

2. Quality Measurement

According to the International Union of Railways (UIC), a quality measurement basically entails a comparison between the current state of play as regards compliance with agreed quality criteria and the situation that should ideally pertain. It enables the quality of the service, product and end result to be appraised and quality-enhancement measures to be designed and introduced.

A quality measurement is structured and documented as follows: criteria, measurement points, responsibility, frequency, statistical records and evaluation, measurement tools.

Quality measurement for railway transport is generally split into three phases:

1. Logistics prior to departure (terminal-railway interface):
 - Provision of wagons;
 - Handover of train;
 - Handover of documentation.
2. Rail journey (railway-railway interface):
 - Departure from departure railway station;
 - Changes of locomotives and crew;
 - Border crossings;
 - Arrival to destination station.
3. Logistics (railway-terminal interface):
 - Time at which the train is handed over or made available for unloading.

Measurement should be concentrated at spots, which are either known or hidden weak points. For customers the vital factor is the train arrival on time. Punctuality is expressed in terms of compliance with final loading and availability deadlines, which are defined as follows:

Final loading deadline: latest possible deadline by which the operator must have finished loading the train.

Availability deadline: point in time by which the train must be positioned at the unloading crane in the arrival terminal, ready for the first container to be taken off. Any forms required should also be available at this stage. If so dictated by circumstances, an alternative definition of the final loading deadline or availability deadline may be agreed upon provided it is clearly stated and allows customers' needs to be met.

3. Quality Indicators

With increased use of rail freight transport it is especially important to identify and evaluate quality indicators of this mode of transport. Key indicators include:

- Freight transportation;
- Cargo handling services (loading, unloading, transshipment operations in warehouses);
- Cargo storage (warehousing) services;
- Preparation for transport services;
- The rolling stock leasing services;
- Freight forwarding services;
- Other services.

Freight transportation is the main type of services that supplemented by other services (loading, unloading, forwarding, etc.). Additional services may include marketing, commercial, insurance and information services.

Basic requirements, which are identified by users of services, are:

- Reliability of carriages (delivery of goods without damaging or otherwise affected them);
- Minimum delivery time (duration of carriage);
- Regularity of delivery;
- Just-in-time delivery;
- Security of carriages;
- Safety cargo delivery;
- Convenience during acceptance and issuance of goods;
- Presence of additional services;
- Presence of different levels of transport services;
- Adapting to customer needs (service flexibility);
- Adequate supply of documentary;
- Proper maintenance of the cargo;
- Delivery of the cargo from door to door;
- Acceptable (proportional) price of services;
- Performance of customs formalities;
- Access to reliable information about rates, conditions of carriage and the location of the cargo;
- Availability of necessary handling units (pallets, containers, wagons, etc.);
- Availability of cargo handling equipment at loading points;
- Avoiding of intermediate transshipment operations;
- The functional relevance of the means of conveyance;
- Specialized transportation option;
- Environmental protection.

Quality of transport services can be defined as the quantification of one or more services to customers, which compose their quality, description of characteristics. The quality of carriages assessment summarized the characteristics that determine their suitability to meet shippers' and consignees needs executing appropriate carriages.

In order to properly determine the quality of services it is necessary to evaluate these groups of indicators:

a) Indicators of timely implementation of carriage. This group of indicators, depending on their characteristics, can be divided into the following *indicators*:

1. *Freight transportation in term.* These indicators describe transportation of the goods for which date of arrival is pre-determined:

- The average deviation from the cargo arrival pre-determined date;
 - The average exceed of the pre-determined date;
 - Maximum exceed of the pre-determined date;
 - The maximum allowable deviation from the pre-determined date;
 - Number of deviations from the pre-determined date of arrival of cargo;
 - Number of timely completed carriages.
2. *Regularity of cargo arrival.* These parameters describe the properties of the carriages, which resulting by receipt of cargo within the stipulated time frame:
- Average number of cargo receipts within the time frame;
 - Minimum number of cargo receipts within the time frame;
 - The average time between receipts of cargoes;
 - The maximum time between the receipts of cargoes;
 - The minimum time between the receipts of cargoes;
 - Number of deviations from the regularity of the receipt of cargoes;
 - Number of received cargoes on pre-determined (agreed) regularity.
3. *Speed of freight carriage.* These parameters describe the properties of the carriages, which resulting by the duration of cargo transportation process or cargo movement speed:
- Agreed duration of freight transportation (timeframe);
 - Average duration of freight transportation (timeframe);
 - The maximum allowable duration of freight transportation (timeframe);
 - The maximum deviation from the average duration of freight transportation (timeframe);
 - The percent of cargo arrivals in excess of agreed transportation time (timeframe);
 - The average deviation from the agreed transportation time (timeframe);
 - Average speed of freight transportation;
 - The locomotive/car daily mileage;
 - Number of cargo arrivals in agreed time.
- b) Safety of cargoes during transportation. This group of indicators, depending on their characteristics, can be divided into the following *indicators*:
1. *Without losses.* These indicators reflect property of transportation service to maintain steady mass of the cargo in the beginning and the end of the carriage or decreased mass depending on natural or specified cargo losses. These indicators are more suitable for perishable, bulk and break bulk cargoes. These indicators may include:
- Loss norms;
 - Comparative losses of the cargoes;
 - Average losses of the cargoes;
 - Value of losses of the cargoes;
 - Number of cargoes delivered without losses;
 - Cargo quality reduction factor during transportation.
2. *Without damages.* Freight transportation without damages means that during the carriage of goods the preservation and suitability to use them according to the purposes after their transportation is ensured. These indicators are very important for the transportation of various household appliances and other devices. These indicators may include:
- Part of the cargoes delivered without damages;
 - The average losses due to cargo damage;
 - Comparative costs due to cargo damage.
3. *Without losses.* Freight transportation without losses describe property of transportation service to save the number of packages of the cargo in the beginning and the end of transportation process. These indicators may include:
- Comparative costs for the lost cargo;
 - Percent of cargo losses during transportation;
 - The average losses due to cargo disappearance.
4. *Without contaminations.* These indicators describe the property of transportation service to maintain cleanliness of the cargo according to established standards and requirements. These indicators may include:
- Factor of contamination of the cargo during transportation (ratio between contaminated cargo and the total quantity of cargo transported);
 - Part of the cargo which the consignee has not accepted due to the contamination during transportation;

- Percentage of allowable extraneous impurities of the cargo;
- Part of extraneous impurities.

c) *Economic indicators.* Estimating the quality of freight transport is necessary to take into account economic indicators that describe the costs associated with full-transport process or through individual work during cargo delivery. Economic indicators set in freight efficiency can be:

- Comparative costs associated with the carriage of goods by different modes of transport;
- Comparative total costs of freight delivery;
- Handling and warehousing costs;
- Percentage of transportation costs inside production costs.

The evaluation of the indicators mentioned above must be performed on a basis of regular quality audit. Taking into account the results of the surveys it is possible to determine the gaps in the railway transportation services quality system.

4. Quality Indicators for Different User Groups

In order to evaluate the importance of rail freight transport quality indicators on 2011-03-25–2011-04-02 the questionnaire was distributed between rail customers, freight forwarders and experts (specialists). The results of this survey are presented in the 1 table.

Table 1. Results of quality survey

| No | Questions | Respondents | | | Average |
|----|--|-------------|--------------------|---------------------|-------------|
| | | Experts | Freight forwarders | Shippers/Consignees | |
| 1 | Reliability of carriages (delivery of goods without damaging or otherwise affected them) | 0,96 | 0,96 | 1 | 0,97 |
| 2 | Delivery time (duration of carriage) | 0,83 | 0,92 | 1 | 0,92 |
| 3 | Regularity of delivery | 1 | 0,85 | 0,93 | 0,93 |
| 4 | Just-in-time delivery | 1 | 1 | 1 | 1,00 |
| 5 | Convenience during acceptance and issuance of goods | | | 0,93 | 0,93 |
| 6 | Comparative total costs of freight delivery | 1 | 0,92 | | 0,96 |
| 7 | Handling and warehousing costs | 0,83 | 0,77 | | 0,80 |
| 8 | Percentage of transportation costs inside production | 0,83 | 0,85 | | 0,84 |
| 9 | Presence of additional services | | | 0,64 | 0,64 |
| 10 | Presence of different levels of transport services | | 0,85 | 0,5 | 0,68 |
| 11 | Adapting to customer needs (service flexibility) | | | 1 | 1,00 |
| 12 | Additional logistic/documentary supply (fito, veterinary certificates, etc.) | | 0,54 | 0,71 | 0,63 |
| 13 | Proper maintenance of the cargo | | | 0,86 | 0,86 |
| 14 | Delivery of the cargo from door to door | | 0,46 | 0,5 | 0,48 |
| 15 | Acceptable (proportional) price of services | | | 0,93 | 0,93 |
| 16 | Performance of customs formalities | | 0,62 | 0,93 | 0,78 |
| 17 | Access to reliable information about rates, conditions of carriage and the location of the cargo | | 1 | 1 | 1,00 |
| 18 | Presence of necessary handling units (pallets, containers, wagons, etc.) | | 0,69 | 0,64 | 0,67 |
| 19 | Presence of cargo handling equipment at loading points | | | 0,79 | 0,79 |
| 20 | Avoiding of intermediate transshipment operations | | 0,69 | 0,71 | 0,70 |
| 21 | Specialized transportation option | | 0,77 | 0,43 | 0,60 |
| 22 | Environmental protection | | 0,77 | 0,64 | 0,71 |

*Measured response: Important 100 % = 1

According to the results of survey the most important indicators ($> 0,95$) for direct customers (Shippers/Consignees) are: reliability of transportation; duration of transportation; in-time deliveries; adapting to customer needs; access to reliable information about rates, conditions of carriage and the location of the cargo.

Other indicators are not so important for the above mentioned group of respondents.

5. Conclusions

Quality is an underlying part of each railway service. Quality implies a match between the customer's requirements and the railway service-provider's technical capacities.

In order to define and evaluate customer's requirements it is necessary periodically perform questioning and indicate most important quality indicators.

The quality of carriages assessment summarized the characteristics that determine their suitability to meet shippers' and consignees needs executing appropriate transportation.

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