

ЕКСПЛУАТАЦІЯ ТА РЕМОТ ЗАСОБІВ ТРАНСПОРТУ

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THE ROLE OF UKRAINIAN RAILWAY TRANSPORT IN MODERN LOGISTIC PROCESSES

Purpose. As Ukraine actively develops its transport and logistics network taking into account the modern changes, the ever-increasing trade volume between the Europe and Asia, presents a good opportunity for increasing interoperability for the networks of international railway transportations. The study is aimed to consider in detail main components of railway interoperability and possible ways for achievement of their interaction. **Methodology.** The idea of interoperability was taken as a basis as a part of logistic system at railway. The crossing of different types of gauges was analyzed on the example of collaboration of Ukraine with European and Asian countries due to the increased freight traffic volume between them. **Findings.** Taking into account the basic technical parameters unifying the railway operation we found out the following principles: to agree upon a set of technical parameters, essential for the interoperability of the entire region; to determine the values and methods for agreement of the technical parameters to achieve technical interoperability; to decide on gradual implementation of technical interoperability, starting from the international corridors in a coordinated way depending on the priorities of international transportations. **Originality.** We considered the value of interoperability as a part of railway logistic systems. **Practical value.** The obtained results of search can be used during implementation of common platform of Ukraine's collaboration with other countries related to the railway interoperability by establishing common base for work in prospective collaboration.

Keywords: interoperability; track gauge; logistic systems; supplies chains

Introduction

In rail transport, the concept of interoperability appeared along with the implementation of European Directives relating to the establishment of the rail market and the increase in the possibility of the transfer of transport by rail between countries [3, 10]. Interoperability of railway transport development is not only a matter of achieving Ukraine's potential but also ensuring the country's access to international markets. Movements of people, goods and information have always been fundamental components of human societies. Contemporary economic processes have been accompanied by

a significant increase in mobility and higher levels of accessibility [16]. Ukraine can take the right steps to seize this opportunity by enhancing development of interoperability in railways through initiatives such as support the investments in railway infrastructure to achieve technical interoperability, harmonization of the regulatory framework for the railway industry (mainly common safety rules), regulation of the border crossing procedures to facilitate international traffic and implementation of the commercial and legal framework for international rail transport [3, 13].

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Purpose

The article is aimed to streamline the study by suggesting that we could offer a common platform of collaboration of Ukraine with other countries for activities related to the railway interoperability subject, preserving common data base for member countries.

Methodology

The contemporary transportation market requires from the railway transport of Ukraine the high level of quality, regularity and reliability of transport services in field of logistics [4]. In the conditions of market economy one of the main factors that contributes to the establishing and securing a leading position at the transportation market is the competitiveness of railway transport in different kinds of traffic volumes. In addition, the transport infrastructure state of Ukraine should comply with the requirements of the European Union (EU) [13]. Under the existing state of the Ukrainian railways technical equipment that needs renewals at almost 80%, there also arises the problem of optimization of the passenger complexes functioning process to achieve the effective organization of transportation process [17]. This is necessary in order to obtain economic effect, which will yield the possibility to gradually update the carrier's rolling stock in our days.

Transportations must not be only convenient and affordable, but they should also meet the requirements of safety and high-speed delivery in order to ensure the competitiveness of the railway transport with logistics methods [4]. In view of the extent and complexity of the rail system, it has proved necessary, for practical reasons, to break it down into the following subsystems: infrastructure, control command and signaling, energy, rolling stock, operation and traffic management, maintenance for freight services. For each of these subsystems the essential requirements must be specified and the technical specifications and interfaces to meet these essential requirements [3].

The railway transport improvements should be sent generally on maintenance of trains and wagons. The main improvement tasks regarding the technology of the trains and wagons processing are the reduction of technological operations duration, the decrease of the interoperable downtime dura-

tion for minimizing transportation costs, ease of the wagons and trains replacement during the circulation in the places of destination [15]. One of the means for the achievement of the interoperability is the division of the European railway system into sub-systems:

- infrastructure (rails, switches, constructions),
- energy (electrification equipment, overhead trolley lines),
- control, command and signaling (equipment for ensuring the safety, control and regulation of the movement of trains),
- interface (current collectors, wheel-rail interface, etc.) [25].

The idea of interoperability it is a part of logistic system work in the world. To implement interoperability into Ukrainian's railway logistic system and around the world means to eliminate the operational barriers in developing flawless international transport services. To make railway interoperable with other railways means to harmonize the technical parameters, operational procedures and the legal environment of the two entities. It is a complicated goal, as it depends on the interoperability of many other entities in the countries to which the two railways belong. International experience shows that achieving railway interoperability may become in some cases an exceptionally difficult task, as it requires strong political support and active involvements from all involved countries to harmonize national policies and practices [10]. Railway interoperability can be achieved through a coordinated approach of the member countries in three major directions shown in Figure 1. There are unified contractual obligations vis-a-vis customers from origin to destination; common technical parameters of railways infrastructure and rolling stock; harmonized operational practices over an entire international route.

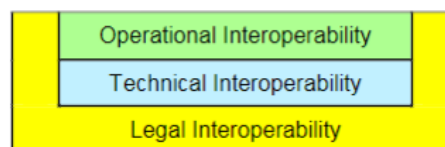


Fig. 1. Components of railway interoperability

Technical interoperability is usually the most expensive component to be achieved compared with the operational and legal components of interoperability. It requires very large investments.

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Most major railway corridors connecting between two and more railways will include at least one exchange of gauge and so the common technical parameters must be agreed upon the technical means necessary to allow trains to continue their routes through destination, running over different gauge of railways. Possible list of countries where Ukraine can have a common platform of collaboration is shown in Table 1 [16].

Currently, when large railway networks are already built on different track gauges, the efforts are directed to develop and implement technical and operational procedures for increasing the interoperability between the existent different track railways by reducing the operating time in the track changing stations and diminishing the operating costs of railway transport from origin to destination.

Collaboration is the highest level of decision making. It involves political alliances between heads of state, parliaments, and governments along the corridor. Cooperation is mutual support by ministries and agencies. Management refers to the effective running of the corridor. An agreement refers to any form of document, binding or not, that reflects the willingness and commitment of the parties concerned by the development of the corridor and endorsed by them, including a memorandum of understanding, a convention, a treaty, or other types of agreements [20]. Joining the existing international railway conventions is the only way to comprehensively address the legal issues of international rail transport across the entire continent and in relationship with Europe. After joining one of the existing international railways conventions, neighboring countries or all countries along a corridor may sign subsequent bilateral or multilateral agreements for joint implementation of their agreed up on obligations for managing international railway transport services, but only in the general framework established by the international convention they belong to [19]. Figure 2 presents schematically the cascade of agreements in their logical order: governmental agreements, agreements of state institutions involved in border crossing procedures, agreements of neighboring railways for handing over the train at border, agreements between railways along the corridor for providing joint transport services.

Table 1

List of countries –Track Gauges

Nr	Country	Track gauge [mm]		
		1676	1520	1435
1	Ukraine			
2	Belarus			
3	Poland			
4	Slovakia			
5	Romania			
6	Moldova			
7	Bolgaria			
8	Turkey			
9	Georgia			
10	Armenia			
11	Azerbaijan			
12	Russian Fed.			
13	Kazakhstan			
14	Uzbekistan			
15	Mongolia			
16	Pakistan			
17	Nepal			
18	India			
19	China			



Fig. 2. Layers of legal interoperability

As customers are interested in door to door transport solutions, railways must develop adequate interfaces with road, water and air transport to become part of logistic chains. It should be a vital objective for the railways, knowing that the

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decision of choosing the routes and modes of transport is usually made not by shippers, but by logistic operators. Any transport corridor will attract traffic and trade only when it will be competitive in the context of supply chains. The needs of specific supply chains, the flexibility of the inter-modal services and the provided value-added services will play paramount roles in the logistic decisions. These requirements do not apply to particular sections of the international routes, but to entire transport-logistic chains. However, infrastructure alone would not facilitate the movement of people and goods between countries if non-physical impediments are not removed. Efforts to facilitate transport are paramount to the smooth movement of goods and people especially in international traffic, as transport facilitation contributes to the diminishing of the economic distance to markets. Transport facilitation can only serve its purpose if based on harmonized legislation, institutions, and practices, at national, sub-regional, regional and international level [2].

Findings

The reality illustrates that it is not easy to define and to put in place a harmonized concept for improving the interoperability of railways across the region. One of the main difficulties is the huge diversity of countries and railways in region. But presently, all European countries are members of The Convention concerning International Carriage by Rail (COTIF) and a lot of barriers to the interoperability of railways, are eliminated. The railway traffic between the European countries is based on these rules and regulations. Also, the Organization for Cooperation of Railways (OSJD) was established as the equivalent of the International Union of Railways to create and improve the coordination of international rail transport. Concerning especially the transports between Europe and Asia, it has helped develop cooperation between railway companies and with other international organizations. The members of this organization created an international transport law [19]. Following from our search work we assumed that both of these organizations can be used as a ground to collaboration of all countries from the list in Table 1 guided by the principles of interoperability set forth in this work.

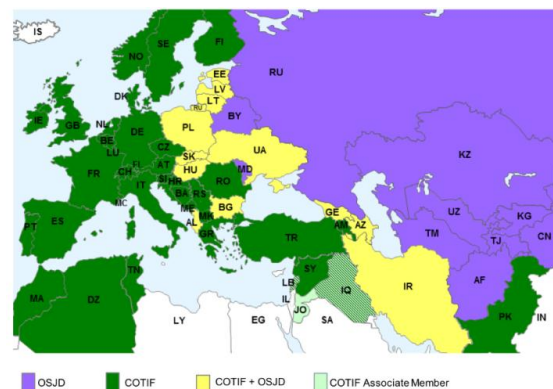


Fig. 3. COTIF / OSJD membership

As we see in Figure 3 Ukraine is a member of both organizations what gives geographically great opportunity for development in interoperable field in the direction with Europe and Asia. Interoperability can use its worldwide influence to invite the experts from OSJD, COTIF and from other relevant international entities to support the efforts of the railways of the regions in this direction. To become competitive on international railway transport is a very challenging task which requires cooperation of countries, adaptability of railways to the market demands and continuous improvement of the quality of railway transport services. Once a system is interoperable it opens the door to new markets, and not just in Europe. Railways have always needed to conform to standards and with an assurance regime to certify that products and systems comply. The EU interoperability regulations provide a common system for verification and approval across all of Europe [2]. The implementation of the interoperability may help the member countries to achieve this objective in a coordinated approach and using working methods adapted to the needs and possibilities of each country.

Originality and practical value

The competitiveness of the international railway transport is a matter of active participation in a coordinated approach of all involved parties, as in all cases of logistic chains, the quality of operation of international traffic along a certain route is defined by the possibility of interactions of transport modes on the way between countries, optimized material and informational flows also. Conducted research on the example of Asian and European countries gave us the opportunity to consider Ukraine as

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a possible participant in interoperable work with Asian countries in connection because of the growth of freight traffic volumes to the country. Presently, maritime transport is by far the dominating mode of transport in the Euro-Asian trade. However, by integrating railways as part of the logistic chains, land transport maybe come an important complement to shipping services and may increase the reliability of high-value and time-sensitive supply chains using all the basics of interoperability. That means the ability of a rail system to allow the safe and uninterrupted movement of trains which accomplish the required levels of performance for these lines. This ability depends on all the regulatory, technical and operational conditions which must be met to satisfy the essential requirements.

In the conducted studies, the analysis of possible variants of transportation logistics from Eastern Ukraine to Poland was made. For comparison, seven possible variants of transportation and a new project solution is selected. Based on the SWOT analysis, as well as marketing and logistics research on project variants, it has been proved that the proposed direct rail route can compete on an equal footing with existing variants of transport [1].

Recently, the demand for international transportation and transport services has increased significantly among Ukrainians and residents of Europe. But nowadays, the clients most often act as a logistician of their transportation, without having complete data on the reliability and safety of transport networks, rolling stock of different modes of transport, schedules and routes.

The introduction of logistic approaches to the development of Ukraine's transport system will allow the client to make his own decision about the option of a trip depending on the most important factors and characteristics of transport service for him. Ukrzaliznytsya (UZ) and Polish Railways (PKP) have a unique opportunity to assist clients in providing information and logistic services, as well as in selecting the most favorable transportation options. For this purpose, it is necessary to organize traffic between the largest cities of Europe and to enable goods to cross the border conveniently and quickly. Therefore, one of the most promising ways of solving this problem is to diversify the activity of railway transport in the market of transport and international transportation services. Expanding the network of international rail

routes will attract goods from other modes of transport, as well as increase the percentage of tourists who plan to visit popular corners of both Ukraine and other EU countries [12, 16].

Conclusions

Opening the railway market for services requires the implementation of the interoperability conditions, to integrate railway systems and enable the movement of passenger and freight trains without unnecessary restrictions arising from the technical and organizational differences in these systems. Allowing access of interoperable trains to interoperable networks is preceded by activities that allow the assessment of the fulfillment of all basic conditions in terms of technical compatibility, performance, and organization of the trains [11]. Taking into consideration the huge financial impact of eliminating the existing technical barriers in railway transportation system, it is highly advisable to develop a strategy for achieving the technical interoperability in stages, starting with the major railway corridors. Railway in the region must be aware that the smooth interoperation of different modes of transport will facilitate more efficient use of the existing infrastructure and will increase the efficiency of transport system. Finally, high-performance transport corridors using intermodal transport chains and integrated routes will facilitate more rapid economic growth. All these challenges require further harmonized efforts of the member countries to identify appropriate solutions to complex issues, as: a) intermodal trans-shipment terminals and logistics centers; b) trans-shipment technologies; c) electronic fare management systems across different transport modes; d) transport management across different modes of transport. The rail transport mode is the more effective and efficient by the fact it connects the most populated areas at increasingly high speeds, providing social cohesion at national, European and international level. The interoperability and resilience of the rail systems are the key challenges to strengthen the competitiveness of rail products and operations. Moreover, the increasing speed opens the door to new services, crossing borders [7]. This issue is highlighted as the next essential step for enhancing the railway transport competitiveness, once the railway interoperability is achieved.

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РОЛЬ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ УКРАЇНИ В СУЧАСНИХ ЛОГІСТИЧНИХ ПРОЦЕСАХ

Мета. Оскільки Україна активно розвиває свою транспортно-логістичну мережу з урахуванням сучасних змін, обсяг торгівлі між Європою й Азією, який постійно зростає, представляє гарну можливість підвищення функціональної сумісності мереж для міжнародних залізничних перевезень. У дослідженні передбачено детально розглянути основні компоненти сумісності залізниць і можливі шляхи досягнення їх взаємодії. **Методика.** За основу була взята ідея інтероперабельності як складової логістичної системи на залізниці. Проаналізовано перетинання різних типів колій на прикладі співпраці України з країнами Європи й Азії через збільшення товарообігу між ними. **Результати.** З огляду на загальні технічні параметри, які об'єднують роботу залізниць, ми з'ясували такі принципи: узгодити набір технічних параметрів, необхідних для взаємодії в усьому регіоні; виявити значення й методи узгодження технічних параметрів для досягнення технічної сумісності; прийняти рішення про поступове впровадження технічної сумісності, починаючи з міжнародних коридорів, скоординовано залежно від пріоритетів міжнародних перевезень. **Наукова новизна.** У роботі було розглянуто значення сумісності як частини залізничних логістичних систем. **Практична значимість.** Отримані результати пошуку можуть бути використані під час впровадження загальної платформи співпраці України з іншими країнами, пов'язаними з експлуатаційною сумісністю залізниць, шляхом створення загальної бази для роботи в перспективному співробітництві.

Ключові слова: інтероперабельність; колія; логістичні системи; канали постачання

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РОЛЬ ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА УКРАИНЫ В СОВРЕМЕННЫХ ЛОГИСТИЧЕСКИХ ПРОЦЕССАХ

Цель. Поскольку Украина активно развивает свою транспортно-логистическую сеть с учетом современных изменений, постоянно растущий объем торговли между Европой и Азией предоставляет хорошую возможность повышения функциональной совместимости сетей для международных железнодорожных перевозок. В исследовании предусмотрено подробно рассмотреть основные компоненты совместимости железных дорог и возможные пути достижения их взаимодействия. **Методика.** Как основа была взята идея интероперабельности как части логистической системы на железной дороге. Проанализировано пересечение различных типов колеи на примере сотрудничества Украины со странами Европы и Азии в связи с увеличением грузопотока между ними. **Результаты.** Учитывая общие технические параметры, объединяющие работу железных дорог, мы определили следующие принципы: согласовать набор технических параметров, необходимых для взаимодействия во всем регионе; выявить значения и методы согласования технических параметров для достижения технической совместимости; принять решение о постепенном внедрении технической совместимости, начиная с международных коридоров, скоординированным образом в зависимости от приоритетов международных перевозок. **Научная новизна.** В работе было рассмотрено значение совместимости как части железнодорожных логистических систем. **Практическая значимость.** Полученные результаты поиска могут быть использованы при внедрении общей платформы сотрудничества Украины с другими странами, связанными с эксплуатационной совместимостью железных дорог, путем создания общей базы для работы в перспективном сотрудничестве.

Ключевые слова: интероперабельность; колея; логистические системы; каналы поставок

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