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Prospects of VAT Administration Improvement in Digitalized World: Analytical Review

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ABSTRACT

In conditions of integral digitalization, governments may face a shortfall in VAT revenues due to tax avoidance and frauds. Here arise two opposite hypotheses: 1) digital technologies can solve problems with VAT; 2) digital technologies are not capable to do so. The purpose of the study is to conduct an analytical review of the main problems and ways to improve the administration of VAT in the context of the digitalization of the economy. To achieve this, literature on digital technologies in VAT administration was analyzed. The literature sample consists of 25 sources on e-invoicing and 27 sources on blockchain in VAT administration. The main criteria for literature selection are: accessibility and significance of source; time horizon (last 10–15 years); keywords (“e-invoicing”, “blockchain”, “VAT”, “taxation”, “tax administration”); interdisciplinary approach (literature set represent standpoints of experts from different fields). It was established, that there is no consensus about e-invoicing and blockchain in VAT administration. These technologies have both shortcomings and advantages. The main result of the review is this: digital technologies are not a panacea for solving all problems with VAT administration. That is, both hypothesis of this paper is not proved, but not refuted. Digital technologies can simplify and reduce costs on VAT administration, provided there is a developed ICT infrastructure and consistent regulatory framework, a high tax culture, a low level of “shadow” economy. Interaction between countries in terms of the tax information exchange is also crucial. If these conditions are met, digital technologies in taxation can be effectively employed in the next 5–10 years in the most advanced countries; less developed countries will need much more time for this.

KEYWORDS

digitalization, VAT, tax administration, legal regulation, information and communication technologies, international trade, tax fraud

JEL H25, H26, K34, F51, O33

Оригинальная статья

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Перспективы совершенствования администрирования НДС в цифровом мире: аналитический обзор

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АННОТАЦИЯ

В условиях всеобъемлющей цифровизации правительства могут столкнуться с падением поступлений НДС из-за уклонения от уплаты налога и мошенничества. В этой связи возникают две противоположные гипотезы: 1) цифровые технологии могут решить проблемы с НДС; 2) цифровые технологии на это

не способны. Цель исследования в проведении аналитического обзора основных проблем и путей совершенствования администрирования НДС в условиях цифровизации экономики. Для этого была проанализирована литература по цифровым технологиям в администрировании НДС. В обзор вошло 25 источников по e-invoicing и 27 источников по блокчейну в администрировании НДС. Основными критериями отбора литературы являются: доступность и значимость источника; временной горизонт (последние 10-15 лет); ключевые слова («e-invoicing», «блокчейн», «НДС», «налогообложение», «налоговое администрирование»); междисциплинарный подход (представлены точки зрения специалистов из разных областей). Установлено, что нет единого мнения об e-invoicing и блокчейне в администрировании НДС. Эти технологии имеют как недостатки, так и преимущества. Главный итог обзора таков: цифровые технологии не являются панацеей от всех проблем с администрированием НДС. То есть, обе гипотезы данной работы не доказаны, но и не опровергнуты. Цифровые технологии могут упростить администрирование НДС и снизить затраты на него при наличии развитой ИКТ-инфраструктуры и последовательной нормативно-правовой базы, высокой налоговой культуры, низкого уровня «теневой» экономики. Взаимодействие между странами в плане обмена налоговой информацией также крайне важно. При соблюдении этих условий цифровые технологии в налогообложении могут быть эффективно использованы в ближайшие 5-10 лет в наиболее передовых странах; менее развитым странам потребуется гораздо больше времени для этого.

КЛЮЧЕВЫЕ СЛОВА

цифровизация, НДС, администрирование налога, правовое регулирование, информационно-коммуникационные технологии, международная торговля, мошенничество с налогами

1. Introduction

Value added tax (VAT) has a relatively short history when compared to, for example, property taxes [1] or excises, known for several centuries or even millennia. It's spread around the world was unprecedented [2, p. 3; 3, pp. 3–4]. However, this applies to the so-called “ideal VAT”, i.e., VAT applicable to all goods and services at the same rate [4, pp. 1, 5].

Supporting the least protected population strata, economic activities, important for a country [6], and, especially – an expansion of services and international trade, have led to shifting away from the “ideal VAT”. This means rebates, exemptions, several tax rates within one country, etc. So, modern VAT is hardly ideal, which leads to distortions in competition and international trade [7; 8], create possibilities for tax evasion and frauds.

For instance, the most common VAT fraud schemes are “missing seller” and “carousel” fraud. Scheme “Missing seller” uses the time lag in VAT legislation between the accrual and the actual payment of VAT to the budget, which allows fraud-

sters to receive payment for the goods (with the accrued amount of VAT) and disappear. The scheme is especially relevant for import transactions, as the importer does not have an “input VAT” [9]. And this scheme may also threaten other (non-fraudsters) members of supply chain [10, p. 11] due to the fact that tax authorities may not recognize their deductions of an “input VAT” from VAT liabilities and impose a penalty. In turn, “carousel” fraud – is an expansion of the “missing seller” scheme, which uses the difference in VAT rates between countries [11, p. 16].

It is estimated that between 2009 and 2016, the EU alone lost € 100–150 billion in tax revenue annually due to these types of VAT fraud [11, p. 10].

Globally losses of VAT revenues due to frauds, tax avoidance and evasion are about 20–30% of all tax revenues or € 500 billion [12, p. 4].

The rapid development of information and communication technologies (ICTs) has led not only to new types of products and ways of trade [13–15], but also to new technologies, that can be used in improving

VAT administration. Their application in practice gives hope for reducing paperwork in tax field, simplifying VAT administration, accelerating interaction between taxpayers and tax authorities, and solving those problems of tax evasion and frauds.

But are they really a decent mean for such issues? So here arise two completely opposite hypothesis:

H1: digital technologies can solve abovementioned problems with VAT administration;

H2: digital technologies are just a fancy tool, not capable to do so.

The purpose of the study is to conduct an analytical review of the main problems and ways to improve the administration of VAT in the context of the digitalization of the economy.

The main focus was on such technologies as e-invoicing and blockchain. The former of them already known in some countries of world as a tool for VAT administration, the latter – only draw attention as a technology, which is possible to use in this field.

2. Review procedure

The points in previous sections of this paper highlighted the situation and opinions, expressed in a set of literature and informational sources. They were selected based on the following criteria.

1. *Accessibility and significance of source.* Academic papers from reviewed journals in open access were included, as well as experts' opinions, expressed on web-sites of influential consulting (e.g., KPMG) and other national and international organizations, legislative documentation from official web-site of national and international organizations.

2. *Time horizon.* Literature over the last 10–15 years was included in this review. This is due to the fact that digital technologies in taxation are quite a novelty. But at the same time, the latest publications in this topic allow to track progress in their implementation, their advantages and shortcomings.

3. *Keywords.* To conduct the analysis the selected source must contain such keywords as “e-invoicing” and “VAT”,

“Blockchain” and “VAT” or combination of words “e-invoicing”, “blockchain” with “VAT”, “tax”, “taxation”, “tax administration”.

4. *Interdisciplinary approach.* Assessing the situation with digital technologies in taxation demands multidimensional and interdisciplinary approach. So, in this paper is summarized standpoints of experts from different fields: technical, economic and financial, legal types of activity, as well as representatives of science, business and governmental bodies.

In total, in the literature sample were selected 25 sources on e-invoicing and 27 sources on blockchain in VAT administration.

Further in this section results of the conducted literature review on the e-invoicing and blockchain for VAT purposes is presented.

3. VAT and digital technologies today and in the near future

There is a belief among tax scholars and practitioners that the development and widespread employment of digital technologies will lead to wide application of state regulations instead of taxes [16, pp. 199–200] or even to disappearance of taxes, for which it is difficult to construct an algorithm (this implies, for example, to corporate income tax [17]). At the same time, consumption taxes (primarily VAT, GST, excises, property taxes, etc.) will remain and even become more important in the formation of budget revenues [8].

Moreover, according to the forecast of the influential consulting company KPMG, consumption taxes will become dominant in the tax systems of all world countries in the next 5 years [8], which will happen due to the widespread introduction of digital hardware and software in the tax field.

The first “wave” of digitalization of the tax field (primarily in the case of VAT) can be considered systems of electronic formation and submission of tax invoices (e-invoicing).

E-invoicing – it is, in essence, ICTs, through which tax invoices in electronic form (e-invoices) are formed and trans-

ferred to customers and tax authorities. In turn, *e-invoice* is an invoice that has been issued, transmitted and received in a structured data format which allows for its automatic and electronic processing¹.

Such ICTs help to avoid paperwork, reduce costs to firms by 50–80% [19, 20, p. 66], the likelihood of human error (e.g., a person may forget to indicate the tax number of the seller or buyer), due to which a tax administration may not allow to use invoice when forming a VAT tax credit [21, p. 37]. Accordingly, the need to submit reports on the adjustment of VAT amounts specified in tax returns, charged penalties for late (not in full details, etc.) transfer of means to the budget is reduced.

From the side of a tax administration e-invoicing can help faster and cheaper track fraudsters and/or suspicious transactions and operations along the supply chain when compared to the VAT paper trail².

Moreover, if the e-invoicing integrates elements of artificial intelligence (AI), then it eliminates the need to involve people in VAT reporting, as such systems will form tax invoices and declarations in automatic mode, and also in automatic mode will provide them to the counterparties and tax authorities [8].

If e-invoicing is implemented on a single (at least within the country) platform, it greatly simplifies the analysis of information on VAT levying, administration of this tax and the corresponding costs³.

One of the most advanced e-invoicing was considered to be the one used in Brazil⁴. Due to the facts, that this state is a Federative Republic and each of 26 States

has differences in VAT (rates, exemptions, principles of jurisdictions, etc.) a problem of VAT avoidance and frauds was very serious even within the country's border, not only in foreign trade [22, p. 20]. So, implementing unified rules for electronic bookkeeping, as well as system of e-invoicing and electronic consignment inventories and customs bonds help to ease tracking fraudsters to tax authorities [23]. Implementing these measures result in a \$58 billion increase in tax revenues in Brazil [21, p. 38].

E-invoicing are actively used in South Korea [24; 25], India [26, p. 31], Ukraine [27], Vietnam, Indonesia⁵, China [28], Saudi Arabia [29]. Many other countries are planning to employ them as well [29].

Several EU members states (after about 10 years of consultations and researches⁶) and the United States (for sales tax) have prepared a legal framework for the application of e-invoicing for B2G (business-to-government) transactions. In January 2023, France will switch to e-invoicing for B2B transactions.

However, already existing and planned e-invoicing are not without their flaws, which leave room for manoeuvre for tax fraudsters.

1. *E-invoicing single platform and costs.*

The same (or at least compatible) software must be used for many taxpayers to interact successfully with each other and tax authorities. It is most logical in this situation to assume that it will be created by state structures or private enterprises according to a state order. For example, in Singapore all trade-related official systems (including e-invoicing) is made by enterprises, the largest share in which is state-owned, and under a supervision of

¹ Eurostat. What is eInvoicing? Eurostat. 2021. Available at: <https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/What+is+eInvoicing>

² Detailed information on VAT paper trail as a mean of combating tax evasion in [18].

³ VATBox. Experts weigh out on the future of VAT. VATBox. 2020, 22 July. Available at: <https://vatbox.com/experts-weigh-out-on-the-future-of-vat/>

⁴ Wolfers L. Future of VAT: Continued evolution and increasing significance ITR. 2019, 3 December. Available at: <https://www.internationaltaxreview.com/article/b1j8ycnj2st8h7/future-of-vat-continued-evolution-and-increasing-significance>

⁵ Havcarci M. E-Invoicing in Asia. Digitization of VAT Invoices. INPOSIA. Available at: <https://www.inposia.com/en/e-invoicing-and-digitization-in-asia/>

⁶ The Association of Chartered Certified Accountants (ACCA). Good practices in the adoption and promotion of e-invoicing in EU member states. November 2012. 48 p. Available at: <https://www.accaglobal.com/content/dam/acca/global/PDF-technical/technology-publications/pol-tp-gpta.pdf>

Singapore Customs and Excise Department and Economic Development Board⁷.

It is also logical to assume that such a system should be distributed free of charge to VAT payers.

Consequently, the development, maintenance and updating of this software, as well as the creation of copies and distribution among taxpayers will require the allocation of a separate item in a state budget. Moreover, as was shown on the example of Nepal in [30, p. 104], at early stages of implementation of such a system, costs will be the highest.

Taxpayers will also incur costs. Most enterprises conduct their economic, financial and tax reporting in electronic form using a variety of ICTs (insourced or purchased from external developers and adapted to their own needs). The requirement to join e-invoicing will mean that in the first stages it will be necessary to involve employees in duplicating data in their own ICT and in this system, while ways will be developed to connect taxpayers' ICT to e-invoicing (i.e., additional costs on specialists will be needed). Taxpayers also will need time to become familiar with this system, to teach employees to work with it, etc. [31].

2. Data integrity and confidentiality.

Every VAT payer who wishes or is required to employ e-invoicing must register in it. In this way, it is not only given access to the system, but, according to the OECD recommendations on VAT, registration is ensured in the country of customers' location. That is, the COD principle is fulfilled.

Also, trade participants and tax authorities have the opportunity to verify the information about their counterparties, which to some extent is a guarantee that the tax authorities will not require the exclusion of certain amounts of VAT tax credit from reporting due to invalid tax invoices. This is a positive side.

But at the current stage of ICTs' development there is no 100% guarantee that information from e-invoicing will not get to the attackers. If such information contains, for example, products supplied to national defence structures, etc., it may threaten the national security of the country.

Another issue is that e-invoicing allows fiscal authorities to collect vast amount of information about taxpayers, even confidential one. And for now, it is not quite obvious, how can state representatives use it.

In view of this, it is necessary to develop mechanisms to protect information in e-invoicing from external, as well as internal interference (e.g., if unscrupulous developers have access to the system and use it for their own purposes) and effective rules of administrative, criminal liability for unauthorized intrusion in this system and mechanisms for implementing these norms in practice (effective judicial system, law enforcement agencies, low level of corruption in the country, etc.).

For example, in 2019 Italy has made first attempt to create respective legal framework: Italian revenue agency received a warning from the Italian Data Protection Authority about danger of misuse of information, collected via e-invoicing⁸.

3. E-invoicing reach to economic agents

An analysis of researches on already implemented e-invoicing and those planned to be implemented shows that they currently cover only B2B agreements [8; 26]. That is, it is possible to apply this system only for legal entities that have the status of VAT payers, and individual entrepreneurs, if national legislation provides for them the status of VAT payers.

B2C and C2C transactions are not covered by this system, and attempts to

⁷ Watanabe K. Research on the Use of Electronic Invoices in the Asian Region and Proposal for Standardized Fixed Layout Format of the Invoice. JASTPRO Research. March 2015. 56 p. P.5. Available at: <http://www.jastpro.org/topics/pdf/e-invoicing20150327eng.pdf>

⁸ ICT Legal Consulting. Italy: The Italian Data Protection Authority Issues a Warning to the Revenue Agency: The Electronic Invoicing Must Be Revised Due To A "Disproportionate Collection of Information and Risks of Misuse". 17 January 2019. Mondaq. Available at: <https://www.mondaq.com/italy/data-protection/772476/the-italian-data-protection-authority-issues-a-warning-to-the-revenue-agency-the-electronic-invoicing-must-be-revised-due-to-a-disproportionate-collection-of-information-and-risks-of-misuse>

administer them may be more expensive than the potentially obtained VAT amounts. Taxation of VAT on services, especially digital ones, is still problematic.

This has led to a proposal to introduce a Digital Services Tax (DST) into the tax systems of the EU member states. This tax should be levied on a multinational service provider's net gross income received in the country where the recipient of services is located. The rate of such tax will be 3% and will be applied to the company if its net gross income received worldwide for the year exceeds € 750 million [32, pp. 11; 33]. The EU-wide revenue from this tax is estimated at € 5 million per year.

However, as there are currently no effective mechanisms in the EU to track receiving services and, consequently, the place of income generation, it is extremely difficult to implement this tax in practice. Therefore, it is not applied there.

4. *The effectiveness of the fight against fraudsters.*

E-invoicing is considered among other things as a tool to combat fraudulent VAT schemes [26; 34].

On the one hand, this is true because trade counterparties and tax authorities have the opportunity to verify the information provided on the registration of VAT payers and the correctness of VAT amounts in tax invoices and declarations.

On the other hand, there is no guarantee that even under such conditions, attackers will not cease to exist (provided that the transaction costs of registering the company as VAT payer are lower than the criminally obtained funds), or the data will not be falsified due to unauthorized interference with e-invoicing.

In addition, if companies carry out part or all of their operations outside such a system, i.e., as a part of a "shadow" economy, e-invoicing also not an effective mean of combating such operations.

These problems have been partially solved in India, a country where, due to the existence of states with different GST rates, the problem of fraudulent schemes with this tax is significant.

This country uses an e-invoicing, the participants of which can receive a tax

credit refund only if their trading counterparty has paid in full the amount of the tax liability corresponding to a specific agreement. In this case, the tax credit is returned only 30 days after confirmation by the tax authorities of such payment, as well as verification of tax invoices in the e-invoicing [26, p. 31].

This approach ensures a very careful selection of trade partners and reduces the possibility of tax revenue losses due to frauds. But at the same time, companies withdraw funds for a month, which can negatively affect their economic activity. Also, this approach covers only companies registered in the e-invoicing and does not solve the problem of "departure from the shadows" of other companies.

Also, when considered B2C transaction, South Korea is a good example of combating "shadow economy". Here in addition to e-invoicing (which comprises B2B transactions) wage and salary earners can claim tax deductions for eligible purchases made using electronically traceable payments when they file their year-end income tax settlements. This result in transition to almost cashless economy, in which it is much easier to combat VAT frauds [35].

In conclusion, the effectiveness of the e-invoicing depends not only on whether or how it is implemented, but also on the general tax culture in a particular country, the scale of shadow economy, the peculiarities of VAT legislation (which of the economic agents and under what conditions must be registered as VAT payers, the share of VAT payers in the total number of economic agents carrying out trade operations, does VAT legislation allows to deduct other taxes in case of B2C transaction in electronic form, etc.).

5. *Infrastructure.*

E-invoicing, like any other ICT, cannot exist by itself. Its implementation and functioning require appropriate infrastructure – from network, server equipment, communication facilities and equipment to institutions of training and retraining personnel, capable of working with such ICT, as well as to develop and upgrade it. Accordingly, such infrastructure involves more funds, the more developed ICT is.

It can be assumed that these costs (at least in part) can be shared between the private sector, the state and individual consumers. Many advanced ICTs use the same elements of infrastructure. For instance, an Internet provider for an enterprise may be another private enterprise, and it is through it (through the infrastructure elements provided by it) that the first enterprise will actually access e-invoicing.

However, poverty, economic underdevelopment of a country or its regions will significantly hamper the development of ICT infrastructure and the ability of economic agents to access modern ICTs, including e-invoicing [59].

6. International cooperation and coordination.

An employment of e-invoicing between countries requires compatibility of these systems. But it may be about national security and protection of national interests, because there is no 100% guarantee of what information the other party will be able to get through such interaction of data exchange systems. When this occurs, the limited e-invoicing functionality in international agreements may be an option.

Another option is to use a different system between countries, for example, based on the developed by the OECD and the existing in the world since July 15, 2014, the CRS – Common Reporting Standard. This standard requires the tax and customs authorities of the countries to compile tax and customs reports according to a single model and the annual exchange of this information between parties in an automatic mode⁹. But for now, it is one of the many existing standards of tax information exchange¹⁰.

⁹ OECD. Automatic exchange portal. OECD. 2021. Available at: [https://www.oecd.org/tax/automatic-exchange/common-reporting-standard/#:~:text=The%20Common%20Reporting%20Standard%20\(CRS,jurisdictions%20on%20an%20annual%20basis](https://www.oecd.org/tax/automatic-exchange/common-reporting-standard/#:~:text=The%20Common%20Reporting%20Standard%20(CRS,jurisdictions%20on%20an%20annual%20basis).

¹⁰ Cory N. Why Countries Should Build an Interoperable Electronic Invoicing System Into WTO E-Commerce Negotiations. March 2020. Information Technology & Innovation Foundation. Available at: <https://itif.org/publications/2020/03/23/why-countries-should-build-interoperable-electronic-invoicing-system-wto-e>

However, the coexistence of two reporting systems – for national and international use – will mean duplication of information and additional costs at least for the salary of employees who extract reports from one system and enter it into another one.

The next issue is still the return to the country of consumption of the VAT amounts, collected in the country of purchase, from consumers (e.g., in cases of B2C and C2C transactions). This issue remains unresolved, as it involves countries reporting and transferring funds between jurisdictions.

This proposal requires much greater cooperation and coordination in the field of taxation between countries, as well as their comparative development in terms of equipment and technology used, which, as follows from¹¹ is still a matter of a distant future.

4. VAT and blockchain

Given the development of digital software and hardware, as well as a number of unresolved issues with VAT administration, e-invoicing can be an intermediate link between the modern method of charging, collection and administration of VAT and the next step – VAT, administered by blockchain.

The essence and technical features of blockchain are considered in detail, for example, in [36; 37, pp. 55–65]. This technology has been developed and applied in different countries for various needs: for creating and functioning of cryptocurrencies, providing financial services, as a support for the Internet of Things and its further development, in providing public services, healthcare faster and more secure, in scientific researches (e.g., in experimental data verification) [38]. And this list continues to expand [39; 40].

¹¹ Cory N. Why Countries Should Build an Interoperable Electronic Invoicing System Into WTO E-Commerce Negotiations. March 2020. Information Technology & Innovation Foundation. Available at: <https://itif.org/publications/2020/03/23/why-countries-should-build-interoperable-electronic-invoicing-system-wto-e>

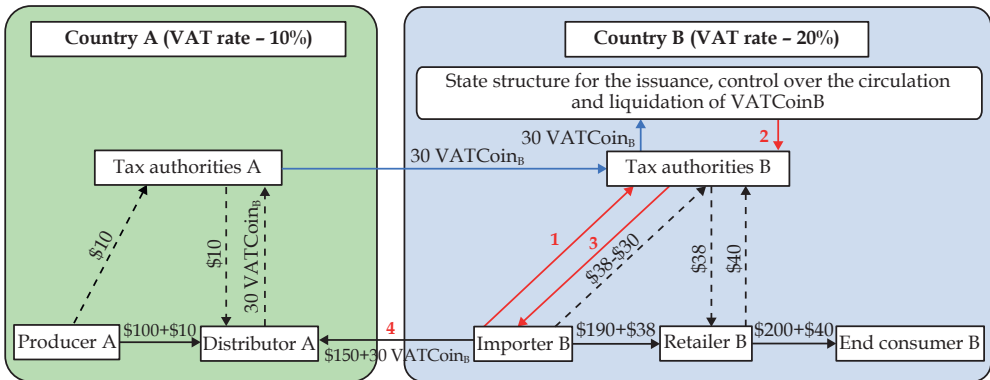


Figure 1. Scheme of VATCoins operations in a blockchain in case of trade between EU member states

Source: compiled on the basis of [26]

However, the feasibility, technical and practical possibility of its use in the tax sphere is still the subject of debate and research by economists¹² and technical experts [41-43]. Therefore, it is possible to make assumptions about the timing of the blockchain with great caution only for the most economically and technically advanced countries. Moreover, as shown in [44, p. 24; 45, p. 48] even in one of the most economically developed country – USA – tax authorities not always have enough financial resources for employment of newest technologies. In this light any forecast for the rest of the world may be overly optimistic.

Blockchain is attractive for VAT purposes due to its high security level (i.e., the guarantee of confidentiality) and the extremely low probability of cracking, which reduces the possibility of data forgery or theft.

At the same time, most proposals for blockchain’s employment in the taxation [21, p. 43; 29; 46] is actually limited to replacing e-invoicing, which was confirmed in [47, p. 65]. That is, apart from

improving the security level, other shortcomings inherent in the e-invoicing in this case will remain in the blockchain, as long as only technology will be replaced, but not general economic, legal and institutional conditions.

Yet, the EU has developed a proposal that will solve the problems of cooperation between countries and VAT frauds (Fig. 1). This is a simplified example. Therefore, let’s assume that the manufacturer had no transactions before the one under consideration, companies immediately after receiving payments for goods (services) pay VAT liabilities to the budget and receive a tax credit after the purchase of goods (services), respectively, and do not take into account the full amount of tax liabilities and tax credit for the period established by law and pay the difference to the budget or receive compensation from the budget.

In Fig. 1 producer from jurisdiction A (the VAT rate is 10%) sells for \$100 goods and charges customer with \$10 VAT of country A. Accordingly, under this agreement he has a tax liability of \$10, which he transfers to the budget of country A (dotted line in Fig. 1).

The distributor receives a refund of \$10 in input VAT from the state A. His sales of goods (export) to country B are charged with 0% VAT rate under COD principle. As a result, country A receives \$0 in tax revenue from the deal within its border with these goods.

¹² Roubini N. Blockchain’s Broken Promises. 26 Jan. 2018. Project Syndicate. Available at: <https://www.project-syndicate.org/commentary/why-bitcoin-is-a-bubble-by-nouriel-roubini-2018-01?barrier=accesspaylog>; Roubini N. The Big Blockchain Lie. 15 Oct. 2018. Project Syndicate. Available at: <https://www.project-syndicate.org/commentary/blockchain-big-lie-by-nouriel-roubini-2018-10?barrier=accesspaylog>

A distributor from country A wants to sell goods to an importer in country B. Therefore, he issues an invoice for \$150 and VAT in the amount corresponding to a 20% rate of \$150. However, in this case, he indicates the amount of VAT in VATCoins of country B (VATCoinB). In the given example for simplicity, it is considered that \$1 is equal to 1 VATCoinB. Therefore, the tax return issued by the distributor to the importer will indicate the amount of 30 VATCoinB.

Before transferring funds, the importer from country B must perform several operations, accompanied by formation of smart-contracts (marked with red arrows and numbers in Fig. 1).

1. An importer makes a request to purchase 30 VATCoinB to the tax authorities of country B and pays the appropriate amount for them (in our example – \$30).

2. The state structure for the issuance, control over the circulation and liquidation of VATCoinB issues 30 VATCoinB and transfers them to the tax authority, which has received a request from the importer.

3. The tax authority transfers 30 VATCoinB to the importer.

4. Importer transfers \$150 and 30 VATCoinB to a distributor from country A.

The remaining transactions with 30 VATCoinB are that the distributor from country A transfers them to the tax authorities of its country, which in turn transfers them to the tax authorities of country B, where they are liquidated.

Since 30 VATCoinBs were issued for a specific transaction, can only be purchased and sold in country B and they have no monetary value abroad, but only some informational one, the tax authorities do not need to somehow accumulate funds in special accounts, determine to which country and how much they should transfer VAT amounts, etc. They just transfer these 30 VATCoinBs to country B as soon as they are received from a distributor. In country B, these 30 VATCoinBs will be eliminated because they have fulfilled their function and are no longer needed. Nevertheless, all the necessary information on their use remains in the blockchain.

In country B, in the following steps, the promotion of goods to a final consumer should bring \$10 in addition to \$30, already paid for 30 VATCoinB (\$8 (\$38–\$30) – as a result of sale to a retailer and \$2 (\$40–\$38) – when selling to a final consumer). That is, in general, the budget of country B will receive \$40 of VAT revenues from the sale of the analysed product. The use of VATCoinB ensures that the importer will not disappear with \$38 of VAT at the stage of its sale to the retailer.

The scheme, presented in Fig. 1, may seem very complicated. But the development of up-to-date ICTs, blockchain and cryptocurrencies (which includes the proposed VATCoin) already allows one to perform these operations fairly quickly: even if all import and export operations carried out in the EU for a year, perform with this technology, it would take only 1–2 days. With the further advance of ICT infrastructure, the whole process could last only some seconds [26].

The mechanism discussed above applies to B2B export-import operations. However, its inventors expect that with blockchain evolution it may be possible to extend it to whole national trade and even cover B2C operations and services.

But, nevertheless, blockchain, like e-invoicing, is not without its flaws, both inherent in the technology itself and in how it is planned to be used in the field of taxation. As for the latter, if this technology would be used just the same way, as e-invoicing, the whole spectrum of drawbacks and peculiarities of that technology will be also peculiar to blockchain.

As for the problems, connected to blockchain itself, there is still problems with bandwidth, difference between blockchain versions and their compatibility, debates on should blockchain for VAT purposes be distributed among many nodes (including non-governmental ones) or regulated by governmental bodies [37; 48–50]. To summaries it all, for now blockchain may be applied with restrictions [42; 43]. And there are unsolved problems of legal framework of blockchain, especially in taxation (what is cryp-

tocurrency, should it be taxed and how, should miners be taxed and with what tax, should miners' activity be regulated by governments, etc.) [36; 49; 51].

Also, the very peculiarity of blockchain – possibility to make transactions without participants' identification (i.e., anonymity) and in autonomous mode – makes it hard for tax authorities to detect frauds [44, p. 18]. Also, in [52] on the example of Danish tax system were proposed some mechanism to overcome the problem of autonomous mode, in particular – by employment of user authentication mechanism (login).

Even if these problems would be solved and most taxpayer would be covered by blockchain and taxed through it, there are still remains big multinational corporations and the richest people of the world, who have enough resources to employ more advanced technologies and staff than tax authorities [44, pp. 28–29; 53; 54]. For example, they still can embrace differences in VAT norms in various countries or even within one country to legally abate their liabilities (using lower tax rates, tax exemptions, transaction between VAT-payers and those, who is not obliged to be registered as VAT payer, etc.) [55]. Another option – they can illegally rise their expenses to enhance the sum of “input” VAT (e.g., by obtained services' price overextension). This will lead to cutting their VAT liabilities and revenue loses by national governments. Blockchain can accelerate those processes or help to hide them from tax authorities when there is not enough governmental control over this technology.

In such a way there is still a possibility of tax (not only VAT) evasion and avoidance and the rise in inequality [44].

To solve at least part of the abovementioned problems, blockchain as technology itself and its use in practice must be under governmental control [56, pp. 566–567; 57]. But, then again, there is a matter of financing apparatus and instruments for executing such control, as well as citizens and firms may be displeased with control of “Big brother” and resist it [58].

5. E-invoicing review: advantages and shortcomings

When analyzing e-invoicing, there were reviewed 25 sources. In [18; 20–25; 28; 29; 34] mostly advantages of implementing e-invoicing in VAT administration were mentioned. Authors [30; 31; 35; 59] expressed negative opinion on this matter, and in the rest sources [8; 26; 27] their authors noted both advantages and disadvantages of e-invoicing. But, in last two cases these negative opinions and ambiguous assessments concerned not so much the specifics of the technology itself (i.e., e-invoicing) as the environment and conditions in which it is applied.

It is also should be mentioned, that among all reviewed in this paper sources 6 from 15 positive opinions were expressed by economists [18; 20; 21; 24; 25; 28], 7 – by representatives of business (practitioners) and law experts [22; 23] and only 2 – from tech experts [29; 34].

In 9 from 15 analyzed sources with positive attitude towards e-invoicing were also presented positive results of implementing and functioning these systems in different countries.

Negative opinions about e-invoicing were presented in 2 sources by tech experts, in 1 source by economists, in 2 sources by law experts and practitioners and in 2 sources, that highlight the results of e-invoicing functioning in different countries [35; 59].

Mixed opinions (e-invoicing has its advantages and shortcomings) were expressed by economists [8; 26; 27].

Such a distribution of opinions may not reflect the full picture of ideas about e-invoicing in view of the relatively small array of analyzed sources. However, on this example it is possible to conclude, that a significant number of publications on this topic in the presented sample, written by economists and highlighting the experience of using e-invoicing in different countries is due to the fact, that these systems is known in different countries for more than 20 years. Economists could draw their conclusions about their influence on VAT revenues and combating VAT frauds and evasions. At the same time, tech experts

for the same reason could shift their focus from these relatively studied technologies to newer and more advanced ones, that overcome flaws of e-invoicing (e.g., to blockchain that will be discussed further).

As for advantages and shortcomings of e-invoicing, extracted from the sources, analyzed in this paper, they are summarized in Table 1.

From Table 1 one may conclude that e-invoicing cannot be considered as perfect or ultimate mean of VAT administration. At least, this is true in a modern world. Nevertheless, countries and international organizations make efforts to change the current situation in taxation for better, taking into account digital technologies development.

Table 1

E-invoicing review: advantages, shortcomings and conditions of efficiency improvement

Advantages	Shortcomings	Conditions of efficiency improvement
<ul style="list-style-type: none"> • Less (or no) paperwork; • Less (or no) human errors in forming invoices <p>Cost reduction to firms and tax authorities in forming and transfer invoices to tax authorities and partners</p> <p>Increasing the speed of formation and processing invoices and ability to do these in automatic mode</p>	<p>Costs on software development, its upgrading and maintaining, which are the highest at initial state of implementation</p> <p>Necessity to use the same or compatible software within one country by all VAT payers and tax authorities</p> <p>Country must have developed ICT infrastructure</p>	<ul style="list-style-type: none"> • Combating poverty; • General economic, technical development of the country
	<p>Data integrity and confidentiality may be under threat of hackers’ attack or misuse of information</p>	<p>Development of legal framework on misuse of information collected via e-invoicing and mechanisms to implement it</p>
<p>Possibility to obtain VAT revenues more fully due to combating frauds and tax evasion</p> <p>Simplifying an analysis of VAT levying and administration, that allows to reveal VAT frauds and find ways to improve VAT administration</p>	<p>There’s still space for fraudsters</p>	<ul style="list-style-type: none"> • Changes of legal framework, that allows to expand e-invoicing on all economic agents and types of operations (B2B, B2C, C2C, etc.); → • Transition to cashless economy; • Fight against “shadow” economy and enhance tax culture in society
<p>Possibility to combat VAT frauds at international level</p>	<p>There’s no compatibility of e-invoicing systems between countries that simultaneously guarantee protection of national confidential data</p>	<ul style="list-style-type: none"> • Providing mechanisms of data exchange through e-invoicing with limited functionality (compared to national ones); → • Exchanging VAT information in automatic mode according to unified standard (e.g., CRS); • Achieving greater cooperation and coordination in the tax field between countries

For example, OECD International VAT/GST guidelines¹³ and Base erosion and profit shifting (BEPS) project, final BEPS package¹⁴ stipulate that VAT should be a neutral tax, regardless of the form of commerce (e-commerce or traditional), type of goods (tangible or intangible) and the buyer (business or end consumer).

To support the principle of VAT neutrality and compliance with COD principle, countries are encouraged to introduce mandatory registration of sellers in jurisdictions of goods' sale with the simultaneous possibility of verifying VAT registration through national electronic databases. It is also advisable to execute international cooperation and coordination in respect of this tax [60, pp. 21-22; 61, pp. 102-104].

In line with these recommendations by OECD developed Asian countries (Japan, Singapore, South Korea) have introduced mandatory registration for VAT / GST¹⁵ purposes of businesses wishing to conduct e-commerce within their borders [62, p. 2; 63, p. 36]. In Australia and South Korea, e-commerce platforms must register as VAT / GST payers, charge these taxes on behalf of sellers, who trade on them, collect the relevant amounts from buyers and contribute them to their budgets [64; p. 17].

In Ukraine - a country with emerging type of economy and lower-middle income per capita - in 2021, the so-called bill on the tax on Google was adopted, which amends Section V (Value Added Tax) of

the Tax Code of Ukraine. This document stipulates that digital corporations (Google, YouTube, Netflix, Amazon, Facebook, etc.) that provide their services to individuals in Ukraine will be required to charge and pay VAT to the Ukrainian budget at a rate of 20%. It also establishes the place of supply of e-services, which is the location of the recipient of such services.

In order to improve the VAT system and overcome the shortcomings and difficulties associated with the charging and collection of this tax EU is implementing a set of measures aimed at simplifying the VAT system [62, p. 2; 65].

To that end, all sellers are encouraged to register as a VAT payer *in any EU member state* and join simultaneously the Mini-One Stop Shop (MOSS) to redistribute VAT revenues to the budget of the EU country where the buyer of the goods is located.

MOSS¹⁶ is in the middle of a clearing house and a special scheme of interaction between the tax authorities of the EU member states on VAT. That is, MOSS is in every EU member state, its activities are regulated by both the legislation of member states and the EU one. Each member state, within its competence, ensures that VAT payers registered in its jurisdiction fulfil their obligations to charge, pay VAT and keep records of this tax, organize cooperation with the tax authorities of other countries (within operations, occurring through MOSS), determines what amounts of tax liabilities to the budget of which EU member state to transfer, organizes procedures for refunding overpaid VAT, etc.

Joining MOSS is voluntary, but if the company is registered in MOSS, all its transactions with customers from all EU

¹³ OECD. International VAT/GST guidelines. OECD; 2015, November: 81 p. Available at: <http://www.oecd.org/ctp/consumption/international-vat-gst-guidelines.pdf>; OECD. Programme of Work to Develop a Consensus Solution to the Tax Challenges Arising from the Digitalisation of the Economy, OECD/G20 Inclusive Framework on BEPS. OECD; 2019. Available at: <https://www.oecd.org/tax/beeps/programme-of-work-to-develop-a-consensus-solution-to-the-tax-challenges-arising-from-the-digitalisation-of-the-economy.pdf>

¹⁴ OECD. OECD delivers international standard for collection of VAT on cross-border sales. OECD; 2015, November. Available at <http://www.oecd.org/ctp/consumption/oecd-delivers-international-standard-for-collection-of-vat-on-cross-border-sales.htm>

¹⁵ GST (goods and service tax) is basically an analogue of VAT with some minor differences [3, p. 10].

¹⁶ The activities of MOSS are regulated by the Directive 2006/112 / EC (The Council of the European Union. Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax. Official Journal of the European Union; 2006, 11 December, L 347/1. 118 p.) and the EU Council Regulation № 967/2012 (The Council of the European Union. Council Regulation (EU) No 967/2012 of 9 October 2012. Official Journal of the European Union. 2012, 20 October, L 290/1. 7 p.).

member states must be conducted exclusively through MOSS.

When conducting trade transactions, the seller must define who the buyer is (business or end consumer), his location (EU or other countries), get information confirming his identity (address to which the invoice is issued, the address of the customer's banking institution, the country that issued the payment card, the IP address from which the customer makes the order, the country of registration of the Sim-card – from this list the seller must select any two elements; VAT registration number in a EU member country); to form the relevant documentation, keep it for 10 years in electronic form, if necessary – to charge VAT at the rates of the country where the buyer is located; to transmit information through MOSS once a quarter regarding sales transactions and accumulated tax liabilities.

In case of B2B deals VAT will not be charged and transferred to MOSS, as the reverse charge mechanism will have to be applied. The seller will provide information on the transaction to the MOSS and the tax authorities of the countries where the buyer is located.

In case of refusal to register in MOSS, companies must register in each EU member state where they have customers, and independently charge VAT in each EU country where they conduct operations, at the rates of such country and pay the appropriate amount of VAT to the budget of these countries.

Aside of these, when concluding a deal, all its participants can check the VAT registration numbers in a special database in order to avoid problems with the tax office¹⁷.

That is, the new measures are aimed at maximizing customer coverage, automating the process of VAT accrual and redistribution of revenues from it between EU member states in compliance with the COD principle, preventing tax competition between countries. It should be em-

phasized that the development of modern ICTs played major role in implementing these measures.

But problems with VAT in EU were not completely solved with introduction of MOSS. The task of further establishment of cooperation and coordination of tax and customs authorities in the EU member states and strengthening information interaction between them is still relevant. Also, there are still no reliable and effective instruments in the EU to force companies located outside the Union to register as VAT payers, charge this tax on their customers and pay it into the budgets of member states, as well as reliable instruments and international powers to fully track e-commerce transactions between economic agents located inside and outside the EU [66].

From 1 July 2021 MOSS was expanded to One-stop-shop (OSS) as the next step in solving existing problems with VAT an EU member state cooperation. It will cover a wider range of supplies and is aimed at further simplifications of VAT and administration, first of all – in respect of VAT returns. These new rules are part of the EU's new e-commerce package and must also cover B2C sales¹⁸. But for now, it is quite early to discuss this OSS efficiency on these matters.

Overcoming still existing faults requires cooperation and coordination not only within EU, but on a global scale. These considerations can be applied to the same extent to every country of the world. But, as noted in [69] “some of the newest factors of the global turbulence and instability cause rather negative than positive changes in national tax systems, disrupting the current level of international tax cooperation”.

Problems combating poverty, economic and technical development of countries, mentioned in table 1 as a condition of increasing the efficiency of e-invoicing go far beyond the framework of VAT, ta-

¹⁷ European Commission. VIES VAT number validation. European Commission. 2021. Available at: <https://ec.europa.eu/taxation-customs/vies/>

¹⁸ European Commission. Guide to the VAT One Stop Shop (applicable from 1 July 2021). March, 2021. European Commission. Available at: https://vat-one-stop-shop.ec.europa.eu/system/files/2021-07/OSS_guidelines_en.pdf

xation and digital technologies and require separate in-depth research.

To sum the abovementioned, it could be stated that the widespread e-invoicing, according to EU and OECD experts, will become a reality at least in advanced economies and those who are trying to catch up with them in economic and digital development in the next 5 years. Accordingly, less developed countries will need more time.

6. Blockchain in VAT administration: advantages and shortcomings

To sum up the literature review, conducted on this paper on the issue of applying blockchain in VAT administration, several moments should be mentioned.

Among 27 analyzed sources only in 6 of them [21; 26; 29; 46; 47; 52] were expressed only positive opinions about blockchain in VAT administration, in [36–38; 48; 49; 51] sources – negative opinions were presented. In the rest 13 analyzed sources mixed assessments were presented [39–45, 48, 50, 54–57]. Simultaneously, authors of [38–40; 48; 50] and N. Roubini¹⁹ express their opinion about blockchain as a technology itself not limited to its use for VAT purposes.

Among 5 sources with negative reactions towards blockchain in VAT administration 2 belong to tech experts [37; 38], 3 – to economists [36], 2 – to practitioners and law experts [49; 51], and in 1 sources was highlighted results of blockchain implementation on practice on example of cryptocurrencies [48].

In 6 from 10 sources prepared by tech expert were mentioned positive and negative sides of blockchain and, more specifically – of blockchain in VAT administration [39–42; 50; 52] and only in 2 sources by them only positive sides of blockchain were mentioned [29; 46].

Aside from 3 abovementioned negative opinions about blockchain expressed by economists, in 4 from 10 sources by

them pros and cons of blockchain in VAT administration are considered [43–45; 55] and only in 2 sources were expressed solely positive aspects of this technology's application for VAT purposes [21; 26].

Due to the comparative novelty of blockchain, there are only 2 sources, highlighting the experience of this technology's implementation in practice. But they describe of blockchain application in other than VAT administration spheres and in connection with cryptocurrencies.

Law experts and practitioners expressed mostly negative and mixed opinions about blockchain in VAT administration [49; 51; 56; 57] and only 1 source by them presented positive assessment [47].

In total, opinions about blockchain, especially – in VAT administration mostly negative or mixed (blockchain have positive and negative sides) ones. Moreover. Even tech specialists have some doubts about its successful implementation for VAT purposes. But, as in the case of e-invoicing, in some of the cases blockchain effectiveness for VAT administration lines not so much in technology itself, but in specific circumstances (institutional, legal, economic, etc.) of its implementation in a given country. Details of pros and cons of blockchain in VAT administration according to literature, analyzed in this paper, are summarized in Table 2.

As can be seen from Table 2, blockchain itself and in connection to VAT has a lot of problems and shortcomings to overcome. Moreover, the very possibility of its implementation in VAT administration receives a lot of negative or mixed responses among economists, legal experts, practitioners and even tech experts. Maybe, this is due to novelty of this technology, lack of experience of its use for VAT purposes and virtual absence of legal framework in this field. The other possibility lies in the lack of trust from the economic agents toward this technology (taxpayers and tax authorities in this case), as well as limitations of blockchain itself, when there is no 100% guarantee that operations with VAT would be possible to make in full volume and fast at the present stage of its development even

¹⁹ European Commission. Guide to the VAT One Stop Shop (applicable from 1 July 2021). March, 2021. European Commission. Available at: https://vat-one-stop-shop.ec.europa.eu/system/files/2021-07/OSS_guidelines_en.pdf

within one small economy, not to mentioned international trade operations.

Given this and taking into account the assessments of experts on the spread of e-invoice and related issues, as well as the need to address technical and legal issues with the implementation of blockchain in VAT administration in international and national trade, it can be assumed that this technology at least in advanced countries may become widespread and employed for VAT purposes in the next 15–20 years. For the rest of the countries, the situation depends on their ability to build and maintain appropriate ICT infrastructure, as well as on the level of their economic, institutional and technological development, computer literacy of economic

agents and tax authorities, ability to create legal framework for new types of activities and technologies and instruments to maintain them.

7. Conclusions

VAT is one of the most important sources of tax revenues to the budgets of most countries of the world. However, the accumulated problems with this tax, which are exacerbated by globalization and digitalization, lead to the need to modernize it in line with new realities.

Two contradictory hypotheses were made in this paper: 1) digital technologies (e-invoicing and blockchain) can solve problems with VAT administration; 2) digital technologies are not capable to do so.

Table 2

Blockchain in VAT administration: advantages, shortcomings and conditions of efficiency improvement

Advantages	Shortcomings	Conditions of efficiency improvement
If blockchain in VAT administration is considered merely as an advanced replacement of e-invoicing, it inherits all of the shortcomings of the latter		
High security level (i.e., guaranty of confidentiality)	→ The same feature can be used by dishonest taxpayers to conduct illegal deeds without fear of statutory punishment	→ Access to and use of blockchain for VAT purposes must be through user authentication mechanism
Low probability of cracking	Mistakes, ways to illegally enter and change the system may be incorporated at initial stages of its designing and application for VAT purposes [43]. That is, there is still no 100% of safety assurance Situation, when data about VAT, trade operation and economic agents are placed on many unregulated nodes and visible to many anonymous miners, may create lack of trust from government officials and prompt taxpayers	All stages of lifecycle of blockchain for VAT purposes must be under governmental control. <i>But in this case, there is a danger of excessive control under economic agents.</i>
	Implementation of blockchain is lacking legal framework in many countries	→ Create legal framework for blockchain, in particular – for VAT purposes
	Blockchain is a quite new technology, it needs advanced and expensive ICT infrastructure for effective functioning and further development to overcome its own technological restrictions and shortcomings (delays in processing transactions, size and speed of data dissemination, threat of the “51 % Attack”, the difference between versions and the problem of ensuring the compatibility of multiple chains [36])	→ Building a state policy, aimed at stimulating investments in ICT infrastructure and R&D in the field of blockchain

An analysis of 25 publications about e-invoice and 27 sources about blockchain implementation for VAT purposes proved or refute none of these hypotheses. The truth is somewhere between these two opposite ends.

Both technologies have their pluses and minuses. Among their advantages are cutting paperwork, possibilities of human errors and costs reduction to taxpayers and tax authorities at the stages, on the stage of systems' operation. At the same time at initial stages of their implementation costs may be substantial.

Also, until there is situation, when in one country VAT legislation allows VAT-registered enterprises as well as businesses, that are not obliged to register for VAT, remains the possibility of VAT evasion and frauds even despite application of digital technologies for VAT administration.

Moreover, blockchain as a new technology has its own unresolved internal problems. Due to this, it may not become a widespread tool for VAT administration in the nearest future.

The main conclusion of the literature review is that digital technologies are not a panacea for solving all problems in VAT administration, but only a tool that can alleviate some of the symptoms if used properly.

So, improvement of VAT administration must lie not only in the further advance of e-invoicing and blockchain, but in creating legal framework for their functioning, mechanisms of safe data assignment between taxpayers and tax authorities at national and international levels, ways of improving cooperation and coordination between tax authorities of different countries in tax fields to combat tax frauds.

If digital technologies are seen as an effective tool for combating tax frauds and tax evasion, it must be kept in mind, that they require appropriate ICT infrastructure, high tax culture in society. Accordingly, that arises questions of countries' economic and technical development, fight against corruption and "shadow" economy, which also require conducting researches and applying policy measures on their grounds.

Considering the abovementioned, and according to the literature review it can be stated that in the near future (within 5 years) e-invoicing may become a worldwide digital technology for VAT administration. As for the blockchain – this technology for now is rather "raw". So, after all necessary alteration (technical, economic, legal etc.) it can be used in VAT administration in the next 10-15 years in most developed countries. The rest of the world may need more time for its implementation.

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