

Article

VAT and Blockchain: Challenges and Opportunities Ahead

Madeleine Merckx*

Blockchain is best known as the technology behind the popular cryptocurrency bitcoin, but the application of blockchain is much broader. In this article the author outlines opportunities and challenges for application of blockchain in VAT. She also analyses in detail what aspects of the VAT legislation and its implementation may be affected by blockchain in the future.

1 INTRODUCTION

Blockchain is best known as the technology behind the popular cryptocurrency bitcoin, but the application of blockchain is much broader. Blockchain is suitable as a means to record transactions and other data. In this article the author explores the potential blockchain has to change the tax landscape, more specifically the VAT landscape. The author outlines where opportunities lie (section 4) and what challenges there are (section 5). Before the author does this, she will discuss the phenomenon of blockchain (section 2) and blockchain-based smart contracts (section 3). She also analyses in detail what aspects of the VAT legislation and its implementation may be affected by blockchain (section 6). She concludes with a final note on the future of blockchain in the area of VAT (section 7).

2 WHAT IS BLOCKCHAIN?

An important feature of blockchain is that it is a distributed ledger. Everyone in the network has the same ledger. As a result, blockchain does not need a central party that we trust and that manages an account, a register etc. for us. Blockchain therefore has the potential to make the trusted intermediaries that we know such as a bank, a notary, an accountant etc. redundant or give them a different role.

There are both public and private blockchains. Public blockchains are accessible to everyone. The only thing a user needs is software and an internet connection. Private blockchains are intended for a certain group of users. If you want to use a blockchain, you need a digital wallet. The fact that we speak of a wallet does not mean that the application of the blockchain is limited to transactions in cash or comparable cryptocurrency. When

you create a wallet, you get two keys, a public key and a private key. The public key is your public address on the blockchain. Someone who wants to reach you via the blockchain must have your public key to reach you. This is a matter of pseudo-anonymity. With a public blockchain, all transactions that have taken place on the blockchain are visible. If another person knows your public key, it can see which transactions you are involved with. Initiatives are being developed that must ensure a complete anonymity via the blockchain. The private key is a security key. It acts as a digital signature when you are involved in transactions. With the private key, you identify yourself as the person authorized to perform these transactions. The public and private key are linked to each other. Vermeend and Smit compare it to a mailbox.¹ To be able to send messages to this mailbox, a user on the blockchain must have access to your public key. When there is a message in this mailbox you are the only one who can open it with your private key.

One of the advantages of blockchain (the author will address this in more detail later) is that transactions are verified by a network instead of a (trusted) party. This means that the majority of participants in the network must agree that a transaction is correct. There are two most used methods for this: proof of work and proof of stake.² The proof of work method is best known because it is used by bitcoin. In this method, so-called 'miners' try to solve a difficult mathematic puzzle independently. The person who solves the puzzle first may add the next block to the blockchain and receives a reward for it, for example in bitcoins from the network or a reward of the person whose transaction (s) has been verified. With proof of stake, the interest that someone has in the

* Partner at the Tax Research Center of BDO Tilburg and professor of indirect taxes at Erasmus University Rotterdam. Email: merckx@law.eur.nl.

¹ S. Vermeend & P. Smit, *Blockchain. De technologie die de wereld radicaal verandert (Blockchain: The Technology That Will Radically Change the World)* 38 and 39 (The Hague: Einstein Books 2017).

² Don Tapscott & Alex Tapscott, *Blockchain Revolution* 32 (Penguin Random House UK 2016) describe some other methods such as proof of activity, proof of capacity and proof of storage.

blockchain is used. The greater the interest the more say someone has in approving the transactions. To obtain an interest, money must be invested. Eventually a block is approved by the majority. When someone tries to add an incorrect transaction to a block and the majority sees this, he is 'penalized' and loses his invested money. A risk in proof of stake is that a small number of parties can manage the entire blockchain. An advantage of proof of stake is that it costs less energy. To solve the mathematical problems, miners need a lot of computers and that costs energy.

In order to guarantee the authenticity of messages or transactions, hashing is used. This is a technique where a message is converted into different numbers and letters. If the message is somewhat adapted, this results in a different combination of numbers and letters. This way any changes made in the message after it was sent can be discovered. A message or transaction also gets a time stamp on the blockchain. With this you can for example show that a certain document existed at that moment.

The biggest advantages of blockchain are:

1. Decentralized. Data is not stored on a central server with a (trusted) party. This means that hackers are less likely to successfully 'attack' a blockchain.
2. Transactions are not controlled by a party, but by a network of participants.
3. Transparency. All transactions are public. After all, all participants have a copy of the general ledger.

The biggest drawbacks of blockchain are:

1. The transaction speed is limited. With bitcoin, for example, it takes ten minutes for a transaction to be validated.³
2. The energy consumption when proof of work is used.
3. The pseudo-anonymity and later probably complete anonymity.
4. The risk that a participant or group of people as a majority gets full control over the blockchain.

3 SMART CONTRACTS

An important application within blockchain technology is smart contracts. The term smart contract is confusing in that it seems to indicate a contract, an agreement between parties. However, it concerns the recording of the agreements made in a contract on the blockchain. After the event mentioned in the contract occurs the 'smart contract' will automatically proceed to implement the related effect. For example, a seller of e-books can settle with his buyers that if the download is completed and received, the agreed payment for the e-book takes place automatically. That way, the seller does not have to wait and see if it is paid after an e-book is downloaded and the buyer does not have to wait and see whether the

seller actually supplies him the e-book after he has paid. One can also think of insurance contracts for farmers that, for example, automatically pay when it has not rained for a whole period. The smart contract can then be linked to a website on which the rainfall is monitored.

4 OPPORTUNITIES

Because blockchain is a very suitable way to record transactions, VAT as a transaction tax in particular comes to mind when discussing potential applications of blockchain technology within tax.⁴ One of the applications of blockchain for tax which is often mentioned is the option to use blockchain to reduce VAT fraud or even prevent it altogether.⁵ A concrete proposal to implement blockchain technology to reduce fraud is from Ainsworth and Shact.⁶ In their proposal they use an already existing system called Digital Invoice Customs Exchange (hereinafter: DICE).⁷ Within this system, in case of cross-border transactions, the buyer, seller and the tax authorities of both countries concerned are aware of the transaction before a formal VAT invoice is issued. There is time for a risk analysis.⁸ With the help of artificial intelligence, transactions with a high risk can be spotted. Suspicious transactions can be delayed or blocked by the tax authorities. In Ainsworth and Shact's proposal, DICE technology is combined with a blockchain solution in which all EU countries participate. They add computers to the network in proportion to their gross national product. Each product or service has its own ledger of transactions, showing who originally owned the property, who the current owner is and in which all intermediary parties are visible. Each verified transaction forms a new block that is added to the ledger and a block can only be added after verification. Verification takes place by all computers in the network. All these computers can perform the aforementioned risk analysis. Because all EU Member States participate in the system, it is possible to map all relevant transaction data.

Ainsworth and Shact admit that with their proposal VAT fraud cannot be resolved completely, but it can be reduced.⁹ In a later publication, Ainsworth,

³ Vermeend & Smit, *supra* n. 1, at 72.

⁴ Cf. PwC, *How Blockchain Technology Could Improve the Tax System 2* (Feb. 2017).

⁵ For example, J. Gruson, *Btw in een Brave New Blockchain World – een introductie (VAT in a Brave New Blockchain World – An Introduction)* (BTW-bulletin 2017/17).

⁶ Richard T. Ainsworth & Andrew Shact, *Blockchain (Distributed Ledger Technology) Solves VAT Fraud* Boston University School of Law, Law & Economics Working Paper No 16-41, 17 Oct. 2016.

⁷ An extensive description of DICE can be found in Richard T. Ainsworth & Musaad Alwohaibi, *Blockchain, Bitcoin and VAT in the GCC: The Missing Trader Example*, Boston University School of Law, Law & Economics Working Paper No. 17-05, 16 Feb. 2017.

⁸ See also Danil Getmantsev, *Electronic VAT Administration System in Ukraine: Comparative Analysis with the European Union*, (5) Int'l VAT Monitor (2018).

⁹ For example, a first link of VAT fraud cannot be detected if the prices are normal and the trading volumes are not exceptionally large, but it is possible to prevent further fraud in that specific chain.

Alwohaibi and Cheetham claim that a combination of the system outlined above with a VAT coins system can prevent VAT fraud altogether.¹⁰ VATcoin is a digital currency like bitcoin. Only the government can convert VATcoins into real money. In the VATcoin's system entrepreneurs do no longer own the VAT in the form of real money. All VATcoins are held in the 'cloud'. According to the authors VATcoins are not sensitive to cyberattacks. If VATcoins are stolen, they are immediately worthless. VATcoins may only be exchanged by the government. A sale or purchase of VATcoins is therefore illegal. In addition, a payment with stolen VATcoins will be refused by the blockchain. It will be immediately clear from where the stolen VATcoins originate. The underlying transaction will be refused, the stolen VATcoins will be cancelled and an audit will be activated.

Van der Bosch, Diederichsen and Demetrius come up with a blockchain solution to combat VAT fraud by labelling payments. The payment of the customer is split into a part remuneration and a part VAT before it reaches the bank account of the supplier.¹¹ The remuneration part is freely available to the supplier. The VAT is automatically transferred from the bank account of the supplier to the tax authorities. When the customer has a right to deduct input tax, this amount is also transferred directly from the bank account of the tax authorities to the bank account of the customer. The system thus proposed is based on smart contracts.¹² Hamilton describes possibilities to simplify reporting and payment of taxes based on blockchain technology. If entrepreneurs record every transaction on the blockchain, it should be possible for tax authorities to get these data out of the blockchain in real time.¹³ Tax authorities can increasingly trust the data that is provided to them.¹⁴ On the other hand, the system can also change behaviour. If there is a greater risk of being caught, taxpayers will behave more compliant.¹⁵

In addition to the possibility to limit VAT fraud, Gruson points to the possibility that smart contracts will automatically carry out real estate transactions and

agreements. He also advocates a blockchain database for Dutch property that facilitates tax due diligence prior to the transfer of real estate.¹⁶ It is also possible that the shared ledger on which blockchain is based makes invoices redundant.¹⁷

The sharing economy poses a challenge for taxation. More specifically for VAT, the question arises whether the parties involved qualify as VAT entrepreneur and whether this qualification as an entrepreneur results in VAT actually being collected. After all, entrepreneurs with limited turnover may be covered by the exemption for small entrepreneurs with the result that no VAT is paid. Blockchain could offer a solution for involving microtransactions in the VAT system because it can simplify the system. This makes it less of a problem to involve small transactions in VAT and the purpose of VAT, a tax on all private consumption, can be better achieved.¹⁸

5 CHALLENGES

New technologies also come with new tax challenges. For example, blockchain and the virtual payment instruments that are based on this technology make it possible to execute transactions anonymously.¹⁹ It can then be difficult, if not impossible, to identify who, for example, the customer of a supply is. This raises issues with regard to the place of supply (is there a B2B or B2C transaction and where does the customer live or where is he established), application of the reverse charge mechanism (is there a customer to whom VAT can be reverse charged?) and the deduction of input tax (in case of a financial service to a customer outside the EU, there is a right to deduct input VAT).

In concrete terms, the Court of Justice already ruled on whether the exchange of legal means of payment in bitcoins and vice versa is a taxable supply for VAT and, if so, whether it is exempt. The Court of Justice held in the Hedqvist judgment that there is an exempt supply.²⁰ Even

¹⁶ Gruson, *supra* n. 5.

¹⁷ Cf. Gijsbert Bulk & Ros Barr, *How Blockchain Could Transform the World of Indirect Tax*, <https://betterworkingworld.ey.com/trust/how-blockchain-could-transform-the-world-of-indirect-tax> (accessed 18 June 2018).

¹⁸ Cf. Pwc, *supra* n. 4, at 1.

¹⁹ Annette Nellen, *Change in Mindset Needed to Move Tax Compliance into the Modern Era* (IBFD Published online 19 May 2017). Lee A. Sheppard, *News Analysis: Nerds and Cops, Part 2: IRS CI Looking for a Few Good Cases* (IBFD 27 Apr. 2018) describes options on how to uncover apparent anonymous transactions with bitcoins. M. Zeegers, *Bitcoin; juridische en fiscale aspecten in beeld (Bitcoin: Legal and Tax Aspects in the Picture)*, WFR 2015/329 explains that even though the blockchain system is anonymous (nearly) all transactions are discoverable, because on blockchain all transactions and addresses are available. It does however take a lot of trouble.

²⁰ CJEU 22 Oct. 2015, C-264/14, ECLI:EU:C:2015:718. Cf. VAT Committee working paper 811 on the VAT treatment of bitcoin, 29 July 2014, taxud.c.1(2014)27772524, VAT Committee working paper 854 on the VAT treatment of bitcoin II, 30 Apr. 2015, taxud.c.1(2015)2066488 en VAT Committee working paper 892 on CJEU case C-264/14 Hedqvist: Bitcoin, 4 Feb. 2016, taxud.c.1(2016)689595.

¹⁰ Richard T. Ainsworth, Musaad Alwohaibi & Mike Cheetham, *VAT Coin: The GCC's Cryptocurrency*, Boston University School of Law, Law & Economics Paper No. 17-04, 31 Aug. 2016.

¹¹ Such a system is also known under the name split payment. See e.g. Deloitte, *Analysis of the Split Payment Mechanism as an Alternative VAT Collection method*. Final Report (2017). Executive Summary, https://ec.europa.eu/taxation_customs/sites/taxation/files/split_payment_report_execsummary_2017_en.pdf.

¹² Tommie van der Bosch, Dolf Diederichsen & Christopher Demetrius, *Blockchain in Global Finance and Tax*, 20(1) *Derivatives & Fin. Instruments* (2018), para. 3.3. Cf. Deloitte, *Blockchain Technology and Its Potential in Taxes* 13 (Dec. 2017).

¹³ Billy Hamilton, *Nevada Bans Local Blockchain Taxes – Just in Case* (IBFD Published online 21 July 2017).

¹⁴ Cf. Pwc, *supra* n. 4, at 1.

¹⁵ *Ibid.*, at 3.

though the fact that bitcoin is not legal tender, the exchange of legal means of payment in bitcoins and vice versa can be considered transactions in banknotes and coins. The question also arises whether the miners supply services and if so to whom. In the author's opinion, miners cannot be regarded as entrepreneurs for VAT. In the first place, a comparison can be drawn with a race for which the winner receives prize money. It follows from the Bastova judgment²¹ that in such a case there is no taxable supply of the participant to the organizer of the competition. Moreover, the question is who would be the customer of the miners' supply. The author does not see any legal relationship pursuant to which there is reciprocal performance between the individual miner and an individual party whose transaction is approved. They do not know each other. The author also does not see such a legal relationship between the network and the miners.²² Even more so, because the network is not an identifiable party. Her conclusion is therefore that the miners do not supply services for VAT and therefore do not qualify as a VAT entrepreneur.

In respect of e-commerce the European Commission and EU Member States will rely strongly on VAT collection by platforms.²³ Blockchain technology has the potential to cut out the intermediary, such as a platform.²⁴ The platform has a function because we cannot trust each other online. Blockchain provides for an opportunity to create this trust without the intermediary. We will have to see whether VAT on e-commerce can still be effectively collected by platforms in the future.

6 TOWARDS A NEW VAT LEGISLATION AND ITS IMPLEMENTATION?

6.1 Introduction

In this last section before the author comes to a conclusion, she addresses the question how the existing VAT legislation can change when blockchain technology becomes common to society, which means that just like the internet it is used by the vast majority of consumers and businesses. The author uses a few starting points. First, that there is still the wish and need to have a VAT as a general consumption tax. After all, the author addresses how the existing VAT legislation can move along with a development such as a blockchain. She does not address which other types of taxes can be levied. This could be the topic of further research. Because of political sensitivity, the author also assumes that reduced VAT rates and exemptions remain

part of the system. In connection with this, she also assumes that the distinction between supplies of goods and supplies of services remains relevant. After all, the exemptions largely apply to services and the application of the VAT rates also depends on whether there is a supply of a good or service. The import of goods is a separate topic for research due to the strong entanglement with customs law and is beyond the scope of this article. In the author's view, research is necessary to map the consequences of blockchain and smart contracts for imports. It must be borne in mind that in case of import not only taxes come into play, but also safety and logistics. Blockchain solutions can be considered in those latter areas as well. In such a research exports of goods needs to be taken into consideration.

In the author's view, blockchain offers two important possibilities that are relevant to assessing the opportunities and challenges of the blockchain technology for VAT:

1. The possibility to record certain data and that it is also clear at what time this data is recorded. This can be done both in a private blockchain that only certain parties have access to and in a public blockchain to which everyone has access.
2. The possibility to make payments automatically via smart contracts, including payment of VAT to the tax authorities and from the tax authorities to the entrepreneur. The author does note here that there are still many legal questions, such as: who sets up these smart contracts, who checks them, are the smart contracts publicly available and how are they secured? If we want to use smart contracts in the future, this kind of topics will have to be arranged very carefully.

In section 6.2 the author addresses the opportunities and challenges when recording data on the blockchain. In section 6.3 the author does the same for smart contracts.

6.2 Data Recording on the Blockchain

Blockchain makes it possible to record certain data that is open to everyone (public blockchain) or a certain group (private blockchain). If every transaction is recorded on the blockchain, the obligation to file VAT returns can be abolished. The same applies for the obligation to issue invoices. The data required for levying VAT can also be saved by the entrepreneur on the blockchain. Here too, the time stamp that can be given to the data and the fact that the past cannot be hidden or rewritten on the blockchain can offer advantages.

EU-wide, the products for which reduced rates apply in different Member States can be included in a public blockchain. Due to the timestamp, in case of changes, it is clear during what period a reduced rate applies to a certain product.

²¹ CJEU 10 Nov. 2016, C-432/15, ECLI:EU:C:2016:855.

²² CJEU 8 Mar. 1988, 102/86, ECLI:EU:C:1988:120 (Apple & Pear Development Council).

²³ Art. 9a of the VAT implementing regulation and the proposed Art. 14a VAT Directive for distance selling of goods. For more information on these provisions the author refers to: Marie Lamensch, *European Union – Rendering Platforms Liable to Collect VAT and Pay VAT on B2C-Imports: A Silver Bullet?*, (2) IVM (2018).

²⁴ Tapscott & Tapscott, *supra* n. 2, at 18.

Blockchain has the potential to play a significant role in international trade. In addition to the solutions mentioned in section 4 targeted at combating VAT fraud in international trade, the technology described where each product or service has its own ledger of transactions, showing who the original owner of the good was, who the current owner is and which parties are the intermediary parties provides great opportunities. Recoding this information on the blockchain, gives insight into the various transactions and movements of the goods to both the parties involved in the supply chain and the tax authorities. By recording the movement of goods on the blockchain, obligations such as the EU Sales Listing and the Intrastat declaration can be abolished. Instead all movements are recorded on the blockchain and can be verified by the (tax) authorities directly. Artificial intelligence might be helpful for verification, because the amount of data will be large.

Recording all transactions in a supply chain on a private blockchain can attribute to the proof that the conditions for an intra-Community supply are met and the exemption can be applied. All parties involved can for example see whether the next supply in the chain is being treated as a domestic supply. Parties can also record the documents relating to their transaction on a private blockchain. In the event the customer picks up the goods himself, the supplier can get access to the CMR consignment note used and he can thus establish the actual arrival of the goods in the Member State of destination. The amount of proof that the tax authorities require from the supplier for the application of the exemption for intra-Community supplies may then also be reduced. Allocation of the intra-Community transport to one of the links in chain transactions can also take place using artificial intelligence. This technology combined with blockchain technology can also make it impossible to apply the exemption for intra-Community supplies to another transaction. The transactions following the intra-Community supplies can thus only be treated as local supplies in the Member State of destination. Preceding transactions can only be treated as local supplies in the Member State of departure. This provides legal certainty to all parties that only one supply in the chain is treated as an intra-Community supply.

Intra-Community acquisitions reported can also be matched with the blockchain to discover mismatches or a smart contract can be used to ensure an automated payment of the VAT due on the intra-Community acquisition. Whether the simplified triangulation scheme can be applied can also be determined using the transactions in the supply chain recorded on the blockchain. If party A treats its supply as intra-Community supply and the subsequent supplies to party B and C, also recorded on the blockchain, show that the conditions have been met the consequences of the simplified triangulation rule can be automatically applied. Artificial intelligence must, of course, be used for this. It is however doubtful whether a

simplified triangulation rule that intends to prevent a VAT registration of B in the Member State of arrival of the goods is still necessary if the payment of VAT takes place automatically. Additions and withdrawals from excise warehouses, customs warehouses and VAT warehouses could be recorded on the blockchain too. Technical solutions could be used that automatically record this on the blockchain, for example when goods have a chip or QR-code. Using this technology, it can also be monitored when goods enter the warehouse, how long they are in the warehouse and when they leave the warehouse. This will provide the entrepreneur with valuable business insights as well.

The VIES system (VAT Information Exchange System), which now contains a database of VAT identification numbers assigned to entrepreneurs, can be replaced by a public blockchain. Apart from the advantages that a decentralized database offers compared to a central database, the author sees in particular an advantage in the time stamp that can be assigned to the blockchain. This makes it possible to see during which period a VAT number has been active. Revocation of VAT numbers with retroactive effect should not be possible.

Blockchain can, in the author's view, make it easier to record and connect the purchase and sale prices of individual goods within the scheme for second hand goods. A simplification such as that of the globalization scheme may no longer be necessary, especially when goods receive a QR code that is recorded on the blockchain together with the purchase price. The same applies for the Tour Operator Margin Scheme (TOMS). Here too VAT is paid on the margin and the blockchain offers a means of recording purchase and selling prices, whereby automated VAT calculation is possible.

If the ins and outs of the company are recorded on the blockchain, in case of a transfer of a going concern the seller can easily provide the acquirer with an insight into the VAT position of the company. This can make a tax due diligence easier. Particularly, because on the blockchain nothing can be concealed and changed as regards the history of the company.

6.3 Smart Contracts

Smart contracts offer the possibility to automatically implement the consequences of certain agreements. The payment of VAT can automatically take place via smart contracts. This may make the MOSS system (Mini One Stop Shop) redundant, where an entrepreneur declares and pays VAT that he owes in different EU Member States in his own Member State (EU entrepreneurs) or a Member State of his choice (non-EU entrepreneur). It is this Member State, the Member State of Identification, that transfers the VAT return and payment to the Member States where VAT is due. If all Member States are connected to the system through which automatic payment of VAT takes place, payments of VAT can be made directly to the different Member States. What's

more the invoice system can be replaced by a cash accounting system when payment of VAT takes place automatically via smart contracts. This means that at the moment the payment is collected by the smart contract, a payment of VAT to the Treasury will also take place.

Using smart contracts to pay the VAT may make the invoice system redundant. Instead the cash accounting system can be applied. When the cash accounting system is applied, there is no need for refunds of irrecoverable VAT if the customer does and will not pay. Audits of requests for refunds are also unnecessary. If a discount is granted afterwards, then a right to a refund might arise for the supplier as well as an obligation to adjust the VAT deducted for the customer. Via a smart contract, this VAT refund and VAT payment can also take place automatically.

If VAT due on intra-Community acquisitions is automatically paid to the tax authorities it is the author's opinion that the special rule for customers that exclusively provide exempt supplies, taxable persons under the flat rate farmer scheme and legal persons/non-taxable person can be abolished. At present, they are obliged to report intra-Community acquisitions only if they acquire goods from other EU Member States for more than EUR 10,000 per year. The reason behind this special rule is that these customers not regularly file VAT returns and reporting intra-Community acquisitions was considered an increase of the administrative burden.²⁵ When smart contracts are used to automatically pay the VAT to the tax authorities the author sees no objection in collecting the VAT due on intra-Community acquisitions with these types of customers. If an entrepreneur/customer uses a VAT identification number for an intra-Community transaction different than the VAT identification number of the Member State of destination of the goods, he now needs to report an intra-Community acquisition in the Member State that assigned this VAT identification number to him. If he can prove that an intra-Community acquisition has been reported in the Member State of arrival of the goods, he may recover the VAT he owes in the Member State that assigned the VAT identification number to him.²⁶ If VAT payment takes place automatically using smart contracts, such a rule is in the author's view no longer necessary. Because all transactions in a supply chain are recorded on the blockchain a non-reported intra-Community acquisition will be detected. The author doubts whether application of the reverse charge rule is still necessary in international trade when VAT payments to the tax authorities take place automatically. To avoid VAT fraud, a reverse charge mechanism may be necessary. This will depend on whether and to what extent blockchain solutions like the ones mentioned in section 4 are implemented successfully to combat VAT fraud.

Like the payment of VAT, the deduction of input tax can also take place automatically via a smart contract. If an entrepreneur does not have a full right to deduct input tax, his provisional deductible proportion must be considered at the moment deduction takes place. Blockchain can also be used for tracking immovable and movable property under the adjustment rules. Currently of course information on adjustments can be found in a taxpayer's VAT administration. Apart from the advantages that blockchain offers as such, the author does not see any specific VAT benefits from using blockchain technology to track immovable and movable property under the adjustment rules. If a taxable persons wants to deduct VAT for a product or service for which there is no right to deduct, because the Member State has implemented a restriction on the right to deduct VAT the VAT deduction can be refused automatically. As with VAT rates, deduction restrictions can be recorded on a public blockchain. Smart contracts can be linked to that public blockchain so that the deduction is automatically refused when there is a product or service for which a deduction limitation applies. If the deduction of input VAT takes place automatically, this can also be used to recover foreign VAT. Directive 2008/9/EC for the refund of foreign VAT may disappear.

If all transactions, B2B, B2C, C2B and C2C were to be recorded in smart contracts, the necessity for a person to qualify as entrepreneur for VAT could perhaps be abandoned and the exemption for small businesses could be abolished. After all, the payment of VAT will automatically take place via the smart contracts and there is no objection to involve parties that have a small volume of transactions in the VAT system. By including all these transactions, the purpose of VAT, a general tax on private consumption, is better achieved. Audits by tax administrations can take place via the blockchain on which the smart contracts have been stored by using artificial intelligence. However, the author doubts whether in the future all transactions will in practice be recorded on the blockchain.²⁷ For example, if cash payments remain part of our economy, these transactions will not be executed automatically via smart contracts. VAT liability can also not be made dependent on the use of smart contracts, because then people who use smart contracts are treated differently than persons who do not use them, while they supply the same goods or services. The author therefore assumes that the interpretation of the concept of taxable person that we currently know and the exemption for small businesses are still necessary for the time being. Abolition of the flat rate farmer scheme is likewise only an option if smart contracts are implemented throughout the whole agricultural industry. In the author's view, the concept of VAT grouping also remains important in a VAT system operating within the world of blockchain.

²⁵ See e.g. Dutch parliament 1991/92, 22 712, n.3, at 13–15.

²⁶ CJEU 22 Apr. 2010, C-536/08 and C-539/08, ECLI:EU:C:2010:217 (joint cases X and Facet).

²⁷ Cf. Jeremy M. Sklaroff, *Smart Contracts and the Cost of Inflexibility*, 166 U. Pa. L. Rev. 263, 2017.

It would be possible to record on the blockchain which persons are part of that VAT group, so that a cross-border application of this concept becomes easier. This can also be recorded in the VIES system, but blockchain has the advantage that this recording of data is decentralized and gets a time stamp. This means that it is always possible to check at which date which person has become part of the VAT group.

Smart contracts can be linked to the public blockchain for VAT rates. By using an algorithm (hard logic) the correct rate can be determined and applied automatically for many products.²⁸ Smart contracts can also take rate changes into account. Where it is still uncertain when a supply will take place, the correct VAT rate can automatically be applied via the smart contract and charged to the customer. Transitional arrangements that often apply to a rate change can also be processed via a smart contract. However, blockchain combined with the algorithm does not provide the option to perform an in-depth legal analysis in order, for example, to determine the applicable VAT rate considering all the nuances that that legislation entails.

In case of a continuous supply, the VAT will become due at the moment that a statement of account is issued or payment takes place or once a year if the Member

State has implemented that rule (Article 64 of the VAT Directive). A smart contract could already pay VAT to the tax authorities based on delivered quantities. This means that the moment at which the VAT is paid no longer depends on the agreements between the parties, which, in the author's opinion, is more in line with the principle of neutrality in VAT.

7 FINALLY

In this article, the author has painted a picture of the impact of blockchain on the VAT legislation and its implementation, without the objective of being exhaustive on this matter. There are undoubtedly more possibilities than the author can imagine now. As the examples show, the author thinks that there are opportunities in particular in the area of international trade and administrative obligations. In particular, smart contracts can be revolutionary in this area. However, many legal issues surrounding smart contracts, such as ownership, maintenance and liability, still need to be worked out. As long as there is no clarity on these matters, effective use of blockchain technology in VAT will not yet be possible. How big the impact of blockchain technology will be and when this impact will be felt, remains to be seen

²⁸ Cf. M. B. A. van Hout, *Rechtsbescherming in het tijdperk van big data (Legal Protection in the Era of Big Data)*, WFR 2017/165, s. 8, Marlies van Eck, *Geautomatiseerde ketenbesluiten & rechtsbescherming (Automated Administrative Chain Decisions & Legal Protection)*, UvT (dissertation) (2018) and Advise from the Dutch Council of State regarding digitalization, 6 Sept. 2018, 2018-0000746654.