

E-INVOICING AS A TOOL FOR THE DIGITALIZATION OF EXPORT-IMPORT ACTIVITIES OF ECONOMIC ENTITIES IN THE PUBLIC SECTOR OF THE ECONOMY OF UKRAINE

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E-invoicing as a Tool for the Digitalization of Export-Import Activities of Economic Entities in the Public Sector of the Economy of Ukraine

In the current conditions of globalization and Ukraine's integration into international economic structures, one of the key tools for improving the efficiency of export-import operations is e-invoicing. Implementing this tool in accordance with the European standard EN 16931 can significantly enhance the transparency and efficiency of financial and economic operations, reduce administrative costs, and simplify international trade. The aim of the research is to theoretically substantiate the feasibility of implementing e-invoicing according to the EN 16931 standard in the export-import activities of businesses in the public sector of Ukraine. To achieve this goal, the authors have tackled a number of key tasks, among which: the revealing of the nature and main characteristics of e-invoicing as a digital tool, the comparison of e-invoicing implementation in EU countries, the identification of key trends and models of its implementation, as well as the determination of advantages and challenges that may arise during the implementation of this tool in Ukraine. The study outlined key aspects of implementing the e-invoicing system in Ukraine's export-import activities, particularly in the context of integration into European standards such as the EN 16931. It is found that e-invoicing is a powerful tool for digitalization that enhances the transparency of financial transactions, reduces administrative costs, simplifies customs procedures, and facilitates integration into the European economic space. The study conducted a comparative analysis of e-invoicing implementation in EU countries, identified key trends, models of implementation, and the impact of this tool on export-import activities, allowing for the formulation of best practices for Ukraine. The result of the research is a theoretical substantiation for the feasibility of implementing e-invoicing in Ukraine's export-import activities, taking into account European experience, as well as identifying the advantages and challenges that accompany this process. In particular, it has been determined that the integration of e-invoicing will allow Ukraine to achieve greater efficiency in foreign trade, improve cooperation with European counterparts, and reduce risks related to errors and fraud in financial transactions. However, the implementation of this technology in Ukraine requires addressing a number of issues, among which technical unification, regulatory legal framework, and staff training are important. Prospects for further research include analyzing the legal, economic, and technical aspects of adapting e-invoicing in Ukraine, particularly evaluating the efficiency of this tool, and developing recommendations for improving national legislation to ensure harmonization with European standards. It is also important to study the social and economic effects of implementing e-invoicing in the context of national economic development and integration into the European digital market.

Keywords: e-invoicing, export-import activities, EN 16931 standard, digital transformation, electronic document management, technical and functional characteristics of e-invoicing.

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Малярець Л. М., Норік Л. О., Скляр Т. П., Молодецький Г. Г. E-invoicing як інструмент цифровізації експортно-імпоротної діяльності суб'єктів господарювання державного сектора економіки України

У сучасних умовах глобалізації та інтеграції України до міжнародних економічних структур одним із ключових інструментів для покращення ефективності експортно-імпортних операцій є e-invoicing. Впровадження цього інструменту відповідно до європейського стандарту EN 16931 здатне значно підвищити прозорість та ефективність фінансово-економічних операцій, зменшити адміністративні витрати та спростити міжнародну торгівлю. Метою дослідження є теоретичне обґрунтування доцільності впровадження e-invoicing відповідно до стандарту EN 16931 в експортно-імпорتنу діяльність суб'єктів господарювання державного сектора економіки України. Для досягнення цієї мети авторами вирішено низку ключових завдань, серед яких: розкриття сутності й основних характеристик e-invoicing як цифрового інструменту, порівняння впровадження e-invoicing у країнах ЄС, виявлення основних тенденцій та моделей його реалізації, а також визначення переваг і викликів, які можуть виникнути у процесі впровадження цього інструменту в Україні. Під час дослідження визначено ключові аспекти впровадження системи e-invoicing в експортно-імпорتنу діяльність України, зокрема в контексті інтеграції до європейських стандартів, таких як EN 16931. Встановлено, що e-invoicing є потужним інструментом цифровізації, який забезпечує підвищення прозорості фінансових операцій, скорочення адміністративних витрат, спрощення митних процедур і полегшення інтеграції в європейський економічний простір. У дослідженні проведено порівняльний аналіз впровадження e-invoicing у країнах ЄС, виявлено основні тенденції, моделі реалізації та вплив цього інструменту на експортно-імпорتنу діяльність, що дозволяє визначити найкращі практики для України. Результатом дослідження є теоретичне обґрунтування доцільності впровадження e-invoicing у експортно-імпорتنу діяльність України з урахуванням європейського досвіду, а також виявлення переваг і викликів, які супроводжують цей процес. Зокрема, визначено, що інтеграція e-invoicing дозволить Україні досягти більшої ефективності у зовнішній торгівлі, покращити співпрацю з європейськими контрагентами, а також знизити ризики, пов'язані з помилками та шахрайством у фінансових операціях. Однак імплементація цієї технології в Україні потребує вирішення низки проблем, серед яких важливими є технічна уніфікація, нормативно-правове регулювання та підготовка кадрів. Перспективами подальших досліджень є аналіз правових, економічних і технічних аспектів адаптації e-invoicing в Україні, зокрема оцінка ефективності цього інструменту, а також розробка рекомендацій щодо удосконалення національного законодавства для забезпечення гармонізації з європейськими стандартами. Також важливо дослідити соціальні та економічні ефекти від впровадження e-invoicing в контексті розвитку національної економіки та інтеграції в європейський цифровий ринок.

Ключові слова: e-invoicing, експортно-імпортна діяльність, стандарт EN 16931, цифрова трансформація, електронний документообіг, технічні та функціональні характеристики e-invoicing.

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Introduction. In the current conditions of digitalization and the increasing role of electronic services, the issue of ensuring the efficiency of export-import activities becomes crucial for the economic development of many countries. A vital component of this process is the use of digital tools that ensure transparency, speed, and security of financial and economic operations. One of the most significant tools in this field is electronic invoicing (e-invoicing), which is regulated in

the European Union (EU) based on Directive 2014/55/EU [1] and implemented according to the EN 16931 standard, which defines the main elements and semantic data model for electronic invoices, ensuring compatibility between different systems within the EU [2]. Its application allows minimizing costs for paper document circulation, speeding up customs and tax administration, increasing transparency, and preventing fraud. The European Commission in its report [3] from February 19,

2024, confirmed that all government administrations of EU countries are able to accept electronic invoices that comply with the EN 16931 standard. This is a key step towards the integration of the Single Digital Market and reducing costs and time for processing payments. In this regard, it can be asserted that e-invoicing not only contributes to enhancing the efficiency of internal processes in EU countries but also is an important tool for improving international trade relations. In the context of globalization and high competition in international markets, the implementation of electronic invoices provides equal conditions for all participants in economic activity, particularly in the field of export-import operations. In turn, the effective use of this tool becomes a necessary condition for countries that seek to optimize their foreign economic relations and integrate into the world economy. Therefore, e-invoicing is an integral part of the European digital economy, which facilitates integration of markets and simplifies foreign economic activities.

In Ukraine, the successful results of document flow automation and increased transparency of public financial operations are evidenced by the development of digital financial and procurement systems, particularly the electronic platform ProZorro [4]. During the second quarter of 2025, 145.18 thousand procurements were announced in the ProZorro electronic system, amounting to a total of UAH 305.07 billion, carried out by 12.45 thousand customers [5]. These procurements were conducted by 12.450 customers, including State-owned and municipal enterprises, government authorities, and other entities in the public procurement sector. The total number of announced procedures indicates a high level of activity in the ProZorro system, confirming the effectiveness and transparency of public procurement in Ukraine. This also reflects an increase in trust in electronic tools for managing public finances and document flow. An analysis of public procurement policies in Ukraine and the EU shows that digital tools are being actively used to enhance the efficiency of financial processes [6], thereby creating favorable conditions for the implementation of e-invoicing in export-import operations. The adoption of e-invoicing in the public sector of Ukraine's economy could serve as an important step towards further digitalization and optimization of document flow processes, contributing to increased efficiency and transparency in export-import activities.

It should also be noted that the relevance of applying e-invoicing in Ukraine today is due to significant factors, namely:

- within the framework of fulfilling obligations under the Association Agreement between Ukraine and the EU and the EU4Digital initiative, a gradual alignment of national digital standards with European ones is anticipated;
- economic entities in the public sector of Ukraine, which are significant participants in export-import operations, require standardized tools for interacting with partners from the EU;
- annual expenses of enterprises on paper document flow in export-import activities can become a reserve for optimizing costs through the implementation of e-invoicing.

In addition, e-invoicing is a vital element in combating shadow schemes in foreign trade, which will signify additional

budget revenues and increased trust from international partners.

Therefore, e-invoicing not only has the potential as a tool for the technical optimization of document flow but can serve as an important means of enhancing the effectiveness of foreign economic relations. For economic entities in the public sector of the Ukrainian economy, the implementation of e-invoicing based on the EN 16931 standard opens up opportunities for integration into the EU internal market, enhancing competitiveness and ensuring transparency in export-import operations. The development of e-invoicing logically follows from already implemented initiatives such as e-Procurement (ProZorro), the digitalization of government services, and the implementation of electronic signatures, facilitating the creation of a unified digital space for interaction between the State, businesses, and international partners. In the field of export-import activities, where speed, accuracy, and transparency in financial and customs operations are crucial, e-invoicing can become not only a convenient digital tool but also an important component of the strategy to enhance international competitiveness.

Analysis of recent research and publications. In the current scientific literature, e-invoicing is viewed as a digital tool for optimizing public and commercial processes. So, the authors of article [7] demonstrate that e-invoicing contributes to increasing the consistency of processes between suppliers and buyers, optimizing financial and logistical flows, as well as reducing administrative burdens. They also emphasize that electronic invoices not only automate document circulation but also serve as a strategic tool for enhancing the efficiency of supply chains, providing a more transparent and controlled interaction among market participants. The study [8] notes that digitalization in EU countries significantly contributes to economic growth, optimization of business processes, and an increase in the digital maturity of enterprises. In the context of e-invoicing implementation, this underscores the importance of unifying digital standards to ensure the integration of cross-border financial operations and the sustainable development of the digital economy.

Another study [9] also defines the impact of electronic invoices on the digitalization of business processes and shows that the implementation of e-invoicing increases the efficiency of financial document flow, reduces paper usage and human errors, ensures transaction transparency, and facilitates audits. The authors paid significant attention to the integration of e-invoicing into corporate management systems and the regulatory aspects in various countries, which contributes to the standardization and adaptation of businesses to digital requirements. Yet another research [10] demonstrated using Italy as an example that the implementation of e-invoicing significantly reduces cases of cross-border tax fraud, increases transparency of financial flows, and contributes to more effective State control. That is, it has been shown that e-invoicing not only optimizes business processes but also serves as an important tool in combating tax abuses, creating additional value for the public sector and the economy as a whole. At the same time, the authors of the article [11], researching the implementation of e-invoicing in Germany in the context of the country's federal structure, noted that despite the high interest in electronic invoices among businesses and government agencies, the im-

plementation process faces challenges due to the diversity of jurisdictions in the federal states. Thus, effective digitalization of business processes requires adaptation of standardized solutions to the specifics of each territory, which is crucial for understanding the implementation of e-invoicing in countries with similar administrative structures.

Alongside international examples, it is important to study the application of e-invoicing in Ukraine, where the digitalization of financial processes and, for example, the administration of value-added tax (VAT), is becoming increasingly significant for efficiency of business and public finances. Thus, in the article [12], the effectiveness of the electronic VAT invoicing system in Ukraine is analyzed, assessing its impact on fiscal revenues and the reduction of tax risks. The author shows that the implementation of electronic invoices allows for the optimization of VAT administration processes, enhances the transparency of financial operations, and reduces the volume of shadow schemes in the domestic market. Such results indicate that e-invoicing in Ukraine is already demonstrating a positive impact on fiscal discipline and lays the groundwork for the digitalization of export-import operations.

The analysis of the research [13] shows that the development of digital tools, particularly electronic document management, is a key factor in enhancing the attractiveness of e-commerce in Ukraine. The authors compare the Ukrainian and German e-commerce markets, showing that the integration of e-invoicing into business processes contributes to a more transparent, faster, and secure exchange of financial data, which is important for both national and international operations. Along with this, the necessity to adapt international standards to Ukrainian conditions for effective digitalization and enhancing business competitiveness is emphasized.

A further scientific work [14] presents the dedicated study of the digitalization of public procurement as an important element of Ukraine's foreign trade policy in the context of the digital transformation of financial processes in the public sector. This work emphasizes the significance of implementing e-invoicing in the field of public procurement, taking into account European experience and the necessity to ensure the interoperability of digital systems. This approach confirms that e-invoicing is not only a tool for internal administration but is a key element of Ukraine's foreign economic strategy in the context of European integration and post-war recovery processes.

Regarding the establishment of conditions for the application of e-invoicing, it should be noted that digital platforms are actively developing in Ukraine. For example, the international service Space Invoices [15] provides businesses with tools for automating the issuance of electronic invoices, integrating with national systems such as the Unified Register of Tax Invoices (URTI) and ProZorro, and ensuring compliance with international standards, including PEPPOL [16]. The use of such platforms minimizes administrative costs, reduces the risks of errors, and enhances the transparency of financial operations in both national and international business.

At the same time, it should be noted that despite the existence of international research dedicated to e-invoicing, there is a lack of works in the domestic scientific literature that examine the specifics of its application in the field of export-import activities. Questions regarding the adaptation of Euro-

pean standards, particularly the EN 16931, to the conditions in Ukraine remain insufficiently addressed, as well as the assessment of economic effects and organizational challenges that accompany the integration of electronic invoices into the business processes of the public sector. This highlights the need for research that will allow for a synthesis of international experience and identify potential directions for the implementation of e-invoicing in Ukraine in the field of export-import activities.

The aim of the research is to provide a theoretical substantiation for the feasibility of implementing e-invoicing in accordance with the EN 16931 standard in the export-import activities of entities in the public sector of Ukraine.

To achieve the set aim, it is necessary to perform a series of tasks, in particular:

- to reveal the essence and key characteristics of e-invoicing as a digital tool in the field of export-import activities;
- to conduct a comparative analysis of the implementation of e-invoicing in EU countries, to identify key trends, models of implementation of this tool, and to determine its potential impact on export-import operations;
- to identify the advantages and potential challenges of implementing e-invoicing in the export-import process in Ukraine.

Presentation of the main research material. E-invoicing is defined as a structured electronic exchange of invoice data between the supplier and the buyer, which allows for complete automation of processing without manual data entry [17]. This ensures continuous information exchange, contributing to a reduction in administrative burdens and an increase in the efficiency of business processes.

E-invoicing is not just an electronic copy of a paper document. It is a structured digital document that is created, transmitted, received, and processed electronically, usually without human involvement. It contains all the mandatory details of an invoice, suitable for automated import into enterprise resource planning (ERP) systems, customer relationship management systems, as well as the tax or customs infrastructure. The key difference between e-invoicing and a scanned copy or PDF file is the machine readability of the document, meaning that the data can be instantly read and processed by appropriate software. Therefore, e-invoicing serves not only as a means of digitizing financial document flow but also as an important component of modern information infrastructure for enterprises. This tool becomes especially relevant in the context of export-import activities, where the efficiency and transparency of exchanging commercial documentation are crucial for optimizing logistics, financial, and customs processes.

In the field of export-import operations, e-invoicing serves not only as an accounting document but also as a legally significant document that can be used in interactions with regulatory authorities, banks, contractors, and customs infrastructure. This necessitates a clear understanding of its key technical and functional characteristics as a digital tool.

The fundamental characteristic of e-invoicing is the *structured nature of the data*, which is realized through the use of standardized formats for electronic documents. Unlike

unstructured PDF files that do not allow for automated data processing, structured electronic invoices, primarily in XML format or UBL (Universal Business Language) format, envisage a clear semantic model with fixed attributes (date, product code, amount, tax rates, etc.). In the EU, the requirements for the structure of electronic invoices are codified in the EN 16931 standard [2], adopted based on Directive 2014/55/EU [1]. This standard is mandatory for all EU public authorities engaged in procurement. For example, Belgium implemented this using the Peppol BIS Billing 3.0 format, which complies with the EN 16931 standard and EU requirements. Since April 2019, all Belgian public authorities can receive electronic invoices that meet the European standard, and the use of electronic invoices has become mandatory for suppliers in public procurement [18].

Interoperability is directly related to structuring, which defines the ability of e-invoicing to interact with various information systems at national and international levels. Technically, this property is realized through the use of unified data transmission channels – in particular, the PEPPOL network, which ensures standardized interaction between parties involved in the exchange. The PEPPOL model allows public sector entities to send and receive electronic invoices through certified access points, without the need for a direct connection to each individual counterparty. Thus, in Denmark, Sweden, Germany, and Finland, the use of PEPPOL is mandatory for all public procurement encompassing foreign economic supplies [19].

The expansion of the functional potential of e-invoicing is facilitated by the use of standardized languages for describing business documents. In this context, the *universal business language* (UBL) plays a key role, enabling the description of not only invoices but also accompanying documents (orders, specifications, certificates of origin, etc.). Such universality is particularly important for public sector entities that carry out supplies or procurements abroad, where comprehensive documentation is required. For example, in Denmark, the OIOUBL standard [20], which is based on UBL, has been adopted as mandatory for the public sector, including export-import contracts. This ensures seamless digital processing of documents from the moment of order to financial reporting.

For economic entities in the public sector involved in export-import operations, *legal assurance of e-invoicing* is critically important. Within the EU legal framework, this significance is defined by three key requirements: authenticity of origin, integrity of content, and accessibility (readability) of the document throughout the retention period. According to the Article 233 of Directive 2006/112/EC, these criteria must be guaranteed for electronic invoices from the moment of their creation until the end of the retention period [21]. For example, in Germany, a mandatory use of the official structured electronic invoice format XRechnung, which complies with the EN 16931 standard, has been introduced for B2G transactions (a form of interaction in which businesses provide goods or services to government institutions). All government bodies are required to accept this format, which guarantees compliance with authenticity, integrity, and accessibility criteria [22].

One of the functional characteristics of e-invoicing is its *ability for full automation of document circulation*. Due to the standardization of formats and exchange protocols, an e-invoice can be automatically created, signed, sent, received, stored, and

processed without human involvement. In Poland, the Krajowy System e-Faktur (KSeF) has been implemented, functioning as a centralized platform for mandatory e-invoicing in the B2B (business-to-business) and B2G sectors. For State-owned enterprises, this system provides digital monitoring of transactions in real time and optimizes the process of interaction with tax and customs authorities [23].

A significant feature of e-invoicing, which is also important in the field of export-import activities of the public sector, is its *integration with the State-controlled accounting and analytical systems* – in particular, with ERP systems, automated customs complexes, and tax administration systems. This integration allows structured invoices to be imported into internal information systems in real time, avoids data duplication, and ensures complete tracking of financial and economic transactions. For example, in Italy, the integration of the national electronic document management platform Sistema di Interscambio (SdI) [24S] with tax registers and customs systems has been implemented. This integration allows public enterprises to conduct foreign economic operations with minimal time spent on document handling and a high level of compliance with regulatory requirements.

One of the key advantages of e-invoicing is its *cross-border flexibility*, enabling the use of this tool in both domestic and international economic contexts, particularly for public sector economic entities. Within the EU, this flexibility is achieved through the implementation of unified technical requirements, support for multiple languages and currencies, as well as ensuring mutual recognition of the legal validity of electronic documents. As emphasized in the analytical study by the Centre for European Political Studies (CEPS) [25], the harmonization of digital processes within the Digital Single Market initiative significantly simplifies cross-border trade and removes technical and legal barriers between member states, including in the area of e-invoicing.

Therefore, the discussed technical and functional characteristics of e-invoicing form a cohesive infrastructure basis for the digital transformation of export-import activities of business entities in the public sector. The Table 1 presents an analysis of the technical and functional characteristics of e-invoicing, as well as a comparison of their manifestations in different contexts. This approach allows not only to classify the main characteristics of this tool but also to identify the typology of key characteristics, enabling a clear distinction between their varieties and their impact on practical implementation.

As can be seen from the data presented in the Tab. 1, the technical characteristics of e-invoicing primarily ensure the unification of the format and exchange channel, which is a prerequisite for the automation of document circulation and its legal recognition. Simultaneously, the functional characteristics determine the tool's ability to integrate into existing state information systems, adapt to tax and customs requirements, and function in the context of cross-border trade. This division allows for a clear delineation between the areas of technical support and administrative introduction, which is important in the context of developing national strategies for the digitalization of export-import activities.

Therefore, the application of e-invoicing in the export-import activities of economic entities in the public sector

Table 1

Characteristics of e-invoicing in export-import activities

Characteristics	Type	Manifestation / Result of Application
Standardized structured data format (XML, UBL, EN 16931)	Technical	Unification of invoices, reduction of errors in processing customs and tax documentation, speeding up cargo clearance at the border
Unified transmission channels (PEPPOL network, Access Points)	Technical	Ensuring secure and fast exchange of electronic invoices among participants in international trade, minimizing delays caused by different IT systems
Use of universal languages for describing business documents (UBL, OIOUBL)	Technical	Application of e-invoicing at all stages of the export-import supply chain, ensuring proper information exchange between counterparties from different countries
Legal support in accordance with the EU regulations	Functional	Functional guarantee of compliance with tax and customs requirements during export-import operations, reducing the risk of foreign partners rejecting invoices
Automation of the creation, processing, and storage of invoices	Functional	Reducing the time for customs clearance and payment processing, eliminating human errors, and increasing the efficiency of export-import financial operations
Integration with the State-controlled ERP and financial-customs systems	Functional	Direct importing of invoices into customs and financial systems, avoiding data duplication, increasing accuracy and transparency in monitoring international transactions
Cross-border compatibility within the framework of the EU Single Digital Market	Functional	Ensuring continuous electronic document flow in international contracts, facilitating procedures for foreign economic activities, and enhancing business competitiveness

Source: the authors' own summaries

should be based on a combination of technical and functional characteristics that ensure not only the efficiency and security of document circulation but also compliance with legal norms, customs control requirements, and international standards. The sequential integration of solutions such as PEPPOL, EN 16931, UBL, and their adaptation to the national context of public administration creates prerequisites for enhancing transparency, reducing administrative costs, and strengthening trust in international trade relations. These characteristics become particularly significant in the operations of public sector entities, for which adherence to regulatory requirements, transparency of financial operations, and interaction with customs and tax authorities are critical factors. The unification of technological approaches to e-invoicing aids in forming a unified digital space for conducting export-import activities, which, in turn, ensures the timeliness of procedures, minimizes human error, and enhances the overall level of digital compatibility among governmental structures of different countries. Therefore, e-invoicing should be viewed not only as a technical tool for document management but also as a strategic element of the digital infrastructure of the public sector in international trade.

The consolidated technical and functional characteristics of e-invoicing, along with the experience of its implementation in EU countries, enable an assessment of the technological maturity of this tool in the context of the digitalization of foreign economic document flow. In this regard, it is important to note that the implementation of e-invoicing in EU countries has specific features that depend on the types of transactions and mechanisms used at the national level.

Each EU country has its own characteristics and time-lines for the implementation of e-invoicing regarding different transaction types, specifically B2G (business-to-government), B2B (business-to-business), and B2C (business-to-consumer). Depending on the country, there are various mechanisms for the mandatory use of e-invoicing for public procurement, as well as variability in requirements for inter-business invoice exchange. Despite the general trends towards the implementation of e-invoicing, the EU Member States differ in the degree of mandatory application for each type of interaction, as well as in the use of the EN 16931 standard, which ensures system compatibility. An important aspect is also the use of PEPPOL – an international platform for exchanging electronic invoices that supports standardization and facilitates integration between EU countries. The EU Member States are gradually introducing mandatory e-invoicing for various types of businesses, which significantly affects the conditions of doing business, particularly in the context of international trade. The Tab. 2 presents the results of the comparison of e-invoicing implementation in different EU countries, specifically regarding their requirements for B2G, B2B, and B2C transactions, as well as features of using platforms for electronic invoice exchange.

From the analysis of the implementation of e-invoicing in EU countries, it can be concluded that EU countries demonstrate varying levels of mandatory use of e-invoicing depending on the type of transactions. For public procurement (B2G), mandatory e-invoicing is applied in almost all countries, although the timelines for implementation vary. This indicates a high level of standardization and a focus on ensuring trans-

Table 2

Comparison of e-invoicing usage in EU countries

Country	B2G	B2B	B2C	PEPPOL	Year of mandatory application
Austria	partial	no	no	no	2021
Belgium	yes	yes	no	yes	2026
Bulgaria	no	no	no	no	2019
Croatia	yes	no	no	no	2019
Cyprus	no	no	no	yes	2019
Czech Republic	no	no	no	no	2016
Denmark	yes	no	no	yes	2026
Estonia	yes	yes	no	yes	2019
Finland	yes	partial	no	yes	2019
France	yes	yes	no	yes	2024
Germany	yes	no	no	yes	2023
Greece	yes	no	no	yes	2025
Hungary	no	no	no	no	2019
Ireland	no	no	no	yes	2019
Italy	yes	yes	no	yes	2019
Latvia	yes	no	no	no	2025
Lithuania	yes	no	no	yes	2017
Luxembourg	yes	no	no	yes	2023
Malta	no	no	no	yes	–
Netherlands	partial	no	no	yes	2017
Poland	yes	no	no	yes	2018
Portugal	yes	no	no	no	2021
Romania	yes	yes	yes	no	2025
Slovakia	yes	no	no	yes	2019
Slovenia	yes	no	no	no	2015
Spain	yes	no	no	no	2026
Sweden	yes	no	no	yes	2019

Source: composed by the authors based on the data from [19]

parency in public financial transactions. When it comes to business-to-business transactions (B2B), only a few countries, such as Italy and France, have mandated the use of e-invoicing for all businesses. In other countries, this process is still not mandatory for businesses, which indicates greater flexibility in approaches to integrating electronic invoices at the enterprise level. In the case of B2C (business-to-consumer), most countries leave this process voluntary, due to the low complexity and volume of transactions between businesses and consumers.

All represented countries adhere to the European standard EN 16931, which ensures compatibility of electronic invoices within the EU. This standard serves as a foundation for the harmonization of e-invoicing and its use significantly reduces technical barriers for international transactions. At the same time, only a few countries actively use PEPPOL as the main platform for exchanging electronic invoices. PEPPOL is

an important component for ensuring compatibility between national e-invoicing systems; however, its application is not universal across the EU. This indicates a difference in the level of integration of national systems with international platforms.

While in some countries e-invoicing is mandatory only for public procurement, countries such as Italy and France are making significant strides by requiring businesses to use electronic invoices in all their operations. This trend is gradually gaining popularity in Europe, and it can be expected that over time other countries will also adopt mandatory measures for all types of businesses.

Analyzing the features of e-invoicing implementation in EU countries allows us to identify opportunities and directions for adapting this tool to the needs of export-import activities of entities in the public sector of Ukraine's economy. For this purpose, the Fig. 1 presents a generalized scheme that illustrates

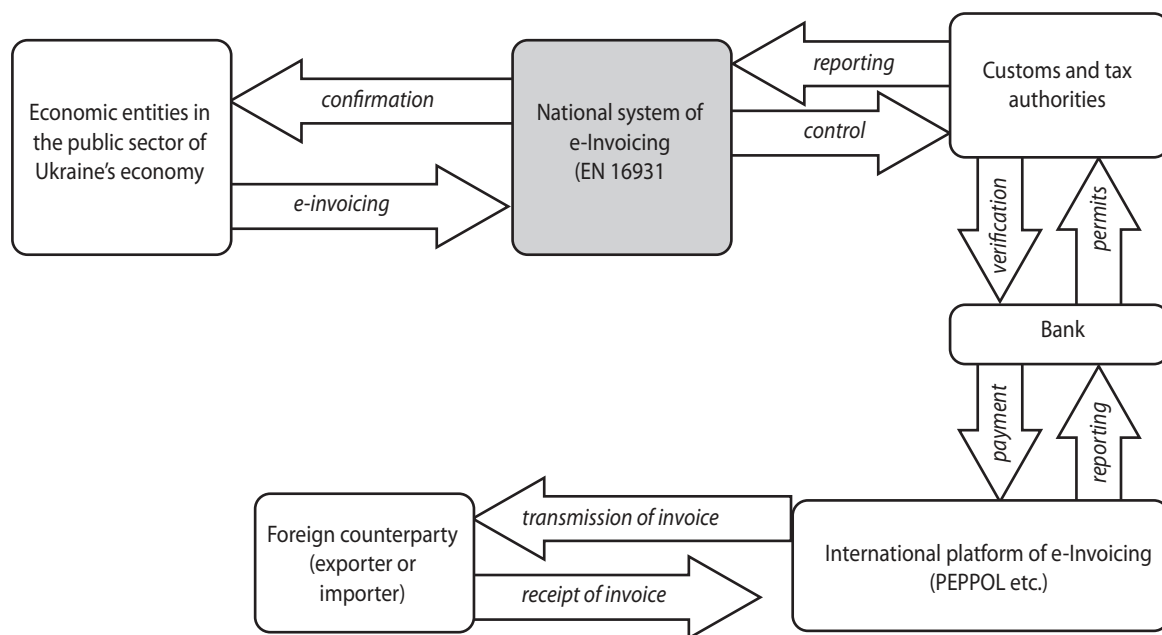


Fig. 1. E-invoicing scheme in the field of export-import activities of the entities in the public sector of Ukraine's economy

Source: composed by the authors

the mechanism of electronic invoice movement in accordance with the EN 16931 standard among the main participants in the process and key control institutions.

A State-owned enterprise in Ukraine can act as both an exporter and an importer, facilitating electronic document exchange with foreign counterparties. All transactions are processed through the national e-invoicing system, which is integrated with regulatory authorities (customs and the tax service), financial institutions (banks and payment systems), and international platforms (notably, PEPPOL). The diagram illustrates the interaction of processes, where each stage is accompanied by both data transmission and confirmation of its receipt. Therefore, the presented diagram outlines the logic of data flow within the e-invoicing system.

Since e-invoicing is a powerful tool for digitalization, its implementation in Ukraine will contribute to optimizing internal document flow processes and increasing the transparency and efficiency of financial operations. At the same time, the experience of European countries demonstrates that standardized electronic invoices contribute to faster integration with international markets, reduce administrative burdens, and increase competitiveness. Thus, adapting the e-invoicing tool for business entities in Ukraine's public sector could become a key step in the digitalization of the economy and improving the conditions for conducting international trade.

Given these aspects, analyzing the experience of e-invoicing implementation in EU countries allows for identifying the opportunities for adapting this tool to the specifics of Ukraine's national export-import activities. This creates the preconditions for integrating e-invoicing into the national context, taking into account the requirements and technological capabilities that exist in Ukraine. Therefore, it is important to focus on the advantages offered by the implementation of e-invoicing, as well as the potential challenges that may arise dur-

ing its implementation for business entities in Ukraine's public sector of the economy.

The implementation of e-invoicing offers a range of strategic advantages that pertain to both the administrative and financial spheres of public institutions and businesses, namely:

- the application of e-invoicing ensures *increased transparency of financial operations*, which is critically important for the public sector (automating invoice accounting helps minimize the risks of corruption, double funding, or manipulation of primary documentation);
- the structured nature of electronic invoicing enables the *integration of document management with national and international ERP systems*, which in turn ensures timely reporting, effective logistics, and compliance with customs procedures;
- unlike paper or unstructured electronic document management, the use of e-invoicing allows for the *reduction of the time taken to process* a single invoice from several days to several minutes, avoiding human intervention at each stage;
- in the context of cross-border operations, e-invoicing significantly *simplifies compliance with international standards and tax requirements*, particularly concerning VAT, certification of product origins, and more. For Ukraine, as a country that actively trades with the EU, this paves the way for a unified format for exchange with European counterparts (for example, through the PEPPOL network).

At the same time, the process of digital transformation is accompanied by a number of challenges that require systematic evaluation, taking into account both the regulatory-legal and technical specifics of the national context.

Despite numerous advantages, the implementation of e-invoicing in Ukraine's public sector faces a series of barriers.

First and foremost, this is the *lack of a unified technical infrastructure* and discrepancies between the IT solutions of various government agencies and economic entities. Without proper unification of formats, exchange protocols, and authentication mechanisms, the effectiveness of the system will be limited.

A significant challenge is also the *regulatory uncertainty and legal ambiguity* regarding the status of electronic invoices in export-import operations. Although the use of e-invoicing is permitted at the level of internal accounting, its full legitimacy in foreign economic activities requires harmonization with EU legislation, WTO rules, and international agreements.

It is also important to consider the *staffing and organizational challenges*. State-owned enterprises and their foreign economic departments often lack the necessary level of digital competence for implementing such tools. The absence of staff training, substantive regulations, and technical support can lead to a formal rather than functional implementation of the system.

Finally, implementing e-invoicing requires *initial investments in IT infrastructure modernization*, which may be limited by the budget resources of State-owned enterprises.

Thus, while the implementation of e-invoicing can provide significant benefits for the public sector and Ukraine's export-import activities, the process of its implementation is complex and multifaceted.

Comprehensive work is required to adapt existing regulations, modernize IT infrastructure, and train personnel for the effective use of this tool. However, considering the potential that e-invoicing opens up, its implementation should become an important step towards digital transformation and Ukraine's integration into the global economy, particularly in the context of cooperation with the EU.

Conclusions. The results of the theoretical analysis demonstrate that implementing e-invoicing in accordance with the EN 16931 standard is an important step towards modernizing export-import activities in Ukraine. This will reduce administrative costs, enhance the transparency of financial operations, and accelerate the process of customs and tax administration. The integration of e-invoicing according to European standards will contribute to a more effective integration of Ukraine into the EU's single digital market.

A comparative analysis of the experience of using e-invoicing in EU countries has shown significant differences in the terms and models of implementing this tool depending on the type of transactions (B2G, B2B, B2C). However, the overall trend indicates an increasing mandate to use electronic invoices in public procurement and business partnerships. Most EU countries are integrating the EN 16931 standard, which ensures the compatibility of various national electronic document management systems. In turn, this reduces barriers to international trade and promotes the creation of a single digital space for business.

The implementation of e-invoicing in Ukraine will achieve significant advantages, such as reducing costs related to paper documentation, decreasing the risks of errors in invoice processing, and accelerating customs and tax control

procedures. This will contribute to the development of the competitiveness of Ukrainian enterprises in international markets and facilitate integration with EU countries. Additionally, the use of international platforms such as PEPPOL will ensure more compatibility with international partners.

Among the challenges regarding the implementation of e-invoicing, it is worth noting the necessity to modernize national IT infrastructures and integrate with international platforms, adapt legislation to the requirements of European standards, as well as the need to train and prepare the staff. Moreover, it is important to establish a reliable mechanism for monitoring and controlling compliance with e-invoicing requirements to avoid fraud and errors in reporting.

Given the positive experience of European countries and the existence of pragmatic initiatives in Ukraine, the implementation of e-invoicing has prospects for gradual development. The increase in the level of digitalization in the country will support the effective development of export and import activities, as well as facilitate Ukraine's integration into the EU's single digital market.

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