

## **PROGRESSIVE VIEW ON QUALITY MANAGEMENT AND RESEARCH ON IMPROVING SERVICES IN RAILWAY TRANSPORT**

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### **Abstract**

*This article describes the results of research focused on progressive view on quality management. It characterizes a research of improving services in railway transport. Improvement of these services has a strong importance in customer considering on the future use of railway transport. The research provides quality characteristics of transportation, defines critical points of technological processes and specifies the quality model supported by software solution. Main principles and results of the research have a significant importance and belong to numerous initiatives aimed to develop and support railway transport as an environmentally conscious mean of transport.*

**Key words:** *quality, management, service, software solution, railway transport*

**JEL classification:** R4

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### **1. Introduction**

Railway transport is an important branch of transport. Its crucial advantages are the lowest negative impact on the environment, the highest level of security among the land transport modes, the lowest specific energy consumption, high degree of safety and others. (Hrašková, Bartošová, 2013). These factors must be monitored by the management of railway companies so

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it goes hand in hand with the world traffic trends. Characteristic is connecting of speed, safety, and economy, while highlighting quality as an integral part of the services offered in passenger and freight transport.

In general, transport market participants have certain quality targets, the fulfilment of which they follow:

The interest of an infrastructure manager focuses primarily on:

- the most efficient use of railway infrastructure,
- cost reduction for maintenance and upgrading of railway network in compliance with all continuity and safety conditions,
- modernization of selected tracks included in the international European corridors.

The interest of the railway company focuses on:

- success in the transportation market,
- operation of processes without faults and incidents,
- minimum reduction of damages related to harm to life, health or property,
- reduction of transport operation costs,
- increase in revenues from transport, ancillary services and total profits,
- building of a good reputation, expertise recognition and financial stability.

The customer's interest focuses in particular on:

- affordable price,
- availability of services,
- ease of transfer selection,
- the minimum time between the establishment of transport requirement and its implementation,
- the shortest time of transport or delivery period,
- ease of administration associated with the transport of goods,
- reduction of changes or transshipments number,
- fast delivery at a specified time for some commodities,
- reduction of waiting times for the relevant connections or takeover of the consignment to transport,
- regular and numerous connections,
- comfort during transportation, protection of shipments,

- accurate information about the services offered and the current state of transportation,
- security of transport.

The way to success leads mostly through the quality services and rational operation of traffic and transport processes.

Improvement of the quality of services provided, the removal of existing deficiencies and regular monitoring of needs make it possible to convince the customer that the primary objective of the company is its satisfaction. The customer will be convinced that he opted for the best partner to transport.

Nowadays, the important approaches mainly focus on processing. In accordance with the above-mentioned facts, it is essential to provide services within transport with integrated planning and process organization, which is the activity of developing the products and processes required to meet customers' needs (Nedeliaková, 2013). It involves a number of universal steps, as defined by Juran and DeFeo:

- define the customers,
- determine the customer needs,
- develop product and service features to meet the customer needs,
- develop processes to deliver the product and service features,
- transfer the resulting plans to operational personnel (Kubasáková, 2005).

The paper emphasizes the need for efficient quality management through new tools and definitions solved within the research. These trends have been identified within the research at the University of Žilina.

Improving services quality should use quality models which create a modern trend in quality management. Models follow the procedural character of the provided services that are unique, unrepeatable and constantly changing (Majerčák, Nedeliak, 2010).

Important determinant for the customer when deciding about the use or non-use of the services of the transport company becomes the quality of provided services. Therefore, if we want to effectively assess the quality of services, it is necessary to take into account the time factor, and models that take into account the procedural character of provided services (Sekulová, Nedeliak, 2013). Consideration of the time factor is based on the recognition

that customer needs and requirements, with respect to the services provided, are constantly changing.

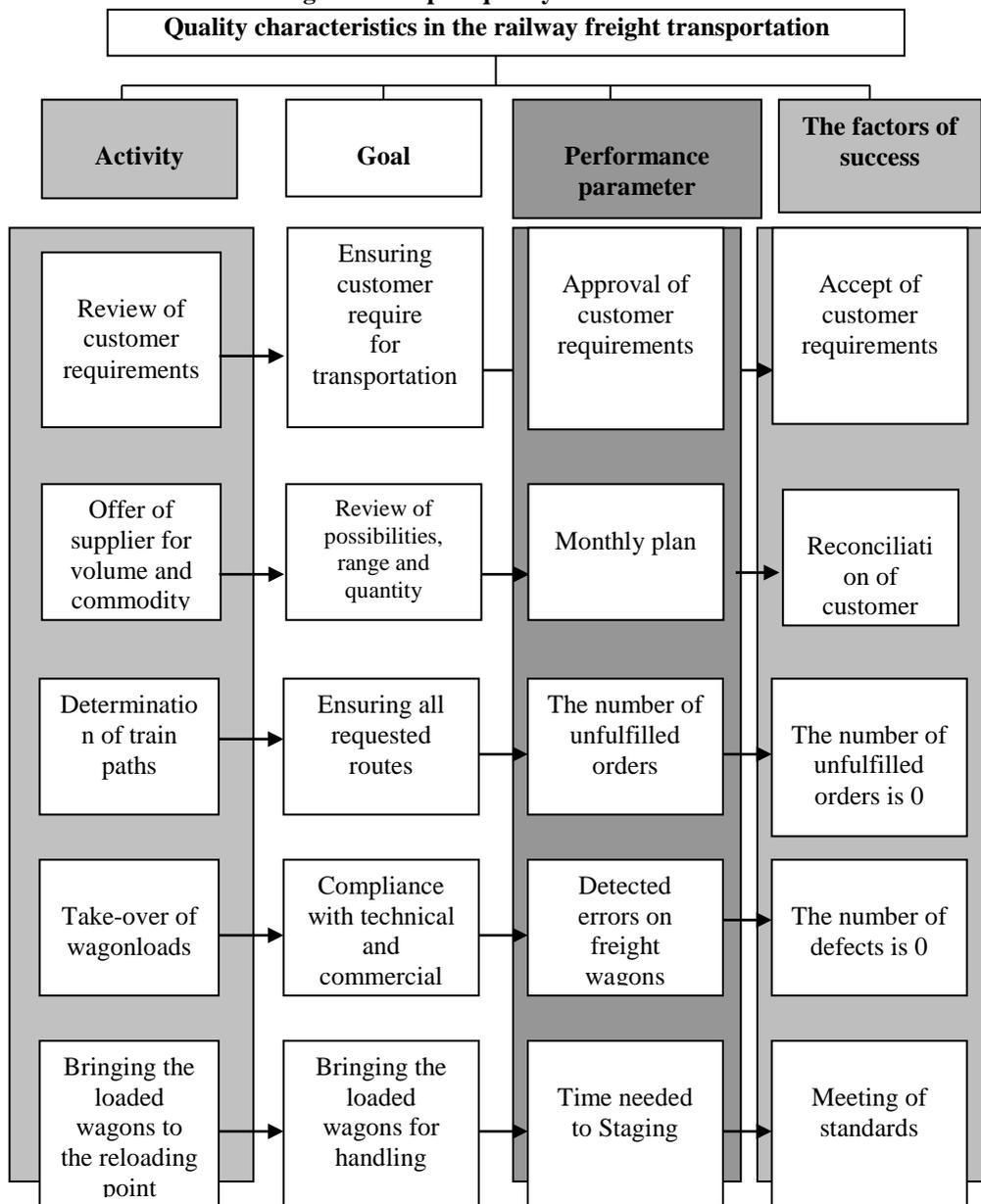
## **2. Setting of Quality Characteristics of Transportation Within the Research**

For the needs within the frame of research carried out by the Department of Railway Transport, in collaboration with railway companies, a model was applied, which takes into account the characteristics of transportation by linking the perception of service quality operations (KEGA, 2015). The model was applied on the conditions of the freight transportation.

Characteristics of transportation are based on customer's perception of freight transportation quality when they evaluate the transport service provided:

- Delivery time - is the time that elapses from the customer's order to the moment of the availability (readiness) of the goods at the customer. Delivery time is one of the key indicators of the carrier service level. Its observance is monitored by the carrier during the entire transport chain and if it is jeopardized, he shall take the necessary measures to alleviate the consequences which may arise from this situation.
- Delivery reliability - it expresses the probability that delivery time will be observed. Failure to comply with the delivery times may cause the customers disturbances of business processes.
- Delivery flexibility - is the ability to flexibly respond to the needs and wishes of customers. These include in particular modality for the allocation of orders, (i.e. off-take quantity, time of order hand-over, the method of delivery of the order), delivery modalities (type of packaging, transport options, possibility of delivery to a call), and information that is available to customers on traffic conditions, the state of the order and implementation of claims for faulty orders.
- Delivery quality - is shipping accuracy according to the method and quantity as well as according to the state of delivery. It is necessary to meet the required quantity, as larger or smaller quantity supplied, may cause the customer the extra costs. Selection of quality characteristics was realized in accordance with Fig. 1.

Figure 1: Map of quality characteristics



Source: (KEGA, 2015)

After detailed findings and search was this scheme used as so called map of quality characteristics. There were defined basic characteristics in application on the freight transportation.

### **3. Definition of Critical Points of Technological Processes and Quality Model**

The research was focused also on the definition of critical points within technological processes in railway transport. Connection between risk management, quality management and detection of critical points in technological processes is clear. Quality management includes daily monitoring mechanism that gives preferences to the possibility of interfering in operational processes, the collection and exchange of information at operative (operational level) as well as employees that prepare the analysis, an overview of customer satisfaction, an overview of the risks that threaten the company and preparation of measures to improve the quality of post-operative level. It is based on cooperation between all the railway companies involved in the transport chain and other relevant partners (Poliak, 2009).

It is possible to use one of the quality models for railway transportation that is used for the detection of key processes, including their threats and their priority noticing. The meaning of the quality model is to map processes in terms of their relevance to achieve objectives on one hand and on the other hand its corresponding level of ensuring quality, including the level of organization and staff management. This model is usable for business processes reengineering (Poliak, Križanová, 2014).

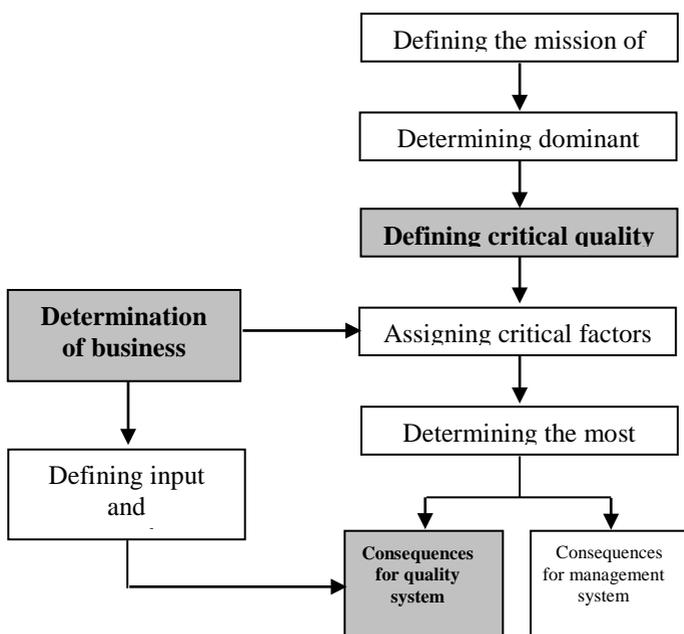
The objective model is a detailed analysis of the processes taking place inside the company and control of their share in the fulfillment of business objectives with the state of their prior assurance:

- identification of key processes critical for successful operation,
- investment evaluation for building a quality system,
- assessment of the effectiveness of prior planning,
- identification of the needs for new investments,
- determine the order of priority,

- ensuring appropriate new activities and their coordination with the already used activities.

It is possible to find critical points or technological processes that affect quality by using this model. Critical point or area in the technological processes is any phase of the technological process. The critical point is if the phase takes place in one place. Fig. 2 defines the procedure of process quality model.

Figure 2: Procedure of quality model



Source: (KEGA, 2015)

Among the critical points and areas of traffic and transport processes and railway transport services belong, for example, embankment and dismemberment of the passengers in passenger transportation. In these cases, the quality taking place in one place is assessed. The risk bearers are people

who operate these critical points. It is similar when assessing the particular run of the vehicle. Here again, those who bear the risk are persons, who ensure the operation of critical points, but unlike from the previous cases, the quality is assessed with respect to a certain area.

Critical points that affect the formation of risk can be defined for example of railway passenger transportation. Similar is a description of the critical points for railway freight transportation or in terms of the infrastructure manager.

Critical points in terms of carrier are as follows:

- operation of the transportation - unprofitability (economy, limitation of transport network, level crossing, capacity of the set, acceptable deviation from the timetable, closures, stopping point and location,
- irregularities of the transportation – irregularities of the vehicle occupancies, irregular number of passengers, irregularities in embarking and disembarking in stopping places, irregular occupation on platform edge,
- railway transportation timetable – optimization, changes of railway transportation timetable, coordination (Sujanová, 2012).

The main reasons for railway transportation timetable non-compliance, which are evident from statistical surveys in Slovakia, are related to these cases:

- failure of safety device,
- repair of the driving vehicle,
- replacement of the driving vehicle,
- inability of driving vehicle,
- failure of traction circuit,
- inability of the wagon,
- closures of the traffic.

Critical points from the customer's perspective can be defined as follows:

- transportation process – the transfer of security, information, disabled passengers transportation, walking distance to the train station, the time consumption in connection to the length of the journey, ensure connection of the trains of higher and lower categories, public transport etc.,

- transportation planning – time and space continuity, tariff equipment, optimal distance of the stations,
- operating characteristics – delays, air conditioning and vehicle lighting, seating, etc.

Based on the created quality model, analysis and identification of critical points in technological processes, it is possible to set specific quality approach. Critical points, that were mentioned, significantly affect quality of transportations and potential customers' decision making on the use of railway transportation.

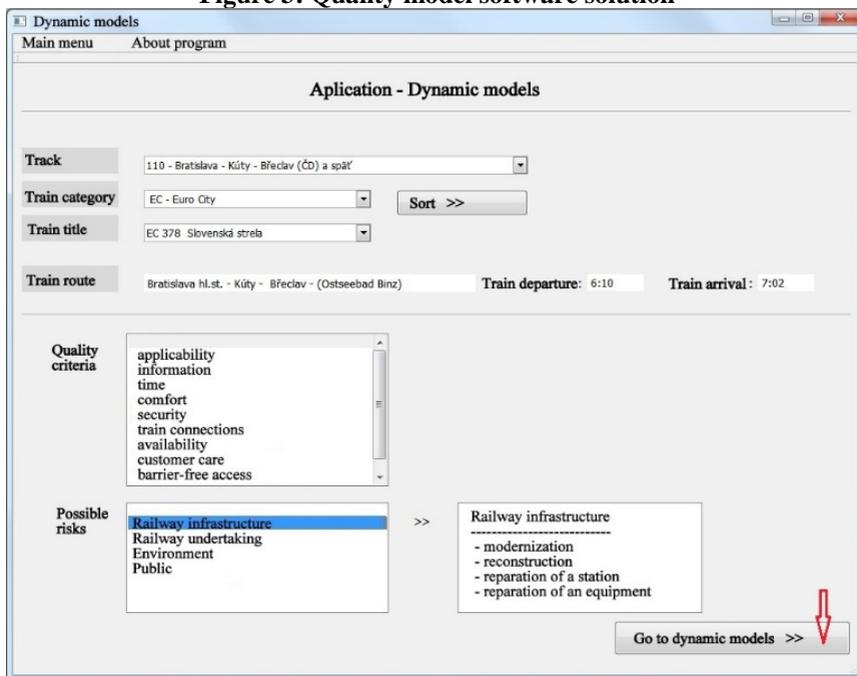
#### **4. Quality Model Supported by Software Solution**

After setting of quality characteristics and definition of critical points of technological processes, created quality model was supported by software solution.

Improving the quality in these areas is difficult in practice, as it is subject to financial claims, access of the state and the managers of railway undertakings. To be able to proceed to improving the quality, knowledge of the constraints that affect the quality of services negatively is necessary.

For more effective monitoring of the quality of the services provided and quality monitoring of the transportation process, it is possible to support the creation and use of quality model in practice through a software application. To address this issue, the research at the Department of Railway Transport proposes a simple application that consists of a Graphical User Interface. Data about the existing tracks and the trains that operate on the tracks were transmitted to this software application, which is shown in the following Fig. 3. This interface is currently being extended to include a module to work with quality model (the transition is shown by a red arrow in the picture).

Figure 3: Quality model software solution



Source: (KEGA, 2015)

The measurement of processes is performed through software solution, through which, can be identified the level of the process quality. Sometimes it is difficult to choose or find an appropriate application for quality assessment, but it is important at least to control the process through information technology and to standardize it. Herewith are also identified weak spots and collision points. Based on software applications can be evaluated the level of quality that can be subsequently increased, compared or maintained.

The research provided the basic quality criteria for processes in information technology which can be defined as follows:

- speed,
- flexibility,
- reliability,
- accuracy.

To monitor quality through information technology it is necessary to have established in the transport company:

- information technology - programs and help-desk,
- process documentation - server documentation,
- electronic corporate culture - net ethics,
- electronic code of ethics.

The main aim of the programs in transport companies is to provide online information on the status of the business product. This part of the program focuses mainly on larger projects in the field of communication network. Integrated therein is mainly operational information assigned by individual employees of the transport company. Currently, programs must be applied precisely to the product of the transport company because of its specific focus. In the development of such a program it is therefore necessary to determine the detailed functional specifications.

Detailed functional specification must contain a benchmark task models, object models and user interface model. It is advisable to arrange in advance how will be performed and identified the update of the application part of the program so as to interfere as little as possible to the actual operation of the program.

Important is also the creation of impact studies on the development and implementation of programs. The objective of these studies must be assessment of the impact of general changes to the programs. Studies shall include the current state and outlook for the selected period. The aim of the programs after initial entry into service is also managing the future development of information and communication technologies, such as the development and implementation of subsequent feasibility studies.

In implementing programs they should be applied as new programs, not as a copy, and improvement of the others. Herewith will be avoided copying of old mistakes already implemented in other programs. The introduction of new programs is implemented progressively in the form of so-called test or training environments. After some test operation based on its evaluation it is proceed to the productive operation.

If all the requirements for a program have been met without errors already in test operation, the productive operation of the program in the transport company is from the beginning with only small problems, because practical experience shows that any implementation of the program, or change of the program brings initial shortcomings.

Productive operation brings based on practical experience failures, and thus the railway company needs solutions to these failures that accompany each program. For the management of these failures it is essential to create so-called help-desk. Any help-desk must have clear procedures for eliminating defects and shortcomings caused by programs or program operators. Sometimes it is appropriate if the transport company in the challenging process creates a number of help-desks for each process, which is somehow specific. Also conditions for the rapid cooperation of those help-desks must be created, to make room for the most effective removal of unwanted defects. Any help-desk must contain a software which allows for an inspection of defects.

Help-desk must also include statistical data to be filtered by the appropriate selection criteria. For example, the number of faults in the selected region for the selected type of equipment, and many others. It shall also contain a database of solutions to all the defects since the help-desk operators can quickly get information how to proceed in troubleshooting and thus speed up or improve the process of troubleshooting.

All documentation must include the current manual for use of documentation servers explaining the operation of these servers (help). For easy navigation of users, the documentation servers need to be constantly updated, or renewed to ensure server transparency and the faster document handling.

For this operation, it is necessary to allocate administrators of first and second degree. Administrators of first degree update the documents on the servers, while the second degree administrators manage the entire documentation servers and their applications. When more documentation servers are required in a transport company it is necessary to build the appropriate mutual network and identification (Vetráková, 2013).

Mentioned net ethics is a collection of rules and principles that all employees in the transport company shall comply with. These rules must be established by an employer for his employees before starting work. Later, during the term of his employment they should be inculcated and reminded. It is an important moment not only for raising qualification of employees, but also for the quality of the output of transport company.

## **5. Conclusion**

The target resulting from the EU's challenges is to support the position of railway transport as a central transport system which is environment-friendly. The European Union in its global strategy significantly supports the railway sector and railway transport plays an important role in the transport market in national and international scale.

For reducing the costs of transport companies it is important to know in detail all the processes. The process can be known only through constant monitoring and control. Consequently, it is possible to perform the process analysis and to take measures leading to the achievement of quality management goals of the company. For such long-term and continuous monitoring is convenient software solution solved within the described research. It is able to provide simplicity, transparency and efficiency.

Suitably chosen quality approach leads to the improvement of the quality services. It enables methodology for improving services quality and for identifying the level of quality of transportation services which must meet the requirements in the environment transportation market and in specific examples, for a selected stations and track sections to provide relevant results.

This new approach respects systemic process, which leads to the prevention of poor quality, reduction the losses which are caused by non-quality of system, help to increase customer satisfaction and control system of service quality in railway company.

Dynamic models allow taking account of a process character of provided services respecting the expected and perceived quality from the customer's perspective. The universal models can be used in any industry or company. Models provide interesting and new perspective on service quality and show often hidden bottlenecks throughout the process of providing service.

## **6. Acknowledgment**

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