# DIGITAL LOGISTICS AND ELECTRONIC DATA EXCHANGE IN FREIGHT TRANSPORTATION

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## ABSTRACT

The article depictures approaches to building a new model of interaction and system optimization of business processes based on the use of digital technologies at all stages of shaping the value chain of products and services that provide the creation of an information platform for digital economy. The methodical foundations of formation of the evidence base for development of digital logistics and introduction of legally significant electronic data exchange in the organization of rail transportation are considered.

*Keywords: digital technologies, freight transportation market, electronic document management, information system of organization of relations with customers of the holding Russian Railways in the field of freight transportation, losses in the transport sector.*

**Background.** *Digital technologies have become a necessary condition for successful development of any company, a source of additional marginality in the transport sector in the organization of domestic and international transportation. A high level of requirements for the efficiency of traffic management in rail transport determines the need for a high level of informatization of the operating activities of transport market participants, their interaction with each other. Digital technologies confidently move from the category of auxiliary tools to the basic class, they allow to significantly reduce the costs of management and communication in the organization and implementation of transportation, improve the quality of transport and logistics services, labor productivity of railway workers, make a company more competitive in the eyes of the client.*

*In this regard, development of digital logistics and introduction of legally significant electronic data exchange in the organization of rail transportation is of increasing interest to the holding company Russian Railways and creates legal, organizational and technological prerequisites for accelerating the turnover of goods, money and services in the national economy, allows to significantly reduce the costs of their planning and provision [1, 2, 3].*

**Objective.** *The objective of the authors is to consider the role of digital logistics and electronic data exchange in modern freight transportation by rail.*

**Methods.** *The authors use general scientific methods, comparative analysis, economic evaluation, statistical analysis, scientific description.*

**Results.** *Information support for freight transportation in railway administration systems is carried out on the basis of EDI agreements in the international UN / EDIFACT standard on the receipt of cargo for transportation with subsequent transfer of information to border stations for preliminary information and document processing via secure Internet communication channels.*

*The use of a consignment note in electronic form with a digital signature is approved on the basis of the Uniform Rules for International Railway Cargo Transportation, which entered into force in the member countries of the International Railroad Committee (CIT) from July 1, 2006 [4, 5].*

*The goal of the «e-rail Freight» project is to replace all paper transport documents with electronic ones within the railway network of the CIT member countries. More than 20 railways of Europe have joined the project to date. It is led by three European railway associations:*

- *CIT – legal framework and procedure development;*
- *UIC – technical solutions and standards;*
- *RailData – IT infrastructure.*

*The project started on July 1, 2009 in Russia after the approval of the CIM Consignment Note and the CUV Wagon Note.*

*Elaboration of the legal basis for electronic document management in the implementation of international and domestic cargo transportations, which account for more than 14 % of the GDP of the European Union, creates prerequisites for development of digital logistics as an innovative technology for managing the information flow throughout the logistics network at all hierarchical levels. Digital technologies for logistics will become an integral attribute of the daily activities of companies, their competitive advantage, if we bear in mind the rapid response to the needs of customers [6].*

*Creation of a single information space with the help of smart technologies forms a huge storehouse of information and opens new opportunities for management of logistics processes. Exchange of information, tracking of cargo transportation, remote management and control over operations and personnel, analysis and automation with the participation of stationary and mobile devices become a requirement of time in the transport sector. Digital technologies allow to optimize costs, create advantages over competitors in management of transport and logistics processes by integrating different target groups of consignors and consignees in all modes of transport.*

*The economic basis of digital logistics is that from 10 to 15 % of transportation costs account for the preparation of paper documents and the delay in delivery times associated with these documents. Both costs and delivery times can be reduced by applying a legally significant electronic document flow by 20–40 %.*

*Similarities and differences in US and European electronic document management technologies in the transport sector are shown in Table 1.*

*One of the «elements» of digital technologies that optimize the company's work is an electronic signature, the application of which allows eliminating losses both for customers and for the holding. Its use in the exchange of electronic transportation documents is one of the leading IT technologies for information interaction with users of railway transport services. The result of the electronic signature for the client is the reduction of time for filling documents in paper form, correspondingly the labor costs are reduced, the satisfaction with the quality of transport services is increased, the time of access to information is reduced. The result for the holding company is the lack of the need to fill in, verify the correctness of execution of documents, record the information in automated systems, resulting in*

**Table1**

**Comparative analysis of technologies for issuing shipping documents**

| Comparison feature | Europe | USA |
|---|---|---|
| Form of documents | Unified electronic form of transport documents | |
| Used communication channels | Data transmission via EDI channels, providing identification of participants and security of information | |
| Possibility of using paper documents | It is allowed to use both paper and electronic documents | The electronic form is the only and obligatory means of organizing document management |
| Participation of state bodies | State structures take an active part in the process of introduction and development of electronic document management for rail transportation | Federal bodies exercise the function of supervision and control over railway freight traffic |

**Table 3**

**Key results of the application of digital technologies in the transport company**

| Type of effects | Results | Indicators |
|---|---|---|
| Commercial | Change in traffic volume; the emergence of new IT services (CA services); increasing productivity and improving working conditions; saving costs of structural divisions | Increase in revenue from additional transportation as a result of technology application; additional revenues in the provision of IT services; saving costs in connection with the use of technology |
| Competitive ability of the company | The impact of the new competitive opportunities of JSC Russian Railways on the market share of the company | Growth of the client base (increase in satisfaction with the quality of service due to a reduction in waiting time when processing documents) |
| Social and economic | Improvement of the organizational structure of the company; improvement of quality, productivity and improvement of working conditions; improvement of quality of processing, transmission and storage of information | Reduction in the number of production personnel and managers due to increased labor productivity; Increase the speed of decisions in the field of traffic management; reduction in the number of paper documents and information per one structural unit or employee (implementation of lean manufacturing principles); Reduction of access time to information |
| Technological | Improvement of the level of progressiveness of the applied technology | Improvement of the quality of implementation of the technological processes of the core business; Reduction of the time for the implementation of technological processes for processing and transferring information |

*reduced labor costs, increased productivity, reduced processing and information transmission time.*

*The possibility of cross-border use of electronic digital signatures in transportation documents is limited by the following factors:*

*– differences in terminology and definitions, differences and completeness of the legal framework, differences in the concepts of qualified certificates;*

*– variability of requirements of the local regulatory bases of Russia, which do not correspond to foreign decisions;*

*– possibility of a multiple interpretation of the European regulatory framework;*

*– impossibility of compatibility of requirements at a European or other transboundary level with a signature on legally significant documents, including an electronic digital signature that is not based on qualified certificates;*

*– insufficient definiteness at the EU level of requirements for services of the third trusted party (time stamp, long-term archiving, identification and authorization) and based exclusively on national legislation;*

*– multiple use of the attributes of certificates: there is no generally accepted standard for attributes that could be used to determine the role of the signatory, as well as a consensus on the meanings that the attribute can contain, including language differences;*

*– verification of the validity of the electronic digital signature through the certifying center that issued the key signature certificate and which is in the same jurisdiction with the owner of the application implementing digital technology.*

*The digital signature provides:*

*– certification of the source of the document. Depending on the details of the document definition, such fields as «author», «changes made», «timestamp», etc. can be signed;*

*– protection against document changes. Any random or deliberate modification of the document (or signature) will change the hash, hence the signature will become invalid;*

*– impossibility of refusal of authorship. Since a correct signature can be created only if the private key is known, and it is known only to the owner, then the owner cannot refuse his signature under the document;*

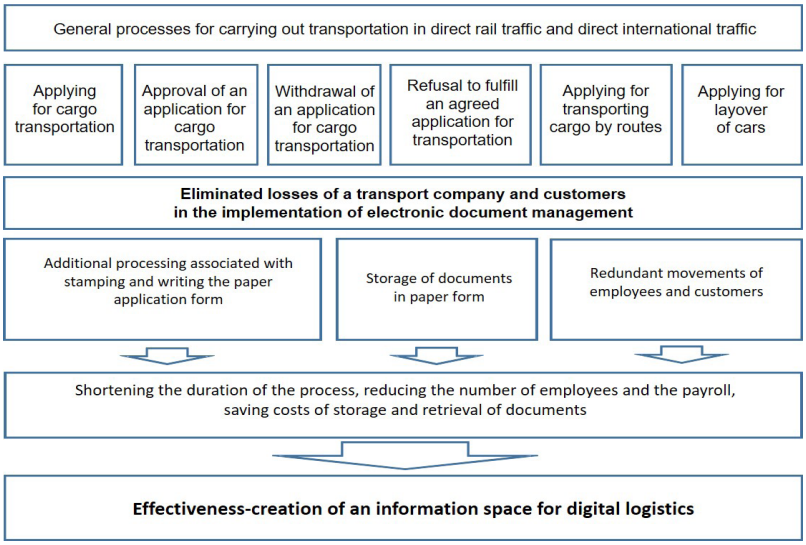
*– enterprises and commercial organizations to submit financial reports to state institutions in electronic form;*

*– organization of legally significant electronic document management.*

*The effect of the use of digital technologies for processing of transport documents using electronic signatures in direct rail traffic and direct international traffic is formed at the highest level of the company management and has a synergistic effect of interaction of all its elements, and also leads to the elimination of losses at all stages of the life cycle of customer relationship management – consignor and consignee [7, 8, 9]. The main types of effects (Table 2) for a transport company with technology using an electronic signature are evaluated from the standpoint of competitiveness, company safety and its commercial effectiveness.*

*The indicators of commercial effect take into account the financial consequences of using the technology of execution of shipping documents with the use of electronic signature at the level of the company and its units.*

*Creation of an information space for electronic documents for transportation, containing a large amount of information about the cargoes shipped, consignors and consignees, creates the prerequisites*




***Pic. 1. Effectiveness of digital technologies in logistics.***

*for the use of big data technologies and at the same time a unique resource that represents the possibility of transition from a competition strategy in the transport sector to a strategy of cooperation and partnership –basic business models in digital logistics (Pic. 1).*

**Conclusion.** *The effects of a full transition to paperless document management and digital technologies in the transport sector will be felt only when solving the problem of long-term storage of legally significant electronic documents, although the most important documents of permanent storage are being produced on traditional carriers all over the world.*

*The attributes of electronic transport documents such as the big data cluster and the internet of thinking technology create unique information about the behavior of customers, the required product offers and price preferences, allow to form effective logistics chains of value creation, as well as solve the global state problem of optimizing the transport component in the price of domestic products.*

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