

Electronic scientific and practical journal  
**INTELLECTUALIZATION OF LOGISTICS  
AND SUPPLY CHAIN MANAGEMENT**

**#17 (2023)**  
**February '23**



**WWW.SMART-SCM.ORG**

**ISSN 2708-3195**

**DOI.ORG/10.46783/SMART-SCM/2023-17**

ISSN 2708-3195



## Electronic scientific and practical publication in economic sciences

Electronic scientifically and practical journal “Intellectualization of logistics and Supply Chain Management” included in the list of scientific publications of Ukraine in the field of economic sciences (category "B"): **Order of the Ministry of Education and Culture of Ukraine dated October 10, 2022 No. 894 (Appendix 2)**

**Field of science:** Economic.

**Specialties:** 051 – Economics; 073 – Management

**ISSN** 2708-3195

**DOI:** <https://doi.org/10.46783/smart-scm/2023-17>

The electronic magazine is included in the international scientometric databases:  
Index Copernicus, Google Scholar

**Released 6 times a year**

**№ 17 (2023)**

**February 2023**

**Founder:** Viold Limited Liability Company

**Editor in Chief:** Hryhorak M. Yu. – Doctor of Economics, Ass. Professor.

**Deputy editors-in-chief:** Koulyk V. A. – PhD (Economics), Professor.  
Marchuk V. Ye. – Doctor of Tech. Sci., Ass. Professor.

**Technical editor:** Harmash O. M. – PhD (Economics), Ass. Professor.

**Executive Secretary:** Davidenko V. V. – PhD (Economics), Ass. Professor.

**Members of the Editorial Board:**

SWIEKATOWSKI Ryszard – Doctor of Economics, Professor (Poland);

POSTAN M. Ya. – Doctor of Economics, Professor;

TRUSHKINA N. V. – PhD (Economics), Corresponding Member of the Academy;

KOLOSOK V. M. – Doctor of Economics, Professor;

ILCHENKO N. B. – Doctor of Economics, Ass. Professor;

SOLOMON D. I. – Doctor of Economics, Professor (Moldova);

ALKEMA V. H. – Doctor of Economics, Professor;

Henryk DŹWIGOŁ – PhD (Economics), Professor (Poland);

SUMETS O. M. – Doctor of Economics, Ass. Professor;

STRELCOVÁ Stanislava – PhD (Economics), Ass. Professor, (Slovakia);

RISTVEJ Jozef (Mr.) PhD (Economics), Professor, (Slovakia);

ZAMIAR Zenon – Doctor of Economics, Professor, (Poland);

SMERICHEVSKA S. V. – Doctor of Economics, Professor;

GRITSENKO S. I. – Doctor of Economics, Professor;

KARPENKO O. O. – Doctor of Economics, Professor;

PATKOVSKYI S. A. – Business practitioner.

The electronic scientific and practical journal is registered in international scientometric data bases, repositories and search engines. The main characteristic of the edition is the index of scientometric data bases, which reflects the importance and effectiveness of scientific publications using indicators such as quotation index, h-index and factor impact (the number of quotations within two years after publishing).

In 2020, the International Center for Periodicals (ISSN International Center, Paris) included the Electronic Scientific and Practical Edition "Intellectualization of logistics and Supply Chain Management" in the international register of periodicals and provided it with a numerical code of international identification: ISSN 2708-3195 (Online).

Recommended for dissemination on the Internet by the Academic Council of the Department of Logistics NAU (No. 7 of February 26, 2020). Released 6 times a year. Editions references are required. The view of the editorial board does not always coincide with that of the authors.

Electronic scientifically and practical journal "Intellectualization of logistics and Supply Chain Management" included in the list of scientific publications of Ukraine in the field of economic sciences (category "B"): **Order of the Ministry of Education and Culture of Ukraine dated October 10, 2022 No. 894 (Appendix 2)**

**Field of science:** Economic.

**Specialties:** 051 – Economics; 073 – Management

t.me/smart\_scm  
facebook.com/Smart.SCM.org  
twitter.com/ScmSmart

DOI: <https://doi.org/10.46783/smart-scm/2023-17>  
e-mail: [support@smart-scm.org](mailto:support@smart-scm.org)

тел.: (063) 593-30-41  
<https://smart-scm.org>

## Contents

INTRODUCTION	5
<b>BUGAYKO D.O.</b> Doctor of Science (Economics), Professor (Associate), Corresponding Member of the Academy of Economic Sciences of Ukraine, Vice - Director of ES International Cooperation and Education Institute, Instructor of ICAO Institute, Professor of the Logistics Department National Aviation University (Ukraine), <b>REZNIK V. V.</b> Postgraduate Student, National Aviation University (Ukraine), <b>BORYSIUK A.V.</b> Vice – Director of ICAO Institute Postgraduate Student National Aviation University (Ukraine), <b>BUGAYKO D.D.</b> Student of the Logistics Department National Aviation University (Ukraine)	
TRANSFORMATION OF THE ORGANIZATION OF MULTIMODAL TRANSPORTATION UNDER MARTIAL LAW	6 – 22
<b>SAVCHENKO L.V.</b> PhD of Technical Sciences, Associate Professor, Associate Professor of Logistics Department of National Aviation University (Ukraine), <b>TSAPENKO O.A.</b> Bachelor degree student, National Aviation University (Ukraine) <i>INTERRELATION OF EXTERNAL COSTS OF ROAD TRANSPORT AND FINANCIAL AND LOGISTICS INDICATORS OF THE EU COUNTRIES</i>	23 – 34
<b>GRYTSENKO S.I.</b> Doctor of Economics, Professor, Professor of Logistics Department, National Aviation University (Ukraine), <b>HRECHKOVSKA A.I.</b> Bachelor degree student, National Aviation University (Ukraine), <b>KORDYAK M.O.</b> Bachelor degree student, National Aviation University (Ukraine) <i>DEVELOPMENT OF INTELLIGENT TRANSPORT SYSTEMS OF UKRAINE</i>	35 – 42
<b>OVDIIENKO O.V.</b> PhD Student, Marketing Department, National Aviation University (Ukraine) <i>THEORETICAL AND PRACTICAL ASPECTS OF CORPORATE SOCIAL RESPONSIBILITY TOOLS USAGE BY AVIATION COMPANIES</i>	43 – 56
<b>REVIEW</b>	
<b>AREFIEVA O.V.</b> Review for a scientific monograph Doctor of Sciences (Economics) Yurii Kharazishvili, Doctor of Sciences (Economics) Dmytro Bugayko, Doctor of Sciences (Economics) Viachyslav Lyashenko "Sustainable development of air transport of Ukraine: strategic scenarios and institutional support", prepared at the Institute of Industrial Economics of the National Academy of Sciences of Ukraine	57 – 59
<b>HRYHORAK M.Yu.</b> Review for a scientific monograph Doctor of Sciences (Economics) Yurii Kharazishvili, Doctor of Sciences (Economics) Dmytro Bugayko, Doctor of Sciences (Economics) Viachyslav Lyashenko "Sustainable development of air transport of Ukraine: strategic scenarios and institutional support", prepared at the Institute of Industrial Economics of the National Academy of Sciences of Ukraine	60 – 62

UDC 332.1

DOI: <https://doi.org/10.46783/smart-scm/2023-17-3>

JEL Classification: C51, F63, L92, O33, R58.

**Received:** 14 January 2022

**Grytsenko S.I.** Doctor of Economics, Professor, Professor of Logistics Department, National Aviation University (Ukraine)

**ORCID** – 0000-0002-3322-3986

**Researcher ID** – N-4298-2018

**Scopus author id:** – 57783729900

**Hrechkovska A.I.** Bachelor degree student, National Aviation University (Ukraine)

**ORCID** –

**Researcher ID** –

**Scopus author id:** –

**Kordyak M.O.** Bachelor degree student, National Aviation University (Ukraine)

**ORCID** –

**Researcher ID** –

**Scopus author id:** –

## DEVELOPMENT OF INTELLIGENT TRANSPORT SYSTEMS OF UKRAINE

**Sergiy Grytsenko, Anastasiia Hrechkovska, Mariia Kordyak.** *"Development of intelligent transport systems of Ukraine".* The article determines that the possibilities of the extensive direction of meeting the needs of society in increasing the volume of passenger transportation by increasing the number of vehicles are largely exhausted, especially in large cities. A generalization of the modern development of intelligent transport systems (ITS) in Ukraine was carried out in two directions. The direction of introduction of advanced driver assistance systems (ADAS) into vehicles is highlighted. Reasonable expediency of the MaaS (Mobility as a service) direction of regulating passenger flows. The importance of ITS implementation in Ukraine is highlighted. The goals of ITS development and the possibility of their application are considered. The main traffic management systems are outlined using the example of GPS tracking in the city of Lviv. Important aspects of the development of ITS in Ukraine are disclosed and the development of ITS of Ukraine is presented, in order to increase road safety. It has been proven that under the conditions of a well-developed intelligent transport system, non-stop synchronized traffic on streets and roads is ensured.

**Keywords:** intelligent transport system (ITS), GPS tracking, innovative technologies, transport network, ITS development.

**Сергій Гриценко, Анастасія Гречковська, Марія Кордяк.** «Розвиток інтелектуальних транспортних систем в Україні». У статті визначено, що можливості екстенсивного напрямку задоволення потреб суспільства в нарощуванні обсягів перевезень пасажирів шляхом збільшення чисельності транспорту в значній мірі вичерпані, особливо в великих містах. Здійснено узагальнення сучасного розвитку інтелектуальних транспортних систем (ІТС) в Україні за двома напрямками.

Виділено напрям впровадження в транспортні засоби передових систем допомоги водієві (ADAS). Обґрунтована доцільність напрямку регулювання пасажирських потоків MaaS (Mobility as a service). Висвітлено важливість впровадження ІТС в Україні. Розглядаються цілі розвитку ІТС та можливість їх застосування. Окреслено основні системи управління дорожнім рухом на прикладі застосування GPS-трекінг у м. Львів. Розкриті важливі аспекти розвитку ІТС в Україні та представлений розвиток ІТС України, задля підвищення безпеки дорожнього руху. Доведено, що за умов добре розвинутої інтелектуальної транспортної системи забезпечується невпинний синхронізований рух по вулицях і дорогах.

**Ключові слова:** інтелектуальна транспортна система (ІТС), GPS-трекінг, інноваційні технології, транспортна мережа, розвиток ІТС

**Сергей Гриценко, Анастасия Гречковская, Мария Кордяк. "Развитие интеллектуальных транспортных систем в Украине".** В статье определено, что возможности экстенсивного направления удовлетворения потребностей общества в увеличении объема пассажирских транспортных средств за счет увеличения числа транспорта в значительной степени исчерпаны, особенно в крупных городах. Осуществлено обобщение современного развития интеллектуальных транспортных систем (ИТС) в Украине в двух направлениях. Выделено направление внедрения в транспортные средства передовых систем помощи водителю (ADAS). Обоснована целесообразность направления регулирования пассажирских потоков МААС (мобильность в качестве услуги). Освещена важность внедрения ИТС в Украине. Рассматриваются цели развития ИТС и возможность их использования. Обозначены основные системы управления дорожным движением на примере использования GPS-трекинга во Львове. Раскрыты важные аспекты развития ИТС в Украине, и представлено развитие ИТС Украины для повышения безопасности дорожного движения. Доказано, что в условиях хорошо развитой интеллектуальной транспортной системы обеспечивается непрерывное синхронизированное движение на улицах и дорогах.

**Ключевые слова:** интеллектуальная транспортная система (ИТС), GPS-трекинг, инновационные технологии, транспортная сеть, развитие ИТС.

**Introduction.** Transport is an integral part of the socio-economic development of the country, cities and regions. Meanwhile, in recent decades, the imbalance between the needs for transport services and the real capacity of all types of transport has been growing.

To regulate traffic flows, new technologies are created every day. They are developed in order to make vehicles safer and to improve comfort when using these vehicles.

Such technologies are called - intelligent transport systems (ITS). With proper application of ITS, transport systems are made more efficient, safe and reliable.

ITS is a mixture of developments in the computer field, information technology and telecommunications together with knowledge in the automotive and transport

sectors. Key ITS technologies emerge on the basis of major developments in these sectors. ITS can be defined as the application of computer, information and communication technologies to manage vehicles and networks in real time, including the movement of people and goods [1].

To date, the National Transport Strategy of Ukraine for the period until 2030 has been approved in Ukraine, which sets the following tasks: the introduction of new technologies and intelligent transport systems (ITS) to improve the quality of the provision of transport services, information systems about the services provided, the introduction of an electronic and integrated automatic fare payment system [2].

At present, the implementation of the planned scope of work has actually been suspended due to military operations. Also, in

order to restore, rebuild, modernize transport infrastructure facilities and gradually integrate the transport network of Ukraine into the EU transport network, it is necessary to take appropriate measures and adopt a number of legal acts.

**The purpose of the study:** to determine the development of ITS in Ukraine and its application in practice.

**Research task:** determination of the main goals of ITS development, implementation of ITS traffic management in the city.

**Presentation of the main results.** Intelligent Transport Systems (ITS) have become a vital component of modern transport infrastructure, providing advanced technologies and innovative solutions for efficient, safe and sustainable movement of people and goods. In Ukraine, ITS development has been gaining momentum in recent years, with various initiatives aimed at improving the country's transport systems.

One of the main goals of the development of ITS in Ukraine is to improve the organization of traffic and reduce traffic jams on the country's roads. The Ukrainian

government has implemented several projects to achieve this goal, including the implementation of intelligent traffic management systems, the deployment of smart sensors and cameras, and the development of intelligent transportation networks.

Examples of functions that can be performed using ITS are shown in Figure 1.

The use of ITS contributes to the solution of problems related to ensuring road traffic safety, planning the operation of public transport, eliminating traffic jams in transport networks, increasing the productivity of transport enterprises, as well as solving problems related to environmental pollution [4].

ITS has many advantages - high accuracy of determining the location of the position of vehicles for managing them in real time, navigation service of emergency vehicles. However, the creation of a continuous stable navigation service in the conditions of tunnels and high-rise urban buildings cannot be provided by the capabilities of modern satellite navigation systems.

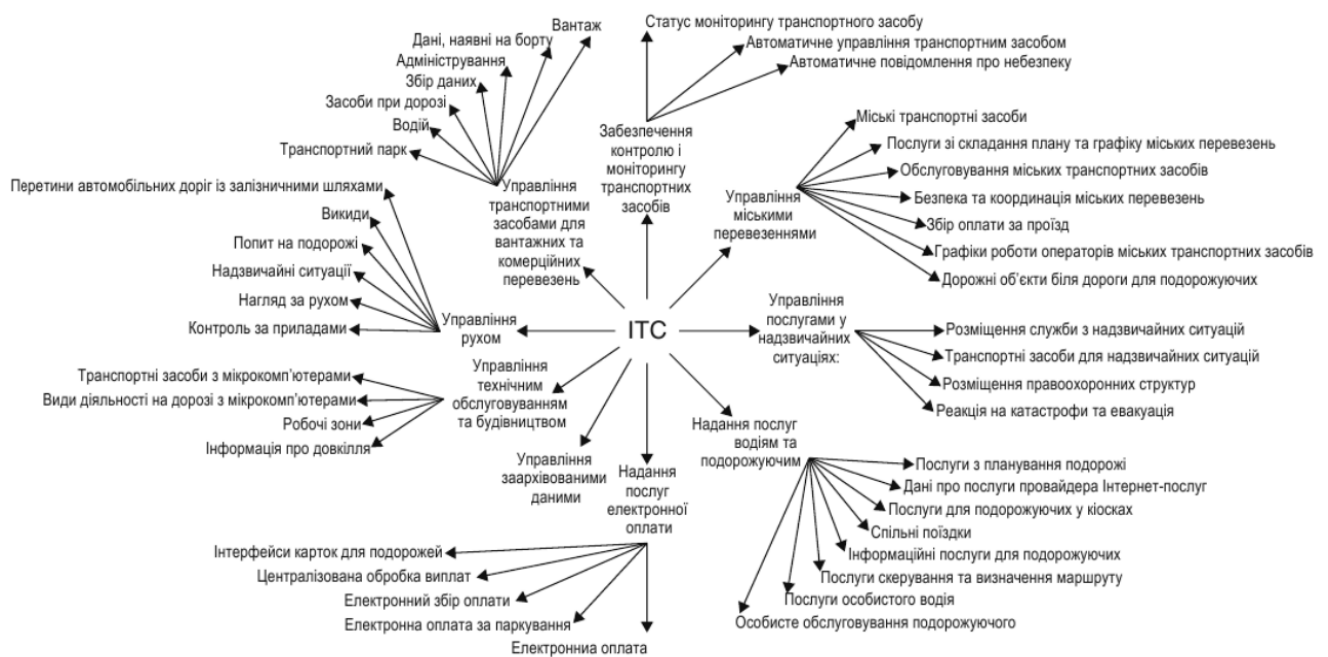


Figure 1 – Functions of the intelligent transport system [3, p. 4]

The implementation of these requirements requires the integration of positioning technologies with wireless communication technologies in order to create a continuous virtual environment of transport management in any conditions.

The trend of intellectualization and digitalization of transport systems causes certain problems [5] (Table 1).

Also, the disadvantages of ITS include:

- locality of the sources (lack of camera coverage of 100% of the territory);
- the emergence of difficulties with the accumulation of statistics on the basis of existing databases;

- the impossibility of a real assessment of the target efficiency - the ITS pilot zone does not scale to the size of the city;

- increasing the data error when changing the ephemerides, which reaches 30 meters;

- the influence of the terrain on the accuracy of the data;

- periodic disturbances in the continuity of the signal, which are expressed in distortion and delay in determining the signal.

Table 1. Pros and cons of implementing innovative technologies in the field of transport systems of the European Union

Pluses	Cons
Overall road safety is increased through better control and monitoring	The cost of electric cars is higher than conventional ones
A single integrated system with other counter and monitoring services is being created	Payments for violations are reduced and the state treasury is reduced
Reduction of cost of transportation	Loss of jobs for drivers, controllers, cashiers
Saving time on driving a car	The issue of cyber security is intensifying
Reducing emissions of harmful substances and increasing the welfare of the population	The problem of disposal of electric accumulators and their service

Today, there are many reasons that inhibit the widespread use of ITS in the transport system of Ukraine. The main such reasons are: large volume and high organizational and technical complexity of implemented ITS projects; imperfection of the legislative framework; shortage of highly qualified personnel who can simultaneously be experts in the transport industry and able to solve the problem of integration at the junction of various related departments, organizations and services; misunderstanding of the complexity of the tasks to be solved by the customer and contractors, etc. [6, p. 121].

One of the most notable ITS projects in Ukraine is the introduction of an intelligent traffic management system in Kyiv. The

system, which is being developed by the city authorities, is designed to provide real-time traffic information, optimize traffic flow and reduce traffic jams. It uses a network of smart sensors and cameras installed throughout the city to collect and analyze traffic data, which is then used to optimize traffic flow and provide drivers with real-time information about road conditions.

In addition to traffic management, the development of ITS in Ukraine also involves the introduction of smart public transport systems. The city of Lviv, for example, has implemented an innovative transport management system that uses GPS tracking to provide real-time information on bus and tram locations, schedules and delays. The



system also includes a mobile app that allows passengers to plan their journeys, buy tickets and track their buses or trams in real time. Another important aspect of ITS development in Ukraine is the promotion of electric vehicles and deployment of charging infrastructure. The Ukrainian government has introduced several incentives to encourage the adoption of electric vehicles, including tax exemptions, reduced parking fees and subsidies for the purchase of electric vehicles. In addition, a network of charging stations has been created in the country, more than 500 charging stations have been installed throughout the country.

In Ukraine, the formation of intelligent transport systems is at an initial stage (standards, legislative framework, technologies and general principles of the system are being developed) [7].

The main financial risk of implementing an improved ITS model is underfunding, which is minimized by staged funding, which requires investing in sufficient volume for the works within each stage of development. The main legal risk is the lack of a legal basis for the construction of IT and standardization in the field of interaction of executive authorities. It is possible to minimize the group of legal risks due to the formation of a legal environment, a methodological complex for the creation of IT, as well as conditions for the coordination of the interaction of various executive authorities. Market and technical risks include the lack of a proven strategy and vision for IT development. To minimize this risk, it is necessary to create a scientific community to develop its own ITS technologies and create a National ITS Development Strategy [7].

Economic efficiency. It consists in creating conditions for ensuring the given mobility of citizens, timely and reliable control of the execution of municipal orders for the implementation of transport work by enterprises that carry out passenger transportation, street cleaning, removal of solid and liquid household waste. The implementation of ITS in regional

management bodies will improve the efficiency of state and municipal transport management due to customers and contractors receiving a complete, up-to-date picture of the planning and execution of transport work of enterprises [8].

Ecological effect. An intelligent transport system using technologies for redistribution of road congestion due to the effective operation of a number of subsystems (subsystems for controlling traffic light objects, subsystems for indirect control of traffic flows, subsystems for restricting access to certain sections of roads, subsystems for managing parking loads, other subsystems) allows to solve this the task of transferring or redistributing places of traffic concentration (traffic jams) to places where the ecological situation is not as serious as in residential areas or places of recreation of townspeople [8].

The operation of smart urban transport requires technologies that will allow data exchange between the center of the system and all its components, as well as between individual elements of communication.

In order to understand the quality of transportation, there is also an operational system for controlling the process of passenger transportation. The set of electronic module GSM / GPS system is installed in the bus [9].

In addition, the control system can register the time and place of engine on-off, memory card removal-insertion, other events represented by relay signals, and can also process one analog sensor, for example, to assess the fuel level in the tank. On request, the control of other parameters can be included in the system or an information board for the driver can be introduced. The block architecture of the electronic module allows it to be used in various configurations, for example, only for the accumulation of traffic logs with delayed control (without a built-in modem), or only for operational exchange with the monitoring center (without a memory card) [10].

The included external memory card is an extremely convenient means of collecting and transmitting movement results.

Smart urban transport is the use of electronic, wireless and Internet technologies that provide access to smarter, safer and faster travel between two points in a large city [11].

It provides city authorities with rich information and control over traffic flows. Cities that want to become a smart city often start by building an intelligent transportation infrastructure in the form of an Intelligent Transportation Network (ITN). ITN includes:

- public transport management system;
- route information system and electronic timetable;
- vehicle safety and control system;
- a single tariff [12].

The development of ITS in Ukraine is also aimed at increasing road safety. The Ukrainian government has proposed a number of initiatives to reduce the number of road accidents, including the implementation of a new road safety strategy and the introduction of advanced driver assistance systems (ADAS) in vehicles [13].

ADAS is a driver assistance system based on machine vision. The goal of the ADAS system is to improve traffic safety by informing and drawing the driver's attention. At a minimum, this is a sound or vibration warning to the driver of a potential risk that requires attention. As a maximum - emergency independent decision-making by the system.

ADAS is distinguished by five levels: from zero (only the driver participates in the management) to the fifth (fully autonomous management), that is, an unmanned car is an extreme case of ADAS [14].

ADAS technologies such as lane departure warning, adaptive cruise control and emergency braking are designed to help drivers avoid accidents and reduce the severity of accidents.

Also, MaaS (Mobility as a service) is one of the examples of ITS for regulating passenger flows. Mobility as a service is the integration

of various forms of transport services into a single mobile service available on demand [15].

The goal of MaaS is to provide an alternative to the use of private (individual) modes of transport and to meet the growing demand for mobility services with a minimum number of vehicles. To meet the needs of the population, the MaaS operator provides the opportunity to choose different types of transport for the trip, such as public transport, car or bicycle sharing (car-, bikesharing), taxi or rented car; or their combination [16].

In MaaS, there is no need to buy tickets for each trip, an account is enough, which allows the user to freely choose the mode of transport convenient for him and pay for a specific trip or pay a monthly fee [17].

Advantages of MaaS:

- improving the quality of life in the city;
- improving the efficiency of the transport network;
- avoiding costs associated with owning and operating own vehicles;
- possibility of effective movement;
- reduction of harmful emissions;
- reducing the number of traffic jams;
- use of the vacated parking space for other public purposes [18].

The experience of the countries of the European Union, the USA, Japan, China and other countries in the promotion of IT projects shows that in the conditions of a market economy, only a single state policy allows to unite the efforts of the state and its subjects, businesses of all levels and sectors of the economy in solving national goals in transport complex. The implementation mechanisms of ITS projects differ in different countries, but the key components are the same.

Early resolution can lead to a stronger and more detailed understanding of ITS, the benefits it can provide, and the accompanying requirements for successful structure, provisioning, implementation, and operations among decision-makers and professionals at all levels. Intelligent transport systems can be effectively applied also in the

network of multimodal transport and logistics clusters [19, p. 347-350].

**Conclusions.** In summary, the development of intelligent transportation systems in Ukraine is a vital aspect of the country's efforts to improve transportation infrastructure, reduce congestion, promote sustainable mobility, and increase road safety. Thanks to the implementation of various ITS initiatives, Ukraine is on the way to a developed and efficient transport system. However, there is still much work to be done

to realize the full potential of ITS in Ukraine, and continuous investment and innovation will be required to achieve these goals.

The experience of the world practice of introducing ITS is recognized as a general transport ideology of integrating the achievements of telematics into all types of transport activities to solve problems of an economic and social nature: reducing the number of accidents, increasing the efficiency of freight transportation, ensuring general transport safety, improving environmental indicators, etc.

### References

1. Gritsenko S.I., Vinichenko I.A. Prospects and opportunities for using foreign experience for the development of intellectual transportation systems in Ukraine. Intellectualization of logistics and supply chain management. [Online], vol.4, pp.53-61. DOI: <https://doi.org/10.46783/smart-scm/2020-4-5>
2. On the approval of the National Transport Strategy of Ukraine for the period until 2030: Decree of the Cabinet of Ministers of Ukraine of May 30, 2018 No. 430-r. URL: <https://www.kmu.gov.ua/npas/pro-shvalennya-nacionalnoyi-transportnoyi-strategiyi-ukrayini-na-period-do-2030-roku>
3. Intelligent transport systems. Module 4 e. Sustainable development of the transport system: A collection of materials for city politicians. URL: [https://city2030.org.ua/sites/default/files/documents/GIZ\\_SUTP\\_SB4e\\_Intelligent-Transport-Systems\\_UA.pdf](https://city2030.org.ua/sites/default/files/documents/GIZ_SUTP_SB4e_Intelligent-Transport-Systems_UA.pdf)
4. Ponomaryova O.M. The essence of the concept of economic efficiency of transport // Collection. of science works Vol. 12. 2007. P. 214-216.
5. Bilichenko N.O., Tsybmal S.V., Krupskiy Y.Yu. World experience in the development of intelligent transport systems. Vinnytsia National Technical University. Materials of the XLVII scientific and technical conference of VNTU divisions, Vinnytsia, March 14-23, 2018.
6. Sokhatskyi A.V., Kuzmenko A.I. Increasing the efficiency of managing the logistics system of multimodal transportation due to the introduction of intelligent transport systems. Collection of materials of the International scientific and technical conference "Intelligent technologies of management of transport processes". November 17-18, 2020. Kharkiv: Khnadu, 2020. – 300 p. P. 121-123. URL: [https://sci.ldubgd.edu.ua/bitstream/123456789/7218/1/%D0%97%D0%91%D0%86%D0%A0%D0%9D%D0%98%D0%9A\\_%D0%9C%D0%90%D0%A2%D0%95%D0%A0%D0%86%D0%90%D0%9B%D0%86%D0%92.pdf](https://sci.ldubgd.edu.ua/bitstream/123456789/7218/1/%D0%97%D0%91%D0%86%D0%A0%D0%9D%D0%98%D0%9A_%D0%9C%D0%90%D0%A2%D0%95%D0%A0%D0%86%D0%90%D0%9B%D0%86%D0%92.pdf)
7. Fan Y, Khattak, A J and Shay E Intelligent Transportation Systems: What Do Publications and Patents Tell Us? Journal of Intelligent Transportation Systems, 2007. 11:2. P. 91-103.
8. Zhankaziev S.V., Tour A.A., Khalilov R.F. Intellectual roads - a modern view. // Science and technology in the road industry. – 2010. - 2- P. 1-7.

- 
9. The fate of V.K. Methods of organizing passenger transportation in cities. Kharkiv: Osnova, 1992. – 144 p.
  10. Improving the quality and reliability of passenger transportation on city routes. URL: [https://www.khadi.kharkov.ua/fileadmin/P\\_vcheniy\\_secretar/ABTOM\\_ТРАНСП/PPBBA/Passagir\\_01.pdf](https://www.khadi.kharkov.ua/fileadmin/P_vcheniy_secretar/ABTOM_ТРАНСП/PPBBA/Passagir_01.pdf)
  11. 5G is all in the timing. URL: <https://www.ericsson.com/en/blog/2019/8/what-you-need-to-know-about-timing-and-sync-in-5g-transport-networks>
  12. Smart city mobility. URL: <https://mobility.here.com/learn/smart-city-mobility/smart-city-mobility-7-major-cities-getting-it-right>
  13. Popken M., Rosenow A., Lübcke M. Driver Assistance Systems // ATZextra Worldwide. 2007. Vol. 12, No. 1. P. 210-215.
  14. ELTIS Urban Mobility Portal. URL: <http://www.eltis.org/resources/videos>
  15. Introduction smart transport. URL: <https://mobility.here.com/learn/smart-transportation/introduction-smart-transport>
  16. Mogre, R. Intelligent Transportation Systems: A Private Organizations Perspective. LAP Lambert Acad. Publ., 2010. – 156 p.
  17. Urban Mobility System Upgrade. URL: [https://www.itf-oecd.org/sites/default/files/docs/15cpb\\_self-drivingcars.pdf](https://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf)
  18. Benefits of implementing MaaS. URL: <https://pro-mobility.org/2017/10/24/maas/>
  19. Hrytsenko S.I. Formation of environmentally oriented activity of transport and logistics clusters using innovative intellectual technologies // Cluster Policy of Innovative Development of the National Economy: Integration and Infrastructure Aspects: collective monograph. Poznań: Wydawnictwo naukowe WSPIA, 2020. 382 p. (P 335-351).