



**Žilinská univerzita v Žiline, Stavebná fakulta**  
**Katedra železničného staviteľstva a traťového hospodárstva**  
**a**  
**Železnice Slovenskej republiky**  
**Oblasť riaditeľstvo Košice a Generálne riaditeľstvo Bratislava**



# **STRAHOS**

# **2022**

**Zborník prednášok – 1. časť**  
**19. seminár traťového hospodárstva**

**POD ZÁŠTITOU**  
**REKTORA ŽILINSKEJ UNIVERZITY V ŽILINE**  
**A GENERÁLNEHO RIADITEĽA**  
**ŽELEZNÍC SLOVENSKEJ REPUBLIKY**



**University of Žilina, Faculty of Civil Engineering  
Department of Railway Engineering and Track Management  
and  
Railways of the Slovak Republic  
Regional Directorate Košice and Directorate General Bratislava**



# **STRAHOS 2022**

**Proceedings – Part 1**

**19<sup>th</sup> Seminar of Track Management**

**UNDER THE AUSPICES OF  
RECTOR OF THE UNIVERSITY OF ŽILINA  
AND DIRECTOR GENERAL  
OF THE RAILWAYS OF THE SLOVAK REPUBLIC**

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**ISBN 978-80-554-1768-4**

Vydala **Žilinská univerzita v Žiline:  
EDIS – Vydavateľské centrum ŽU.**

Published by **University of Žilina: EDIS –  
Publishing House of the University of Žilina.**

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Redakčná úprava zborníka:  
Janka Šestáková

Edited by:  
Janka Šestáková

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## **MODELLING THE QUALITY OF THE PASSENGER AND CARGO TRANSPORT SERVICES**

**Katarzyna Markowska \***, **Aleksander Śladkowski \*\***, **Besik Sirbiladze \*\*\***

### **1. Introduction**

The article presents modelling of the quality of cargo and passenger transport services. The general model of the quality of the passenger transport services was developed. The created models of the transport service quality. The article suggests how to facilitate improvement of the quality of the passenger and cargo transport services, considering the customer service components. Moreover, it proposes continuous improvement of the cargo transport service quality, developing the model considering its individual stages. The model of improving the cargo transport service quality was developed based on the PDCA process, i.e. continuous transport service improvement. It distinguishes characteristic stages in the passenger and cargo transport service quality. It presents a sample model of the quality of the passenger and cargo transport services, considering the customer service components.

The transport service quality is interpreted as “the degree in which it satisfies the transport users’ needs throughout the complete transport process, this degree being a function of technical, operating and economic properties connected with the route, means of transport, time and the transported goods”. The article focuses on the aspects of modelling transport service quality. When modelling the passenger and cargo transport quality, an important role has such transport service stages as: demand for the transport service, planning the transport service, implementation, checking, customer service components, service provision to the user, transport service quality assessment [1].

Transport systems are very complex. Modelling of rail transport is a particular difficulty due to its specificity. The volume of rail passenger transport is affected by a number of socio-economic factors. These factors have different impact for volume of transport [2]. In addition to factors whose size is presented by the Central Statistical Office, such as the number of inhabitants or the number of enterprises, other factors such as the access of inhabitants to the railway line have an impact on the volume of transport. This factor is calculated using the CSO data [3].

The number of passengers and also the operation of rail passenger transport is also affected by the location of transport hubs in large cities. The functioning of public road transport affects rail transport.

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In turn, when modelling rail freight transport in international traffic, the competition of rail administrations in different countries should be taken into account. The volume of cargo transport on a particular route depends, among others, on the conditions of rail transport in the countries through which this route passes [4].

The proposed improvement cycle, or the so-called Deming process in the model of the continuous cargo transport service quality improvement, can be used also for the provision of the passenger transport services. The customer service level contributes to the transport service quality. The customer service, termed the customer logistics, is one of the most important notions in the contemporary logistics. Customer service is the ability to satisfy the customers' needs and expectations, considering the time, destination of the ordered deliveries, transport and information management. The developed sample models of the passenger and cargo transport service quality considering Deming process, constitute a pattern of the continuous improvement of the transport service quality. They also motivate and facilitate the transport services [5], [6].

## 2. Passenger transport service quality models

Modelling the passenger transport service quality is aimed at increasing the level of such services and improving their quality. It is to reduce the nuisance connected with travelling in the aspect of its duration and conditions. Also improving the conditions in cities plays a significant role. It should be stressed the higher transport service quality is advantageous not only for the passenger, but also for the carrier. The passenger transport preference model in Figure 1 presents the passenger transport service quality properties on the customer's part. They include: the availability and price of the ticket, travel speed, punctuality, drivers' culture, information at the stops, transport on Sundays and holidays.

The passenger transport service takes place when the service is received by the users [7]. The completed transport service no longer exists. The stage of planning and performance exerts an influence on the transport service quality. The performance stage is inseparably connected with controlling the performed transport service. The performance stage is followed by the stage of assessing quality of the performed passenger transport service. It is not possible to correct it once it has been completed. A transport service user is not able to assess the usable and qualitative properties of the service before s/he orders the transport service.

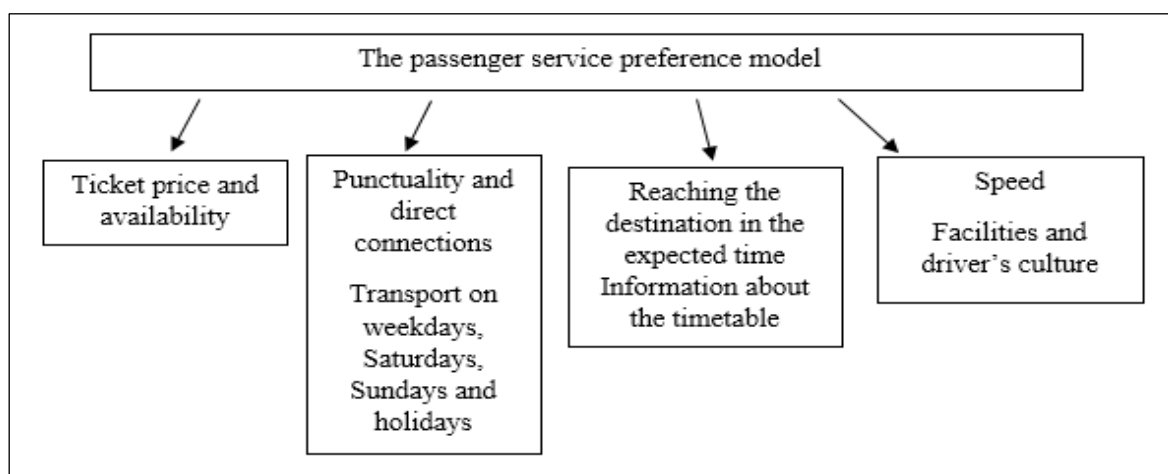


Fig. 1 – The passenger service model

### 3. Cargo transport service quality models

The model of the cargo transport service quality improvement presented in Figure 2 proposes continuous improvement of the railway cargo transport service quality using Deming process. Deming process is a concept from the quality management area. It is termed also Deming circle, control cycle or PDCA cycle. PDCA is an acronym created from the initial letters of the following English words: P - Plan, D - Do, C - Check, A - Act [8].

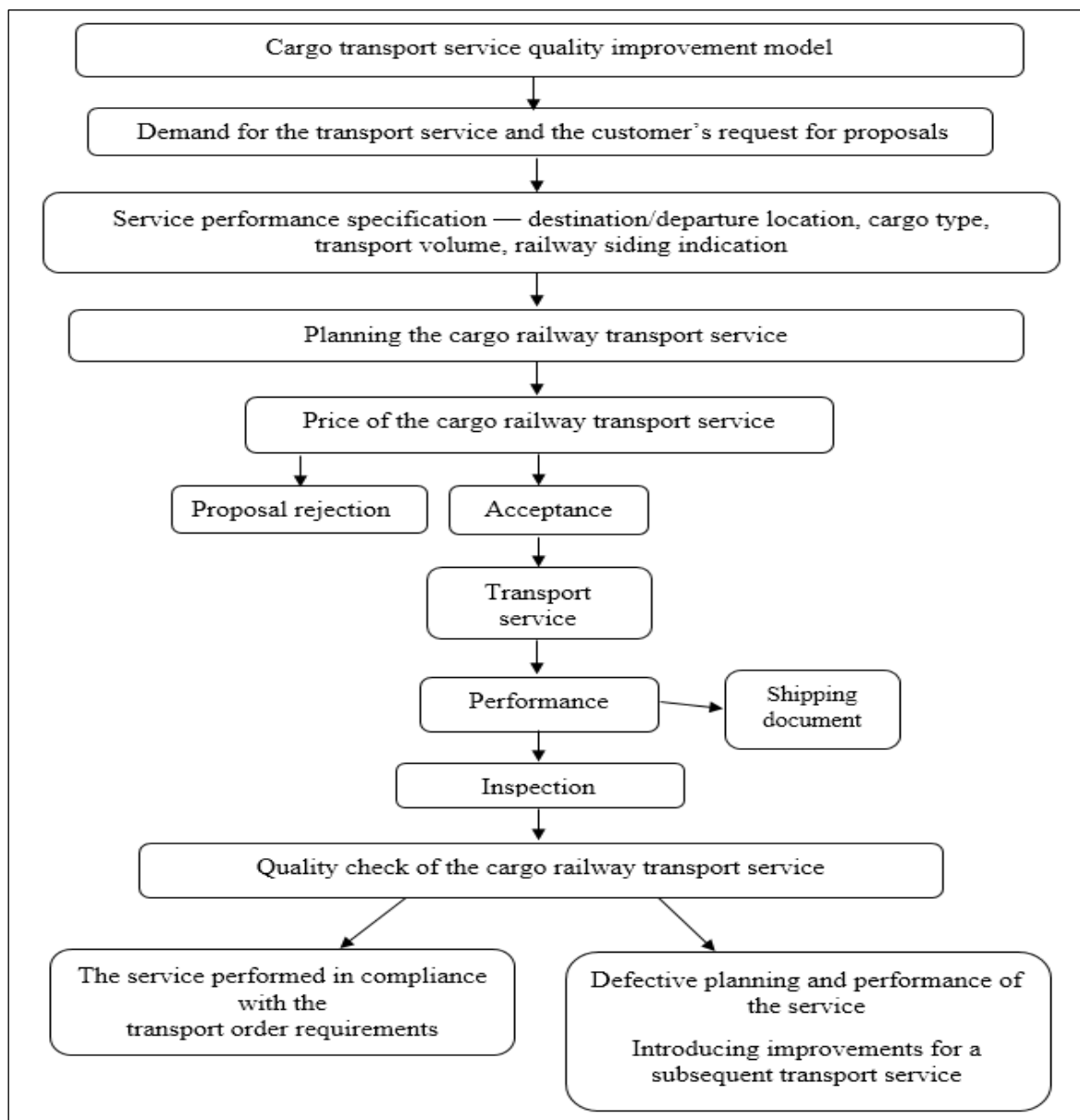


Fig. 2 – Cargo transport service quality improvement model

The PDCA/Deming process of continuous improvement of the performed service quality can be used by companies transporting cargo by rail.

The Deming process is applied in DB Cargo Polska company. DB Cargo Polska has been present on the Polish logistics-freight market since 2009, ensuring domestic and international transport and logistics solutions in cooperation with the international network of German DB Cargo AG. With many years of know-how and extensive

experience, it is a reliable and solid partner for clients in every industry, with various needs of broadly understood transport and logistics solutions. DB Cargo Polska Group also includes DB Cargo Spedkol, specializing in shipping, terminal services and line trains, and DB Port Szczecin, complementing the offer of rail transports.

The proposed improvement of the cargo transport service by rail, using Deming process, consists in continuous systematic improvement of the performed service. Thanks to those activities, characteristic of the control cycle, the employees can be aware of any emerging problems. What is more, this can be used to motivate employees. The first stage of the model is the demand for the cargo transport service by rail. The next stage is the customer's request for proposals sent to the Sales Department. In their RFP, the customer determines where the cargo is to be transported from, cargo type, which railway siding it leaves from, which railway siding it reaches with the cargo and the transport volume. The following stage after the customer has accepted the proposal is drafting the transport agreement. Drafting the transport agreement is followed by the key stage, namely the service performance. At this stage it is necessary to consider transport planning in connection with other transport services performed. It is necessary also to check the availability of resources for the specific transport service performance date, including e.g. the railway engine, employees. The consignor's activities include loading the cargo while the controller is to check the seal tightness and brakes. The performance stage is followed by the cargo collection.

The cargo transport service quality is conditional on the stage of planning, performance and check related thereto, as well as the provision of the service to the user in line with the transport agreement provisions, i.e. punctually, within the agreed budget, to the relevant destination, in accordance with the adopted quality standards. Please note the cargo transport service quality is conditional on the factors listed in Table 1.

*Tab. 1 – Factors contributing to the insecurity and quality of the performed cargo transport service*

<b>Item</b>	<b>Factors contributing to the insecurity and quality of the performed cargo transport service</b>
1.	Poor condition of roads
2.	Overloaded road system
3.	Nonconformity with the environmental conditions in container transport
4.	Incorrect check system
5.	Accidents in cargo transport, including by rail, road, sea
6.	Incorrect monitoring of the cargo location sites
7.	Nonconformity with the procedures and legal requirements
8.	Inappropriate selection of the transport containers and packagings
9.	Incorrect choice of the reloading devices and means of transport
10.	Inappropriate qualifications of the staff
11.	Terrorist acts, most frequently connected with the property damage
12.	Overloading means of transport in different transport modes
13.	Incorrect transport documents
14.	Employee strikes
15.	Inadequate familiarity with the infrastructure, geographical, cultural, regional and country conditions affecting the cargo transport service provision



They include e.g.: poor condition of the roads, nonconformity with the procedures and legal requirements, incorrect choice of the reloading devices and means of transport, incorrect transport documents, inadequate familiarity with the infrastructure, geographical, cultural, regional and country conditions affecting the cargo transport service provision [9], [10].

#### 4. Sample model of the quality of the passenger and cargo transport services

Figure 3 presents a sample model of the passenger and cargo transport service quality. The customer service plays a key role in performing individual stages of the passenger and cargo transport services. The components of the passenger and cargo customer service include: a service performed punctually, service flexibility matching the customer's needs and expectations, suitability of the documents required when placing orders, transfer and availability of information [11], [12].

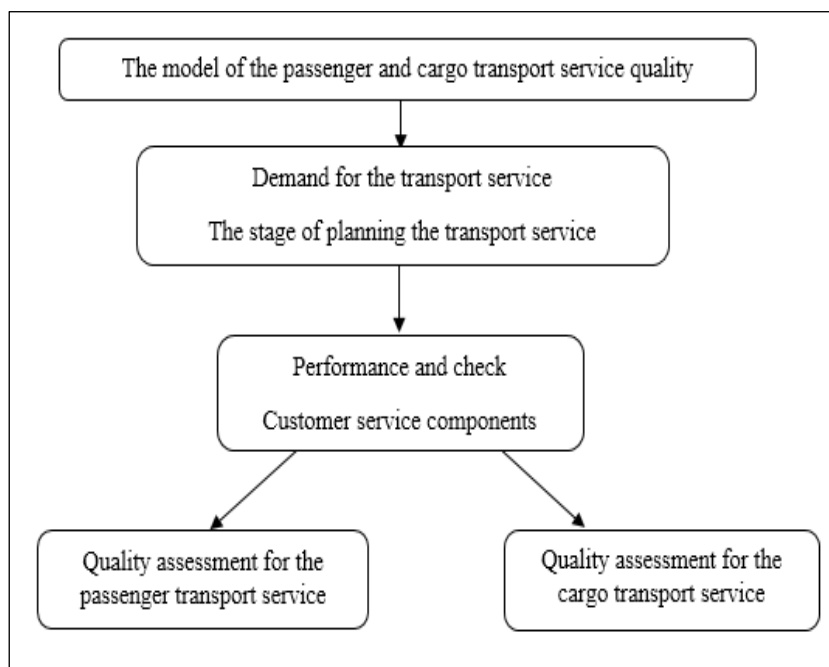


Fig. 3 – Sample model of the quality of the passenger and cargo transport service

#### 5. Conclusions

The subject of the transport activity is the provision of services consisting in carrying people and cargo. Users of the passenger and cargo transport are more and more demanding in such aspects as punctuality, price, transport quality, safety, information provision, favouring the customer. The organisers of the passenger and cargo transport as well as carriers must be aware of their customers' expectations and, consequently, strive to improve the transport service quality. Otherwise, they may expect to lose significant numbers of customers buying the passenger or cargo transport services. The transport service quality is conditional on planning and implementing individual transport service stages where the significant role is played by the customer, their requirements, expectations and needs. Continuous improvement of the transport service quality based on Deming process contributes to the continuous facilitation, improvement

or modifications of certain stages of an incorrectly performed transport service. The transport organisation problems for Polish transport companies are really urgent. On the one hand, this results from the geographical location of Poland crossed by the major transport routes joining the East and West of Europe [13]. The transport of goods from Balkan to Scandinavian and Baltic countries is also the easiest via Polish transport corridors. On the other hand, the development of commercial relations between the European countries is easier thanks to their membership in the European Union and Schengen Area. Given the globalization of the commercial and industrial relations, the development of different types of cargo keeps growing year by year. The transport of large, heavy and oversize cargo plays a special role among the different transport types in Europe [14].

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