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THEORETICAL AND ANALYTICAL SUBSTANTIATION OF THE FACTORS AFFECTING THE LEVEL OF SERVICE QUALITY MANAGEMENT OF RAILWAY TRANSPORT ENTERPRISES

ABSTRACT

The purpose of the study: theoretical and analytical substantiation of factors affecting the level of quality management of services of railway transport enterprises in Ukraine.

The article analyzes the main scientific works of domestic and foreign scientists regarding the determination of the factors affecting the level of service quality management of enterprises, including railway transport enterprises. This is especially acute during the period of hostilities taking place on the territory of Ukraine. Thus, during the period of hostilities, the number of transportation services increased, especially due to the evacuation of the population and free travel. That is why the development of the potential of transport enterprises, including railway ones, is of crucial importance. The dynamics of changes in the transportation of passengers and cargo by modes of transport are presented in the paper with railway transport as a priority. The category of concepts "product quality" and "quality of services" has been analyzed.

The internal (production, socio-psychological, human, organizational) and external (political, economic, social, technological, ecological, cultural, medical-biological) factors that affect the quality of services have been singled out, as well as the factor that affects the level of service quality management of railway transport enterprises, which, according to the authors, includes: reliability, safety, sensitivity, competence, accessibility, sociability, understanding, materiality, as physical parameters of the service, trust, courtesy. An integral indicator of the quality management level of railway transport enterprises is proposed. It has been found that in the future the construction of an integral indicator of the level of service quality management of railway transport enterprises and the determination of its forecast values may form the basis of the development of the state regional development strategy and separately be important for the development plans of railway transport enterprises.

Keywords: railway transport, enterprise, management, service quality, factors

JEL Classification: L98

INTRODUCTION

The transport industry in Ukraine and other countries of the world occupies an important place in everyone's life. This is especially acute during the military operations, due to the invasion of the Russian Federation on the territory of independent Ukraine, where transport services for the transportation of goods and passengers are important not only for the population but also for the country as a whole for the success of its social and economic development. Thus, during the period of the full-scale invasion of the Russian Federation, from January to April 2022, railway transport companies transported 7.4 million passengers, which is 1.5 million more passengers than in the same period of 2021 [1]. The largest increase of 64% was precisely in March 2022, which is connected with the evacuation of the population from the war zone and the transportation of passengers and cargo to a safer area. However, such transportation was carried out free of charge. At the same time, after the reduction of the number and cancellation of

evacuation trains, the passenger flow has significantly decreased. For example, in 2022, the number of passengers carried was 19% less than the level of the same period in 2021. In general, transport work requires the expansion of logistical transport links, where the greatest attention, at the same time, should be paid precisely to managerial, economic and financial aspects. It should also be noted that a significant percentage of cargo and passenger transportation in Ukraine is occupied by railway transport enterprises [2]. Railway transport is one of the most important basic branches of the economy of Ukraine, since it provides internal and external transportation and economic connections and meets the needs of the population in transportation [3].

Taking into account the future prospects – the accession of Ukraine to the European Union, the country's government must immediately resolve issues related to the integration of the railway industry of Ukraine into the EU transport system, considering the improvement of the quality of services provided by enterprises. This problem has become relevant also in connection with the fundamental reform of the transport industry and the admission to the organization of the transport process of state, private and international investments, where capital investments are an important condition for the development of the potential of the transport industry.

Thus, the globalization processes that are actively taking place in Ukraine require a significant expansion of the transport system. However, the significant demand for transport system services must also take into account the high quality of the services provided, which is one of the most important indicators of the activity of any enterprise. The assessment of railway transport services, first of all, depends on such basic criteria as reliability, economic efficiency, availability and flexibility. Therefore, it is important to single out the factors that affect the level of quality management of railway transport enterprises, which makes the research particularly relevant.

LITERATURE REVIEW

In general, a significant number of domestic and foreign works of leading scientists, both in Ukraine and abroad, are devoted to issues related to the management of the quality of services at enterprises and the justification of factors affecting it (Kuznyetsova, A., Tiutiunyk, I., Panimash, Y., Zsolt, Z., & Zsolt, P. [4]). For example, Tymchuk S.V. and Neschadym L.M. [5] were engaged in improving the quality of enterprises' services in the tourism sector, where they emphasized the importance of implementing international quality standards and their certification in accordance with the requirements of the international standard ISO 9001. Trachenko L.A. [6] in the study substantiated the factors that influence the formation and functioning of quality management systems of enterprises in the field of engineering services and, in the author's view, the formation and implementation of a quality management system following the requirements of the international standard ISO 9001:2015 at enterprises in the field of engineering services are an effective means of improving the quality of work (services). According to N. Badalov [7], the quality management certification system is of great importance for enterprises in any field. Dzhereliuk Yu.O. studied the methods of service quality assessment [8]. He believed that the assessment of service quality indicators is an effective management tool for managing the level of service quality. Thus, the authors W. Shuli, and Q. Minrong [9] in their study proved that the quality of services has an important influence on the export-import behaviour of enterprises, which is of significant interest for their further profitable activity. Boichenko K., Klymenko S., Shevchuk N., and Terentieva O. [10] substantiated a complex methodical approach to assessing the quality of complex development of enterprises as a basis for making effective management decisions. Jinzhi Weng [11] believes that enterprises can use quality management measures to promote service innovation, thereby creating new competitive advantages and achieving the goal of enterprise production capacity. C. Kochariyeva [12] investigated the quality management system at non-manufacturing enterprises taking into account the marketing approach, where the marketing activity is analyzed from the point of view of management quality.

However, it is worth noting that the works of scientists regarding the management of the quality of services of transport enterprises, including railway transport, deserve special attention. Investigating the processes related to the provision of quality services at railway transport enterprises, M. Rudenko [13] proposed mechanisms of interaction, which are a set of organizational structures, distribution of powers and responsibilities, methods and resources necessary for establishing, maintaining and improving the quality of services passenger transportation by rail. Also, L.A. Tarandushka and N.L. Kostian proposed mechanisms and means for automating the functions of the quality management system in order to optimize the activities of transport enterprises [14]. Measures to improve the quality indicators of transport company services, namely: expanding and simplifying the transport network, modernizing the infrastructure and ensuring the comfort of trips due to the arrangement of convenient transport waiting areas, facilitating access to stations and tolls were proposed by Nazarenko Ya.Ya. [15]. In general, the services of transport enterprises were also analyzed in the works of E. Vodovozov, O. Rudachenko [16], V.O. Ovchinnikova, D.D. Dudin, and N.M. Dyakova. [17], Obruch H. [18] and others.

Therefore, all the scientists in their works investigated the issue of service quality management at enterprises of various fields, and formed appropriate approaches and mechanisms that, in the future, will ensure the improvement of the enterprises' efficiency. Some of the scientists substantiated the factors affecting the quality of services. However, in general, the factors affecting the level of quality management of railway transport enterprises are not fully substantiated. Based on the foregoing, the question arises as to the definition of such factors.

AIMS AND OBJECTIVES

The purpose of the study is theoretical and analytical substantiation of factors affecting the level of quality management of services of railway transport enterprises in Ukraine. To achieve the goals set in the work, the following tasks are formulated:

- to analyze the main theoretical and methodological approaches of domestic and foreign scientists in determining the factors that affect the level of quality management of services of enterprises, including railway;
- substantiate the importance of the transport industry as the basis for ensuring the socio-economic development of the country;
- to construct an algorithm for building an integral indicator of the level of railway transport enterprises' services quality management.

METHODS

Research related to the substantiation of factors influencing the level of services quality management of the enterprise is based on theoretical, empirical, as well as economic and mathematical methods, which include:

- collection, analysis and systematization of scientific foreign and domestic literature, regulatory and legal documents;
- analysis of the dynamics of freight and passenger transportation indicators by types of transport;
- comparison of transportation indicators in dynamics by year;
- graphic method for the visual representation of indicators;
- tabular method for summarizing data in research;
- the taxonomy method for building an integral indicator of the level of quality management of services of railway transport enterprises.

Also, methods for determining the factors affecting the quality of services should include comparison and grouping, peer review, synergistic approach, etc. It should be noted that modern methods and models contribute to facilitating the solution of issues of substantiating the factors of influence on the level of quality management of services of enterprises in other industries. This indicates, first of all, that the development of new methods and models, the improvement of existing ones is relevant and in demand.

RESULTS

It is worth noting that quality is the most important part of consumer satisfaction. High quality leads to high satisfaction, and high satisfaction leads to loyal customers. And purchasing loyalty is a guarantee of high profits and growth of the enterprise. In general, the term "quality" belongs to the category of special and ambiguous concepts, about which each person has his/her own specific idea. But whatever his/her own idea is, it only emphasizes the subjectivity of this concept, since its interpretation depends on a person's worldview and own practical experience. To date, there are a large number of definitions of the concept of "quality". The category "quality" can also be considered applied to: the quality of products and services, quality of work, business qualities, quality of education, quality of craftsmanship, quality of life, etc. Quality is affected by a large number of factors, both internal (which are subject to control and management) and external (control and management of which is impossible). In general, the main external factors affecting the quality of products or services of enterprises can be attributed to political, economic, social, technological, ecological, cultural, medical and biological, etc.

Internal factors are of particular interest. Thus, the following should be included among the internal factors affecting the quality of the enterprises' products (Figure 1).

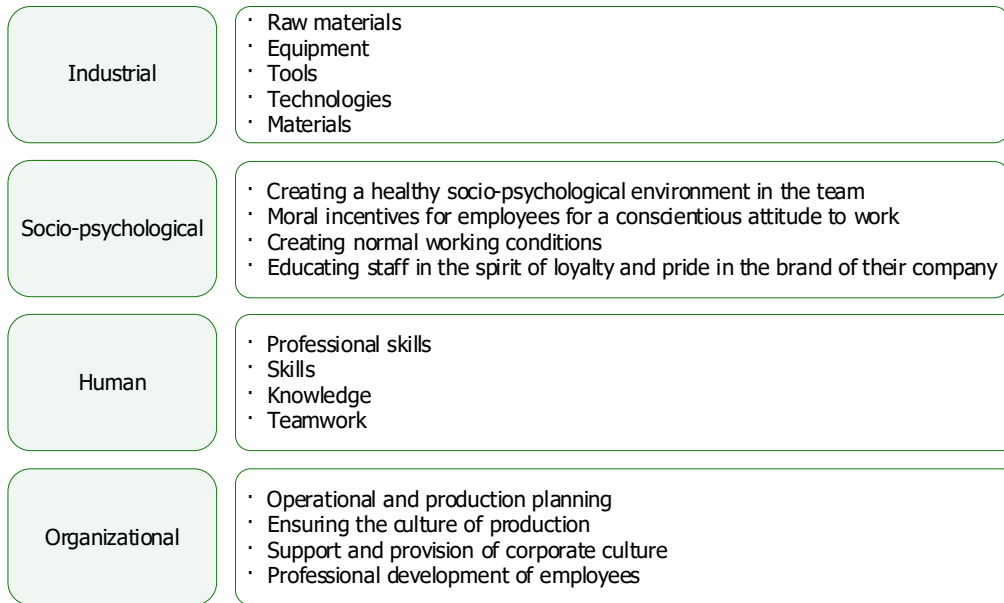


Figure 1. Internal factors affecting the quality (products) of enterprise services.

Improving the quality of products or services is one of the most important factors in increasing the efficiency of enterprises, in general, as a decisive competitiveness prerequisite. In other words, the quality of the strategy becomes part of the enterprise's marketing. Thus, in [19], "product quality" is considered a catalyst for the formation of a production system and technology, united under the concept of "Industry 4.0". Product quality as the basis of consumer satisfaction is considered in the study [20]; the authors believe that the main motivation of any enterprise is constant work on improving product quality. Product quality can be directly related to the vertical integration of the enterprise [21]. "Product quality is the total set of products (work, service) characteristics that are included (are components) in marketing, development, production and maintenance, with the help of which the product (work, service) must satisfy the needs of the consumer at an affordable price" [22]. Summing up the research of the authors [23], we believe that the quality of a product is a combination of its properties that can satisfy the needs of consumers according to the intended purpose of this product.

The development of quality management makes it possible to separate the two concepts of "product quality" and "service quality". In more detail, we would like to pay attention to the category "quality of service". The quality of service, as a set of its features, signs and characteristics, based on its ability to satisfy the stated or expected need of the client (consumer) is considered in the paper [24]. "The quality of products and services is determined by their ability to satisfy consumers and their expected and unexpected impact on relevant stakeholders" [26]. Service quality is considered in [25] as a service that meets needs. So, under "quality of services" we mean, first of all, satisfaction with the provided services that meet the established and expected standards or parameters. For transport enterprises, such parameters may include the time period from the receipt of the application for transportation to the end of the transportation of the cargo; the level of tariffs and other service costs; complete fulfilment of the client's order; cargo processing in the warehouse; execution of package and container transportation, etc. So, the main task facing the management of the enterprise is the ability to correctly and rationally manage the quality of services. Today, many enterprises consider quality management as a serious competitive struggle, which allows for increasing sales volumes and market share.

It is worth noting that the management of service quality should be understood as the use of existing economic, managerial and production potentials, which collectively make it possible to satisfy the demands of the consumer, provided that the entity that provides it benefits for its own economic development [26]. It is also worth noting that the development of the quality management system should consider international and state quality standards, including the state standards of Ukraine, integrated under the ISO 9000:2000 standards and oriented primarily to the consumer [27].

Enterprises that provide services include transport enterprises. Thus, transport is one of the most important branches of the national economy, designed to meet the needs of the population and public production in the transportation of passengers and cargo. It is also worth noting that transport is a necessary prerequisite for the functioning of both material production and the service sector, including passenger transportation. Transport is a branch of the non-manufacturing sphere. Figures 2-3 show the dynamics of changes in the transportation of passengers and cargo according to the data of the State Statistics Service of Ukraine for 2018-2021 [2].

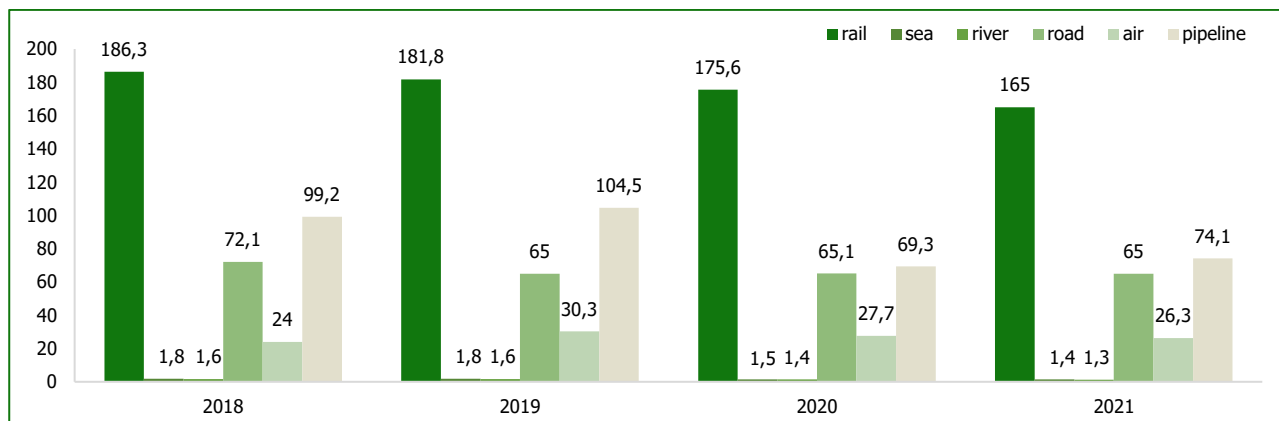


Figure 2. Freight transportation by types of transport, million tons. (Source: developed by the authors based on [2, 28])

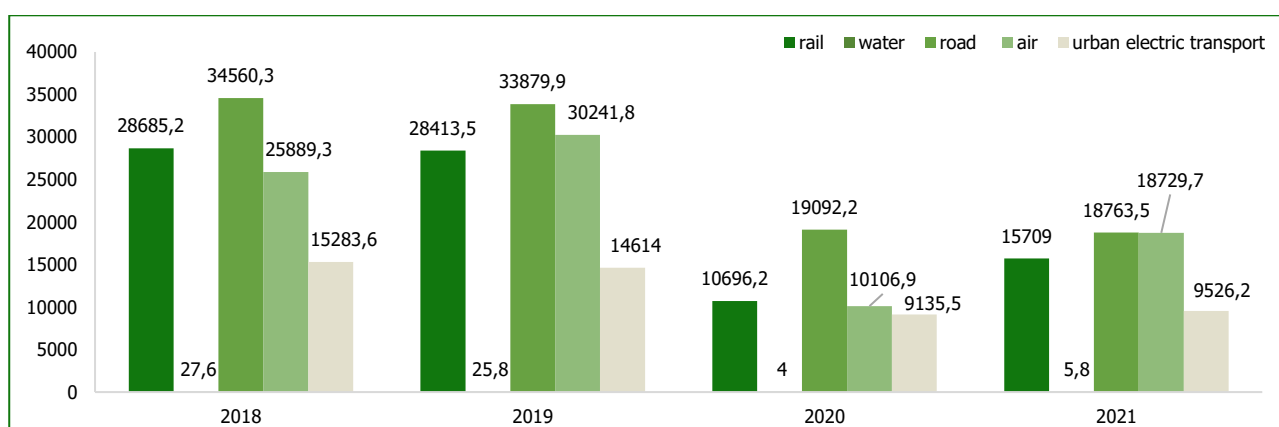


Figure 3. Passenger transportation by types of transport, million passenger-km. (Source: developed by the authors based on [2, 28])

The dynamics of changes in the values of indicators for the transportation of passengers and cargo clearly demonstrate the priority of railway transport, which is considered the leader in the transport complex of Ukraine. The advantages of railway transport include reliability and relatively high speed of delivery of goods and passengers, independence from weather conditions, regularity, mass, versatility, etc. However, taking into account the significant advantages and priority of railway transport enterprises, the quality of the provided services should also be taken into account. Thus, in order to achieve sustainable socio-economic development in the country, it is necessary to constantly improve the quality of the provided services, and for this, first of all, it is necessary to be able to correctly assess the quality and identify the factors that affect it. In today's realities, it is possible to objectively assess the quality of transport enterprises' services if a generalized characteristic of the general technological process is developed, in which two separate directions can be distinguished, namely:

- assessment of the provided service quality as the simplest approach, which involves preventing the occurrence of defects in work. However, when evaluating the results of the quality of transport services, it is almost impossible or very difficult to determine the causes of deficiencies without additional research;
- assessment of the level of transport services, which, using an assessment of the overall production process, will provide a correspondingly reliable and qualitative level of the process.

Thus, for a more effective analysis of the transport enterprises' quality, it is possible to use a wide range of the quality indicators of passenger transportation, which are divided into four groups:

- transport support indicators;
- transport service quality indicators;
- transport product quality indicators;
- quality indicators of transport work.

It is worth noting that when assessing the quality of services, it is important to consider the factors affecting them. Thus, the above analysis of scientific works [6, 8, 12] regarding the list of factors that influence the improvement of quality

management efficiency confirms the fact that each of the authors singles out different factors, at the same time attaching the appropriate significance to their research.

Also, the authors formed the main factors that affect the level of quality management of railway transport enterprises (Table 1). The difficulty of determining such factors is due to the fact that, as mentioned above, railway enterprises belong to the non-manufacturing sphere, that is, the service is intangible, and the task of dividing quality into components is more difficult than in the case of tangible goods.

Table 1. Factors affecting the level of service quality management of railway transport enterprises.

Factor	Features
Reliability	Quality stability, functional reliability, the firm's ability to keep promises
Safety	Absence of danger, risk, doubt. It includes physical security, financial and moral peace of mind.
Responsiveness	The desire and readiness of the staff to provide the service, the timeliness of the service
Competence (expertise)	Possession of the knowledge and skills necessary to provide the service
Availability (physical and psychological)	The openness of service personnel and simplicity of contact with them
Sociability	The ability to speak a language understandable to passengers (Ukrainian, English), the ability to listen
Understanding	Knowing your customers and being able to understand their needs
Materiality, as physical parameters of the service	The external and internal view of the carriages used for transportation, the appearance of the personnel, the physical (material) elements of the service
Trust (reliability, honesty)	Presupposes that service personnel are primarily guided by the interests of passengers
Courtesy	Courtesy, respectful attitude, courtesy, and friendliness of personnel working with the consumer

It is worth saying that the use of the listed factors affecting the level of service quality management makes it possible to ensure consumer satisfaction. Thus, according to ERADIS [29], the best indicators in 2021 regarding consumer satisfaction with the services of railway transport enterprises are observed in Great Britain. The sample of the study was based on three main criteria: satisfaction with railway stations, their equipment and conditions of stay; satisfaction with the technical equipment of rolling stock, the comfort of cars and the quality of service in trains; satisfaction with the ease of purchasing travel tickets.

Thus, the importance of determining the factors affecting the level of quality management of railway transport enterprises is an important task today, both at the level of enterprises and at the level of the country in general.

Therefore, with the help of taxonomy methods, it is proposed to form an integral indicator of the level of service quality management of railway transport enterprises, which will take into account the factors affecting the quality of services. The construction of an integral indicator by the taxonomic method was proposed by Z. Helwig. The taxonomic indicator of the level of management is a synthetic value, the "equivalent" of all features that characterize objects. This allows you to linearly arrange the elements of the studied population with its help [30]. The advantage of using the integral indicator by the taxonomic method is the linear ordering of multidimensional objects; the indicator is normalized, which makes it possible to rank the studied states by the level of management; the integral indicator is easily interpreted.

The algorithm for constructing an integral indicator is presented in Figure 4.

1. Stage. Analysis and assessment of factors affecting the quality of services
2. Stage. Formation of the matrix of input data indicators
3. Stage. Normalization of the information space
4. Stage. Differentiation of signs into stimulators and destimulators
5. Stage. Construction of the benchmark
6. Stage. Determining the distance between the object and the standard
7. Stage. Construction of an integral indicator
8. Stage. Interpretation of an integral indicator

Figure 4. Algorithm for building an integral indicator of the level of management of the quality of services of railway transport enterprises.

At the first stage of the process of building an integral indicator, the analysis and evaluation of factors affecting the quality of services is carried out. It should be noted that the assessment of factors is proposed to carry out by expert assessment. As an example, a 5-point scale can be used to provide expert ratings based on various criteria, where 5 is very good, 4 is good, 3 is average, 2 is below average, and 1 is bad. However, it is worth noting that there is no single methodology for determining the level of service quality management. It is also worth mentioning that there is no final number of factors that can affect it.

At the second stage of the process of constructing an integral indicator, the matrix of input data is formed, namely: the elements of the matrix of observations are determined (formula 1):

$$X = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1j} & \dots & a_{1m} \\ a_{21} & a_{22} & \dots & a_{2j} & \dots & a_{2m} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ a_{i1} & a_{i2} & \dots & a_{ij} & \dots & a_{im} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ a_{\omega 1} & a_{\omega 2} & \dots & a_{\omega j} & \dots & a_{\omega m} \end{bmatrix} \quad (1)$$

where ω – the number of researched objects, m – number of features, a_{ij} – the value of the j -th feature for the i -th object.

At the third stage of the process of building an integral indicator, the above indicators are normalized. The need for normalization is justified by the fact that the indicators have different units of measurement, which complicates the calculation of the integral indicator. Normalization involves the transformation of absolute indicators into relative values, while the minimum value of the series is zero, and the maximum value is a single value, which is considered the largest (formula 3.2):

$$a_i = \frac{a_f - a_{\min}}{a_{\max} - a_{\min}}, \quad (2)$$

where a_i – the normalized value of the i -th indicator; a_f – the actual value of the statistical indicator; a_{\min} , a_{\max} – respectively, the minimum and maximum value of the indicator.

At the fourth stage of the process of building an integral indicator, the features of the observation matrix are differentiated. All variables are divided into stimulators (have a positive effect) and destimulators (have a negative effect).

At the fifth stage of the process of building an integral indicator, the standard is built. The distance between individual points-units and the point P_0 , which is the standard of development, is denoted by x_{i0} and is calculated according to the formula:

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At the fifth stage of the process of building an integral indicator, the standard is built. The distance between individual points-units and the point P_0 , which is the standard of development, is denoted by x_{i0} and is calculated according to the formula:

$$P_{i0} = \sqrt{\sum_{j=1}^m (x_{ij} - x_{0j})^2}. \quad (3)$$

where P_0 – reference point; x_{ij} , x_{0j} – indicator value;

In the sixth stage, the integral indicator of the quality management level of railway transport enterprises is constructed (formula 4):

$$IP_1 = \frac{1}{m} \sum_{i=1}^m a_i, \quad (4)$$

where IP_1 – an integral indicator of the level of management of the quality of services of railway transport enterprises, the share of the unit; m – the number of indicators (factors) used to construct an integral indicator; a_i – the normalized value of the i -th indicator used for the integral assessment, the share of the unit.

At the last seventh stage of the process of constructing an integral indicator, its interpretation takes place. So, for the value of the integral indicator, a scale from 0 to 1 is set: the closer the value of the indicator is to one, the higher is the level of control; the closer is the value of the indicator to zero, the lower is the level of control.

DISCUSSION

Considering the future prospects of Ukraine – obtaining the status of a candidate member of the EU, the primary task of today is to improve the quality of enterprises' services. It is the railway transport enterprises that are increasing this potential in international transportation, in this context the issue of the quality of transport enterprises' services remains important. Thus, we partially agree with the definitions proposed in [25–26], where the quality of services refers to services that satisfy consumers and meet their needs, but the authors do not take into account the fact that services must also meet established and expected standards (parameters). Factors affecting the quality of services should also be taken into account. The results of the analysis of the studied works [5–18] showed the ambiguity of the authors' views in the list of factors affecting the level of quality management of transport enterprises' services.

Issues regarding the formation of the final list of factors that are proposed to be included in the construction of an integral indicator of the level of service quality management of railway transport enterprises are also debatable in the work. Such factors depend on the conditions of operation of a specific railway transport enterprise, however, the algorithm for constructing an integral indicator, which is proposed in the work, is universal. According to the authors, such an algorithm will make it possible in the future to form measures to improve proposals for managing the quality of enterprise services.

CONCLUSIONS

The transport industry is the basis for ensuring the socio-economic development of the country, where the largest specific weight among passenger and cargo transportation is occupied by railway transport enterprises. The analysis of the main theoretical and methodological approaches in the form of scientific works of domestic and foreign scientists regarding the determination of influencing factors on the level of service quality management of enterprises made it possible to single out the factors affecting the level of service quality management of railway transport enterprises. Such factors should include reliability, safety, sensitivity, competence (professionalism), accessibility (physical and psychological), sociability, understanding, materiality, as physical parameters of the service, trust (reliability, honesty), and politeness.

The algorithm suggested in the study for constructing an integral indicator of the level of quality management of railway transport services has a practical focus for management, which makes it possible to increase the level of quality management of enterprises' services and ensure its competitiveness and profitability.

Thus, the perspective for further research should be the construction of an integral indicator of the level of services quality management of railway transport enterprises and the determination of its predictive values, which in the future can form the basis for the development of the state regional development strategy and separately for the creation of plans for the development of railway transport enterprises.

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ТЕОРЕТИКО-АНАЛІТИЧНЕ ОБҐРУНТУВАННЯ ФАКТОРІВ УПЛИВУ НА РІВЕНЬ УПРАВЛІННЯ ЯКІСТЮ ПОСЛУГ ПІДПРИЄМСТВ ЗАЛІЗНИЧНОГО ТРАНСПОРТУ

Метою дослідження є теоретичне та аналітичне обґрунтування факторів, що впливають на рівень управління якістю послуг підприємств залізничного транспорту в Україні. У статті проаналізовано основні наукові праці вітчизняних та зарубіжних учених щодо визначення факторів впливу на рівень управління якістю послуг підприємств, у тому числі підприємств залізничного транспорту. Зазначено, що транспортна галузь в Україні та в інших країнах світу відіграє важливу роль у забезпеченні соціально-економічного розвитку країни. Особливо гостро це відчувається саме в період воєнних дій, які відбуваються на території України. Так, за період воєнних дій послуги з перевезення збільшилися, особливо це пов'язано з евакуацією населення та безкоштовним проїздом. Саме тому важливим залишається розвиток потенціалу транспортних підприємств, у тому числі залізничних. Наведено динаміку зміни перевезення пасажирів та вантажів за видами транспорту, де пріоритетним видом транспорту залишається залізничний. Проаналізовано категорію понять «якість» та «якість послуг». Сформовано внутрішні (виробничі, соціально-психологічні, людські, організаційні тощо) та зовнішні (політичні, економічні, соціальні, технологічні, екологічні, культурні, медико-біологічні тощо) фактори, які впливають на якість послуг (продукції) та окремо обґрунтовано фактори, що впливають на рівень управління якістю послуг підприємств залізничного транспорту, до яких, на думку авторів, відносяться: надійність, безпека, чуйність, компетентність (фаховість), доступність (фізична та психологічна), комунікабельність, розуміння, матеріальність як фізичні параметри послуги, довіра (достовірність, чесність), чемність. Запропоновано інтегральний показник рівня управління якістю послуг підприємств залізничного транспорту, побудова якого представлена у вигляді поетапного алгоритму. Використання такого алгоритму дасть можливість керівництву підприємства підвищити рівень управління якістю послуг та забезпечить його конкурентоспроможність і прибутковість. З'ясовано, що в майбутньому побудова інтегрального показника рівня управління якістю послуг підприємств залізничного транспорту та визначення його прогностичних значень може бути покладено в основу розробки державної регіональної стратегії розвитку й мати важливе значення для розробки планів розвитку підприємств залізничного транспорту.

Ключові слова: залізничний транспорт, підприємство, управління, якість послуг, фактори

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