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MODERNIZATION OF THE CONTROL SYSTEM

FOR PRODUCTION AND TURNOVER OF TOBACCO PRODUCTS

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The paper systematizes the international experience of the functioning of tracking and tracing tax stamps and tobacco products, namely on the impact of their introduction on the market and tax revenues. The arguments on the feasibility of application, functionality, cost of implementation, mechanism of financing of expenses, stakeholders etc. are determined. The technological decisions on tracking and tracking based on tax stamps and product brand tracking criteria are classified. Conceptual approaches to the creation and implementation of an electronic tobacco production control and circulation system in Ukraine are proposed.

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ABBREVIATIONS LIST

T&T System is Track and Trace System

FCTC is World Health Organization Framework Convention on Tobacco Control (*WHO Framework Convention on Tobacco Control)*

FCTC Protocol is Protocol to Eliminate Illicit Trade in Tobacco Products of the WHO Framework Convention on Tobacco Control

TPD is Directive 2014/40/EU on the approximation of the laws, regulations and administrative provisions of the Member States concerning the manufacture, presentation and sale of tobacco products and related products *(Tobacco Product Directive)*

UI is Unique Identifier

ISO is International Organization for Standartization

GS1 is International Organization for Standardization of Accounting for Goods and Services and Bar Coding of Logistics Units

GTS GS1 is Global Traceability Standard

RFID is Radio Frequency Identification

INTRODUCTION

In the period of long tax transformations in Ukraine aimed at improving fiscal efficiency of taxes and ensuring budgetary balance, the issues of improving state regulation of the market for excisable goods in general and tobacco products in particular are extremely timely. This will allow to substantially increase the excise duty revenue without increasing the total tax burden. In response to the challenges of today related to the significant shadowing of the excise goods market, the Government is developing proposals to introduce modern innovative technologies for controlling the circulation of such goods. In particular, the system of electronic administration of excise duty on fuel is already functioning and the latest control technologies are introduced: flow meters and level meters, which should record the amount of excise goods available to the business entities and pass this information to the tax authorities; in addition, the mobile application "Legal Excise" is running in the pilot mode.

Nowadays, the problem of illegal circulation of tobacco products in Ukraine has gained public resonance. In recent years, the illicit circulation of tobacco products causes significant problems for both law enforcement agencies in Ukraine and partner countries. In addition, the availability of illegal products on the market, which is much cheaper than legal ones, increases the availability of these harmful goods, which creates obstacles to implementation of the state policy on tobacco control. Equally important is compliance with the requirements of the Association Agreement with the EU and the Protocol to Eliminate Illicit Trade in Tobacco Products of the WHO Framework Convention on Tobacco Control (hereinafter – the FCTC Protocol), taking into account Ukraine's integration processes.

Thus, the issues raised in this paper, namely: regulatory support for innovative mechanisms for combating tobacco smuggling in the Member States to the WHO Framework Convention, technological solutions to counteracting tobacco trafficking and best world practices in the use of track and trace systems, are an important source of information for decision-making in the sphere of counterfeiting in the market of excisable goods on matters within the competence of the MFI of Ukraine, as well as during the formulation of proposals, reservations to other legal acts, initiated by both the executive authorities of Ukraine and the Verkhovna Rada of Ukraine regarding the formation and implementation of the state excise policy in general and control over the circulation of excisable goods in particular.

1. Legal support for innovative mechanisms for combating the illicit circulation of tobacco products in the Member States to the WHO Framework Convention

Countering such a significant threat to public health and financial security as the illegal circulation of tobacco products, requires comprehensive efforts by tax authorities and is an integral part of national and international strategies to combat the shadow economy.

According to experts of the World Bank, mainly cigarettes are illegally traded. The significant adverse effects on the functioning of such a market are that the prices of illegal tobacco products are lower than the retail prices of legal cigarettes, which makes them more attractive to consumers. For example, the average street price of smuggled cigarettes in Brazil, Argentina, Uruguay and Paraguay was lower than legal by 50, 50, 60 and 67% respectively. In Ukraine the price is lower by 52%. Worldwide, average cigarette prices are reduced by about 4%, resulting in an increase in cigarette consumption by about 2%[1]. Illegal trafficking is about 600 billion cigarettes per year, or 10% of world consumption, which causes tax losses of USD 40–50 billion, and these funds could be invested in tobacco control measures and funded to other priority public programs.

This work will focus on tools to counter such segments of counterfeiting as counterfeiting, smuggling, cheap whites, undeclared production and sales. This requires development and implementation of modern tobacco control mechanisms, including *track and trace, security* and *tax verification systems.* Such systems are usually technologically separated from one another and have different functional purpose. Thus, *security system* is designed to verify the identity and authenticity of the goods, *tax verification system* is designed to confirm the payment of tax, legality of import and the right to sell excisable goods in the territory of the state. In turn, *track and trace system* (hereinafter – the T&T system) is aimed at improving the effectiveness of procedures for monitoring the movement of excisable goods from the manufacturer through the supply chain, finding out at what stage of the supply chain tobacco products switched from legal circulation to illegal circulation[2].

Considering that security and tax verification systems are already operating in Ukraine, and the issue of implementation of the tracking and tracking system is on the government's agenda, let us focus on investigating its regulatory support and its peculiarities in some countries of the world.

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[1] Confronting Illicit Tobacco Trade: A Global Review of Country Experiences. The World Bank URL: https://www.worldbank.org/en/topic/tobacco/publication/confronting-illicit-tobacco-trade-a-global-review-of-country- experiences/

[2] N. V. Novytska, I. I. Khliebnikova. Innovative Mechanisms for Controlling the Circulation of Excisable Goods: European Trends. *Taxation and Economic Security of the State in the Age of Digitization*: Scientific works coll. on materials of international scientific-practical roundtable, February 23, 2018 / University of the State Fiscal Service of Ukraine. Irpin, 2018. P. 134-137.

The T&T system requires mandatory labeling of tobacco products with a unique identifier, the use of remote control tools, enhancing the security of the excise goods supply chain. The purpose of this system is, in addition to reducing the illegal circulation of tobacco products, raising tax revenues, ensuring a competitive market environment, protecting legal businesses and consumers from dangerous and harmful counterfeit goods, reducing the availability of tobacco products caused by illicit trafficking.

Implementation of this system is a requirement of the WHO Framework Convention on Tobacco Control (hereinafter – the FCTC), which entered into force on February 27, 2005. In particular, it sets out requirements for the formation of a tax and price policy on tobacco products. The objectives of this policy should be to protect the public from the harmful effects of tobacco consumption. Article 4 calls on Member States to be stricter in regulating the tobacco market at national, regional and international levels[3]. Articles 5, 15 set out the technical conditions for the application of innovative technological solutions to counteract the illegal circulation of tobacco products. In particular, the requirement for their independence from the tobacco industry's business interests and the need to develop and implement a track and trace system were identified.

The FCTC is supplemented by the Protocol on the Elimination of Illicit Tobacco Trafficking (hereinafter – the FCTC Protocol), which entered into force on September 25, 2018[4] and is aimed at eliminating all segments of the illicit trade in tobacco. From the date of entry into force of the Protocol, the Parties should, within five years, implement a global regime for the detection and tracking of products based on international standards to allow the exchange of information. This mode should be coordinated by the information center located at the FCTC Secretariat. Through this mechanism, the Member States will have access to data on the movement of tobacco manufactured or imported into any other Member State with the purpose of detecting illicit trafficking. Therefore, international criteria, standards and best practices must be taken into account when developing the domestic system.

The T&T system is based on the creation of a secure and non-removable unique identifier (such as codes or stamps). This identifier must be affixed or be part of a unit of packaging, secondary or tertiary packaging. The Member States need to create a data warehouse to display and store unique identifier information. The exchange of this information will be crucial in assisting Member States in determining the origin and movement of tobacco products, providing, for example, the possibility of establishing deviations of the product from the planned route.

[3] WHO Framework Convention on Tobacco Control of May 21, 2003. URL: https://zakon.rada.gov.ua/laws/show/897_001.

[4] Currently, 56 countries have ratified the Protocol, including Austria, Germany, France, Spain, Portugal, Latvia, Lithuania, Cyprus, China and the European Union as a whole.

In order to operate this mechanism, each Member State should request access to the information recorded by the information exchange coordination center. For this purpose, a standard electronic interface will be created with the relevant coordinators at the national system level.

The Member States should cooperate with each other and with relevant international organizations to exchange better results of the operation of track and trace systems. An important aspect in this area is the development and implementation of advanced technological solutions, the support of training and capacity building to improve the devices for the labeling and scanning of tobacco products. In addition, the FCTC Protocol further emphasizes the prohibiting the States from delegating these responsibilities to the tobacco industry.

It is worth noting that Ukraine is a party to the FCTC, but has not yet ratified the FCTC Protocol, which is one of the important obstacles to the development of a system for combating the illegal circulation of tobacco products.

Similar innovative solutions have already been implemented and are successfully operating in selected countries in which the illicit circulation of tobacco products reached catastrophic proportions. Such countries include *Albania, Brazil, Burkina Faso, Belarus, Armenia, Georgia, Ecuador, EU, India (Delhi), some US states, Canada, Kenya, Kyrgyzstan, Kosovo, Mozambique, Morocco, Russia, Thailand, Turkey, Sri Lanka.* The experience of some of them will be explored below.

Considering the legal support of the T&T system, it is also worth considering international standards, as this system is global and involves the exchange of information between tax authorities of different countries. Therefore, their technological solutions must be compatible with each other, which is impossible without the use of standards and cooperation with global standardization bodies, such as the International Organization for Standartization (ISO) and the International Organization for Standardization of Accounting for Goods and Services and Bar Coding of Logistics Units[5] (Global Standards One, hereafter GS1).

The current practice of implementing the T&T system in the world indicates that it can complement the tax verification system. In response, the tax stamp standard was updated. Currently, the ISO 22382:2018 standard of tax stamps[6] has been recognized by tax authorities in many countries. It provides guidance on information on the features, design and specifications of the stamp, serialization and unique code, and the security features that must be provided to confirm excise duty

[5] GS1 is recognized by the World Health Organization, the World Customs Organization *(WCO)* and works closely with national customs authorities, represented by nearly two million companies serving 150 countries.

[6] ISO 22382:2018 *(Security and resilience – Authenticity, integrity and trust for products and documents – Guidelines for the content, security, issuance and examination of excise tax stamps).*

and authentication[7]. In addition, the standard defines the procedures for reconciling the tax stamps with stakeholders, planning the process of selecting suppliers; organization of the process of purchase of stamps; examination of stamps; tracking their movement.

ISO 22382:2018 is applied only to physical tax stamps that are put to a consumer product or its packaging and are obvious to the human visual and tactile perception. It should be emphasized that the standard refers to the authenticity of an tax stamps rather than a product and does not apply to the tax authority's procedures for issuing stamps, controlling and monitoring excise duty revenue, circulation of products[8].

The GS1[9] system provides a set of reliable and recognized standards, services and solutions that ensure compatibility and interaction of all authentication and tracking technology supply chain in the world. As of October 2014, GS1 uses the ISO-recognized EPC IS[10] standards.

EPC IS is an integral part of the EPCglobal Network[11], enabling users to exchange data relating to an object identified by the Electronic Product Code (EPC) with trading partners through the EPCglobal Network[12].

It should be emphasized that EPC IS is a part of the non-profit organization GS1, which develops and maintains global standards of business communication, the most famous of which are barcodes, symbols printed on products and which can be scanned electronically. The GS1 open standards that most commonly are used in the trace and track system are divided into the following:

− Global Traceability Standard, hereinafter the GTS GS1*;*

− GS1 Visibility Framework*;*

− Business-messaging Standard.

GS1 standards are designed to enhance the efficiency, security and visualization of supply chains through physical and digital channels and, in the aggregate, create opportunities for safe and secure supply chains[13].

Parties develop cooperation and harmonize policy on counteraction and fight against fraud and smuggling of excisable goods

Taking into consideration Ukraine's European integration commitments, it is particularly relevant and appropriate to study the legal and regulatory support for the

[7] Security printers Banknotes + Identity. March 22, .2019. URL: https://www.securityprinters.org/dwl/Infosecura79.pdf

[8] ISO 22382:2018 Security and resilience – Authenticity, integrity and trust for products and documents – Guidelines for the content, security, issuance and examination of excise tax stamps: Abstract/ISO. 2018. URL: https://www.iso.org/standard/73859.html.

[9] The standard forms a business language that identifies, captures and enables the exchange of key information about products and their location.

[10] Electronic Product Code Information Service, EPCIS.

[11] A complex of technologies that allows immediate automatic identification of goods and distribution of information about them in the supply chain.

[12] System GS1 terminology. Specifications of the GS1 Ukraine Association. Version 1.0. URL: https://gs1ua.org/media/120/download/GS1_Glossary_spec_v1_0.pdf?v=1.

[13] The Need for Global Standards and Solutions to Combat Counterfeiting: White Paper / GS1. URL: https://www.gs1.org/docs/GS1_Anti-CounterfeitingWhitePaper.pdf

implementation and operation of the T&T system in the European Union. This system became operational on May 20, 2019 for cigarettes (from May 20, 2024, for all other tobacco products). Its functional purpose is to facilitate the reduction of the circulation of illegal tobacco products, to reduce the artificial reduction in the supply of illegal tobacco products, public health, international standardization of product tracking[14], to ensure tax revenues and create equal conditions for all actors in the single European market.

The T&T system is provided for in Article 15 of Directive 2014/40/EU of the European Parliament and of the Council of 3 April 2014 on the approximation of the laws, regulations and administrative provisions of the Member States concerning the manufacture, presentation and sale of tobacco and related products and repealing Directive 2001/37/EC (Tobacco Product Directive, hereinafter – the TPD)[15], which implements the provisions of the FCTC Protocol. Such Track and Trace System will significantly improve control of supply chains and strengthen measures applicable to intra-EU movement of excisable goods (EMCS – for intra-EU movement of goods or New Customs Transit System (NCTS) – for non-EU countries). At the stage of implementing its own T&T system, Ukraine should take proactive harmonization measures to implement the TPD provisions.

In addition to the TPD, regulatory support for the T&T system in EU countries covers the implementation and delegated acts of the European Commission, which define key concepts and regulations[16]:

1) Commission Implementing Regulation (EU) 2018/574 on technical standards for the establishment and operation of a traceability system for tobacco products [17] and its annexes (hereinafter – the Regulation (EU) 2018/574);

2) Commission Delegated Regulation (EU) 2018/573 on key elements of data storage contracts to be concluded as part of a traceability system for tobacco products[18] (hereinafter – the Regulation (EU) 2018/573);

3) Commission Implementing Decision (EU) 2018/576 on technical standards for security features applied to tobacco products (hereinafter – the Commission Decision (EU) 2018/576)[19].

The architecture, structure of such T&T system and the requirements for its individual elements are discussed in detail in the STCF Report “Building a Complex System for Countering the Shadowing of the Excise Goods Market in Ukraine”,

[14] Tobacco control is traditionally separated from the control of alcoholic beverages, which is necessitated by the need to comply with the Protocol on the Elimination of the Illicit Trade in Tobacco in the WHO Framework Convention on Tobacco Control.

[15] Tobacco Products Directive 2014/40/ЄС. 2014. April. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOL_2014_127_R_0001.

[16] Determine the technical details.

[17] On Technical Standards for the Establishment and Operation of a Traceability System for Tobacco Products: Commission Implementing Regulation (EU) 2018/574. URL: https://op.europa.eu/en/publication-detail/-/publication/536e4d37-4140-11e8-b5fe-01aa75ed71a1

[18] On Key Elements of Data Storage Contracts to Be Concluded as Part of f Traceability System or Tobacco Products: Commission Delegated Regulation URL: https://op.europa.eu/en/publication-detail/-/publication/536e4d37-4140-11e8-b5fe-01aa75ed71a1

[19] On Technical Standards for Security Features Applied to Tobacco Products: Commission Implementing Decision (EU) 2018/576. URL: https://op.europa.eu/en/publication-detail/-/publication/536e4d37-4140-11e8-b5fe-01aa75ed71a1

commissioned by the State Fiscal Service of Ukraine during 2017–2018. Therefore, let us briefly discuss the main components of the T&T system, which are presented in Fig. 1.1. The following sections will focus on the status of its implementation in the EU Member States.

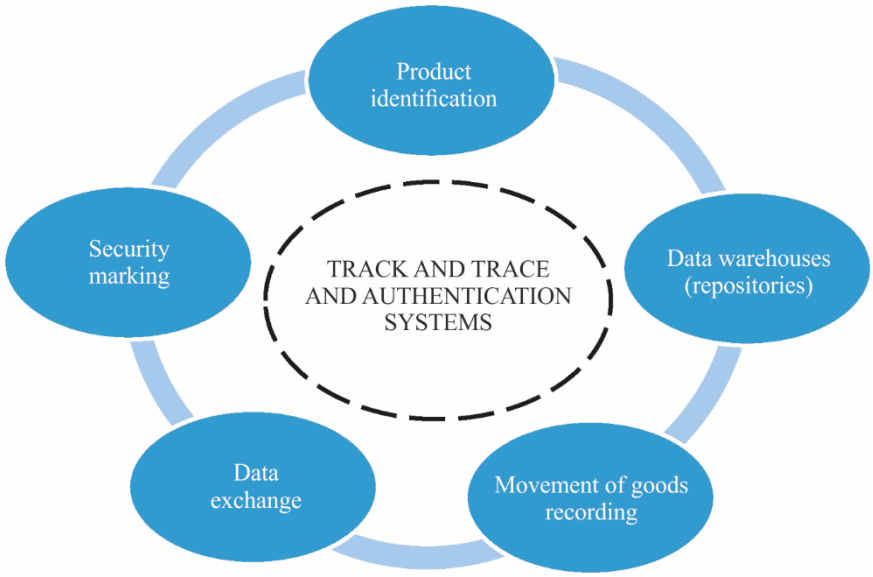

Fig. 1.1 – Main components of track and trace and authentication systems

Source: compiled by the authors on the materials: Analysis and Feasibility Assessment Regarding EU systems for Tracking and Tracing of Tobacco Products and for Security Features URL: https://ec.europa.eu/health/sites/health/files/ tobacco/docs/2015_tpd_tracking_tracing_frep_en.pdf.

The first and fundamental component of the tobacco track and trace system is *product identification,* which involves the process of assigning and designating a unique identifier (hereinafter referred to as UI) by the manufacturer of each product unit. The identifier must be able to determine the following information: date and place of manufacture; production facility; equipment used for the manufacture of tobacco products; change or time of production; product description; predicted retail market; estimated route of departure; importer; actual route of departure from production to the first retail point of sale, including all warehouses used; date of shipment; point of destination; point of departure and consignee; identity of all buyers from production to the first retailer; invoice, order number and payment details of all supply chain members to the first retail outlet.

In some countries, T&T is implemented with a UI that contains a different set of information. In particular, in some US states, only brand, product, manufacturer (importer) information are displayed, and the subsequent movement of product by the supply chain in the UI is not tracked. In EU countries, it is stipulated that the UI should indicate the time of manufacture of tobacco products.

Member States may independently issue unique identifiers or designate third-party contractors independent of the tobacco industry for which a clear system of evaluation criteria has been developed.

The second component of the T&T system is data warehouses (repository system). Regulation (EU) 2018/574 requires the establishment of a two-level storage system for tobacco products. Each manufacturer or importer of tobacco products must designate an independent third-party vendor to store its product information. All parties designating the primary repositories should then agree on the appointment of an independent third party to manage the secondary repository, where data from all primary repositories is stored and can be accessed by Member States and the European Commission.

The secondary repository operator must also install a router to exchange data between the primary and secondary repositories and the issuers of identifiers. This provision establishes significant technical requirements for stores and routers, and costs are borne by importers and manufacturers of tobacco products.

Event data is collected automatically by encoding a unique product identifier to quickly that allows quickly and accurately process information and record relevant tracking event data.

The third component of the T&T system is the recording of the movement of goods. The primary repository stores and records all events that occur in the supply chain, from the moment when the goods are identified to the time they are no longer controlled, enabling to track the complete history of each unit packet movement record.

Data sharing is the *fourth element* of the T&T system and provides users with the ability to share information about physical or digital objects according to their needs. At the same time, technology solution providers must comply with international standards for identification, storage and data sharing.

It should be noted that the T&T system must be complemented by elements of the authentication system. In accordance with Commission Decision (EU) 2018/576, tobacco products must be marked with safety elements at each level of aggregation. The security system must consist of at least five different elements, and the following categories must be always available: overt, semi-covert and covert. EU Member States should define and regulate at least 12 safety features for selection by manufacturers/importers. In this case, one of the elements must be applied by an independent contractor.

Complementing the T&T system with powerful authentication and performance tools based on established international standards and best practices will ensure operational compatibility of systems and enable different technology

vendors to develop their own T&T systems. In addition, it allows harmonizing such systems internationally for effective counteraction to illicit trafficking.

Considering the legal support for the functioning of the T&T system, it should be noted that in order to overcome the illegal circulation of tobacco products in Ukraine it is necessary to take a set of measures and effective mechanisms to counteract this phenomenon, which include own regulatory framework and appropriate implementation procedure, in particular: transparent accounting by raw material producers, order of destruction of confiscated tobacco products/equipment of raw materials, etc., creation of an open register of confiscated products, tougher sanctions for violation of legislation in the field of production and circulation of tobacco products. These measures should be complemented by an electronic system of excise duty, which is under development.

In today's conditions of automation of all processes at the enterprise, it is logical to introduce the T&T of products, not of tax stamp, which will make impossible to break the legal supply chain and help minimize the human factor in conducting tax audits. It is necessary to take into account the interests of manufacturers of tobacco products and to compare the economic benefits and costs of implementing such technology. Thus, in recent years, several technology solutions based on paper stamp with the addition of new security features and functions of electronic identification have been proposed. However, none of the initiatives received support from tobacco manufacturers, since their introduction created additional financial costs for honest taxpayers.

According to business representatives, these decisions will overcome only 10% of illegal cigarette trafficking and attract only UAH 260 million to the budget and will not affect the segments of unmarked smuggled cigarettes and cigarettes of unknown origin. The latter cause losses of the state budget in the amount of UAH 2.3 billion and require improved law enforcement and investigative measures.

In view of the above, the following measures are necessary to effectively counteract the illegal circulation of tobacco products in Ukraine: ratification of the FCTC Protocol; proactive harmonization with the EU, namely the implementation of Art. 15 of TPD Directives; harmonization of T&T system architecture with legitimate manufacturers. In addition, it is important to apply open standards for the detection and tracking of tobacco products and their authentication, which are operationally compatible and may contribute to limit the amount of tax evasion both within Ukraine (due to the rapid detection of consumers and tax authorities fake, counterfeit and contraband products) and globally (through rapid international exchange of relevant information). The introduction of modern, operationally compatible at the global level tobacco track and trace systems and their authentication in Ukraine will help reduce the volume of illicit tobacco trafficking,

ensuring the reduction of budget losses due to excise and other tax evasion, as well as the achievement of health goals (by limiting consumer access to relatively cheap counterfeit, fake and contraband products).

2. Structure of illegal circulation in the tobacco market of Ukraine and mechanisms of counteraction depending on its segments

The market of goods and services of Ukraine has undergone significant changes in view of the new political and economic realities. Particularly important in this context is one of the main budget-forming branches of the food industry of Ukraine, namely the production of tobacco products. Exactly this industry is most affected by government regulation, which is aimed at raising excise duty rates. At the same time, the absence of a systematic excise policy in the area of tobacco market regulation, and frequent changes to the "rules of the game" in tobacco taxation are one of the factors of avoidance and evasion. This leads to an increase in the level of the illegal tobacco market, which causes significant damage to the country's economy in the form of not only unpaid taxes but also problems with public health. The avoidance of excise duty implies the use of forestalling (the accumulation of cigarettes by manufacturers of tobacco products in warehouses before raising the rates of excise duty)[20] and dumping (the underestimation of cigarette prices by tobacco companies)[21], and the evasion – production and circulation of products in violation of applicable laws and international treaties and covering unaccounted tobacco products[22].

Illegal types of cigarettes include smuggling; counterfeit; obtained as a result of fraud; with tax stamp purchased for other products ("cigar" schemes); cigarettes which are not fully paid in the supply chain during the supply chain (VAT "scrolls", non-payment of excise duty on tobacco sales, "cheap whites", etc.); cross-border purchases.

Illegal circulation of tobacco products on the domestic market is formed from separate segments that have different nature and factors of manifestation, namely: undeclared production, smuggling, falsification, undeclared sale.

Analyzing the dynamics of illicit trafficking in terms of such segments as contraband and counterfeit of cigarettes in Ukraine, we can see that its growth is taking place. Thus, according to Kantar TNS in Ukraine during 2016–2019 the illegal tobacco market grew 7 times (from 1.1 to 7.5% of the total market volume)

[20] V. I. Korotun, N. V. Novytska, I. I. Khliebnikova Tobacco companies forestalling countermeasures: European experience and conclusions for Ukraine. Problemy economiky. 2019. No. 2 (40). P. 134-144.

[21] V. I. Korotun, T. V. Koshchuk Anti-dumping Mechanism for Stabilization of Tax Revenues from Tobacco Products. Finansy Ukrainy. 2018. No. 9. P. 60-72.

[22] Those that do not appear in official statistics and are not taxed.

and amounts to 3.8 billion units cigarettes (Fig. 2.1).

The State Budget of Ukraine's losses from non-receipt of the excise duty on tobacco products in 2019 amounted to about UAH 5.0 billion. The most common of these are Duty Free-branded cigarettes, which account for 66% in the smuggling structure. The main selling points for such cigarettes are street vendors, shops, open markets and kiosks.

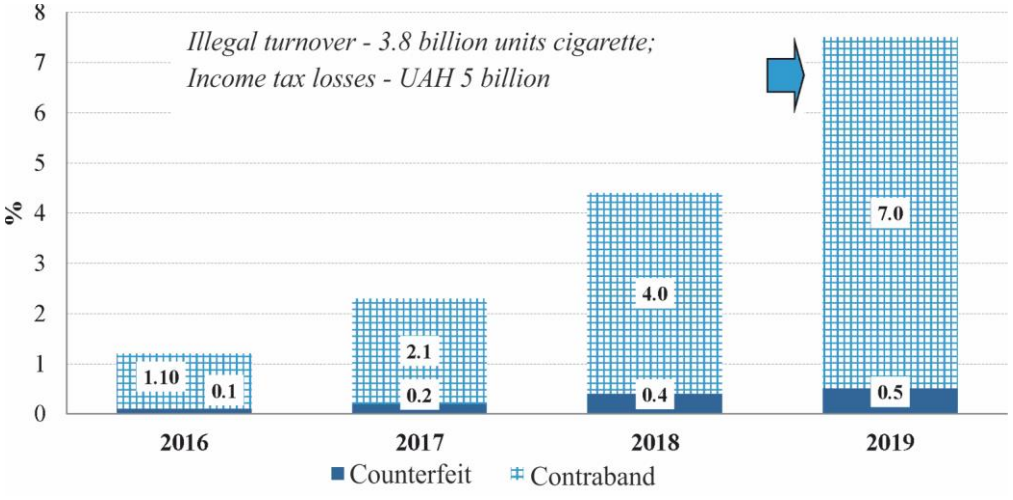

Fig. 2.1 – Dynamics and structure of the illegal tobacco market in Ukraine, 2016–2019

Source: compiled by the authors according to Kantar TNS.

Given the increase in the illegal circulation of tobacco products, it is advisable to determine its place in the market structure, terminological definition, classification of its components, clarifying the causes and formulating measures to counteract such a negative phenomenon (Fig. 2.2).

One type of illicit trafficking in tobacco products is falsification of the goods *(falsificatio,* from *falsifico* "counterfeit"), actions aimed at defrauding the consumer by falsifying the sale and purchase object with a gainful purpose (due to deterioration in consumer properties).

Article 1 of the Law of Ukraine "On State Regulation of Production and Turnover of Alcohol Ethyl, Cognac and Fruit, Alcoholic Beverages and Tobacco Products"[23], falsification of tobacco products is defined as intentional, production of tobacco products for profit with violation of technology or improper use of the stamp for goods and services, or the copying of the form, packaging, exterior design, as well as the direct reproduction of the goods of another entrepreneur with the unauthorized use of his name.

[23] On State Regulation of Production and Turnover of Alcohol Ethyl, Cognac and Fruit, Alcoholic Beverages and Tobacco Products: Law of Ukraine of December 19, 1995 No. 481/95-BP.URL: http://zakon2.rada.gov.ua.

In science and practice, in addition to "falsification" of tobacco products, the concept of "counterfeit products" is widely used. If the terms "forgery" and "falsification" in Ukrainian are used as synonyms and signify what imitates a genuine product, then the counterfeit is an unauthorized use of someone else's copyright. Accordingly, the term “counterfeit products” refers to products that have been manufactured in violation of these rights[24]. The main differences between the terms "forgery" and "counterfeiting" lie in the scope of these concepts, namely: the concept of "forgery" is used in several areas of activity, while the concept of "counterfeiting" only in respect of intellectual property violations.

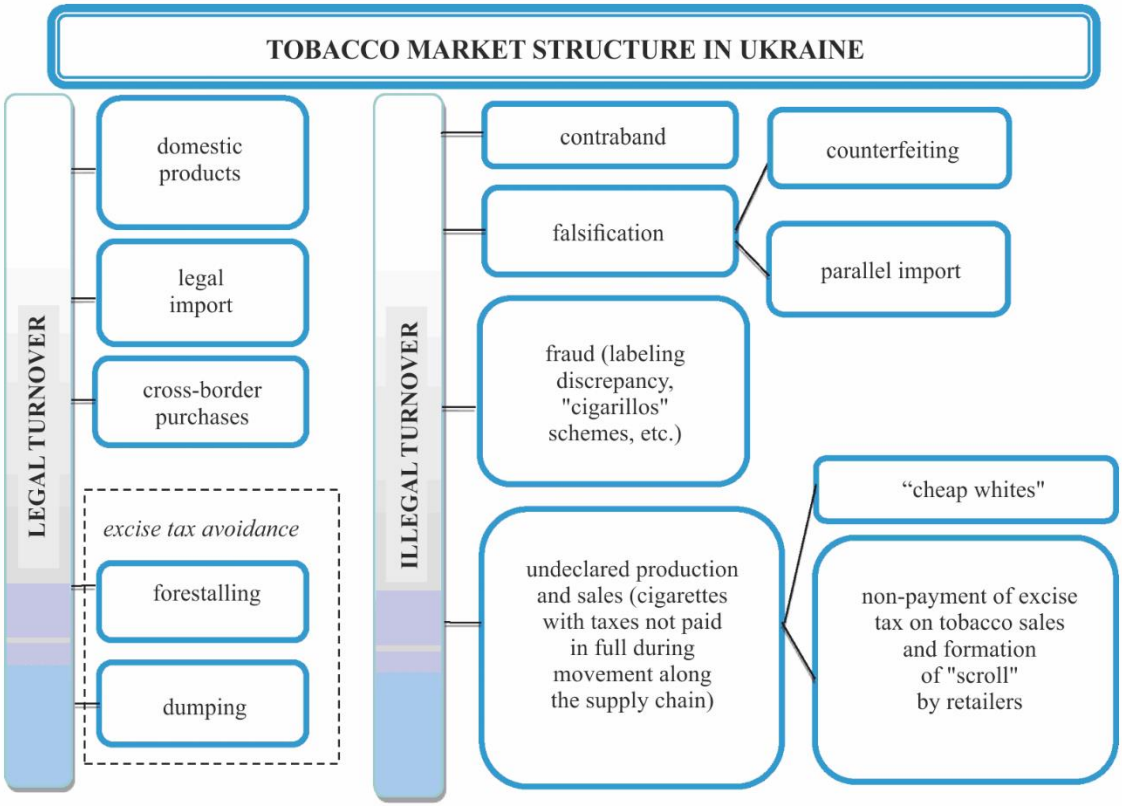

Fig. 2.2 – Structure of the tobacco market in Ukraine

Source: compiled by the authors.

According to the Customs Code of Ukraine[25], counterfeit goods are goods that contain objects of intellectual property rights, the importation of which to the customs territory of Ukraine or export from this territory is a violation of intellectual property rights, protected in accordance with the legislation of Ukraine and international treaties concluded in the legislative order.

Counterfeit goods are often opposed to goods imported through parallel imports. The first ones are regarded as fake, and the second ones as legally

[24] Korostashova I. M. Types of Intellectual Property Violations: Questions of Terminology Application and Classification.
[25] Customs Code of Ukraine: Law of Ukraine of March 13, 2012 No. 4495-VI.URL: http://sta-sumy.gov.ua/mk/

manufactured and put into civil circulation, i.e. original.

For example, concurrent import is a term generally used to refer to non-counterfeit goods imported from another country without the permission of the right holder[26].

"Parallel imports" is a concept that exists at the legislative level in many countries. This term means the importation for the purpose of sale of original goods, which have been put into circulation in the territory of another country. Parallel imports are closely related to the concept of "exhaustion of intellectual property rights". In accordance with the basic principles of intellectual property rights, an exclusive right exists for a specific product in which the protected intellectual property object is used before the first product is put into circulation. That is, if a product that uses a protected intellectual property is put into circulation with the knowledge of the copyright owner, the exclusive right is considered to be "exhausted"[27].

Although tobacco policy has traditionally been a matter of national and sub-national levels, in recent decades this situation has changed a lot. Along with the significant increase in trade and travel, there has been much more opportunity to transport tobacco products across national borders or through Duty Free, or by other legal means or as smuggling.

Another type of illicit trafficking in goods is the circulation of original products (goods) smuggled into the customs territory of Ukraine. The term "smuggling" refers to the illicit transportation or movement of goods and other items across the customs border (state border). According to the Customs Code of Ukraine, moving through the customs border means the actual importation, exportation or transit of goods or objects by any means.

Therefore, smuggling is considered to have been completed since the actual illegal movement of items across the customs border, which is only possible upon importation. If the objects of smuggling were discovered during export outside Ukraine, then it qualifies as attempted smuggling.

The domestic market is also characterized by such forms of illegal circulation of tobacco products as fraud by improperly labeling of excise goods. This applies both to the use of counterfeit tax stamps and to the violation of the use of legal stamps, in particular "cigarillos" schemes. The latter is the purchase of tax stamps for cigarillos. This was made possible by the application of the general approach to marking and the same design of tax stamps for both filter cigarettes and cigarillos under the code of the Ukrainian Classification of Foreign Economic Activity Goods

[26] Mykolska N., Makhinova A. Parallel Imports under Ukrainian Law. *The Ukrainian Journal of Business Law*. 2009. No. 5. P. 30.

[27] Kuzmenko L. Parallel Imports are an Important Mechanism for Existence of Competitiveness. *NaUKMA Scientific Notes. Economic sciences.* 2016. No. 1. P. 96–100.

2402 10 00 00. The main factors that contributed to the use of such a scheme for the purpose of unduly reducing the tax liability include the following: lower rates of excise duty on cigarettes; lack of ad valorem component and minimal excise duty; ability to produce small packages for this type of product (thus paying significantly less excise duty per tax stamps)[28].

Due to the fact that for the first type of tobacco products the excise duty considerably exceeds the amount of excise duty in the price of cigarettes, the use of the scheme with the replacement of the object of marking with tax stamps with further clarification of the amount of tax liability when filing excise duty declaration made possible to significantly optimize the payment of excise duty to the budget.

Such optimization was manifested in the deferral of excise duty payment (the full amount of the obligation was paid not on the purchase of tax stamps, but on submission to the State Fiscal Service authorities of the relevant declaration) by using the gap in the tobacco excise duty mechanism used in Ukraine. To prevent the use of the "cigarillos" scheme, the Cabinet of Ministers of Ukraine[29] approved new samples of tax stamps for cigarettes and cigarillos differing in color.

At the same time, it remains possible to apply a similar scheme of excise duty optimization by manipulating the number of cigarettes or cigarillos in one packet. The use of such legal conflicts allows receiving a delay in payment of part of the tax liability for excise duty for a period exceeding 60 days. The next step to eliminate similar schemes is to introduce new props on the tax stamps – the number of units of tobacco in a package/pack. The proposal is that each stamp of excise duty on tobacco products must have a separate number and designation of the quarter and year of its issue, as well as the number of units in the package (packet).

In recent decades, the schemes of tobacco products movement along the supply chain with a partial payment of excise duty have become widespread in the illicit tobacco market. In particular, these include the so-called *"cheap whites"* (also called *"illegal whites"*), which are made specifically for smuggling. It should be noted that the term "cheap/illegal white" was first used in the *World Customs Organization (WCO)* report in 2009[30].

These include cigarettes produced “legally in the country of origin and legally sold to the first buyer”, but “the total consumption of cigarettes at the national level is less than the volume of production”[31]. A large number of "cheap white" cigarettes

[28] Matiichuk O. V. Combating Tax Evasion of Tobacco Products in Ukraine. Countering Tax Minimization: Ukraine's World Experience and Practice. Coll. mater. IV Scientific Pract. Internet Workshop (Irpin, May 16-17, 2019 Irpin, 2019. P. 90–93.

[29] Some Issues of Introducing Excise Tax Stamps on a New Sample for Alcoholic Beverages and Tobacco Products: Resolution of the Cabinet of Ministers of Ukraine of May 14, 2015. No. 296 URL: http://zakon4.rada.gov.ua/laws/show/296-2015-%D0%BF

[30] Countering Illicit Trafficking in Alcoholic Beverages and Tobacco: The Experience of EU and OECD Countries: gen. ed. V. Khliebnikova Korotun. Irpin: University of the State Fiscal Service of Ukraine, 2017, 66 p.

[31] World Customs Organization. Illicit Trade Report, 2013 (2014). URL: http://www.wcoomd.org/en/topics/enforcement-and-compliance/activities-and-programmes/~/media/WCO/Public/Global/PDF/Topics/Enforcement%20and%20Compliance/Activities%20and%20Programmes/Illicit%20Trade%20Report%202012/WCO%20REPORT%202013%20-%20BR.ashx

are illegal in the countries of destination and, as a rule, do not meet the regulatory standards set in them. WCO also defines the "cheap whites" sub-category as binary products with name, graphics and color similar to well-known trademarks.

An analysis of the definition of "cheap white cigarettes" suggests that government agencies usually emphasize tax evasion, and law enforcement agencies focus on the legal aspect of trade. At the same time, everyone stresses that such cigarettes are legally produced in one of the countries, but intended for smuggling. The export of such tobacco from some countries may be quite legal. The goods are then smuggled to other countries without paying taxes, using both legal and unofficial distribution channels. As a rule, such activities do not violate the rights of manufacturers who own other trademarks, but some manufacturers of "illegal white" cigarettes successfully imitate the elements of packaging and design of more popular global brands. The quality of such products may be reasonably acceptable in comparison to counterfeit cigarettes.

The problem of distribution of "illegal white" cigarettes is faced by most countries of the world. According to experts from the International Tax and Investment Center, the main suppliers of illegal white cigarettes are countries such as Belarus, Vietnam, Indonesia, Philippines, India, Cambodia, Paraguay, Ukraine, Russia, Brazil, UAE, Kenya, and a number of free trade zones. Canada, Malaysia, Turkey, South Africa, Mexico, Brazil, Argentina, and EU countries are also among the countries in which this problem is particularly acute.

On the basis of the mirror statistics method, we compared the information of the UN comtrade database[32] on the flow of goods between Ukraine and partner countries. According to the method of estimating the illegal circulation of alcoholic beverages/tobacco products on the basis of the method of evaluation by realization developed by the author's team[33] it was calculated a trade gap, which during 2011-2017 had a growing dynamics and ranged from 1.21 to 9.47 billion units of cigarettes. In 2018, there is a negative trade gap of 3.4 billion units, which, by our assumptions, can be explained by the emergence of new schemes of illegal trade due to the significant increase in excise duty burden in Ukraine compared to the neighboring countries (Fig. 2.3). Thus, according to the State Fiscal Service of Ukraine, it is now more profitable to import smuggled cigarettes from Russia and Belarus via Ukraine to the EU than to transport Ukrainian ones. This is supported by several facts. In particular, in December 2019, the customs authorities of Ukraine found smuggled cigarettes in the amount of 197.6 packets (in the amount of UAH 5 432 thousand) and 62.8 thousand packets (in the amount of UAH 2 708 thousand)

[32] UN Comtrade Database. URL: https://comtrade.un.org/data.

[33] Korotun V. I., Novytska N. V., Khliebnikova I. I. Nelehalnyi Obih Alkoholnykh Napoiv ta Tiutiunovykh Vyrobiv v Ukraini: Metodyka Statystychnoi Otsinky [Illegal Circulation of Alcoholic Beverages and Tobacco Products in Ukraine: Statistical Estimation Methodology]. *Svit finansiv*. 2018. No. 2. P. 43–56

that were sent to Romania. According to the shipping documents, the products were referred to as "corrugated paper" in rolls and "hardwood coal".

Another scheme of illegal trafficking, which is a prerequisite for the growth of both the shadow market of Ukraine and the smuggling of cigarettes into the European Union, is the creation of "scroll" subject to a wholesale license by tobacco retailers. Thus, the opportunity for retailers to buy cigarettes by bank transfer or cash allows not show these operations in circulation.

Such products are subsequently sold without cash registers and without payment of retail excise duty, which creates conditions for lowering the market price, distorting competitive conditions. The application of this scheme allows to generate flows of unaccounted cash and illegal VAT refunds[34].

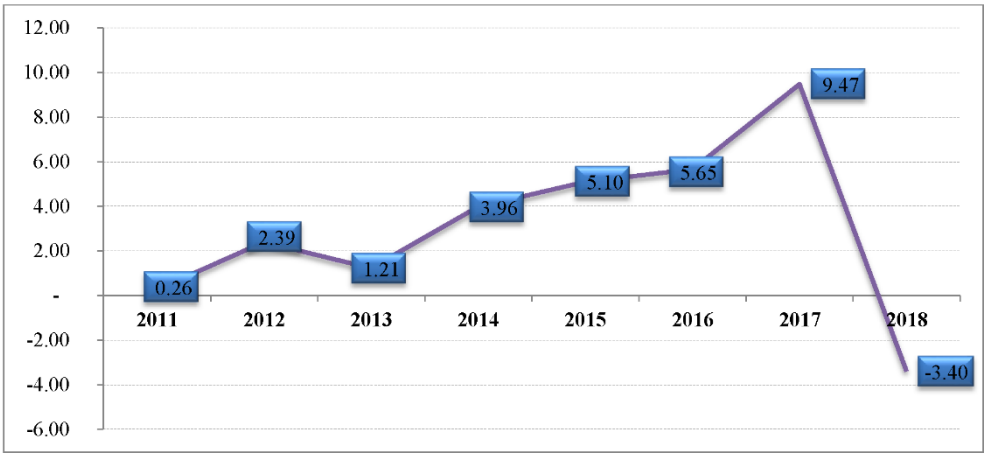

Fig. 2.3 – Dynamics of the discrepancy between tobacco exports of Ukraine and imports of the respective countries (trade gap) in 2012-2018, billion units.

Source: authors' calculations according to data[3536].

With the rapid growth rate of specific excise duties on tobacco products in Ukraine (2017 – by 40%, 2018 – by 30%, 2019 – approximately by 30% more) would experience a significant increase in revenues of the retail excise from this category of excise goods, since the "standard" excise duty is included in the retail excise duty base. However, actual revenues from the retail excise duty on tobacco products increased from UAH 2.3 billion in 2017 to UAH 2.4 billion in 2018 and will amount to UAH 2.5 billion in 2019 (according to preliminary estimates).

This is a confirmation of the large amount of tax evasion. According to the State Fiscal Service, in 2018 this resulted in fiscal losses of UAH 1.7 billion (i.e. 70.8% of the corresponding upward trending revenues) (Fig. 2.4). In addition, the

[34] Yavorskyi O. Retail Excise Duty – Point of no Return Reached? ZENSOR.NET URL: https://censor.net.ua/blogs/3145287/rozdrbniyi aktsiz tochka nepovernennya dosyagnuta.

[35] UN Comtrade Database. URL: https://comtrade.un.org/data.

[36] Korotun V. I., Novytska N. V., Khliebnikova I. I. Nelehalnyi Obih Alkoholnykh Napoiv ta Tiutiunovykh.

volume of VAT shortfalls due to the abuse of this category of excise goods is increasing.

Therefore, the urgency of improving the administration of retail excise duty on tobacco products is increasing. The latter should first and foremost improve the ability to control the transfer of tax to the budget. It is also necessary to strengthen the responsibility of retailers for non-compliance with cash discipline during the sale of tobacco products.

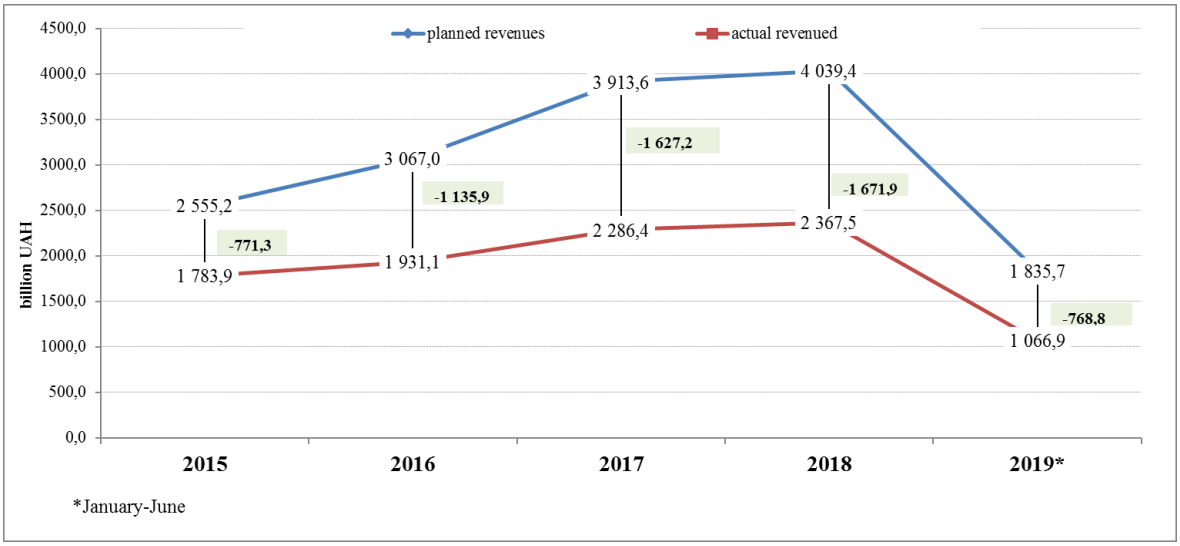

Fig. 2.4 – Dynamics of Fiscal Excise Duty Losses on Retail Tobacco Products in 2015–2018

Source: compiled by the authors according to the State Fiscal Service of Ukraine data.

We note that the widespread tax evasion schemes with the participation of wholesalers and retailers of tobacco products create opportunities for cigarette smuggling from Ukraine to EU countries.

Therefore, these measures to combat these abuses will not only increase in the retail excise duty on tobacco and VAT, but also decrease in illicit cigarette trafficking in Europe.

Such illegal tobacco products are sold in all corners of the world, in both low- and high-income countries. At the same time, the destination countries on the territory of which illegal products are marketed have the following common features:

– high rates of excise duties on tobacco products, which cause high relative consumer incomes, retail prices (as a consequence, low cigarette affordability) or prices higher than in neighboring countries;

– regulatory acts of a non-tax nature in the area of control over the circulation of tobacco products, such as the ban on flavorings;

− lack of attention to the problem of illegal trade by law enforcement agencies, due to the availability of other tasks of higher priority or a general lack of resources;

− imperfect legal regime (for example, one under which the legislation or the judicial system does not properly regulate the protection of intellectual property rights and the liability for smugglers is not sufficiently rigid and does not exercise a restraining and punitive function);

− tolerant treatment of illegal products or lack of information about the counterfeit origin of certain products.

Thus, the smuggling of tobacco products is detrimental to the economy of the state, which is related to the non-payment of duties, excise duty, VAT and other payments, both during the crossing of the customs border and during the sale of smuggled goods on the territory of Ukraine or abroad. Counterfeit tax stamps printed in Turkey, the Czech Republic and China have been and continue to be used for the sale of illegally made products imported by smuggling.

The illegal sale of tobacco products is global in nature, exists worldwide without being tied to a specific country, overall level of development of its economy, income level of the population, national characteristics of tobacco consumption, and so on. Illegal sale of tobacco products in terms of scale ranks second in the world among all types of illegal activity, second only to drug trafficking. According to Euromonitor International[37], the annual worldwide illicit trafficking in tobacco products reaches 600 billion cigarettes, or USD 40−50 billion.

Experts from the *International Tax and Investment Center (ITIC)* identify the main factors that influence the development of the illegal trade in tobacco products (Table 2.1).

Table 2.1 – Main factors affecting the development of the illicit trade in tobacco

Factor	Characteristic
1	**2**
Consumers' desire to save money by buying cheap illegal cigarettes	Tobacco products remain one of the most common illegal trade sites in the world because they are easily transported with a very attractive ratio of weight and value, subject to high taxes and are in great demand among the population
High profitability of illegal tobacco trade	Even if the country has relatively low absolute rates of excise duty, illegal trade in its territory can bring a considerable profit to smugglers, provided that the tax rates are relatively high in terms of income. Consequently, tax evasion is beneficial not

[37] Illicit Trade in Tobacco Products. Will the new protocol be effective? / International Tax and Investment Center. 52 c.

continuation of table 2.1

1	2
	only to smugglers but also to consumers who can buy cheap cigarettes
Unbalanced taxation of tobacco products	It is considered that the rapid increase in excise duties is one of the favorable factors for development of illicit trade in tobacco products. Increasing the excise duty rate leads to a sharp rise in prices, making legal products less accessible to consumers
Protectionist measures	Import restrictions, including prohibited import duties or protectionist measures aimed at creating technical barriers to international trade, give additional economic impetus to the development of illicit trafficking in goods, as demand for foreign brand products remains
Not effective enough work of law enforcement agencies	Many countries adopt legislation to counteract illicit trafficking, however, law enforcement agencies are often unable to enforce such legislation properly. Effective control of goods moving across borders requires significant resources and involvement of both local and international law enforcement agencies. This requires qualified professionals involved in crime prevention, its analysis, intelligence activities, detecting offenses and investigations, as well as specialized information systems for the collection and analysis of information, risk assessment, allocating of resources and providing feedback from participants of events. In addition, interaction with the relevant authorities and services is an important aspect of effective controls
Ineffective legislation and excessively lenient sanctions	In many countries of the world, law enforcement agencies are not given the broad powers necessary to effectively combat the illicit trafficking of tobacco products, as it is considered to be an offense, which is not dangerous to society. Therefore, such activity is attractive to criminal syndicates because it generates more profit at minimal risk, whereas more soft punishments are provided for the illicit sale of cigarettes than for drug trafficking, human trafficking or arms smuggling
Tolerant attitude of the society to the illegal trade in tobacco products	The development of illegal trade is largely driven by consumer demand. For the most part, consumers are aware that they are buying smuggled or counterfeit goods, but in order to save money, they knowingly choose illegal goods

continuation of table 2.1

1	2
Abuse of privileges of free economic zones	Criminal groups use free economic zones for the smuggling of illegal products or their redirection to the domestic market, and in some cases for the illegal production of counterfeit and smuggled goods. Statistical data on removal of illegal cigarettes confiscated in the territory of free economic zones indicate that criminals often declare illegal tobacco products as legal

Source: compiled based on: Illicit Tobacco Trade and Methods of Dealing with It: International Tax and Investment Center. 2015. 52 p. URL: http://docplayer.ru/28442615-Nezakonnaya-torgovlya-tabachnymi-izdeliyami-i-metody-borby-s-ney.html.

Due to the different manifestation of the problem of illegal trafficking in each segment, it requires the use of different mechanisms to counteract it. For some of them it is necessary to develop and improve the mechanisms available in the controlling bodies, namely: to found unmarked cigarettes – licensing and control measures, to determine their origin – operational-search ones, to VAT "scrolls" and unpaid excise duty on retail sales – analysis of databases available to the tax authorities and T&T information system and others.

Control measures should be combined with stimulating tax compliance and media campaign in the media to inform the public that the distribution and/or purchase of tobacco products, of which taxes have not been paid, are illegal activities. The synergistic effect of such measures will be manifested in the form of reduced supply and demand for illegal tobacco products.

In addition, to overcome the illicit market of cigarettes, an urgent issue is the improvement of the legal and regulatory support in the sphere of control over the circulation of tobacco products, in particular with regard to the accounting of producers of raw materials, the order of destruction of confiscated tobacco products, equipment, raw materials, etc., and formation of the corresponding register in free access.

At the same time, increasing the responsibility for offenses in the tobacco production and circulation is important for effective counteraction to the illegal market.

Therefore, the control measures should be comprehensive and targeted at those links in the tobacco supply chain that present the greatest risks of illicit trafficking. Control authorities should be empowered to oversee all distribution channels, from production to retail. It should be noted that tax authorities in Ukraine do not have the right to carry out sudden inspections of retail outlets, which are usually small business entities. According to research by Kantar TNS Ukraine, exactly through these channels that illegal products are distributed. In 2019, 77% of

total illegal production was distributed through street vendors, open markets and stores.

An equally important tool to counteract illegal trafficking is use of modern information technologies of product tracking throughout the supply chain. This enables tax authorities to promptly find out the origin, movement and distribution channels of the product, as well as to identify products that were marketed in violation of the law.

3. Worldwide experience tracking and tracing tax stamps and tobacco products

3.1. The experience of countries with track and trace systems for tax stamps

In some countries, technological solutions to counteract the illegal circulation of tobacco products are implemented through the complementation of a *system of tax verification* (tax stamps) *by the security* and *T&T systems*. This involves the gradual acquisition by the tax stamps of several physical and digital security features to facilitate the authentication of tobacco products, simplify their use and complicate duplication and elements of track and trace system to enable tracking of the supply chain. That is, tax stamps, not products, are tracked in these countries. In this case, such an instrument is one of the means used by the states to guarantee the authenticity of the excisable goods, the assurance of its legal production and circulation, the confirmation of payment of the full amount of excise duty.

For this purpose, some countries have begun to partner with innovative technology providers that offer proprietary solutions[38] to counteract illegal products and the system of protection of tax stamps. In some cases, especially in companies already operating in the field of counterfeit banknote protection, these systems have been adapted for use with tax stamps and based on the same elements of high security. Other businesses, which came on the market at a later stage, usually offered a mix of new security products and innovative tracking technologies.

Some companies have taken up new niches forming business offers for specific sectors (e.g. labeling of fuel).

Further, we take a closer look at T&T systems that operate nationwide (or at the state level) and are implemented to protect tobacco products. In the individual cranes considered below, tax stamps contain a unique identifier, but it is not used to

[38] Proprietary solution is a decision that retains both non-property and property rights. By receiving or acquiring such a technological solution, the user obtains limited rights to use it: it may be forbidden or closed access to the code (study), modification, duplication, distribution and resale. As for software, it is considered proprietary in the case of at least one of the following restrictions.

track them. And, accordingly, a control system based on it cannot be identified as a full-fledged track and trace system. However, to simplify the perception of the material we will use the term "T&T system".

3.1.1. North American countries

Canada. Since 2010, a new regime of tax stamps on tobacco products has been developed and implemented in the crane[39]. The use of the system of tax stamps has become mandatory since April 1, 2011 and allows to confirm the payment of the federal excise duty and the legal origin of tobacco and cannabis products. The tax stamp has up-to-date overt and covert identifiers and contains security features that can be detected only by federal, provincial and territorial law enforcement agencies[40]. The tax stamp makes it easier for law enforcement, retailers and consumers to identify illicit tobacco and cannabis products[41].

A joint venture between *Canadian Bank Note Company Limited* and SICPA *Security Solutions Canada Corporation*, which expired on September 30, 2019, was the provider of the Canadian tax stamp system. Instead, after the bidding procedure, another contract for the development, production and distribution of tax stamps for the period from October 1, 2019 to September 30, 2024, was provided by the *Canadian Banking Note Company Limited*. Under the new contract, the cost of one tax stamp will be USD 0.0067425. All applicable taxes and fees are additional charges. To facilitate a smooth transition, tax stamps users will store their current IDs and passwords to access the ordering websystem.

The tax stamp is mandatory for all tobacco products produced domestically or imported to Canada. Under Canadian law, no person may manufacture and market tobacco or cannabis products without a tax stamp, except for cannabis products with low psychotropic substances and appropriate medicines released by prescription.

The tax stamps provider will provide safe delivery of tax stamps to users through *Canadian Bank Note Company Limited* as subcontractor or a commercial carrier represented by the user of tax stamps and agreed with *Canadian Bank Note Company Limited*. The tax stamps supplier is responsible for the tax stamps until the user becomes their owner. The cost of safe delivery of the tax stamp is included in the cost and paid for by the user.

The tax verification system cooperates with *T&T* system. Fig. 3.1 shows an example of a tax stamp with the code *T&T*, as well as description of some unique features of overt, semi-covert and covert security features.

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[39] In accordance with the requirements of the Law on Labor and Economic Growth (Bill C-9) established by the Ministry of Justice of Canada.

[40] EDN61 Excise Stamping Regime – Transition to New Contract. 2019. URL: https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/edn61/excise-stamping-regime- transition-new-contract.html#toc2

[41] Tax stamps are manufactured by the Canadian Bank Note Company and SICPA. They are distributed by the Canada Revenue Agency. URL: http://news.gc.ca/web/article-en.do?nid=612329

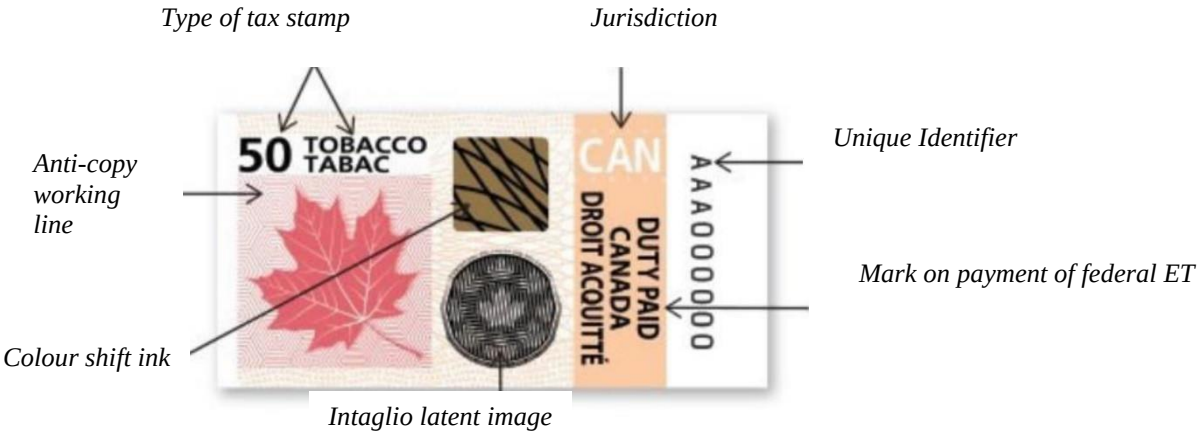


Fig. 3.1 – Description of elements of tax verification, T&T and security features in Canada

Source: EDN61 Excise Stamping Regime – Transition to New Contract. 2019. URL: https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/edn61/excise-stamping-regime-transition-new-contract.html#toc2.

The *overt* security features include the following: size of tax stamps (20 × 40 mm); type of tax stamp that indicates the type of product to which it will be applied (cannabis, cigarettes, tobacco, cigars, tobacco raw materials); name/abbreviation of the jurisdiction (Canada or any province or territory), as well as the color band and background specific to that jurisdiction; unique identifier – an alphanumeric code specific to each tax stamp and consisting of 3 capital letters and 6 digits; the federal tax stamp clearly indicates that the federal tobacco excise duty has been paid.

Semi-covert security features include the following: covert metal engraving with unique tactile and visual effects (in the case of slight movement of the tax stamp at different angles the letter C is visible); ink color change – a visible protection feature when the ink changes from green to red when the tax stamp is tilted (color change occurs with a change in viewing angle); the anti-copy work line gives a clear and unique look to the tax stamp (this function is aimed at preventing photocopying of the mark, since the quality and clarity of the work line is not transferred to the copied document).

The tax stamp also has covert security features that can be detected only by federal and territorial law enforcement agencies. In particular, these include ultraviolet inks that change under the influence of a device that emits black light.

As tax stamps contain semi-covert security features, tax authorities shall ensure that portable devices of the first level are accessible to users of tax stamps by

leasing them. Such an instrument of verification is optional, but is used to comply with the law and to verify the authenticity of tax stamps. Customers of excise duty brands will be able to order the first level devices through the ordering websystem. The rental price will cover improvements, upgrades or replacements, as well as any costs of revoking the instrument (full firm price). The country's T&T system is used to electronically control the delivery of tax stamps, and does not allow any tracing of products with the applied stamp. This indicates a limited functionality of the system.

Similarly, the second level devices available to tax and law enforcement officials, the use of which allows to check the authenticity of the stamp and provide additional information on compliance with relevant legislation.

Some USA states. T&T system has been implemented to counter the illicit circulation of tobacco products in *California* since 2002 (transition period to January 2005) at the state level. The main reason for its implementation was the significant loss of tax revenue due to the illegal circulation of tobacco products. In particular, in 2003, the California tax authorities estimated them at USD 292 million. The criminal activity was aimed at counterfeiting tax stamps, pseudo-exports, cross-border smuggling, online purchases, and unmarked products. As a result of inspections, 25% of state-owned retailers sold counterfeit cigarettes[42].

T&T system now works in conjunction with the tax verification system and is implemented as a high-tech tax stamp with unique identifiers based on the SICPATRACE platform. However, such a system has limited functionality because it partly provides for the tracking of tobacco products (the unique identifier does not contain information about the date of the movement of the product along the supply chain).

To improve supply chain control and reduce tax revenue losses, the authorities have also introduced licensing obligations and set up a special supervisory authority.

In California, about 1 billion tax stamps are produced per year with overt and covert security features. Manufacturers/importers of licensed warehouses apply tax stamps to cigarette packets using high-speed automated stamping machines.

It should be noted that within two years after the introduction of T&T system, tax evasion was reduced by 37%. In addition, the tax authorities managed to raise additional USD 870 million of excise duty revenue in 2009.

Through a systematic approach to counteracting the tobacco trade that combined licensing, use of security features and the detection and tracking of tax stamps, California managed to increase the USD 70.3 million in excise duty

[42] Ensuring Supply Chain Security: The role of anti-counterfeiting technologies. United Nations Interregional Crime and Justice Research Institute. URL: http://www.unicri.it/topics/counterfeiting/anticounterfeiting_technologies/Ensuring_supply_chain_security_report.pdf

revenues in 2014−2015. The total additional revenue is estimated at USD 91 million less the cost of using proprietary technologies.

According to some sources, the cost of the tax stamps system in 2017−2019 was USD 0.0082 per unit, while according to others, in some states, manufacturers of tobacco products received a discount of USD 0.0085 for each stamp, in other states, the reimbursement of stamping equipment in the amount of USD 180,000 for each machine (Annex B, Table B.2). However, there is no data on reimbursement of T&T system implementation costs in California[43].

In addition, this technology has made it possible to increase the efficiency of field checks, in particular by reducing the seizure of illegal goods at points of sale, as well as the percentage of retailers distributing illegal products. Thus, in 2009 the number of packets seized was 100.9 thousand, which is 73% less than in 2004.

In *Massachusetts*, since 2010, *T&T* system similar to the California one, also developed on the SICPATRACE platform, has been operating. This system was created to control the supply chain and to verify the wholesale and retail distributors, as well as to track and trace tax stamps.

SICPA, which offers proprietary solutions based on the SICPATRACE platform, provides tax authorities with tools of control and means of inspection of products authenticity. Through the SICPA HORIZON inspection platform, inspectors can obtain license information and record real-time data on the movement of tax stamps across the tobacco supply chain. During operation, the system allowed to mobilize an excise duty of approximately USD 600 million.

In addition, a state register of manufacturers of tobacco products has been created, to which the tax stamp may be applied. Tax stamps contain covert and overt security features given the possibility of multi-level authentication, as well as colored ink that displaces color, microtext, invisible code and forensic markers[44]. It enables to implement multi-user authentication features, design and presence of clear security features allow consumers to test the product, while the use of covert security features enables law enforcement officials to verify its authenticity using hand-held scanning devices.

The Massachusetts State Revenue Collection Platform covers approximately 220 million annual products, providing a scheme to track and trace statewide tax stamps.

In 2013, the *Michigan* Ministry of Finance started implementing a proprietary solution to track and trace the tax stamp for tobacco products (including

[43] Michael DeFeo, Mark A.R. Kleiman, James E. Prieger. Combating the Illicit Trade in Tobacco Products in California and at the National Level through Track and Trace (T&T). URL: https://poseidon01.ssrn.com/delivery.php?ID=544017099074094115027114098018065011027055029016031058025073030064120027095093109074110122119106047059058117064122123121083026102009075041077099102022121097069004088011018121086012124112012120116116126109022103122102020116098089066011104114007101084&E XT=pdf.

[44] Massachusetts Department of Revenue. URL: http://www.mass.gov/dor/businesses/help-and- resources/cigarette-and-tobaccotax/cigarette-stamp-validator-information.html.

configuration of applications, scanners and software aimed at maximizing revenue), selected by Xerox and OpS providers[45]. As a result, a complex encrypted digital tax stamp (*SecureITT*) was introduced (Fig. 3.2). The main stages of system deployment were the design and production of tax stamps, integration of different technologies, intensive testing and qualification of stamping machines.

SECURITY ELEMENTS:
Hologram
Digital code
Adhesive Application

Fig. 3.2 – Description of elements of tax verification, T&T and security features in Michigan

Source: ITSA Presentation for HSP Hanoi 3 Dec 2018. URL: https://www.tax-stamps.org/userfiles/files/ITSA%20Presentation%20for%20HSP%20Hanoi%203%20Dec%202018.pdf.

As for the use of the tax stamp, the security system is programmed to scan the *Universal Production Code (UPC)* and compare it with the list of approved brands. If the machine finds an unapproved brand, the marking is canceled. Also, for security reasons, monitoring measures are being taken to prevent the placing on the market of fake *SecureITT* brands. *Contraband Watch Services* focuses on targeted monitoring of websites and social media aimed at identifying counterfeit tax stamps worldwide.

The system allows customs officers to use special mobile applications to track and authenticate tax stamps.

In addition, the QR code, which is indicated on the tax stamps, enables consumers to interact with the service and receive a variety of information. This allows the state to benefit from public participation in smoking cessation programs and educational initiatives related to the impact of illicit tobacco trafficking. As a result of the implementation of the T&T system in Michigan, excise duty revenues increased by 1.8%.

Despite some positive fiscal effects, existing systems based on the tracking and tracing and of tax stamps with unique codes and continuous monitoring capabilities do not meet the needs of the United States, the main problem of which is interstate circulation. Tobacco products without the tax stamp, with the tax stamp of another state, or with the export-marking can only be visually identified but not tracked. Therefore, the combination of state-level verification and T&T systems at the state level is not appropriate to track the interstate circulation of tobacco products. For them, it would be more effective to separate the operation of such

[45] The development and implementation was carried out by Xerox and OpSec Security. URL: http://www.opsecsecurity.com/assets/files/gov_literature/Michigan_SecureITT_Case_Study.pdf

systems, which involves the affixing of a unique identifier directly to the packet, including products intended for export and duty-free shops.

Such a solution will allow the identification and traceability of products that are legally manufactured but are moving illegally along the supply chain. This will make it unprofitable to sell non-taxable cigarettes that are intended for export but are in circulation in the domestic market.

3.1.2. South American countries

Brazil. Starting in March 2007, the country has implemented a test regime (industrial operation since August 2008) of a nationwide tobacco excise tax administration platform called SCORPIOS, created on the SICPATRACE detection and tracking platform provided by SICPA company jointly with the Brazilian Mint *(Casa da Moeda do Brasil – CMB).*

SCORPIOS system provides equipment for automatic counters and anti-counterfeit devices at the place of production of cigarettes at each production line. It is worth noting that in Brazil, T&T system works in conjunction with the tax verification system, the functional purpose of which is the constant monitoring of the tax stamp movements by tax authorities. Thus, Fig. 3.3 shows an example of a tax stamp and T&T system code for cigarettes intended for domestic production and export. It should be noted that imports are not tracked due to low volumes.

The basis of the T&T system of tax stamps for cigarettes intended for consumption on the domestic market is an invisible unique identifier. It allows you to store the following information: manufacturer's name, date of manufacture, brand and final destination. The export of cigarettes uses a special mode of marking (since 2011), which provides for the application of a visible two-dimensional matrix bar code on the block and other types of aggregated packaging. The letters BR at the end of the numeric code indicate that the country of origin of cigarettes is Brazil[46].

Part of the authorization for the components of the T&T system of tax stamps in Brazil is delegated to licensed manufacturers of tobacco products that activate the code using specially installed equipment. This equipment identifies special inks, verifies the code, and records all information, thus allowing the packet of cigarettes to be authenticated. Tobacco products are labeled in real time on high-speed production lines (over 700 bundles per minute).

The control authorities use special scanners to read the tax stamps. If the unique code is not verified, the system will send a message to the data management server and the tax authorities. The data is stored in a central government data warehouse, and tax and law enforcement officials are equipped with hand-held

[46] WHO report on the global tobacco epidemic, 2015: raising taxes on tobacco. World Health Organization 2015, 103 p.

devices for authenticating of tobacco products[47]. In parallel with SICPA system, the Brazilian tobacco industry uses its own Inexto system, which is designed to identify and track each unit packet for commercial purposes.

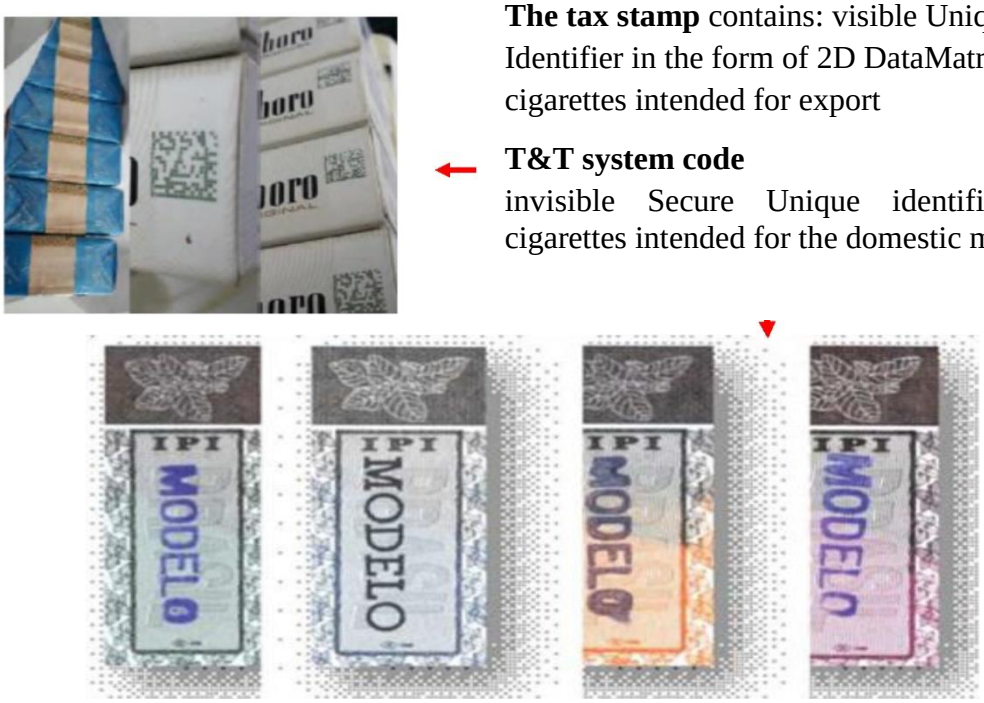


Fig. 3.3 – Description of elements of tax verification, T&T and security features in Brazil

Source: ITSA Presentation for HSP Hanoi 3 Dec 2018. URL: https://www.tax-stamps.org/userfiles/files/ITSA%20Presentation%20for%20HSP%20Hanoi%203%20Dec%202018.pdf.

The T&T system of tax stamps operates at the expense of business. As of 2011, costs were approximately USD 0.01845 per packet (Annex B Table B.2). Only in the first three months of the operation of the innovative control system in Brazil, USD 90 million tobacco excise duty was collected, which is more than expected. As a result of application of T&T system, five legal producers, which accounted for 16% of the tobacco market, as well as seven illegal enterprises were closed for illegal production and circulation of tobacco products. Between 2007 and 2009, tax revenues from the excise duty on tobacco products increased by 24%, and illegal trade was reduced by 6%. Today, SCORPIOS provides monitoring tax stamps for over 5 billion packets of cigarettes annually[48]. It should also be noted that due to the application of this system in conjunction with the excise duty policy aimed at increasing the tax burden, the number of smokers in Brazil decreased from 21.35

[47] Ibid.
[48] WHO report on the global tobacco epidemic, 2015: raising taxes on tobacco. World Health Organization 2015, 103p.

million in 2006 to 18.10 million in 2012[49]. In addition, the introduction of the system made it possible to overcome one of the most important problems of the illegal circulation of tobacco products – the scheme of "fictitious exports" after the mandatory labeling of products for export in 2011.

In May 2009, SICOBE beverage production control system was developed and implemented. The scope of SICOBE covers beer, soft drinks and mineral water, and designates each product with a unique machine-readable code using security features.

Despite certain positive effects of the T&T excise duty system's functioning, corruption factors were present at the stage of its introduction, which contributed to the non-competitive tender conditions.

In *Ecuador*, from 2017, *SIMAR* tobacco tax stamp tracking system by SICPA company was put into effect. The purpose of the implementation of this system was to minimize the manifestation of excise duty evasion and traceability of domestic production. The project cost USD 81.5 million for a five-year contract. The T&T system involves the use of the tax stamp and the verification code, the elements of which contain the physical security features applied to this type of marking (Fig. 3.4).

Stamp has four types of security features:

− *overt* – change colors, paints, holograms, covert images, watermarks;

− *semi-covert* – check of safety features by means of ultraviolet radiation;

− *covert* – invisible security features require the use of special electronic devices to read information,

− *expert forensic* – use of forensic markers that will only be identified through laboratory analysis.

SIMAR contains a number of technical components that enable marking and storage of data *online* at all stages of production. The technology platform is based on the installation of equipment on each tobacco production for marking. Each manufacturer must apply to the inspection body for a unique identifier, which is then applied during the excise duty marking. Using this system allows you to enter data in a unique identifier for the production, sale and transportation of tobacco products.

[49] Controlling Illicit Tobacco Trade: International Experience. 2015. URL: https://tobacconomics.org/wp-content/uploads/2015/05/Ross_International_experience_05.28.15.pdf.

SECURITY ELEMENTS:

Overt
Color shifting
Fine line
Latent image

Covert
Forensic marker
authenticated specialized
laboratory equipment

Semi-covert
Double polarization of color
shifting ink, UV ink

Expert forensic
Forensic markers

Fig. 3.4 – Description of elements of tax verification, T&T and security features in Ecuador

Source: ITSA Presentation for HSP Hanoi 3 Dec 2018. URL: https://www.tax-stamps.org/userfiles/files/ITSA%20Presentation%20for%20HSP%20Hanoi%203%20Dec%202018.pdf.

As a result of the use of track and trace system of tax stamps in the period from 2017 to 2018, 10 million packets of illegal cigarettes worth USD 36 million were found, however, excise duty revenues have declined significantly since 2015.

3.1.3. African countries

Kenya. Since 2013, the Electronic Excise Tax Administration system (EGMS) has been introduced. This system was developed by SICPA for the Kenyan Revenue Authority (KRA) and is worth around 732 million Kenyan shillings (USD 9.5 million) per year (Annex B Table B.2).

The Electronic Excise Tax Administration system allows to calculate products, track tax stamps, control inventories, forecast tax revenues and required number of tax stamps, manage accounts and collect other business analytics. This facilitates the detection of counterfeit goods, prevents smuggling, and helps eliminate counterfeiting.

EGMS also helps reduce brand protection costs and helps control production by legitimate manufacturers.

The implementation of EGMS requires minimal infrastructure: high-speed Internet and a reliable telecommunications network covering areas of the country where T&T equipment for tax stamps are installed (headquarters of tax authorities, factories, warehouses and ports). It also requires constant energy supply at all production lines and excise warehouses where the necessary equipment is installed.

The T&T system works in conjunction with the tax verification system, that is, the tax stamp combines the tracking function and the fiscal function. The tax stamp must be affixed to each packet in such a way that it cannot be used after opening. It contains a unique identifier based on the 2D code, as well as security features (overt, semi-covert, covert and forensic) (Fig. 3.5).

SECURITY FEATURES:

Overt
Colour shifting
Fine line

Semi-covert
Polarization of Color shifting ink

Covert
Invisible Unique Identification

Expert forensic
Forensic markers

Fig. 3.5 – Description of elements of tax verification, T&T and security features in Kenya

Source: ITSA Presentation for HSP Hanoi 3 Dec 2018. URL: https://www.tax-stamps.org/userfiles/files/ITSA%20Presentation%20for%20HSP%20Hanoi%203%20Dec%202018.pdf.

Visible elements such as holograms, color changes, two-dimensional codes provide authentication through visual inspection or through a mobile application via smartphone or special scanner.

Semi-covert security elements are intended for product authentication in the supply chain by distributors and retailers (mini-text printing, metameric inks, ultraviolet fibers, fluorescent inks detected by special devices).

Covert security elements are intended for product authentication only by tax authorities during the inspection (fluorescent fibers and protective inks).

Forensic elements can only be detected in the laboratory.

Cigarette manufacturers are required to install light-sensitive readers on production lines that transmit production data in real time to the KRA servers. Each individual excise duty is applied to the production line, activated and associated with the brand and size of the packaging. On the packaging line, the reader can scan up to 200 boxes and send data on the quantity and type of products produced every 15 minutes.

Employees of market surveillance units using portable devices can read a covert photomagnetic line on the tax stamp and transmit real-time data to a central KRA server. The server processes the data received and automatically verifies the

product's authenticity and compliance with tax laws. The system eliminates the impact of the human factor during the verification process, thus eliminating errors and increasing the speed and accuracy of data processing. The portable device can also be used offline. Cigarette distributors and retailers are also required to have scanners to authenticate tobacco products before placing them in their outlets.

The T&T system of tax stamps applies to both domestic and imported products. Cigarette importers buy tax stamps in Kenya and ship them to their facilities abroad, where they are glued to each packet of tobacco products, destined for Kenya. All domestic manufacturers and importers must activate excise duties online. The excise duty liability arises at the time of removal of the goods from the factory or at the time of importation into the customs territory of Kenya. Tobacco products intended for export are labeled in accordance with the law of the importing country and are not monitored, which creates the possibility of illegal cigarettes appearing on the market.

Starting in 2016, Kenyan citizens have ability to identify purchased cigarettes and alcohol by reading tax stamp information using the Stamp Checker mobile application (Figure 3.6).

Fig. 3.6 – Screenshot of the Stamp Checker mobile application

Source: How to Use KRA Stamp Checker To verify the Genuineness and Authenticity of a Product. URL: http://hustleyetu.co.ke/2016/09/how-to-use-kra-stamp-checker-to-verify-the-genuineness-and-authenticity-of-a-product.html.

For the implementation of the EGMS, the Kenyan Revenue Authority has set up an interdisciplinary technical team of tax authorities, information and communication technologists, legal and procurement experts.

Prior to and during the implementation of the EGMS KRA, consultations were held with other anti-trafficking agencies, the Kenya Bureau of Standards (KEBS) and the Anti-Counterfeiting Agency, as well as the Kenya Private Sector Alliance and other parties concerned to ensure that all parties are informed and support the project. Despite these measures, it was later revealed that offenses were committed by the officials of the competent authorities at the stage of forming the tender conditions. As a result, the extension of the functionality of the system to other products was suspended because of violations of constitutional rights of citizens of

the country[50].

The total cost of stamping and supplying the tax stamp with EGMS traceability system in 2014 was USD 0.01. The system is financed by the mechanism of refinancing of payers at the expense of paid excise duty. That is, manufacturers pay for the placement of photosensitive readers on their production lines and have the right to reduce their tax liability from the excise duty on the value of these technical means.

The implementation of EGMS resulted an increase in tobacco tax revenues by 38% in 2014. In addition, KRA established new law enforcement units that seized more than 300,000 illegal goods from about 900 outlets and prosecuted more than 150 offenders in the period from February to June 2014 only.

As a result of the set of measures, including the implementation of the system of detection and tracking of tax stamps in the 2016/17 financial year[51], the excise duty on beer and tobacco increased by 13.3% and the excise duty on alcohol by 22.7%.

In the same year, a similar system began operating in *Mozambique*. December 18, 2013. The Mozambican Tax Administration has signed a contract with the British firm OpSec Security Ltd to develop and implement a system of tax stamps for tobacco and alcohol. According to Mozambique's legislation, the tax stamp is mandatory for tobacco and alcohol products produced domestically and imported into the country. The system of tax stamps has been introduced in order to counteract the illegal circulation of products in the domestic market and to combat excise duty evasion.

This system allows tracking tax stamps from the time they are applied to tobacco products, as well as during the movement of the product supply chain in real time.

T&T system, combined with the tax verification and security system, is based on the use of the tax stamp. The tax stamp has modern security features that make it impossible to fake them: overt, semi-covert, covert. There are currently four types of tax stamp in Mozambique, depending on whether tobacco or alcohol is imported or produced domestically.

The tax stamp on imported tobacco products is green. In Fig. 3.7, the design of the mark, which is formed by the complex continuous lines of green in the tobacco imported tobacco product (indicated by figure 1), is presented. The tax stamp contains a protective socket, central and edge boundaries, made using protective

[50] MPs send away KRA boss John Njiraini over 'unacceptable' responses on tax system. 2018. URL: https://www.businessdailyafrica.com/news/MPs-dismiss-KRA-boss-Njiraini-over--unacceptable--responses/539546-4363330-hdhh8b/index.html.

[51] July 2016 – June 2017

lines in the form of positive and negative elements (figure 2), positive microtext (figure 3), holographic foil strip of copper color (figure 6).

Number 4 in the figure shows the name of the product and the type of tax stamp. Elements of the T&T tax stamp system are a unique identifier consisting of an alphanumeric eight-digit number and a matrix 2D barcode (figure 5).

Fig. 3.7 – Description of elements of tax verification, T&T and security in Mozambique

Source: OpSec security Mozambique. URL: opsecsecuritymozambique.com/stamp-family.html.

Authorized suppliers of tax stamps may request the number of stamps through Mozambique's Revenue Office. According to OpSec, government revenue from excise goods increased by 85% in the first year after the introduction of the tax stamps system.

3.1.4. Eastern European countries

Armenia. As of January 1, 2018, within the Eurasian Economic Union program[52] *(EAEC)* on reduction of illegal production and circulation of products, a tax marking has been introduced in Armenia, which operates on the basis of *Vero* proprietary technology and is applied to more than 30 types of goods, including tobacco products[53].

The system provider is the Armenian AM-PG *(AM-PG Group)*[54], which started producing of tax stamps in 2002 and has developed nearly 70 types of tax stamps over the past years[55]. The purpose of such a system is to verify the authenticity, trace the movement of tax stamps on the supply chain and confirm the tax payments.

[52] The EAEU includes Belarus, Armenia, Kazakhstan, Kyrgyzstan and Russia.

[53] Alcohol and non-alcoholic beverages, fuel and lubricants, pharmaceuticals, packaged food, candy, detergents, cosmetics, media (CD / DVD / Blue-Ray discs with media content), leather and fur, footwear, jewelry.

[54] Established in 1998, the first company in the field of authentication in the South Caucasus. The company has gradually transformed itself into a regional center of innovation and leading experience in the printing of security and programming elements. Today, AM-PG is the only printing company in Armenia that has a state license for the production and printing of safety components due to compliance with international standards (certified by ISO 9001 and membership in the International Hologram Manufacturers Association (IHMA)). It is currently implementing various innovative projects with government, financial institutions, customs and tax offices, private local, national and transnational companies.

[55] As not only excise goods are marked in Armenia, the concept of tax stamp is applied.

The unique identifier posted on the tax stamp contains information about the manufacturer or importer details, product details, current location, unique serial number, and whether or not a check has already been carried out.

The system of tracking and tracing tax stamps has a modular architecture and consists of modules for tracking and processing information about it, rejecting/approving taxpayers' applications, assigning a serial number and processing requests for tax stamps. The system allows tracking serial numbers assigned to taxpayers' applications; to automatically generate reports for relevant government agencies; to prepare documents for the return of tax stamps.

The functions of the group AM-PG related to the tracking and tracing include:

− generation of unique identifiers and their distribution;

− providing complete product information to authorized persons;

− ensuring the exchange of information between commercial partners.

Tax stamps include physical and digital security features as well as detection and tracking features. Physical security is the use of holograms with a bi-metal mirror effect. The unique identifier was developed on the basis of proprietary serial coding technology of the AM-PG group – *Vero Code.* It is a three-dimensional code in the form of a square consisting of multicolor modules, in which the information about the products is encoded by means of individual closed algorithms (Fig. 3.8). Unique code generation platform adapted for cloud work is constantly being upgraded, adapted to mobile devices and based on blockchain technology.

Blockchain technology is based on the use of a decentralized, encrypted publicly available system of registers to record information on the movement of tax stamps across the supply chain of certain products. It formalizes a system of "trust" in products from a network of registered participants. All participants share encryption keys, agree the format of registries and make them available to each other.

Each participant has own private key that allows to store and encode information, and the system has public keys that provide access to the registers.

The record of production is added to the distributed database and supplemented by information on the movement of tax stamps in the supply chain. That is, the storage devices for the database are not related to the common processor, but are placed in the systems of all participants as a decentralized database.

SECURITY ELEMENTS:
Overt
Hologram with bi-metal mirror effect

UNIQUE IDENTIFIER:
Vero Code

Fig. 3.8 – Description of elements of tax verification, T&T and security features in Armenia

Source: AM-PG's Tax Labels to be Used on Over 30 Products in Armenia. Tax Stamp News. 2017. № 9. P.2.

The system periodically groups tracking information to form a block that displays code authentication and its path. Each block has a timestamp and references to the previous block[56]. If a fake code is entered into the system, it will not conform to the public registry. For example, if code 012345 indicates that the products of a particular manufacturer have gone to a wholesaler and is currently available in a warehouse in Long Beach and the copied code 012345 now appears elsewhere in the network, the blockchain will not conform to the public registry of the copied code and mark these products.

The same applies to counterfeit products. If code 012345 belongs to the tax stamp on products sold in Moldova, while all registries show that it is located in France, then such packet will be marked with a contraband mark. The distributed functioning of the database allows all participants to check the authenticity and track the movement of the tax stamp on the supply chain.

The T&T system has a three-tier structure in which the user interface, application servers and database management are supported as independent modules on separate platforms.

Each of the system modules can be upgraded or replaced on its own without affecting the rest of the system. The server infrastructure allows the global online validation, and several language options make it possible to use the system worldwide.

AM-PG offers two different "architectures" that allow users to use the system's functionality – online architecture and offline architecture. The first type involves the transfer of data over the Internet to storage using a scanner, which is available on the smartphone of the inspector. The second type allows to conduct

[56] AM-PG's Tax Labels to be Used on Over 30 Products in Armenia. Tax Stamp News, 2017. No. 9. P. 2.

authentication code regardless of Internet connection, as inspectors can scan and store code products for further verification.

This T&T tax stamp system allows the exchange of information with other public authorities and agencies, such as the Customs Service or the National Statistics Office, which are interested in obtaining information in the relevant market. In addition to law enforcement, the public and consumers can authenticate the product with portable scanners or smartphones based on common operating systems, such as Apple iOS, Android, and Windows Mobile. Relevant information displayed on the product screen includes manufacturer or importer details, product details, current location, unique serial number, and whether or not a check has already been carried out. Each check also generates a special report, which is then passed to the data warehouse. The World Customs Organization interface is part of the system and the structure complies with GS1 standards.

Georgia. In November 2011, the Georgian tax authorities announced a tender for the development of an Integrated System of Movement and Registration of Products.

Seven companies have applied for participation, as a result of selection preference was given to the company SICPA, although it did not meet the conditions of competition on 5-year experience in Georgia. System development began in March 2012 and was launched in March 2013.

Tax stamps with security features (overt, semi-covert and covert) and a unique identifier (Fig. 3.9) applied to products in the production process.

DataMatrix includes:
unique identifier,
cryptographic code.

The tax stamp contains:
holographic security element
with spectral labels;
multicomponent security printing.

Fig. 3.9 – Description of elements of tax verification, T&T and security features in Georgia

Source: author's photo.

All products intended for the domestic market are subject to marking. The unique identifier contains information stored in serialized code designed to track and trace of tax stamps, as well as the data management system. This information

includes name of manufacturer or importer, product name, time and place of production and volume. The system does not allow tracking unmarked products.

The data management module is hosted by the Georgia tax authority and the information sent to the data center is transmitted in real time.

The web application allows domestic manufacturers and importers to order, forecast, pay and activate tax stamps. Although the system is capable of both detection and tracking, it is currently only used for tracking purposes.

The marking and scanning of tobacco products take place on the production line, and the information on the marked products is automatically recorded and transmitted to the warehouse electronically together with the waybill through the system operator. In addition, all promotional events at each stage of the supply chain are stored in the repository by scanning a unique identifier, thus creating a history of each product. Tax authorities' inspectors carry out periodic retail inspections of authentication of tobacco products in retail by hand-held control devices.

In addition to tobacco products, SICPA also provides separate modules for tracking tax stamps on alcoholic beverages (since 2012), beer (since 2012) and non-alcoholic beverages (since 2016). Overall, Georgia is monitoring the movement of 900 million units per year. The cost of one tax stamp is EUR 0.005. The implementation of the T&T system in Georgia was carried out at the expense of the state budget, and from 2018, the cost of financing the system was transferred to business.

It is worth noting that Georgia has encountered problems inherent in the use of proprietary technologies, namely SICPA has accused the Georgian government of failing to meet the agreed volume of non-alcoholic beverages for marking.

However, application of this system at the same time as excise policy aimed at significantly increasing the excise duty on cigarettes from 33.3% of the retail price in 2008 to 54% in 2016, allowed to keep the level of the illegal tobacco market at 3% of the total volume.

3.2. The experience of countries with products tracing and tracking system

3.2.1. Asian countries

The experience in the United Arab Emirates, which are the first in the Asian region who actively introduce a system for detecting and tracking of tobacco products, is significant. As of January 1, 2019, the *Digital Tax Stamps Scheme (DTS),* the issuer of which is *De La Rue, has come into operation in a test mode.* The industrial operation of the system began in August 2019. It provides for the marking and unique identification of packets of cigarettes, which allows to trace the

movement of products from the moment of its production to the final point of its wholesale (distribution)[57] in the UAE, as well as to take measures to counteract the illegal trade in tobacco products. At the same time, the tax verification and detection and tracking systems operate separately. In order to identify and track the products and the free functioning of the market, the unique identifiers are applied to all types of aggregate packaging of manufactured and imported tobacco products and are registered in the UAE's *Emirati Federal Tax Authority (FTA)* database.

The main functional purpose of DTS:

− enhancing the ability of the Federal Tax Service to control excise duty processes and administer the excise duty on tobacco products manufactured/imported into the country for internal consumption;

− giving control authorities the ability to analyze and verify supply chains to better identify trafficking in illegal tobacco products;

− ensuring compliance with compliance standards established by FCTC installed through the ability to detect and track tobacco products.

Analyzing the innovations of the country envisaged for the control of cigarette circulation, it should be noted that DTS is required to be used today by[58]:

− any cigarette *manufacturer* in the UAE or abroad (international manufacturer) who sells its products by importing into the UAE for sale on the territory of the country or for sale at duty-free points of sale (airports and ports) in the UAE;

− any *importer* who obtains a relevant license from the state and buys cigarettes in bulk from international manufacturers with an obligation to sell them individually or to wholesale them in the UAE or in duty-free zones within the territory of the country;

− any *official distributor (economic operator, wholesaler)* who will be the recipient of domestic and officially imported products for sale on the domestic market or for sale at duty free outlets (airports and ports) in the UAE.

According to the national legislation of the UAE, manufacturers of tobacco products and other stakeholders must comply with improved standards for the circulation of tobacco products in the country. In particular, apply high security tax stamps and unique identifiers to detect and track tobacco products throughout the supply chain in the UAE for all packets of cigarettes (Fig. 3.10)[59].

The DTS system peculiarity is that products manufactured in the UAE for export or pass in transit through the country through special customs zone are not tracked.

[57] To the ultimate economic operator preceding the retail sale.
[58] Digital Tax Stamps Scheme for Tobacco Products. Federal Tax Authority of UAE. URL: https://tax.gov.ae/DTS.
[59] Codes are also used for all types of packaging.

The tax stamp has security features (it performs the function of counterfeiting) and is proof of tax payment. It is not used for tracking and tracing. Paper tax stamps in the country are supplied by De La Rue, which has won the relevant tender, in blocks of 500 pieces and are glued by the manufacturer.

Fig. 3.10 – Description of elements of tax verification, T&T and security features in the UAE

Source: Digital Tax Stamps Scheme for Tobacco Products. Federal Tax Authority of UAE. URL: https://tax.gov.ae/DTS

The unique identifier is a product identification and tracking code generated and provided by De La Rue and applied directly to the cigarette packet by manufacturer.

It should be noted that before the introduction of the DTS system in the UAE, there was no marking of tobacco products with tax stamps at all.

Therefore, given the lack of appropriate practice, the country has simultaneously introduced a system of paper tax stamps and detection and tracking, despite the fact that such a system of control over the circulation of tobacco products is relatively expensive to use.

The new system for controlling the circulation of cigarettes in the UAE was implemented gradually, with the following steps[60]:

− stage 1 – from 1 January 2019, importers and manufacturers of cigarettes in the UAE could order tax stamps for their use in packets of cigarettes;

− stage 2 – from May 1, 2019, no types of cigarettes were allowed to be imported into the UAE without a digital tax stamp.

[60] Digital Tax Stamps Scheme for Tobacco Products. Federal Tax Authority of UAE. URL: https://tax.gov.ae/DTS.

− stage 3 – from 01.08.2019 – industrial operation. Cigarettes cannot be marketed, imported or manufactured in the UAE unless they have a digital tax stamp. All cigarettes manufactured or imported into the UAE after this date must have DTS with supply chain tracking.

It should be noted that the development and preparation for the implementation of this control system, which covered the designing of the paper tax stamp and the formation of technical and organizational support for its use, designing and launching the system for tracking and tracing of cigarettes, continued from July 1, 2017 to January 1, 2019.

The following steps were taken by the stakeholders to implement the DTS system[61]:

− informing about peculiarities of economic activity (sites of economic operators, consumers, etc.);

− contact GS1 organization to get location codes and product types;

− informing by importers about peculiarities of economic activity of producers;

− informing by importers about the peculiarities of the economic activity of their economic wholesale operators;

− study by the manufacturers of the pilot site for testing the DTS system;

− providing the technical information necessary to implement the system.

Currently, all members of the tobacco supply chain in the UAE are required to use the digital tax stamp system. It enables to identify and track relevant events based on information received from manufacturers, importers and other stakeholders in the supply chain using global standards. The Federal Tax Service of the country performs the functions of licensing, order approval (for receipt of paper and digital stamps), acceptance of reports on the use of DST[62].

The DTS system is based on the GS1 global standard on creation and sharing of data events in the *EPC IS* supply chains. The use of the GS1 EPC IS enables the DTS system to be integrated into the global tobacco supply chain trace and track system and to ensure that it complies with FCTC standards. The main elements that must have a unique identifier in GS1: 1) location code (GLN – global location number); 2) product code (EAN/UPC product barcode).

De La Rue company complies with the DTS system, which involves, in particular, the generation of unique identifiers, the storage of data in storage and the provision of information exchange between competent authorities[63].

The DTS system is based on the fulfillment of various functions during

[61] Digital Tax Stamps Scheme for Tobacco Products. Federal Tax Authority of UAE. URL: https://tax.gov.ae/DTS.
[62] Ibid.
[63] Ibid.

production, import of goods, movement of cigarettes in the supply chain for the purpose of their wholesale sale:

- *international manufacturers:* production of products and their movement to the border;

- *national producers:* production of products and their movement for further wholesale. The main *obligations of the manufacturer* under the DTS system are as follows: registration of tobacco products and excise duty declarations in the FTA Excise system; placing an order for digital tax stamps in the FTA DTS system; product registration in GS1 to receive EAN/UPC code; obtaining paper tax stamps and ordering unique identifiers; activation of paper tax stamps before production and application for their use (indicating the type of products, its batch, production equipment); gluing paper tax stamps on the production line; printing unique identifiers on packages (sending information about their commissioning to the data warehouse) during production; unique identification of aggregated packaging; shipment notification (sending delivery event information to the data warehouse); declaration of defective and damaged paper tax stamps and unique identifiers;

- *importers:* import of products and their movement from the border to the first distributor. They are required to register tobacco products (product description through EAN/UPC) and excise duty declaration in the FTA Excise system and to order digital tax stamps (indicating the product type, quantity, manufacturer's site, retail market) at the FTA DTS system;

- *economic operators engaged in wholesale trade*: movement of goods for their distribution in the UAE. The main *obligations* are the following: sending information on receipt and unpacking of the goods with the establishment of the place of receipt, serial numbers to the data warehouse; identifying the product (with the serial number of the unpacked pallet or box, location) (sending information on unpacking event to the data warehouse); detecting repackaging of goods (indicating serial numbers, new pallet or box serial numbers, location) (sending information on aggregation event to the data warehouse); detection of further shipment of goods (with identification of shipment ID, product type, serial numbers, destination) (sending information on delivery event to the data warehouse)[64].

It should be noted that the implementation of an open standards-based trace and track system has been a significant achievement in the fight against tobacco trafficking in the UAE. However, it has some disadvantages, namely: the use of a cigarette production and circulation control system based on the reporting of paper tax stamps with a large amount of information (type of product, its batch, production equipment) overloads the functionality of the tax verification system, since its main

[64] Digital Tax Stamps Scheme for Tobacco Products. Federal Tax Authority of UAE. URL: https://tax.gov.ae/DTS.

purpose which is proof of excise duty payment. It is advisable to include this information as part of the code with a unique identifier, and it is sufficient to report the product type, description, amount of tax paid and the number of trademarks damaged.

It is important for Ukraine to initially introduce a relatively simple track and trace system of tobacco products in order to avoid a number of procedural and technical problems that could lead to negative economic consequences during its testing and approbation. In view of this, the relevant UAE experience may be beneficial for our country.

3.3.2. Eastern European countries

Nowadays, in Eastern European countries, which are part of the EAEU, including Belarus, Kazakhstan, Kyrgyzstan, Armenia and Russia, innovative or control systems for production and circulation of excise and other goods, which differ from each other by the information systems platforms, the list of mandatory products, the product security systems and the requirements for security features, are implemented or in the initial stages of implementation.

In countries such as Russia and Kazakhstan, innovative solutions to counteract the illegal circulation of products have been implemented with the separate functioning of the tax verification system (tax stamps) and the T&T system.

Russia. Since January 2018, the national information system of tobacco labeling and circulation "Chesnyi Znak" (hereinafter – the NISTLC) has been implemented in test mode. Commercial operation of the system was launched in March 1, 2019. Connection and registration in the system is mandatory for all participants in the tobacco market. The State Center for Development of Advanced Technologies (hereinafter referred to as the CDAT) was the developer and operator of the NISTLC. This system provides for mandatory marking by manufacturers and importers of tobacco products with a unique identifier and enables the product to be tracked at all stages of its circulation from the manufacturer to the end consumer. Marking and tracking allows checking the authentication of tobacco products and prevents their illegal production, importation and circulation.

Production of any tobacco products on the markets of Russia without marking from July 1, 2019 is prohibited.

It is worth noting that the T&T system in Russia operates in conjunction with the authentication system. The structure of the T&T system complies with GS1 international standards. Thus, manufacturers and importers use a special marking mode that provides a visible two-dimensional DataMatrix format code on a packet of tobacco product, as well as on all types of aggregate packaging (block,

mastercase, pallet) to ensure full tracking during production and movement along the supply chain (Fig. 3.11).

It is impossible to forge or reuse such code. Fake protection is provided by the use of a unique identifier.

The unique code is assigned by the operator of the CDAT system by requesting the marking of each unit of tobacco products by manufacturers and importers. After marking the packaging, this information is supplied to the system, which from now on controls all movements of the goods. When importing imported cigarettes, the marking is carried out either at the manufacturer's factory or at the warehouses of the importing company.

DataMatrix includes:
unique identifier,
cryptographic code.

Fig. 3.11 – Description of the elements of the T&T system and security features in Russia

Source: taken from the Internet resource.

The product identification code allows to track its movement at each stage of movement along the supply chain Distributors and logistics companies must, after receiving the goods, scan the code and submit information to the system; retailers are required to scan the code and send information to the system before placing the item on the shelf, and after its sale and printing the fiscal check, the online cashier will inform the system that the "code is out of circulation". Therefore, information at all stages is transmitted electronically, along with the invoice through the operator of the electronic document management system. By means of tracking the movement of goods at each stage, it is impossible to put into circulation the twin products and to re-enter into circulation the goods sold, including the goods that have expired.

Thus, each tobacco market participant should be equipped with the necessary technical tools to draw and read two-dimensional DataMatrix codes, as well as additional software for electronic document circulation.

"Chesnyi Znak" tobacco labeling and circulation system is based on open source technology and Apache stack to handle large amounts of data, in particular using Dell and HP storage servers and Cisco networking equipment.

The system is funded through business and, according to some data, costs about USD 94 million annually. The cost of one DataMatrix format code as of 2018 is USD 0.0077.

The main advantages of this system are: removal of counterfeit tobacco products from the turnover; reducing the shady circulation of tobacco products; protection of consumers from substandard and dangerous products; protection of legal producers from unfair competition; public control at points of sale of tobacco products.

In 2018. The *Republic of Kazakhstan* has implemented in est mode an information system for the labeling and tracking of tobacco products similar to the Russian one. The developer and administrator of the project is Kazakhtelecom Joint Stock Company. The Committee of the State Revenue of the Ministry of Finance of the Republic of Kazakhstan is the authorized body for marking and tracking of tobacco products. The subjects of tobacco circulation are tobacco manufacturers, retailers and wholesalers, importers. Connection and registration in it is free of charge for all participants in the pilot project. Tobacco labeling will be mandatory from April 1, 2020.

The test regime will determine the feasibility of switching to compulsory tobacco labeling by means of identification (on excise duties) and refusal to label tobacco products with paper tax stamps. Duration of this project: for manufacturers – from October 1, 2018 to March 31, 2019; for importers – from February 10, 2019 to April 30, 2019

The T&T system is implemented to track the movement of tobacco products from the manufacturer and importer to the end consumer by tracking the unique identifier on the tobacco packaging. This system will provide manufacturers with protection against unfair competition and will allow confirming the legal origin of tobacco products.

Marking involves affixing a visible two-dimensional DataMatrix barcode (Fig. 3.12) to any external packaging containing the manufacturer's information, serial number and unique identifier. Much attention is paid to the security and protection of information in the central database by using crypto encryption, which prevents falsification of the marking and protects the database from hacking.

Identification of tobacco products allows the product to be monitored at all stages of its circulation. The whole way of the goods at each stage is recorded in the information system, ie after the marking of the goods the manufacturer enters the information into the system, the distributors after receiving the goods scan the code

and enter the information into the system, the retailer scans the code and sends data to the system before selling the goods. At the time of sale of the goods at the checkout, 2-D scanner reads the marking, and then the code is withdrawn from circulation.

At the same time, the consumer can check the legality of the sale of tobacco at the point of sale using the mobile application and inform the inspection body about the violations detected.

DataMatrix includes:
unique identifier,
cryptographic code.

Fig. 3.12 – Description of the elements of the T&T system and security features in Kazakhstan

Source: taken from the Internet resource.

DataMatrix code peculiarity is its resistance to read information even in case of significant damage to the image and the ability to store maximum information in a small area.

Each participant in the pilot project must be equipped with the necessary software for electronic document flow and special technical tools for drawing and reading DataMatrix. In particular, manufacturers install special equipment for two-dimensional code application, respectively, retail outlets should have cash registers connected to the system and 2D scanners for code reading. The participants of the pilot project provide the necessary equipment to Kazakhtelecom JSC for free.

Belarus. In Belarus, the track and trace system is in the initial stages of implementation, namely, an interagency working group has been set up to coordinate the launch of the national labeling and product tracking system. The purpose of such a system is to track the complete circulation of tobacco products from the manufacturer to the end consumer, to reduce the volume of gray imports and counterfeit products on the market.

At present, a system of marking by control (identifying) marks of certain groups of goods is in place in Belarus, which was introduced in 2005. At the same

time, tax stamps were introduced for tobacco and alcohol products with an additional element of protection, but without possibility of product tracking. In addition, for the introduction of the system of marking goods with control marks, the government approved the list of goods subject to marking of control (identifying) marks, created a single information database, developed a regulatory framework that defines the order of marking of goods and provides control by the state and consumers on the sale of branded products.

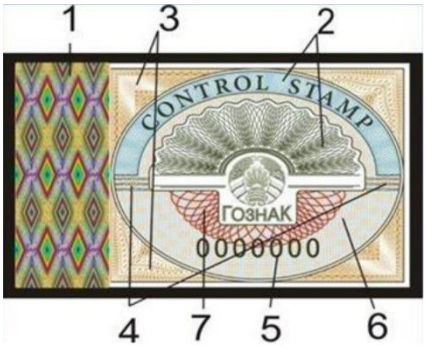
The tracking system works in conjunction with the authentication system and is separated from the tax verification system and implemented as a control (identification) mark with security features. It should be noted that the control mark is not a tax stamp.

Control mark is protected from forgery by adhesive label which is applied to each unit or product packaging to be marked. In particular, it has a unique identification number and security element – a unigram. The mark is obligatory for goods produced domestically or imported into Belarus. Manufacturers or importers pay only for the control mark and are not subject to the excise duty on the branded product.

Before applying the marking of goods with control marks, manufacturers or importers submit to the tax authority a request for their purchase, stating the required quantity and type of goods. The application shall be accompanied by a package of documents confirming the legality of the production or import of the goods. The tax authority examines the application with the submitted documents and gives permission for issuance of control marks, which is entered into the electronic database (EDB). State-owned enterprise "Goznak" produces and issues control marks and submits data on issuance to the EDB. After receiving the marks, the manufacturer applies them in the production process. The importer marks the goods at customs warehouses or at the manufacturer before importing the goods into the customs territory of Belarus.

Tax stamps/control marks are forms of rigorous reporting that must be accounted for in the EDB and reported to the supervisory authorities. Before purchasing the next batch of tax stamps/control marks, manufacturers or importers submit to the tax authorities a report on the use of the previous batch (used, transferred for marking, written off, defective).

Control marks contain covert and overt security features (Fig. 3.13).



SECURITY FEATURES:

1 Unigram
2 Positive guilloche elements
3 Negative guilloche elements
4 Microtext
5 Unique identifier
6 Polygraphic security element

Guilloche element that is applied with a protective paint.

Fig. 3.13 – Description of the elements of the control mark in Belarus

Source: taken from the Internet resource.

It is worth noting that the control marks were initially used for malt beer and motor oils, which led to an increase in domestic beer production along with an increase in tax revenues by 220%. Considering the effectiveness of the product marking system, in 2006 it was extended to vegetable oil, canned fish and caviar, water, soft alcohol and synthetic detergents, and since 2007 to tea and coffee, vinegar, biologically active additives, antifreeze, shoes, audiovisual storage media, cell phones, watches and TVs. In total, more than 23 types of products are currently marked, including liquid used in electronic smoking systems.

Like the control marks, the tax stamps on alcohol and tobacco were issued with an additional element (unigram) in 2010. A unigram is a multilayer material that can hold more than 10 layers of protection. It has an 8-10-digit machine-readable diffraction barcode. It can be read using a device connected to a PC, providing in fact an optional authentication tool. This feature is currently used in Belarus on commercial invoices (bills) and has been proposed by developers for use on tax stamps both in Belarus and abroad.

Although this code is not a unique identifier in the understanding of the track and trace system, it does not contain variable data other than serial numbers. However, according to experts, this does not affect or limit the functionality of the system (Fig. 3.14).

For many years, the system has worked effectively, giving the government control over its alcohol, tobacco and consumer markets and helping it increase tax revenue. With the recent focus in the industry on digital technologies and real-time tracking features, Belarus is a best practice for effective use of the tax verification system, combining digital and physical security features on tax stamps. As a result of the innovation, the volume of tobacco production increased 1.6 times, and tax revenues during 2004–2008, in parallel with the increase in excise duty rates – 4 times.

The tax stamp
contains:
unigram with diffraction barcode

Fig. 3.14 – Description of the elements of the tax verification system in Belarus

Source: Tax Stamps A Technical Study and Market Report – 2nd Edition. 2012. Reconnaissance International Ltd 4 Windmill Business Village, Brooklands Close, Sunbury-on-Thames. 140 p.

The use of unigrams does not require special equipment for authentication of the goods, since the covert image can be seen using a polaroid. This is a fairly simple and inexpensive way of verifying the authenticity of products. The unigram cannot be played by scanning, copying and printing due to its uniqueness.

Control bodies, when checking with a simple device, an identifier of covert image, check the authenticity of the product. This device is given to them for free. In particular, the consumer can use this device to check the legality of the product and make sure of its quality when purchasing in real time. The cost of the device is available for purchase to any consumer and makes USD 0.5–1.5.

Although there is no tracking and tracing system in Belarus, international experts believe that the country's experience is demonstrable, as the combination of digital and physical security features has effectively managed to counteract the illicit trafficking of goods and significantly increase tax revenues.

The *Kyrgyz Republic* is another country that has begun to create a state-owned automated information system for the labeling of goods. The Government of the Kyrgyz Republic Resolution No. 470 of September 12, 2019 approved the Regulation on the Marking of Goods by Identification Means in the Kyrgyz Republic, according to which goods produced domestically or imported into Kyrgyzstan are subject to mandatory marking by means of identification, as well as goods exported to the EAEU Member States. The T&T system will allow tracking the turnover of goods by means of identification in the supply chain from the manufacturer/importer to the consumer, and will create conditions for the promotion of products of domestic manufacturers in the domestic market.

3.2.3. EU countries

The European systems for tobacco traceability and security features was put into operation on May 20, 2019, allowing public authorities to track the movement

of around 29 billion packets a year and to detect the facts of putting the product into illegal circulation[65].

The preceding paragraphs have considered in detail the legal support for its functioning, as well as organizational and technical aspects.

Since the system has just started functioning, it is impossible to talk about its effectiveness in counteracting illicit trafficking. However, it will definitely create positive impetus for the development of other related activities. Thus, the requirement to maximum use the international open standards will provide incentives for innovation and technology development communication. The fact that different providers can offer their services within the tracking system will increase the level of development of checks and balances system. Finally, the system provides high quality data as it covers all movements of tobacco products, sets reporting deadlines and has a specific format for individual reports that will allow authorities to effectively control the supply chain.

It should be emphasized that on December 21, 2018 the European Commission has selected *Dentsu Aegis Network AG (DAN AG)* from the list of approved storage providers as a secondary storage service provider. Issuers of identifiers are "primary storage providers" designated in the countries shown in Table. 3.1.

Table 3.1 – Issuers of identifiers in EU Member States

Country	Issuer of identifier	Country	Issuer of identifier
1	**2**	**3**	**4**
Austria	*Monopolverwaltung*	Malta	*Opsec*
Belgium	*Incert G.I.E*	Netherlands	*ATOS*
Bulgaria	*Printing Works of the Bulgarian National Bank*	Germany	*Bundesdruckerei GmbH*
Great Britain	*De La Rue*	Poland	*Polish Security Printing Works*
Greece	*General secretariat of information systems*	Portugal	*Imprensa Nacional Casa de Moeda – INCM*
Denmark	*Wordline SA*	Romania	*Compania Nationala Imprimeria Nationala S.A*
Estonia	*Allexis s.r.o*	Slovakia	*Datacentrum*
Ireland	*Allexis s.r.o.*	Slovenia	*Agencija za komercijalnu djelatnost d.o.o. ID issuer: SMART NET d.o.o. Subcontractor*

[65] Track & Trace // Esta. URL: https://www.esta.be/track-and-trace/

continuation of table 3.1

1	2	3	4
Spain	*Fabrica Nacional de Moneda y timbre*	Hungary	*ND Nemzeti Dohanykereskedelmi Nonprofit Zrt.*
Italy	*Custom Monopolies agency*	Finland	*Allexis s.r.o.*
Cyprus	*General secretariat of information systems*	France	*Imprimerie Nationale*
Latvia	*VAS Latvijas Radio un televlzijas centrs*	Croatia	*Agencija za komercijalnu djelatnost d.o.o.*
Lithuania	*State Tax Inspectorate*	Czech Republic	*State Printing Works of Securities*
Luxembourg	*Incert G.I.E*	Sweden	*Allexis S.R.D.*

Source: Systems for tobacco traceability and security features. URL: https://ec.europa.eu/health/sites/health/files/tobacco/docs/tt_id_issuers_en.pdf.

European Commission statistics show the successful implementation and overall functioning of detection and tracking system by EU Member States. Thus, according to the latest information, all producers requested unique identifiers for marking cigarettes, the system works without major problems or disruptions since its official launch. Examples of unique identifiers in individual EU countries are presented in Fig. 3.15.

Austria | Denmark | Finland | Germany

Luxemburg | Poland | Slovenia | Switzerland

Fig. 3.15 – Cigarette packets marked with a unique identifier in individual EU Member States

Source: *own photos.*

At present, more than 370,000 identifiers of economic operators, 630,000 identifiers of objects 860 identifiers of production line are registered in the system.

The total number of user interfaces created and registered in the secondary repository was nearly 900 million. The repository system noted the activity of most of the issuers of identifiers.

It is worth noting that EU Member States have made significant progress towards implementing the system in the first half of 2019.

The first issuer of the identifier that was registered in the system was the *Agencija za komercijalnu djelalnosl (AKD) company*, selected by Croatia at the end of April 2019. In Germany, there were significant difficulties with regard to the regulatory and legal support for the operation of the T&T system, and in France, there were litigation over a government decree over its inconsistency with the FCTC protocol.

It is worth noting that the rules for tracking cigarettes and some tobacco products, as well as overt, semi- covert and covert safety features, apply to them from May 20, 2019 (for other tobacco products, from May 20, 2024). All cigarettes that have been manufactured or imported into the EU before the specified deadline will remain on the market and can be sold for one year until 19 May 2020, after which they must be withdrawn. This will give producers of other tobacco products (which are often small and medium-sized enterprises (SMEs)) a longer period for adaptation.

According to the European Commission, within six years of operation of the T&T system in the EU countries will allow to achieve a progressive reduction of illegal trade and to increase annual tax revenues (Table 3.2).

In particular, to reduce illegal trade: by 30% – smuggling, by 10% – counterfeit goods, by 10% – "illegal whites", and to increase tax revenues to EUR 2.76 billion, namely: EUR 2.55 billion from the increase in legal sales and EUR 0.2 billion in other socio-economic benefits.

Table 3.2 – Expected overall result from system implementation T&T in the European Union, EUR million

Indicators	2018	2019	2020	2021	2022	2023	2024
Increase in legal sales	–	250.33	735.68	1 716.59	2 201.93	2 452.28	2 554.45
Other economic benefits	–	20.05	58.91	137.46	176.33	196.38	204.56
Total revenue growth	–	270.38	794.59	1 854.05	2 378.27	2 648.66	2 759.01

Source: Implementation analysis regarding the technical specifications and other key elements for a future EU system for traceability and security features in the field of tobacco products. 2015. URL: https://op.europa.eu/en/publication-detail/-/publication/19af17cf-5ca3-11e8-ab41-01aa75ed71a1.

Considering some aspects of the implementation of T&T in EU countries, it should be noted that, despite the Brexit process, the UK is planning to further

introduce a detection and tracking system in the country. Thus, the tax authorities concluded a five-year contract with De La Rue, the world's largest company that develops design and prints banknotes and passports. The cost of the contract was GBP 3.5 million. Under the terms of the agreement, De La Rue has developed and provided a technical solution for tracking 1.7 billion packets of tobacco products sold in the UK, from production to retail sale, through a unique alphanumeric code printed on each packet (Fig. 3.16).

UNIQUE IDENTIFIER

SECURITY FEATURES:

Overt
Color change
Hologram
Microprint

Semi-covert
Fluorescent ink

Covert
Forensic markers

Fig. 3.16 – Description of elements of tax verification, T&T and security features in the United Kingdom

Source: own photos and Delarue case-studies: UK HMRC. URL: https://www.delarue.com/global-insights/case-studies.

Only cigarettes and HTPs are marked with tax stamps, for other tobacco products no marking is provided. The presence of the stamp means an excise duty paid in the UK. All imported goods must be marked before being imported into the country and penalties may be imposed on the delivery or sale of the non-conforming goods. The requirements for the design of the stamp are clearly defined in the regulatory documents[66]. UK DUTY PAID messages should be clearly and legibly marked in black and white Helvetica font on a white background. The stamp should not be hidden or obscured, and it should not cover any health warning or visual warning.

The tax stamp contains overt, semi-covert, covert security features. Such elements are shown in Fig. 3.16. In this case, semi-covert and covert elements are created by adding chemicals to the ink for their printing that can be detected using hand-held scanners[6869]. The introduction of such safety features was a result of the arrangements between tobacco manufacturers and the UK government. These safety

[66] Excise Notice 476: Tobacco Products Duty. URL: https://www.gov.uk/govemment/publications/excise- notice-476-tobacco-products-dutv/excise-notice-476-tobacco-products-dutv.

features were introduced for cigarettes in October 2007 and for HTPs in October 2008.[676869]

Therefore, based on the systematization of the experience of individual countries around the world on the implementation of T&T systems, they can be classified according to the excise duty and product branding criteria.

In countries, tax stamp tracking systems are one of the means of guaranteeing the authenticity of an excisable product, assurance of its legal production and circulation, confirmation of payment of taxes and tracking of tobacco products. As such, T&T systems were introduced prior to the adoption and entry into force of the FCTC Protocol, they do not correspond to Art. 8. concerning the identification of codes or marks on a packet of cigarettes. It does not allow to track the whole range of excise goods, including those intended for interstate circulation (export, Duty Free). In addition, T&T systems that are based on proprietary solutions are owned by private companies. This causes considerable difficulties for governments, in particular, makes them dependent on specific providers, leads to the need to pay royalties on a regular basis for the use of patented technologies, thereby increasing the cost of administration of taxes.

An analysis of the functioning of the T&T tax stamp systems proves their effectiveness in counteracting the illicit circulation of tobacco products and increasing tax revenues. However, they do not meet mentioned international requirements.

Technological solutions with the separate functioning of the T&T system from tax verification, which were introduced at a later period, take into account the following requirements. Their advantages include the ability to track all products on the tobacco market and for exports, which reduces the likelihood of new tax evasion schemes and the fact that they are based on open standards will allow them to join the global network in the future. In addition, the separate functioning of both systems does not overload the functionality of each other. However, it is difficult to draw conclusions about the effectiveness of their operation due to the lack of long practice.

In Ukraine, which has a long-standing practice of marking tobacco products with paper tax stamps, it is impractical to choose an electronic control system that will require a radical change in approaches to the functioning of the verification system. At the same time, it may be valuable for our country to implement and deploy cigarette track and trace system with separate functioning that is developed

[67] FCA. Technology and the Fight against Illicit Tobacco Trade. Framework Convention Alliance. URL: http://www.fctc.org/images/stories/2008/INB-2_Media%20briefing_Technology_and_Illicit_Trade.pdf.

[68] TMA. Track & Trace and Security Features. Tobacco Manufacturers Association. URL: http://the- tma.org.uk/policy-legislation/tobacco-products-directive/track-trace-security-features.

[69] HMRC & UKBA. Tackling Tobacco Smuggling – building on our success. HM Revenue and Customers and UK Border Agency. 2011. URL: https://www.gov.uk/government/publica-tions/tackling-tobacco-smuggling-building- on-our-success.

based on open international standards, taking into account the relevant FCTC requirements and EU harmonized approaches.

4. Conceptual approaches to creating and implementing a tobacco track and trace system in Ukraine

Significant loss of tax revenue from the illicit circulation of tobacco products necessitates the search for appropriate new tools to counteract this negative phenomenon, and undoubtedly, to the fore are those created through digitization and increased transparency of economic processes. In some countries, these opportunities are implemented through the supplement the tax verification system with security features and elements of T&T systems.

This involves the gradual acquisition by the tax stamps of several physical and digital features of protection in order to facilitate the authentication of tobacco products, simplify their use and complicate duplication. In these countries, tax stamps and trademark protection systems – authentication and tracking technologies are generally used in conjunction with supply chain tracking. This involves combining overt, semi-covert and covert security features as well as components of the T&T system. However, as stated above, such technological solutions do not comply with the FCTC Protocol and do not allow tracking the whole range of tobacco products, since goods intended for export and duty-free shops were outside the scope of T&T system. More modern systems, which have been implemented since the entry into force of this international instrument, usually allow the monitoring of the circulation of all tobacco products for both domestic and other consumption.

Overall, the experience of the T&T systems operation confirms to a greater extent increase in fiscal efficiency excise duty on tobacco in Brazil – by 53% (basic growth rate – 4 years after introduction), in Kenya – by 45%, in Turkey – by 31.5% and significant gains in combating illicit trafficking decreased in Brazil – by 6%, in Kenya, according to various estimates, – from by 19 to by 23%.

Given the needs of the tax authorities of Ukraine in modern instruments to counteract the illicit circulation of tobacco products, the question of introducing their own T&T system, which must meet the needs of stakeholders and take into account the best practices of the world experience, has arisen. In this connection, we will consider some important issues that will determine the basic conceptual provisions on which such a system should be based, its scope, taking into account the specifics of the illegal market and the factors of its successful launch.

First of all, it is advisable to classify the technological solutions of T&T countries in the world, which will allow to draw a conclusion about the future appearance of the domestic T&T system and the necessary list of goods for tracking.

Having systematized the global experience, we propose to classify T&T systems by the criterion *of combination with the tax verification system* into *T&T tax stamps systems* and *T&T products systems* (Annex A). This criterion was decisive in constructing the logic of the study of best practices in the third chapter. Thus, *T&T tax stamps systems* are used in Brazil, Georgia, Armenia, Ecuador, Canada, Kenya, Mozambique, some US states, etc. *T&T products systems* are used in Kazakhstan, Kyrgyzstan, EU countries, UAE, Russia, etc.

Having analyzed the experience of T&T operation in the countries of the world, we have come to the conclusion that they are built taking into account the country's need to track certain types of products, as well as the specifics of its production. For example, in some countries, T&T systems only work for tobacco products (Canada, some US states, including California, Massachusetts, Michigan, EU countries, etc.). In other countries (Brazil, Armenia, Georgia, Ecuador, Kenya, Kyrgyzstan, Mozambique, Russia, Turkey, etc.), *integrated* control systems for the circulation of tobacco and alcohol are used. Among the countries that protect mainly alcoholic beverages, it is worth highlighting China, India (Delhi), Thailand.

The need for *differentiation of systems according to technological features of production and logistics* is caused by different technological processes of production, aggregation of packaging of tobacco products and alcoholic beverages, in-house systems of marking of each of these types of excisable goods. In particular, it should be noted that tobacco products are manufactured on high-speed production lines and that the equipment for drawing a unique identifier should not slow them down.

The production of alcoholic beverages is characterized by a moist environment. The movement of finished products by conveyor also has its own specificity – the bottles are constantly rotating. This should be taken into account when selecting the unique identifier method.

For example, in Brazil, the T&T system is implemented on two different platforms, provided by one provider. These platforms operate separately and allow tracking the movement of goods across the supply chain of separately manufactured tobacco and alcoholic beverages. Thus, the nationwide tobacco excise duty collection platform – SCORPIOS, which was introduced in March 2007, involves the application of a unique identifier to the tax stamps. And the control system for the production of beverages – SICOBE (implementation – May 2009), covers beer, non-alcoholic beverages and mineral water and involves identification with a unique identifier and security elements directly from the product (bottles, other utensils).

The experience of implementing T&T systems in countries around the world also shows that they were introduced gradually: first for one type of product and then for another. This made it possible to find out the weaknesses of the system, eliminate them and launch a better solution for other products. A striking example is Kenya, in which the T&T system for tobacco products was implemented in three phases during 2012−2014, and subsequently the system was extended to alcoholic beverages.

Therefore, during the implementation of the domestic T&T system, the *phased application* of separate systems for alcoholic beverages and tobacco products is necessary.

It is important to note that the integration of T&T with the installed production equipment and every single step in the circulation of excisable products does not slow down the functioning of the market and ensure the unique identification of individual packets/bottles and all types of aggregate packaging of tobacco products and alcoholic beverages. In addition, when selecting an information carrier, the size of the packaging of the product unit and the space allocated for its placement must be taken into account. In this regard, it can be said that the use of certain machine-readable codes requires a minimum area. For example, the minimum QR Code size is 21 x 21 modules and the 2D Data Matrix is 10 x 10 modules, which is 77% less.

It should be noted that the test mode of operation is also an important factor in the effective implementation of the T&T system. This will allow tobacco market participants to test sophisticated hardware and software, calculate workloads, and identify weaknesses in the supply chain. Based on world experience, we can conclude that its duration can range from seven months to several years (UAE – 8 months, Canada, Kenya, EU countries – up to 1 year, Russia – 1 year 3 months, Brazil – 1 year 5 months, Kazakhstan – 1 year 7 months, California – 3 years).

Therefore, we propose to introduce a domestic T&T system for tobacco products in stages, in particular for cigarettes with or without filter, and for tobacco products other than those mentioned – from January 1, 2025.

In addition, it is important to emphasize that in the context of the spread of illicit tobacco, the *economic efficiency* of the T&T system is important. The cost of implementing and maintaining innovative tracking technologies for such products must be compared to likely fiscal effects from such countermeasures. Based on analysis of the best practices in the world, it can be concluded that an increase in the value of products through enhanced authentication and control of the supply chain should account make a small percentage of its value.

This is especially true for the tobacco market of Ukraine, as the additional increase in the value of tobacco products in the context of a gradual increase in excise duty rates can lead to a significant decrease in sales of legal products. Thus,

during 2015−2019 fiscal burden of excise duty increased three times, which led to an increase in the volume of illegal tobacco production seven times. Initial investments for the installation of equipment at the manufacturing/trade facilities of each manufacturer and distributor of the tobacco market should be non-discriminatory.

In order for the T&T system to function effectively, it is important to empower supply chain manufacturers and economic operators to independently select the most appropriate equipment to ensure the functioning of the system. The peculiarity of the markets of both types of products is that tobacco manufacturers are representatives of big business with sufficient financial resources and powerful modern production equipment, and the list of producers of alcoholic beverages is quite diverse, including both large and small enterprises. Buying T&T equipment for the latter can significantly reduce competitiveness.

When choosing the type of domestic T&T system for tobacco products, it is necessary to take into account the requirements of *international regulations.* In view of Ukraine's European integration commitments, it is particularly relevant and appropriate to comply with Directive 2014/40/EU on the approximation of the laws, regulations and administrative regulations of the Member States on production, presentation and sale of tobacco products and related products implementing the FCTC Protocol. In accordance with Article 15 of this document, a unique identifier must be printed or securely affixed on all packets of tobacco products.

Taking into account the requirements of these documents to place a mark on the packets will allow tracing the products throughout the supply chain both in the customs territory of Ukraine and for export. It should also be noted that under the FCTC Protocol, namely Art. 8, according to which national T&T systems should be developed and implemented with the further possibility of integration with the global detection and tracking mode. In addition, a unique and reliable identification marking, code or marks must be affixed or be integral to all unit packets, packages and any outside packets of cigarettes for a period of five years and for other tobacco products – for a period of ten years from the entry into force of the FCTC Protocol.

Standards of functioning should be attributed to the determinants of successful implementation of the domestic system. The positive effects of applying *international open standards for tracking and tracing* of tobacco products and their authentication should be emphasized. This will allow you to integrate with the global tracking system in the future and avoid royalty dependency when choosing proprietary technologies. Systems developed on their basis are operationally compatible and can contribute to limit the amount of tax evasion both within Ukraine (thanks to rapid detection by consumers and tax authorities of counterfeit, fake and contraband products) and globally (through rapid international exchange of relevant

information). The introduction of modern, operationally compatible at the global level tobacco track and trace systems and their authentication in Ukraine will help reduce the volume of illicit tobacco trafficking, ensuring the reduction of budget losses due to excise and other tax evasion, as well as the achievement of health goals (by limiting consumer access to relatively cheap counterfeit, fake and contraband products).

Another important issue is determining the scope of the system. Given the positive world experience, the trace and track system should cover the manufacturer/importer of tobacco products, wholesaler, distributor. It should be noted that the tobacco manufacturer is outside the scope of the track and trace system.

The main users of the T&T system data, the competent authorities (State Tax Service, State Customs Service) will be able to track the products on the supply chain from production to the retail point of sale to the end consumer. Any notifications of the T&T system of detected violations will be the basis for actual verification, and the data will allow the competent authorities to have information about the volume of products that the entity must have available. In turn, manufacturers/importers can track the products of their own brands, and consumers can to check their authenticity.

In view of the individual conceptual provisions outlined above, the domestic track and trace system should be defined as the *Electronic Tobacco Monitoring System* (hereinafter – the ETMS), which is a system for accounting, tracking and movement of excisable products manufactured (including for sale at export) or imported into the customs territory of Ukraine, from the manufacturer or importer to the place of retail trade.

The basis of the ETMS system must be unique product identification[70]. *Unique Identifier (UI)* technology is more than providing a product with a simple batch number and barcode that contains a *Global Trade Item Number (GTIN)*, it is a factor that contributes to any process of aggregation, building relationships between different levels of packaging in the production process.

Currently, code assignment, application, and validation technologies are reliable and flexible enough to provide nearly all products with a unique identifier.

Unique identification of the unit of production (bottle (other utensils) of alcoholic beverage, packet of cigarettes, pack of medicines, spare engine parts, etc.) consists in the possibility of authentication and tracking of the minimum part of the products allowed for circulation on the market. In information systems, a unique identifier is intended to identify a particular object on the network and prevents any

[70] Ling Li "Technology designed to combat fakes in the global supply chain" Business Horizons, Volume 56, Issue 2, March-April 2013, p. 167-177.

likelihood of duplication of that object, thereby confirming its validity. The primary purpose of a unique identifier is to allow an authorized entity to obtain unique information about a specific object without a coordination center. Information with a unique identifier can be entered into a common database without the need to resolve the name conflict[71].

Nowadays, the unique identification of objects or entities is quite widely used in rail transport, postal items, government billing documents and so on. New advanced economic solutions are being used extensively and refined to support authorities and brand owners to track the supply chain from manufacturer to retailer and consumer, and to monitor and verify their authenticity.

The UI of a single package can be encoded by one of the following data carriers: Data Matrix, QR code, DotCode, etc. (Fig. 4.1). Annex B describes their characteristics in more details.

Fig. 4.1 – Data carriers and their possible location

Source: compiled by authors based on[72].

The most effective is the combination of machine-readable code with alphanumeric code, which provides better protection of the information contained in the *UI*, and the ability to read it both by a special device and by a person.

Therefore, the *UI* for tobacco products should be applied in alphanumeric and machine-readable form directly on a single package (pack, box or any other packaging of tobacco products for their sale other than shipping) of tobacco products, allowing it to be identified and grant access to information about them. In addition, according to international requirements, the *UI* should not be overlaid with

[71] A. Kud, M. Kucheriavenko, E. Smychok Digital Assets and Their Legal Regulation in Blockchain Technology: Monographs. Kharkiv: Pravo, 2019. 216 p.

[72] Vero code comparison with other codes. URL: https://veroseal.com/

tax stamp, price tag, any images or printed information, and should be an integral part of the packet.

The *UI* peculiarity is that one part of the code should be generated by issuer of identifier assigned by the government. The power to generate the rest of the code should be given to the economic operators on the production supply chain.

In order to be able to identify the past or current location of the tobacco product, the *UI* should include the following information: location of production; date of production; object identifier; identifier of the production line on which the product is manufactured; general and personal name of the product with additional information about characteristics (if necessary); planned route of transportation; country of destination (in case of export); importer to Ukraine (in case of import); date of shipment to the wholesaler; identifier of the economic operator – the entity that carries out the wholesale trade; date of shipment to the retail entity; identifier of the economic operator the business entity engaged in retail trade.

In addition, ETMS should provide for the possibility of identifying all types of aggregate packaging: *from minimum units of production to units in the "parent-child element" interconnection.* This will ensure complete aggregation of production during production and movement along the supply chain (unit packet, carton, mastercase, pallet); possibility of quick and easy reading of each UI at each stage of aggregation to trace the whole supply chain while preserving the integrity of the original packaging by tax and law enforcement officials, consumers of products (Fig. 4.2). Such a decision will promote the full functioning of the market, which is characterized by rapid turnover, and will not slow its logistics.

Conditions must be created so that all tobacco market operators from the manufacturer to the retail outlet register all packs, as well as all intermediate and final movements.

Given the experience of the countries of the world and the requirements of their national law, the *UI* should not be applied to tobacco products intended for export to countries where detection and tracking systems work. For example, in Australia, it is prohibited to import into the customs territory of the country any tobacco products with any marks not provided for by their legislation.

An important component of the ETMS system is a *repository* that stores data for the traceability of tobacco products, which relate exclusively to the products of the respective manufacturer/importer. General characteristics and issues of repository operation should be established by the government, and the collection of event data should be automated by *UI* encoding for the rapid and accurate processing of information and the recording of relevant data. The repository stores and records all events that occur in the supply chain, from the moment when the goods are identified to the time they are no longer controlled, enabling to track the complete

history of each individual pack movement record. According to the experience of some countries in the world, such information may serve as evidence in court.

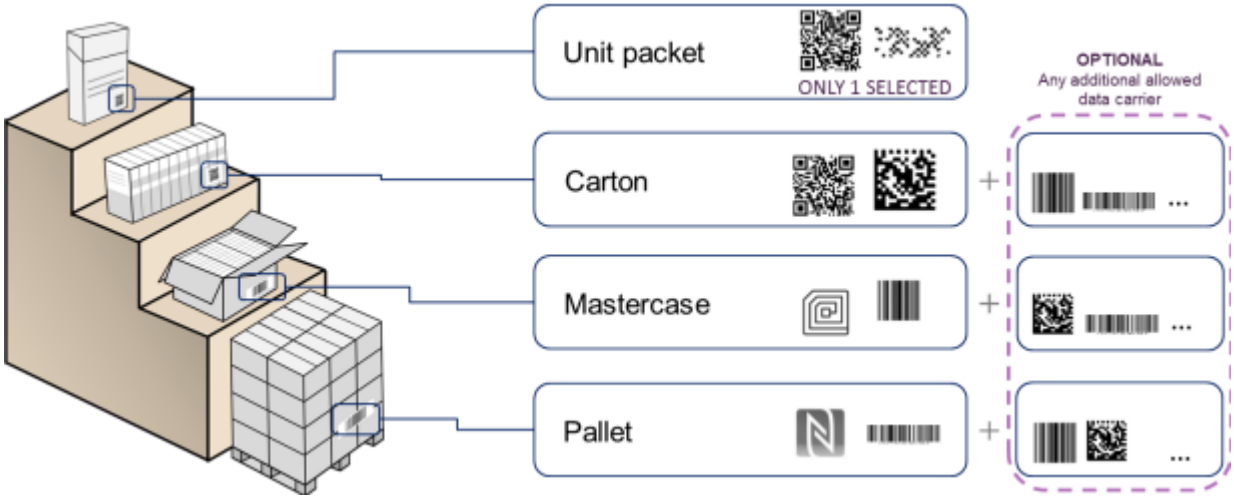


Fig. 4.2 – Types of eligible storage media, depending on the packaging of tobacco products

Source: EU systems for traceability and security features of tobacco products [Directorate General for Health and Food Safety, EU Commission Regional Workshop No. I Stockholm, 25 January 2018] URL: https://ec.europa.eu/health/sites/health/files/tobacco/docs/ev_201801252_ag_en.pdf

Users have possibility of general access to information about physical or digital objects according to their needs through the *exchange of data* in ETMS. At the same time, the issuer of the identifier must take into account international standards for identification, storage and exchange of data. Experience in the implementation of the T&T system in many industries shows that its successful operation compatibility depends directly on the seamless operational compatibility between the various IT systems and the internationally recognized technical standards that set clear rules for data retention and exchange. Operational compatibility is an important requirement for tracking, tracing and control, as trade is transboundary in nature. The systems of different economic operators and authorities involved in the legal supply chain should be able to "contact each other", namely to exchange data regardless of national borders (since the original products are legally sold between countries).

ETMS should provide *the possibility of generating various reports* for both controlling bodies and economic operators, providing electronic document flow, query processing.

The main components considered and the general scheme of functioning of ETMS are presented in Fig. 4.3.

Due to the development of technological infrastructure for the assignment and application of unique mechanisms of identification of a wide range of consumer and industrial products for both tobacco manufacturers and tax authorities, there is now

a large selection of technologies on the market to protect products and control their circulation. When it comes to counterfeiting tools, government agencies and brand owners can choose from a range of modern technologies, methods and providers to ensure both legal circulation and product protection. At the same time, it is important to grant the ability to use the most appropriate solutions available and identify the most effective security and authentication elements.

In determining the optimum performance of technological solutions of the track and trace system, cooperation with the legal business is needed to agree on a methodology for setting standards with the involvement of internationally recognized standardization bodies[73]. The industry should be involved in determining the amount of product information to be tracked, the type and structure of the system. Close cooperation between authorized authorities, countries of origin and destination, economic operators in the supply chain, law enforcement and regulatory authorities of other countries is also important, especially given the complexity of international supply chains.

The analysis of the global experience in implementing and operating innovative tobacco control systems has shown that they can be complemented by product authentication technologies to confirm their originality. Such solutions can be implemented through security features that take many forms: overt, semi-covert, covert and forensic, as well as through the use of UI applied directly to product packaging. Overt solutions are obvious to the unaided eye and provide quick authentication through visual inspection, such as holographic devices and color-changing inks when viewed from different angles. On the other hand, covert and semi-covert solutions, such as microtext and ultraviolet/fluorescent inks, often require the use of simple special devices to detect them (ultraviolet torch, etc.). The next level of authentication is represented by expert forensic solutions that cover the use of characteristic properties within the packaging to create unique signatures or molecular markers that can only be detected using laboratory equipment. Product authentication can be carried out by a designated party, control body or even by a consumer quickly and efficiently using a smartphone. However, if necessary, their application should take into account the specifics of illegal trafficking in the country, the economic impact of implementation. In Ukraine, for example, it is impractical to use high-value security features, since the volume of counterfeit goods in the structure of illegal circulation is insignificant (0.5% of illegal turnover, which is approximately UAH 333 million of tax revenue losses). Improving the authentication system may be the next step after the implementation of the T&T system.

[73] Tracking, Tracing and Authentication Systems. Governance and Data Management for Cross-border. 2016. URL: http://www.nano4u.net/wp-content/uploads/2018/04/CAIT-white-paper-6Dec2016-1.pdf.

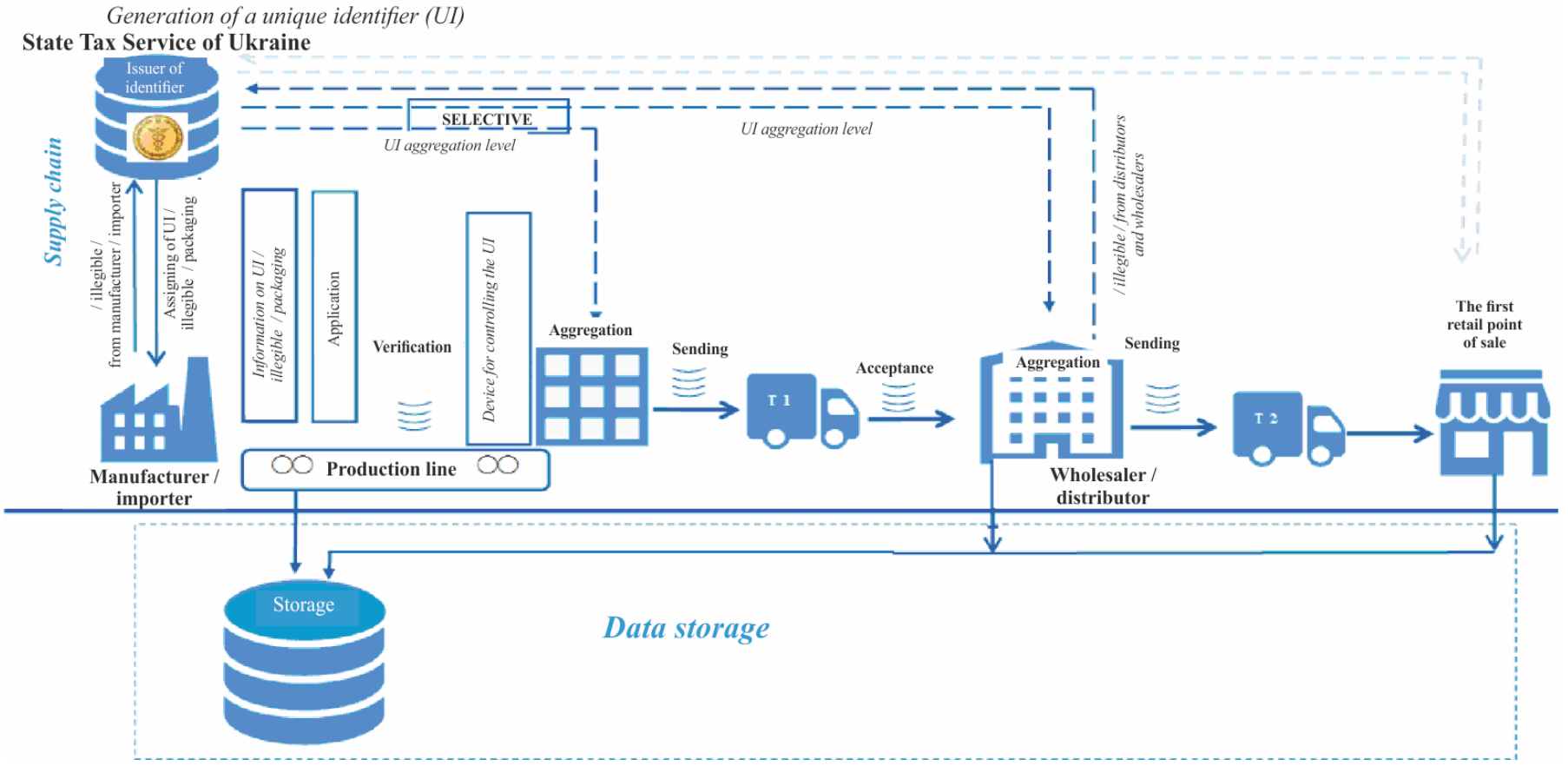


Fig. 4.3 – The proposed scheme of functioning of ETMS and its main components

Source: developed by authors.

The successful implementation factor of ETMS is, of course, a choice of technology solution provider. For this, it is important to investigate the business history of potential providers and to understand the characteristics of system software and its security, as the state is responsible not only for the protection of its data, but also for the data of tobacco market operators. At the same time, competition in the market should be encouraged through open procurement, allowing many providers of various technologies and services to offer their T&T systems. For the choice of the provider of such a solution, it is useful to have a list of questions[74], which are shown in fig. 4.5.

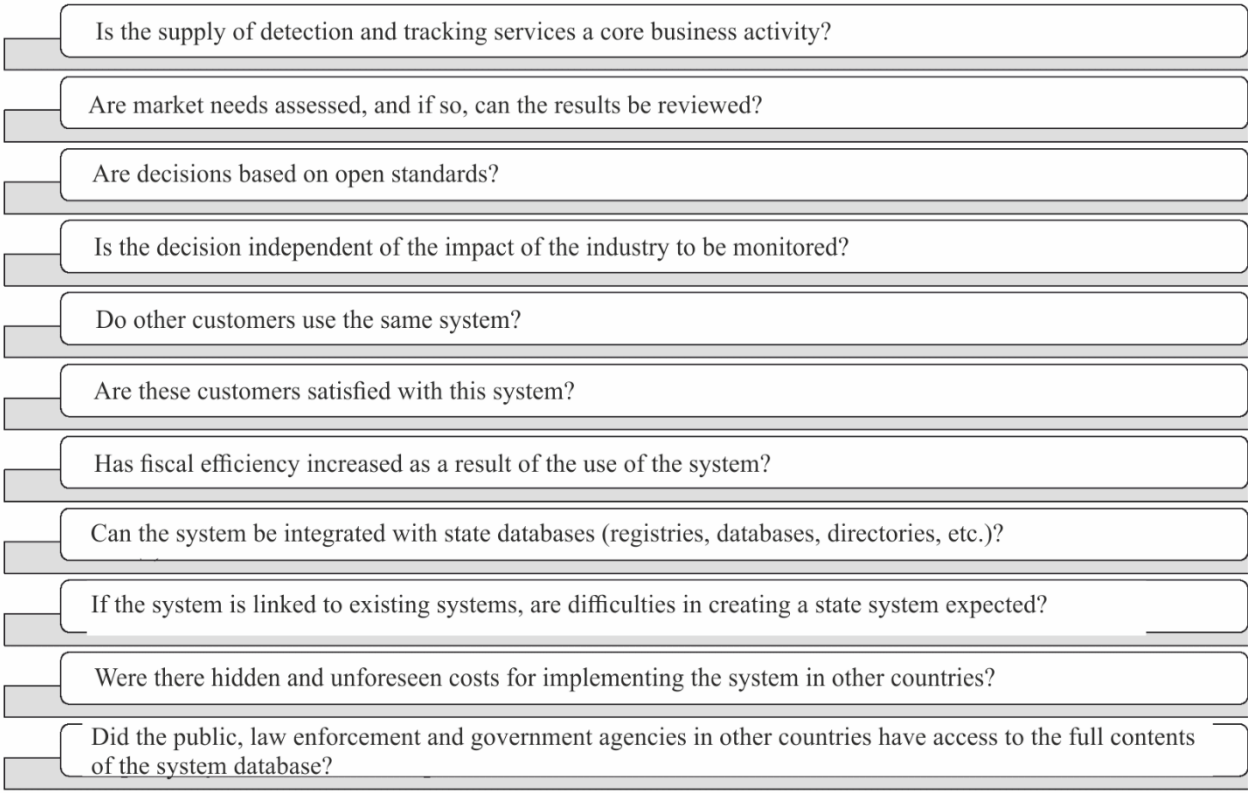


Fig. 4.5 – Listed questions for providers of technology solutions of track and trace system

Source: Hana Ross Measures to Control Illicit Tobacco Trade. Economics of Tobacco Control Project, University of Cape Town. 2015. file:///C:/Users/Administrator/Downloads/Ross_Available_Measures_8.10.15%20(1).pdf

Equally important is the business reputation of technology solution providers, and it is unacceptable to select companies that in other countries have allowed misbehavior in influencing the formation of tender conditions.

Track and trace system, based on defined conceptual approaches, will be cost-effective and convenient for use both by employees of regulatory authorities and market operators and consumers. It will allow to provide effective tax supervision (control) of the circulation of tobacco products from the manufacturer/importer to

[74] Contained in the document "Measures to Control Illicit Tobacco Trade".

the retailer, to counteract illegal circulation (by covering all types of products subject to and not subject to excise duty marking), to minimize the influence of human factors on administration, adherence to international standards and, in the future, to integrate into the global track and trace system.

CONCLUSIONS

In order to develop proposals for improving the tobacco control system, international regulatory instruments in this field have been investigated, in particular: the WHO Framework Convention on Tobacco Control, FCTC Protocol, Directive 2014/40/EU on the approximation of laws, regulations and administrative provisions of the Member States regarding the production, presentation and sale of tobacco products and related products, as well as the implementing and delegated acts of the European Commission on the regulation of the T&T system. It is established that the requirements of these documents must be taken into account when building the track and trace system in Ukraine. The positive effects of the application of international open standards for the tracking and tracing of tobacco products and their authentication are analyzed, which are operationally compatible and may contribute to limit the amount of tax evasion both within Ukraine (due to the rapid detection of consumers and controlling bodies any fake, counterfeit and contraband products) and globally (through rapid international exchange of relevant information). The introduction of modern, operationally compatible at the global level tobacco track and trace systems and their authentication in Ukraine will help reduce the volume of illicit tobacco trafficking, ensuring the reduction of budget losses due to excise and other tax evasion, as well as the achievement of health goals (by limiting consumer access to relatively cheap illegal products).

It has been found that as a result of significant increase in excise duty rates in Ukraine, the use of tax avoidance schemes and tax evasion was intensified by economic entities. Measures of accumulation at the warehouses of tobacco products before raising the rates of excise duty – forestalling, as well as measures of lowering prices for cigarettes – dumping are attributed to avoidance.

Evasion involves the production and circulation of products in violation of applicable laws and international treaties and cover unprocessed tobacco products. The structure of the illegal market is investigated and its components are identified, which include smuggling, falsification, fraud (discrepancy of marking, "cigarillos" schemes, etc.); undeclared production and sale ("cheap whites", non-payment of excise duty on tobacco sales and formation of "scroll" by retailers), etc. It was established that the increase of the illegal tobacco market reduces the effectiveness of fiscal and regulatory excise duty and does not allow achieving the objectives of public health.

It is determined that for different segments of the illegal market the appropriate mechanisms of counteraction are needed: for detected unmarked cigarettes – to strengthen control measures of tax authorities, to clarify their origin

– operative-search measures, for VAT "scrolls" and unpaid excise duty on retail sales – analysis of retail sales data available to tax authorities, etc. It is determined that for manifestation of synergistic effect such measures should be combined with stimulating tax compliance and media campaign in the media to inform the public that the distribution and/or purchase of tobacco products, of which taxes have not been paid, are illegal activities.

It is stated that for the prompt identification of information on the origin and movement of tobacco products through the channels of its distribution, as well as the detection of illegal products, it is necessary to implement information technologies of their tracking throughout the supply chain. It was determined that the operation of innovative solutions of control of production and circulation of tobacco products increases the fiscal effectiveness of excise duty by reducing the level of illegal trafficking.

The worldwide experience in the implementation and functioning of tobacco track and trace systems has been systematized and on this basis systems are classified according to the criteria of joint and separate functioning with the tax verification system (tax stamps). Separate systems have been found to be more up-to-date, taking into account international requirements and allowing tracking of the entire spectrum of tobacco products.

Conceptual approaches to the implementation of the national tobacco track and trace system have been developed and proposed, which include: compliance with international regulatory acts and international open standards; separate functioning for alcoholic beverages and tobacco; step-by-step implementation (test mode and industrial operation); economic efficiency; cooperation with manufacturers and economic operators of the supply chain; unique identification of product unit and aggregate packaging; possibility of quick and easy reading of each identifier and authentication of tobacco products throughout the whole supply chain while preserving the integrity of the original packaging by employees of control and law enforcement agencies, consumers of products; providing electronic document flow.

The electronic tobacco control system of Ukraine, implemented taking into account the proposed provisions, will become a component of the global regime of detection and tracking, an effective mechanism for counteracting the sale of counterfeit and smuggled excisable products, which will eventually lead to a more complete realization of fiscal and regulatory activity.

It will also allow Ukraine to become a party to the FCTC Protocol, integrate with the global tobacco control system and meet the requirements of Art. 352 of the Association Agreement between Ukraine and the EU, which calls for the

development of cooperation and harmonization of policy on counteraction and fight against fraud and smuggling of excisable goods.

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ANNEXES

Annex A

Table A. 1

Classification of innovative solutions for monitoring the circulation of excise and other goods in selected countries

Innovative control systems		Countries													
		Brazil	**Armenia**	**Georgia**	**Ecuador**	**Canada**	**Kenya**	**Kazakhstan**	**Kyrgyzstan**	**EU Member States**	**Mozambique**	**UAE**	**Some US states**	**Russia**	**Turkey**
Criteria for combining with the tax verification system	Excise tax stamp detection and tracking		AM-PG GROUP	SICPA	SICPA	CANADIAN BANK NOTE COMPANY, LIMITED	SICPA				OpSec		Different providers xerox OpSec		SICPA
	Product detection and tracking							SICPA КАЗАҚТЕЛЕКОМ	De La Rue	Different providers (see Table 3.1)		De La Rue		ЗНАК	

Source: compiled by the authors according to the data: Ensuring Supply Chain Security: The role of anti-counterfeiting technologies. United Nations Interregional Crime and Justice Research Institute. URL: http://www.unicri.it/topics/counterfeiting/anticounterfeiting_technologies/Ensuring_supply_chain_security_report.pdf.

Annex B Company suppliers of the T&T technological solutions and the funding mechanisms of their products

Table B.1

Overview of the T&T technology solutions company suppliers

Name of the technology solutions company supplier	Technological products	Main fields of application	Illegal market segments to counteract with which the solution is applied	Examples of solutions
1	2	3	4	5
SICPA	Safe inks, T&T, overt, semi-covert and covert security features, secure identification technologies, tax accounting software	Banknotes, identity cards, tax stamps, brand and product protection	Fraud, illegal trade, forgery	**Protective Inks** are designed for certain printing processes to protect banknotes and documents from forgery and fraud. **SICPATRACE** System covers authentication and T&T technology combined with material digitally protection means. Allows to identify the legality of the product and provide the supervisory authorities with the necessary data to improve the quality of the audit. The functioning of this system involves the so-called secure marking due to the generation of a unique code for each product item. Such code may be applied either to the tax stamp or directly to the product in the production process. Tax stamps and identification codes contain several security features, including overt, semi-covert and covert elements. Each code is activated on the production line, which enables online monitoring. The codes are scanned and the read information is transmitted to the database at each stage of the movement of production along the supply chain. Thus, all information about the movement of goods from the manufacturer to the final point of sale is transmitted to the data management system. The **handheld** scanners are used by tax and law enforcement agencies to conduct inspections. Handheld scanners allow control authorities to track the product and identify it according to the database, reading unique codes
Opsec Security Group	overt, semi-covert and covert security features, T&T, electronic monitoring and security labels, foil stamping and optically variable means	Protection of brand and products, banknotes, tax stamps	Counterfeiting, fraud	Tax stamps with technology of optically variable means (OVD) combined with liquid crystals. Stamps can be adhesive based or in the form of labels for a number of products (including analysis, pharmaceutical, tobacco and alcohol).

continuation of Annex B

continuation of Table B. 1

1	2	3	4	5
				The tax stamp contains overt and covert safety features that allow consumers and control authorities to verify the legality of products. **OpSec Secure ITT and eTRACS –** is a system for generating and applying a digital tax stamp on tobacco products, which works in conjunction with an electronic tax reporting and audit system. Secure ITT enables to interact with customs officials, authorized distributors, retail partners and the public. This interaction is ensured by the use of a QR code in conjunction with security technology
CDAT	Overt, covert security features, T&T	Packaging of each item, brand and product protection	Fraud, illegal trade, forgery	"Chesnyi Znak" tobacco labeling and circulation system This system provides for mandatory marking by manufacturers and importers of tobacco products with a unique identifier and allows the product to be tracked at all stages of its circulation by the manufacturer and end consumer. Marking is done by affixing a visible two-dimensional DataMatrix matrix code to any external tobacco product packaging to ensure complete aggregation during production and movement along the supply chain (package, block, mastercase, pallet). Information at all stages of the circulation of goods is transmitted electronically to a single database system together with the invoice through the operator of the electronic document circulation system.
Kazakhtelecom Joint Stock Company	Overt, covert security features, T&T	Packaging of each item, brand and product protection	Fraud, illegal trade, forgery	Tobacco labeling and tracking information system. This system provides for the labeling of tobacco products with a two-dimensional DataMatrix barcode and allows tracking tobacco products from the manufacturer and importer to the end consumer. The entire path of goods at each stage is recorded in the information system

Source: Ensuring Supply Chain Security: The role of anti-counterfeiting technologies. United Nations Interregional Crime and Justice Research Institute. URL http://www.unicri.it/topics/counterfeiting/anticounterfeiting_technologies/Ensuring_supply_chain_security_report.pdf.

continuation of Annex B

Table B.2

Mechanisms for financing technological solutions for monitoring of tobacco circulation in some countries of the world

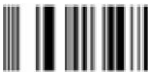
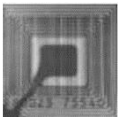
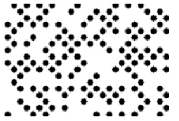
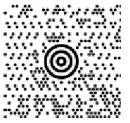
Country	Financing mechanisms	Cost of technological solution	
		Initial investment	Maintenance
Belarus	At the expense of manufacturers of goods and importers	–	From 1 to 50 bel. cop. for the control stamp
Brazil	To be paid by manufacturers of tobacco products by setting an excise duty surcharge	no data	USD 0.01845 tax stamp (as of 2011)
Canada	At the expense of manufacturers of tobacco products – the excise duty payers	–	USD 0.0067425 for tax stamp
Georgia	at the expense of the state budget. From 2018 – at the expense of business		EUR 0.005 for tax stamp
Germany*	At the expense of manufacturers of tobacco products	no data	EUR 0.01 for one code
Georgia	Implementation was carried at the expense of budget. From 2018 – at the expense of manufacturers of tobacco products	–	No data code cost
Kazakhstan	At the expense of the state, for the duration of the pilot project	–	Free
Kenya	To be paid by the state through the mechanism of refinancing of tobacco products manufacturers – the excise tax payers at the expense of tax paid	USD 9.5 million annually	USD 0.027 for excise tax stamp (2017)
Kyrgyzstan	Under implementation	–	Under implementation
Mozambique	Reimbursed by the state at the expense of excise duty paid	–	No data on tax stamp cost
Russia	At the expense of manufacturers of tobacco products	USD 94 million annually	USD 0.0077 for one code
Some U.S. states (California)	Reimbursement by the state to manufacturers of tobacco products – the excise duty payers of equipment cost, tax stamps	USD 180 thousand For each piece of stamping equipment	USD 0.0085 for tax stamp

*According to the workshop "The system of taxation of excisable goods in the European Union and its implementation in national law within the framework of the taxation of energy, electricity, spirits, alcoholic beverages and tobacco", organised on 24–28 January 2020, at the Ministry of Finance of Ukraine with the support of the German Society of International Cooperation (GIZ) within the framework of the project called "Support to the reform of public finance management". Experts – Friedrich Seewald and Dennis Nehring (Germany).

Annex B. Types and characteristics of data carriers

Table B.1

Types of data carriers

Data carrier	Characteristic
Alphanumeric code **(21)274877906943**	Unique identifier printed or affixed to the appropriate packaging. A compulsory requirement of a printed serial number is to enable human readability. Can be combined with any other marking technology
1D DataBar 	Barcode is machine-readable code, which is a series of vertically adjustable thickness and separation lines that represent variable data in a linear format. The information is then stored along the width and spacing between the printed parallel lines. The global standard for 1D DataBars is the GS1 DataBar, which allows GTIN to be identified for small, hard-to-label products that may contain additional information on the batch and batch number
2D DataMatrix 	The machine-readable code consists of the presentation of solid and clear images (usually squares) in matrix format over a particular two-dimensional structure. The global standard for this code is GS1 DataMatrix, which allows GTIN to be identified for small, hard-to-label products that may contain additional information on the batch and batch number
RFID mark 	RFIDs are small microchips that can contain unique and individual information related to the object to which the chip is attached. The chip, and therefore the information, is addressed by radio waves that are transmitted to the chip by a connected antenna. These devices can be implanted into plastic cards or paper. An object with such a chip can be detected at distances of several millimeters to several meters. The standard for this data carrier is EPC
DotCode 	A two-dimensional (2-D) matrix code consisting of points located in a defined rectangular array. Released in 2009, DotCode was designed for printing on high-speed industrial printers where print accuracy cannot be guaranteed
MaxiCode 	Two-dimensional machine-readable code created for logistics systems. The code is reduced to one standard size, inch by inch with the tolerances corresponding to thermal laser printing. It can contain 100 characters of information, as much as the 19-inch Code 128 standard
QR Code 	QR Code is a machine-readable code that uses four standardized encoding modes (numeric, alphanumeric, binary and kanji) for efficient data storage; extensions may also be used
Vero code 	Three-dimensional code in the form of a square consisting of multicolored modules where you can encode arbitrary information. Vero code can be built in different formats and can be read by a special scanner or any smartphone

Source: Analysis of the available technology for unique markings in view of the global track-and-trace regime proposed in the negotiating text for a protocol to eliminate illicit trade in tobacco products. FCTC. 2010. URL: https://apps.who.int/iris/bitstream/handle/10665/75715/FCTC_COP_INB_IT4_ID1-en.pdf?sequence=1&isAllowed=y.

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