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Rule of Law Versus Rule of Code: A Blockchain-Driven Legal World

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Rule of Law Versus Rule of Code: A Blockchain-Driven Legal World

The technological innovation of the bitcoin blockchain network has impacted how we think of the transfer and ownership of information and value. Its use has been demonstrated to fundamentally speed up transactions, reduce costs, remove middlemen and provide transaction transparency. It has also ushered in an era of application platforms that rely on decentralised consensus networks, such as Ethereum. This means that contract terms can now be executed by a computerised protocol with little or no friction between contracting parties. New decentralised models have emerged, such as decentralised governance, autonomous organisations, arbitration and crowdfunding in the form of initial coin offerings (ICOs). The legal sector continues to rethink how the business of law must adapt and optimise for changing client needs, technological advances, cost-effectiveness and efficient delivery of legal services. This paper describes the innovation, business impact and legal treatment to date in order to anticipate how it will affect the legal profession and legal services on a global scale. It is divided into three parts:

Part 1: What is the technological innovation of the blockchain and how does the law treat it?

Part 2: What is the potential impact on business? Will there be new or reshaped blockchain-driven business sectors with new or changed products and services? What are some of the new emerging models?

Part 3: What is the potential impact on the legal profession and legal services? Will there be a shift from human readable law to code: rule of law versus rule of code?

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Part 1: Introduction

Since 2009, when a white paper was authored called *Bitcoin, A Peer-to-Peer Electronic Cash System,*[1] there has been continued debate on bitcoin, what it is, its legality and how it impacts finance. This is because of the white paper's premise that a pure peer-to-peer (P2P) version of cash allows for online payments between parties without the need for banks.[2] This premise is a fundamental re-imagination of the structure of the current finance sector and governing legal regimes. Simply put, this cash system makes us re-evaluate how we think about money and value exchange, whether we are exchanging money, stocks, financial securities, assets or the associated data itself (metadata). Jurisdictions have had varied approaches, but no legal regime anticipated this type of P2P system, now commonly referred to as the bitcoin blockchain network. It offers the potential to remove the artificial barrier between trade and transactions by generating computational proof of transactions in chronological order. The likely effect is a commercial world with transactions conducted and settled instantaneously with a high degree of automation. The technology is immature but carries strikingly innovative features, currently being enhanced by technologists, which are of interest to sector participants. This paper discusses the potential impact of this new technological system on the legal profession and legal services.

Terminology of an immature sector

As interest in the electronic cash system has grown, and the technology sector continues to be developed, regulators and legislators have been challenged to understand the technology and, as a result, have applied varied or inaccurate terminology. In many instances, regulators and legislators have avoided adopting any definitions at all, while at the same time have amended, clarified and/or issued guidance on existing regulatory frameworks to bring business-related activity on the bitcoin blockchain network within scope, as discussed below.

Because this is an emerging area, varying language has been used. Thus far, the tendency of regulators and legislators has been to refer to bitcoin as a 'digital currency' and more often as a 'virtual currency' (VC). Yet, this is regrettable, arguably inappropriate and inapplicable, often leading to numerous and significant misunderstandings. This is because, while virtual currencies are a type of digital currency, not all digital currencies are virtual. Virtual currencies may refer to units in the virtual world of an online game, which have no real-world value. By comparison, bitcoin is a cryptocurrency with real-world value, which continues to peak in trading values.[3] Additionally, the majority of money in modern economies has been in electronic form for some time. For example, less than four per cent of broad money (money supply) balances in the United Kingdom are notes and coins[4] and in the United States this appears to be about ten per cent.[5]

For the purpose of this paper, some basic definitions are provided for clarity:

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1   Satoshi Nakamoto, 'Bitcoin: A Peer-to-Peer Electronic Cash System' (2008), white paper, available at https://bitcoin.org/bitcoin.pdf accessed 20 June 2017.

2   *Ibid*, 1.

3   Bitcoin trading statistics, available at https://blockchain.info/charts/market-price?timespan=all accessed 11 October 2017.

4   John Barrdear and Michael Kumhof, 'Staff Working Paper No 605: The macroeconomics of central bank issued digital currencies', July 2016, p 4, available at www.bankofengland.co.uk/research/Documents/workingpapers/2016/swp605.pdf accessed 20 June 2017.

5   Federal Reserve Statistical Release, 15 June 2017, available at www.federalreserve.gov/releases/H6/20170615/h6.pdf and www.federalreserve.gov/faqs/currency_12773.htm accessed 20 June 2017.

- 'Bitcoin' means a unit of value and, in this context, is similar to gold or a real fiat currency, such as US dollars ($), British pounds sterling (£) or Japanese yen (¥).

- 'Blockchain' is commonly referred to as the technology behind bitcoin. To be accurate, when people say 'the blockchain', they are commonly referring to the bitcoin blockchain network, of which bitcoin, the unit of value or currency, is a feature. However, the bitcoin blockchain is just one type of blockchain. At its simplest level, a blockchain is a corruption-resistant string of ledger entries shared over a network by multiple parties.

- 'Cryptocurrency' means a medium or unit of exchange that uses cryptography as security and is created without an issuer or contract.

- 'Decentralised autonomous organisation' (DAO) means an organisation whose participants communicate with each other via the rule set of a computer network protocol, enabling them to achieve consensus or an agreement on rules and execute or implement the rules. This rule set means the decentralised organisation can be programmed to run autonomously without human involvement. People commonly refer to the widely publicised 2016 DAOhub.org initiative as 'the DAO'.

- 'Distributed ledger' (DL) means any database distributed and shared among all users and synchronised across a network that keeps a record of all transactions using a public ledger, for example, the bitcoin blockchain.

- 'Fintech' means financial technology. It usually refers to new technology and innovation that aims to compete with and disrupt traditional financial methods in the delivery of financial services, such as banking, payments, lending, fundraising and asset management.

- 'Multi-signature' means two or more digital signatures, typically approving or validating an action, for example, a multi-signature transaction.

- 'Peer-to-peer' (P2P) means occurring between parties without an intermediary, such as a financial institution or broker.

- 'Smart contract' is a computer protocol that executes the terms of a contract. It is not a legal contract, but a protocol designed to satisfy common contractual conditions (such as payment terms) and reduce the need for trusted intermediaries.[6] In other words, it is a computer protocol capable of taking data input, processing it through a specified rule set and automatically taking any actions required of it as a result (such as payment) without the need for a third party to govern the process.

The bitcoin blockchain network

The blockchain is a shared cryptographically secured ledger that records and tracks data and value between users in chronological order, creating an immutable record of transactions. In other words, a record of transactions that cannot be changed or tampered with. This is because each new transfer is verified using cryptographic signatures by the decentralised consensus of the users of the network and added to the ledger as a new 'block' in the chain. The entire encrypted chain is publicly viewable, making it totally transparent without revealing personal data. What makes this ledger unique is that it is cryptographically sealed so that no record can be tampered with after it has been added to the ledger, and it is completely distributed so that no single participant has control over it. The blockchain can

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6   Nick Szabo, 'Smart Contracts' (1994), white paper, available at www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/ Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html accessed 12 September 2017.

only be updated by the consensus of a majority of the participants. These key features mitigate the risk of fraud and, perhaps more importantly, remove the need for any centralised coordinated verification process. In this sense, the distributed nature of blockchain could pave the way for significantly reducing the role of one of the main actors in our society: the intermediary. New services, such as Uber and Airbnb, are already doing this. In the context of blockchain, bitcoin is the best-known example, removing the need for any central authority to approve or secure transactions, and enabling trustless, P2P exchanges instead. This renders DL technology one of the most exciting and potentially game-changing innovations since the internet.

In the context of cryptocurrencies, a 'private key' is a secret number (usually a 256-bit number) associated with a deposit wallet that allows bitcoins in that wallet to be spent. However, transactions are not perfectly anonymous – sometimes referred to as 'pseudo-anonymous' – because the time and amount of each transaction is recorded in the blockchain.

What is bitcoin?

Bitcoin is a digital currency issued and transmitted by the P2P bitcoin network. This network hosts what we call the blockchain, a DL where every bitcoin transaction is recorded. The bitcoin network is not owned by anyone; it relies on a collective user base, which runs individual copies of the ledger. This digital money can be used to pay for goods and services and, as with every currency, bitcoin has an exchange rate to allow for conversion into fiat currency.

How it works

Each bitcoin transaction is verified, processed and recorded on the blockchain within a specific 'block'. Instead of account numbers or user details, bitcoin addresses (a unique hash comprised of letters and numbers) are used to represent the source and destination of the transaction. Access to these addresses can be gained by the owner using a secure cryptographic key.

How bitcoin is transferred

Bitcoin does not need any intermediaries to facilitate the transfer of funds. A bitcoin user only needs a bitcoin wallet, which provides a private key and public key. The public key is used by someone to transfer bitcoins to your wallet, while you use the private key to authorise a bitcoin transfer to someone's wallet. When a public key encounters a private key, the transaction is executed.

How bitcoin is created

By following a set of complex mathematical calculations, successful bitcoin miners create a block to the blockchain. Those blocks contain details of part or all of the most recent transactions. When a miner creates a new block, the miner is rewarded with a fixed amount of bitcoin. That is how new bitcoins enter into public circulation.

Difference between public and private keys

The public key can be seen by every bitcoin user. It is the 'address' to which a user can send bitcoin. A private key can only be seen by the owner. It allows a person to send a bitcoin transaction to

someone's public address (key). However, if the private key is lost, the bitcoin associated with the bitcoin address related to that private key will also be lost. Despite this, a private key is almost impossible to hack because this would require an extremely high degree of computer processing. Thus, bitcoin is largely safe from private key compromise.

Chronological record

As aforementioned, transactions are recorded in blocks. They are recorded in a chronological way; this means that it is easy to keep track of every transaction that occurs on the bitcoin network. The attractive part is that, compared with other entities and financial institutions, this record cannot be affected by human behaviour because the transaction is automatically recorded and cannot be modified.

Mathematically controlled supply and limitation of bitcoin number

Bitcoin creation is mathematically controlled in a way that the supply of bitcoin grows at a limited rate. In fact, the number of bitcoin rewarded when solving a new block is automatically divided by two every 210,000 blocks. So, if the reward is 25 bitcoins, it will decrease to 12.5 when this 'limit' is attained. This voluntary limitation means that the number of bitcoin in circulation will never outrun 21 million and bitcoin will never drop in value because of excessive supply.

Jurisdictional treatment

No jurisdiction has officially recognised bitcoin as legal tender. Apart from its non-legal tender status, at best, the legal treatment of bitcoin across the globe is varied and severely fragmented.[7] Very few regulators have positively affirmed that the use of bitcoin is lawful activity and the majority have either, issued warnings about its use between 2013 and 2015,[8] or remained silent. Subsequently, the regulatory attitude appears to have shifted; Japan is a recent example which, effective July 2017, recognises bitcoin and VC as 'a means of payment'.[9] Central banks worldwide have expressly recognised the beneficial attributes of the blockchain (eg, reduced transaction costs, faster transaction speed and financial inclusion), and their interest in exploring its attributes, as discussed later on.

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7   Gabrielle M Patrick, 'Bitcoin, a traveller's risk or reward?' (2014) Travel Law Quarterly, 171.

8   Eg, Banco de México press release (10 March 2014) (in Spanish), available at www.banxico.org.mx/informacion-para-la-prensa/comunicados/miscelaneos/boletines/%7B5D9E200E-2316-A4B8-92A9-3A5F74938B87%7D.pdf; Central Bank of Kenya public notice, 'Caution to the public on virtual currencies such as bitcoin' (December 2015), available at www.centralbank.go.ke/images/docs/media/Public_Notice_on_virtual_currencies_such_as_Bitcoin.pdf; European Banking Authority, 'Warning to consumers on virtual currencies' (12 December 2013), available at www.eba.europa.eu/documents/10180/598344/EBA+Warning+on+Virtual+Currencies.pdf; Banque de France, 'The dangers linked to the emergence of virtual currencies: the example of bitcoins' (in French) Focus No 10 (5 December 2013), available at https://publications.banque-france.fr/sites/default/files/medias/documents/focus-10_2013-12-05_fr.pdf; Bank of India, 'RBI cautions users of Virtual Currencies against Risks' (24 December 2013), available at www.scribd.com/document/193633455/Reserve-Bank-of-India-Statement-on-Bitcoin-Dec-2013; Banque du Liban, 'Notice No 900 Risks related to Electronic Money' (19 December 2013) (in Arabic), available at www.bdl.gov.lb/news/more/5/111/65; Bangko Sentral NG Pilipinas (BSP), 'Warning Advisory on Virtual Currencies' (6 March 2014), available at www.bsp.gov.ph/publications/media.asp?id=3377; Central Bank of the Republic of China, 'Bitcoin Is Not Real Currency; Accepters Please Look to the Risks' (30 December 2013) (in Chinese), available at www.cbc.gov.tw/ct.asp?xItem=43531&ctNode=302; US Securities and Exchange Commission (SEC), 'Investor Alert: Bitcoin and other virtual currency-related investments' (7 May 2014), available at www.sec.gov/oiea/investor-alerts-bulletins/investoralertsia_bitcoin.html; Bank Negara Malaysia, 'Statement on Bitcoin' (2 January 2014), available at www.bnm.gov.my/index.php?ch=en_announcement&pg=en_announcement&ac=49&lang=en; MoneySense, 'Initial Coin Offerings, Digital Tokens and Virtual Currencies', available at www.mas.gov.sg/moneysense/understanding-financial-products/investments/consumer-alerts/virtual-currencies.aspx; South African Reserve Bank, 'Position Paper on Virtual Currencies' (3 December 2014), available at www.resbank.co.za/RegulationAndSupervision/NationalPaymentSystem(NPS)/Legal/Documents/Position%20Paper/Virtual%20Currencies%20Position%20Paper%20%20Final_02of2014.pdf; The State Bank of Vietnam 'Press release on bitcoins and other virtual currencies', available at www.sbv.gov.vn/webcenter/ShowProperty?nodeId=/UCMServer/CNTHWEBAP0116211755916//idcPrimaryFile&revision=latestreleased; 'Statement of Bank Indonesia Related To Bitcoin and Other Virtual Currency' (6 February 2014), available at www.bi.go.id/en/ruang-media/siaran-pers/Pages/SP_160614.aspx; 'Superintendencia Financiera de Colombia carta circular 29', (26 March 2014) (in Spanish), available at www.superfinanciera.gov.co/jsp/loader.jsf?lServicio=Publicaciones&lTipo=publicaciones&lFuncion=loadContenidoPublicacion&id=10082781; Central Bank of Nigeria, 'Circular to Banks and Other Financial Institutions on Virtual Currency Operations in Nigeria' (20 January 2017), available at www.cbn.gov.ng/Out/2017/FPRD/AML%20January%202017%20Circular%20to%20FIs%20on%20Virtual%20Currency.pdf all accessed 20 June 2017.

9   Revised Enforcement Order of the Consumption Tax Act of Japan.

Only a handful of jurisdictions have incorporated bitcoin into their legal regimes. This incorporation is primarily due to tax or money laundering concerns, although we are beginning to see legal incorporation driven by other motivations, such as efficient payments in the finance and gaming sectors. The fragmented approach is especially highlighted in the US, where bitcoin is viewed and treated differently by federal regulatory authorities, the tax authority and the courts. Overall, the global legal and regulatory landscape has been inconsistent, piecemeal and reactionary in order to prevent criminal abuse of the technology.

The general regulatory approach taken so far has been to regulate:

- indirectly by virtue of existing laws and regulations or amend them to extend their reach to bitcoin-driven business;

- directly through stand-alone bitcoin-specific regulations although, to date, the US state of New York and Japan are the only jurisdictions to do this;

- the transmission of value, meaning bitcoin as a unit of value (eg, the exchange of fiat currency into bitcoin and vice versa, or the sale of bitcoin denominated investment contracts), and take a hands-off approach to what is commonly referred to as 'the technology underlying bitcoin'; however, this approach is problematic because the two are intertwined, and the sector, while compelling, is new and being developed, so there is ongoing discussion on what type of service providers should be regulated; and

- avoid legal definitions and/or standalone bitcoin-specific regulations at this time in preference of an investigatory period to understand how the technology works for the purposes of regulation and use (the development of a central bank's own cryptocurrency or blockchain).

Bitcoin-specific regulatory frameworks

The only jurisdictions to effect a bitcoin-specific financial services licensing regime are Japan and the US state of New York.

New York effected its BitLicense Regulatory Framework in 2015 (the 'NY BitLicense Regulations') so that bitcoin business activity in that state must be licensed.[10] Only two companies have been granted a BitLicense in New York.[11] A few months after the NY BitLicense Regulations were finalised, the Conference State Bank of Supervisors (the nationwide organisation of US state banking regulators) issued a Model Regulatory Framework to promote consistent regulation across US states.[12] There is no indication that any US state has adopted this model.

California's AB-1326 Digital Currency Bill (the 'California BitLicense Bill')[13] was introduced to the California State Assembly in February 2015. It proposed a Virtual Currency Act that would require licensing of VC businesses. The effect of the California BitLicense Bill would be that VC businesses would have to meet licensing and capital requirements, similar to the NY BitLicense approach, and would be brought under California's Money Transmission Act and Financial Code, meaning that

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10 'Title 23. Department of Financial Services: Chapter I. Regulations of the Superintendent of Financial Services: Part 200. Virtual Currencies', available at www.dfs.ny.gov/legal/regulations/adoptions/dfsp200t.pdf accessed 11 October 2017.

11 Department of Financial Services, 'Press release: NYDFS announces approval of first BitLicense application from a virtual currency firm' (22 September 2015), available at www.dfs.ny.gov/about/press/pr1509221.htm accessed 20 June 2017.

12 Conference of State Bank Supervisors, 'State Regulatory Requirements for Virtual Currency Activities: CSBS Model Regulatory Framework' (15 September 2015), available at www.csbs.org/regulatory/ep/Documents/CSBS-Model-Regulatory-Framework(September%2015%202015).pdf accessed 20 June 2017.

13 California AB-1326 Bill, Digital Currency, available at https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB1326 accessed 20 June 2017.

these businesses would have to meet anti-money laundering (AML) requirements as applicable. However, the bill failed to pass by the stipulated deadline and was ordered an inactive file at the request of sponsor Senator Mitchell,[14] meaning that it can be reactivated at a later date but did not pass into law.

The 2016 Florida ruling in *Florida v Espinoza*[15] highlights the absence of bitcoin-specific regulation and the way that bitcoin has forced the issue of updating vague and archaic legislation. By a July 2016 ruling,[16] Miami-Dade District Circuit Judge Teresa Mary Pooler highlighted the absence of bitcoin-specific regulation and legal definition. She also opined on the challenges of trying to fit this new technology into the existing Florida statutory schemes of money services business (MSB) is like trying to fit a 'square peg into a round hole'[17] compared to businesses like Western Union, which clearly fall under Florida's MSB laws. The criminal case centred on the questions of whether the defendant was operating an unlicensed money transmission business and violated Florida's AML laws when he was told by the buyer that the bitcoin would be used to buy stolen credit cards.[18]

The European Central Bank (ECB) stated in 2015 that, due to the newness of bitcoin use, which is moving in different areas, 'it would be too early to try to make new tailor-made legislation'.[19] Yet, in August 2016, the European Banking Authority (EBA) proposed that a bitcoin-specific regulatory framework should be developed, but that this would probably take several years to formulate and transpose into law. The EBA issued its opinion on the European Union Commission's proposal to bring virtual currencies under the scope of the AML Directive.[20] This opinion addressed the July 2016 EU Commission's proposals for amendments to the AML Directive ('4AMLD'),[21] including proposals to bring custodian wallet providers and bitcoin exchanges within the scope of the AMLD as obliged entities. The EBA suggested that a separate regulatory regime or far-reaching amendments to existing EU legislation (eg, the revised Payment Services Directive ('PSD2'))[22] would be needed to bring bitcoin transactions into the scope of the EU's financial sector legislative framework. However, this will likely take several years to develop, consult, finalise and transpose into law.[23]

Effective April 2017, Japan implemented its bitcoin-specific financial services licensing regime. The revised Payment Services Act of Japan,[24] together with relevant regulations, are collectively referred to as Japan's 'VC Regulations'.[25] These VC Regulations represent a significant legal development in Japan because, in addition to defining VC and requiring regulatory supervision of exchanges, they also introduce capital, cybersecurity, operational, employee training and audit requirements.

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14   California AB-1326 Bill, Digital Currency, Status, available at https://leginfo.legislature.ca.gov/faces/billStatusClient.xhtml?bill_id=201520160AB1326, accessed 17 August 2017.

15   *Florida v Espinoza,* Case No FL14-2923 (Fla 11th Cir Ct) (22 July 2016).

16   *Ibid* at 6.

17   *Ibid.*

18   Florida Money Laundering Act, Fla Stat s 896.101(5)(a) and (b).

19   ECB, 'Virtual currency schemes – a further analysis' (February 2015), available at www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf accessed 17 August 2017.

20   Opinion on the European Banking Authority on the EU Commission's proposal to bring virtual currencies into the scope of Directive (EU) 2015/849 (4AMLD).

21   Directive (EU) 2015/849 of the European Parliament and of the Council of 20 May 2015 on the prevention of the use of the financial system for the purposes of money laundering or terrorist financing, amending Regulation (EU) No 648/2012 of the European Parliament and of the Council, and repealing Directive 2005/60/EC of the European Parliament and of the Council and Commission Directive 2006/70/EC.

22   Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC.

23   See n 19 above, at para 19.

24   No 59 of 2009.

25   Revised Order for the Enforcement of Payment Services Act, the Cabinet Office Ordinance on Virtual Currency Exchange Service Providers issued by the Financial Services Agency of Japan and Guidelines Relating to Virtual Currency Exchange Providers issued by the Financial Services Agency of Japan.

Classification by tax and gaming authorities

Tax authorities such as the US Internal Revenue Service (IRS) treat bitcoin as property,[26] whereas the Inland Revenue Authority of Singapore treats the supply of bitcoin as the supply of services and not as money or a currency.[27] The Canada Revenue Agency refers to bitcoin as digital currency that can be bought and sold like a commodity.[28] Some jurisdictions are in the process of incorporating bitcoin into their regimes primarily for purposes of taxation or AML regulation. A recent example is the May 2016 Australian government consultation to address the treatment of digital currency under Goods and Services Tax (GST), including defining bitcoin and other digital currencies.[29]

At the same time, in 2016, the Isle of Man conducted a consultation with the e-gaming sector on proposed secondary legislative changes (Gambling Regulations Package 2016) to allow bitcoin and other virtual currencies to be accepted as gaming deposits as if they were cash.[30] The initial Registration and Accounts Regulations 2008 (SD283/08) only allowed gaming licensees to accept deposits of money. However, the Isle of Man's Gaming Supervision Commission proposed that a 'deposit of money' be expanded to include money or 'money's worth' to include bitcoin deposits. These proposed changes were subsequently adopted by virtue of the Isle of Man's Online Gambling (Amendments) Regulations 2016.[31] By the revised regulations, the meaning of 'having a value in money's worth' was expanded to include things such as bitcoin or other cryptocurrencies, which are treated, for the purposes of online gaming, as if they exist in the natural world and have a value.[32] This is similar to the UK's approach, where the UK Gambling Commission's (UKGC) position that bitcoin is not money, but 'of money's worth' under the Gambling Act 2005, which requires operators to be licensed. In 2015, this prompted the UKGC to contact several website operators whose activity was deemed illegal because they offered gaming facilities using bitcoin and were unlicensed by the commission. Bitcoin is viewed as a cash equivalent that its gaming licensees could accept as a payment method.[33] New and amended licence conditions and codes of practice issued by the UKGC effective April 2017 state:

> 'Licence condition 5.1.1
>
> Licensees, as part of their internal controls and financial accounting systems, must implement appropriate policies and procedures concerning the usage of cash and cash equivalents (eg bankers drafts, cheques and debit cards and digital currencies) by customers, designed to minimise the risk of crimes such as money laundering, to avoid the giving of illicit credit to customers and to provide assurance that gambling activities are being conducted in a manner which promotes the licensing objectives.'[34]

26   'IRS Virtual Currency Guidance : Virtual Currency Is Treated as Property for U.S. Federal Tax Purposes; General Rules for Property Transactions Apply' (Internal Revenue Service, IR-2014-36, 25 March 2014), available at www.irs.gov/uac/newsroom/irs-virtual-currency-guidance accessed 20 June 2017.

27   Inland Revenue Authority of Singapore, 'Sale of Virtual Currency', available at www.iras.gov.sg/irashome/GST/GST-registered-businesses/Specific-business-sectors/e-Commerce/#title5 accessed 20 June 2017.

28   Canada Revenue Agency, 'What you should know about digital currency' (2013), available at www.cra-arc.gc.ca/nwsrm/fctshts/2013/m11/fs131105-eng.html accessed 20 June 2017.

29   Australian government, 'GST treatment of digital currency: Discussion Paper' (May 2016), available at https://bravenewcoin.com/assets/Industry-Reports-2016/GST-treatment-of-digital-currency.pdf accessed 20 June 2017.

30   Isle of Man's Gambling Regulations Package 2016: Consultation with Manx e-Gaming sector on proposed regulatory changes, available at www.gov.im/lib/docs/gambling/egamingsectorconsultation.pdf accessed 20 June 2017.

31   SD No 2016/0341, reg 11.

32   *Ibid.*

33   iGamingBusiness, 'The UKGC issues licence warning to Bitcoin gaming operators', www.igamingbusiness.com/news/ukgc-issues-licence-warning-bitcoin-gaming-operators accessed 12 September 2017.

34   UKGC, 'Licence conditions and codes of practice: January 2017, In effect from 6 April 2017', available at http://live-gamblecom.cloud.contensis.com/PDF/LCCP/Licence-conditions-and-codes-of-practice.pdf accessed 20 June 2017.

By comparison, the legal status of bitcoin in the gaming sector in the US remains unclear, especially in the context of years of uncertainty of the US legal treatment of online gambling. Since the enactment of the federal online gaming law in 2006, the Unlawful Internet Gambling Enforcement Act of 2006 (the 'UIGEA'),[35] there has been a significant lack of clarity on online gaming activity in several US states. The US Federal Act does not prohibit online gaming itself, but acceptance of any financial instrument for unlawful internet gambling.[36] Unlawful internet gambling is defined as betting or wagering activity that is unlawful under any federal or state law.[37] The lack of clarity on the application of the Act, its conflict with other US federal laws – namely The Interstate Wire Act of 1961[38] – and what activity is a violation of US federal and states statutes has prompted several legal opinions on the legality of financial institutions processing internet gaming payments. This notably includes the US Department of Justice[39] and the Office of the Attorney General of New Jersey.[40] Yet, some states have taken a clear position. For example, the 2015 criminal case of the *State of Nevada v Micon*[41] was described by Nevada's Attorney General Office as a 'first-of-its-kind prosecution'[42] being both Nevada's first state-level internet gaming prosecution and criminal prosecution of an illegal internet poker site using bitcoin as currency.[43] In that case, Micon was criminally indicted[44] and pleaded guilty to operating an unlicensed interactive gaming website, a category B felony, which accepted online wagers in the form of bitcoin.[45]

By comparison, the Oregon Racing Commission has approved an online horse betting model that allows its users to place bets using bitcoin. Horse betting is an exception under the definition of unlawful internet gambling under the UIGEA,[46] meaning that any horse racing gaming activity allowed a state level in the US falls outside the scope of the UIGEA. DerbyJackpot.com has been licensed as an affiliate company of a multijurisdictional account-wagering hub, licensed in the state of Oregon, and operated and regulated by the Oregon Racing Commission. No action has been taken against the website or hub licensee.

Legislative definition

There is little legislation anywhere that defines bitcoin. Since 2012, when legislators, policy-makers and regulators began to pay attention to bitcoin, they have struggled to understand it and fit it into existing legislative and regulatory frameworks. A lack of common vocabulary persists where inappropriate and inconsistent terminology has been used across the globe, which is reflected in the lack of legislative definition.

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35   31 US Code, ss 5361–5367.

36   *Ibid* at s 5363.

37   *Ibid* at s 5362 (1)(10).

38   18 US Code 1084.

39   Virginia A Seitz, 'Memorandum Opinion for the Assistant Attorney General, Criminal Division: Whether Proposals by Illinois and New York to Use the Internet and Out-of-State Transaction Processors to Sell Lottery Tickets to In-State Adults Violate the Wire Act Opinions of the Office of Legal Counsel' (2011) Vol 35, 3–12.

40   New Jersey Attorney General Opinion – Internet Gaming Payment Processing, dated 15 November 2013, 1–5.

41   8th JD C-15-307604-1.

42   'Attorney General Laxalt Announces Guilty Plea Of Las Vegas Man For Operating An Unlicensed Interactive Gaming Website', press release, available at http://ag.nv.gov/News/PR/2015/Attorney_General_Laxalt_Announces_Guilty_Plea_of_Las_Vegas_Man_for_Operating_an_Unlicensed_Interactive_Gaming_Website accessed 17 August 2017.

43   *Ibid.*

44   *State of Nevada v Micon* 8th JD C-15-307604-1; Criminal Complaint dated 25 April 2015.

45   *Ibid*, Guilty Plea Agreement dated and filed 6 July 2015, available at http://ag.nv.gov/uploadedFiles/agnvgov/Content/News/PR/PR_Docs/2015/2015-07-06_MiconPlea.pdf accessed 17 August 2017.

46   The Unlawful Internet Gambling Enforcement Act 31 US Code ss 5362 (10)(D).

In March 2013, the US Financial Crimes Enforcement Network (FinCEN) issued guidance intended to clarify the application of US AML laws on bitcoin and other cryptocurrencies ('2013 FinCEN Guidance'). FinCEN is the bureau of the US Department of the Treasury responsible for enforcing the US Bank Secrecy Act. The Act is the most comprehensive US Federal AML statute. FinCEN issued guidance on the Application of FinCEN Regulations to Persons Administering, Exchanging, or Using Virtual Currencies.[47] FinCEN compared the meaning of currency versus VC as defined by the Bank Secrecy Act, but did not define bitcoin itself, merely describing it as a medium of exchange:

> 'In contrast to real currency, "virtual currency" is a medium of exchange that operates like a currency in some environments, but does not have all the attributes of real currency. In particular, virtual currency does not have legal tender status in any jurisdiction.'[48]

However, the FinCEN regulatory guidance does not constitute a legal or legislative definition.

The NY BitLicense Regulations define 'Virtual Currency' and 'Virtual Currency Business'[49] as:

> '(p) *Virtual Currency* means any type of digital unit that is used as a medium of exchange or a form of digitally stored value. Virtual Currency shall be broadly construed to include digital units of exchange that (i) have a centralized repository or administrator; (ii) are decentralized and have no centralized repository or administrator; or (iii) may be created or obtained by computing or manufacturing effort. Virtual Currency shall not be construed to include any of the following:

> (1) digital units that (i) are used solely within online gaming platforms, (ii) have no market or application outside of those gaming platforms, (iii) cannot be converted into, or redeemed for, Fiat Currency or Virtual Currency, and (iv) may or may not be redeemable for real-world goods, services, discounts, or purchases.

> (2) digital units that can be redeemed for goods, services, discounts, or purchases as part of a customer affinity or rewards program with the issuer and/or other designated merchants or can be redeemed for digital units in another customer affinity or rewards program, but cannot be converted into, or redeemed for, Fiat Currency or Virtual Currency; or

> (3) digital units used as part of Prepaid Cards;

> (q) *Virtual Currency Business Activity* means the conduct of any one of the following types of activities involving New York or a New York Resident:

> (1) receiving Virtual Currency for Transmission or Transmitting Virtual Currency, except where the transaction is undertaken for non-financial purposes and does not involve the transfer of more than a nominal amount of Virtual Currency;

> (2) storing, holding, or maintaining custody or control of Virtual Currency on behalf of others;

> (3) buying and selling Virtual Currency as a customer business;

> (4) performing Exchange Services as a customer business; or

> (5) controlling, administering, or issuing a Virtual Currency.

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47   FIN-2013-G001, Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies (18 March 2013), available at www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf accessed 20 June 2017.

48   *Ibid.*

49   Title 23, Department of Financial Services Chapter I, Regulations of the Superintendent of Financial Services Part 200, Virtual Currencies s 202(p) and (q), respectively.

The development and dissemination of software in and of itself does not constitute Virtual Currency Business Activity.'

Defining bitcoin under the NY BitLicense Regulations was challenged in *Chino v The Department Of Financial Services*.[50] Chino, a New York resident and bitcoin entrepreneur, challenged the authority of New York's Department of Financial Services (NY DFS) to define VC and the definition itself. Chino's argument was two-fold. First, that the NY DFS was overreaching its authority to regulate and define since this required an express mandate from the New York State Legislature. Second, that the NY DFS drafted the definition arbitrarily, without scientific basis or research, and it was riddled with loopholes based on this lack of understanding. While the NY BitLicense Regulations provided, internationally, recognition by a respected supervisory authority of the existence and potential growth of a new financial services sector, and regulatory certainty where none existed prior, the two main arguments put forward by Chino encapsulate the challenges of the legal definition of bitcoin. That is to say, there has been a challenge by those formulating the legal rules to understand the technology and create rules that are not premature, vague or over burdensome, but are still in the interests of integrity of financial systems. Chino's claim was dismissed because it was made during the public comment period for the draft regulations and, as such, was premature.[51] However, since Chino's challenge and subsequent public comment, the 'virtual currency' definition was amended and the NY BitLicense Regulations finalised. The NY DFS recognised the challenge by public comment on vagueness and broadness of the then proposed definition leading to its change in definition:

'Many comments requested clarification over who is, and is not, required to obtain a virtual currency license. Several of those commenters requested that the Department specify that certain activities, such as software development, non-financial uses of virtual currency technology, and investment in virtual currency, and certain programs, such as gift cards and customer loyalty programs, are exempt from the regulation. The Department has revised the definitions of virtual currency and virtual currency business activity accordingly to exclude certain activities and programs. In particular, the Department has clarified that virtual currency business activity does not include transactions that are undertaken for nonfinancial purposes and that do not involve the transfer of more than a nominal amount of virtual currency, and that virtual currency does not include digital units used in gift cards. The Department has also revised the regulation to clarify that the development and dissemination of software in and of itself does not constitute virtual currency business activity. (Section 200.2)'[52]

California BitLicense Bill's Senate Floor Analysis highlights the absence of consensus on a legal definition of VCs while proposing its own definitions of VC as 'any type of digital unit that is used as a medium of exchange or a form of digitally stored value'[53] and of a VC business as 'maintaining full custody or control of virtual currency in California on behalf of others'.[54] As indicated previously, the

50   *Chino v The Department Of Financial Services*; and Benjamin Lawsky In His Official Capacity As Superintendent Of The New York State Department Of Financial Services, # 2015-049-021, Claim No 124835, Index # 101880-15, Motion No M-85707.

51   *Ibid*, Decision dated 16 March 2015.

52   Rule Making Activities, NYS Register/25 February 2015, 18 https://docs.dos.ny.gov/info/register/2015/feb25/pdf/rulemaking.pdf accessed 27 June 2017

53   See n 13 above, s 3.

54   Senate Rules Committee, 'California BitLicense Bill's Assembly Third Reading Analysis', 5, available at https://trackbill.com/s3/bills/CA/2015/AB/1326/summaries/senate-floor-analyses.pdf accessed 27 June 2017.

VC terminology is not ideal. Further, while business licensing requirements on the basis of custody or control of bitcoin or other cryptocurrencies may be appropriate, a broad sweeping legislative definition as proposed in the California BitLicense Bill is over-simplistic and problematic because, as noted in the Bill's Third Reading, a sweeping definition of 'custody or control' can be a challenging concept to interpret when multiple parties are required to independently effect a transaction before it can be authorised.[55]

In May 2016, Japan amended its laws to include definitions of 'virtual currency' and 'virtual currency exchange services'. An Act to Partially Amend the Banking Act, etc for the Purpose of Responding to the Changing Environment Due to the Development of Information and Communication Technologies amends the Payment Services Act and the Act on Prevention of Transfer of Criminal Proceeds and will come into force as specified by the cabinet order but not more than a year after promulgation. 'Virtual currency' is defined as:

'(i) proprietary value that may be used to pay an unspecified person the price of any goods purchased or borrowed or any services provided and may be sold to or purchased from an unspecified person (limited to that recorded on electronic or other devices by electronic means and excluding Japanese and other foreign currencies and currency denominated assets; the same applies in the following item) and that may be transferred using an electronic data processing system; or

(ii) proprietary value that may be exchanged reciprocally for proprietary value specified in the preceding item with an unspecified person and that may be transferred using an electronic data processing system.'[56]

'Virtual currency exchange services' is defined as:

'any of the following acts carried out as a business:

(i) sale/purchase of Virtual Currency or exchange for other Virtual Currency;

(ii) intermediary, agency or delegation for the acts listed in (i) above; or

(iii) management of users' money or Virtual Currency in connection with its acts listed in (i) and (ii).'[57]

Notwithstanding the above, most jurisdictions remain silent on the legal definition of bitcoin and have avoided legislative or regulatory definition thus far. Examples discussed below are the recent 2016 law passed in Israel for the regulation of financial services, the 2014 AML law passed in Canada and the collection of US federal administrative rulings, federal guidance and state case law from 2013 to date.

In July 2016, the Knesset, Israel's Parliament, approved the Law for Supervision of Regulated Financial Services. Under this new law, 'virtual currency'[58] is classified as a financial instrument that requires a license in order to be traded, but the term itself it not defined by the law.

In 2014, Canada amended its Proceeds of Crime (Money Laundering) and Terrorist Financing Act of

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55   *Ibid.*

56   Takashi Nakazaki and Ken Kawai, 'Development of Legal Framework for Virtual Currencies in Japan' (Financial Services & Transactions Group Newsletter, April 2016), available at www.amt-law.com/pdf/bulletins2_pdf/160425.pdf accessed 27 June 2017.

57   *Ibid*, 2.

58   Law for Supervision of Regulated Financial Services, Section 1(7)(7) (in Hebrew), available at http://fs.knesset.gov.il//20/law/20_ls2_pb_345485.pdf accessed 27 June 2017.

2000^{59} to include within the meaning of a MSB 'dealing in virtual currency'[60] and the scope of AML requirements. Yet, the term 'dealing in virtual currency'[61] was not defined by the Act or regulation, and the amendments are not yet in force.[62]

Courts have recognised the challenge of defining bitcoin where there is an absence of a frame of reference, far less a legislative definition. In *Florida v Espinoza*,[63] Judge Pooler noted the absence of a legislative definition of bitcoin, ruling that it was property[64] and not money.[65] She refused to punish an individual selling bitcoin to undercover law enforcement looking to make a case, and where the AML statute was so vaguely written, even legal professionals could not find a singular meaning. She ruled that Florida's MSB law was vague and did not properly define what constitutes money, and Florida's AML laws were unclear as to whether the defendant had the requisite criminal intent.[66] She stated: '[n]othing in our frame of references allows us to define or legally describe bitcoin.'[67] This ruling is currently under appeal[68] and may prompt state legislation accordingly.

Bitcoin's status and treatment: legislation versus regulatory guidance versus case law

The only consistent approach to legal status so far is that no jurisdiction recognises bitcoin as legal tender. The single element of consistency concerning legal status is that no jurisdiction on an international level has yet recognised bitcoin as legal tender. Aside from that, jurisdictions vary greatly in their treatment of bitcoin.

This differing treatment is particularly evident in the US, where different federal regulators and law enforcement (Securities Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC), FinCEN) have adopted different classifications of bitcoin under US federal laws, with federal and state courts differing in their rulings. Moreover, various approaches have emerged as the US federal and state regulators have been forced by the use of bitcoin to address their MSB frameworks on both a federal and state level. In many states, MSB laws are antiquated or in some instances non-existent, so that perhaps the US is the best example of how differing treatments have emerged in one country by different arms in grappling to fit bitcoin under a governing AML framework.

The 2013 FinCEN Guidance left many questions open as to the application of US federal AML law and the Banking Secrecy Act to different activities in the bitcoin or DL technology ecosystem.[69] Subsequently, FinCEN has made several administrative rulings to clarify different aspects of the sector activities, such as bitcoin mining and trading, and what activity constitutes money

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59   SC 2000, c 17.

60   *Ibid*, Amendments Not Yet in Force: 256 (2) para 5(h), 294 (1) para 73(1), Parliament of Canada, available at at www.parl.ca/LegisInfo/BillDetails.aspx?billId=6483626&Language=E&Mode=1&View=6 accessed 27 June 2017.

61   Ibid, 256(2) para 5(h), 294(1) para 73(1).

62   Financial Transactions and Reports Analysis Centre of Canada, FINTRAC policy interpretations, available at www.fintrac-canafe.gc.ca/guidance-directives/overview-apercu/FINS/1-eng.asp accessed 27 June 2017.

63   *Florida v Espinoza*, Case No FL14-2923 (Fla 11th Cir Ct) (22 July 2016).

64   *Ibid*, Order Granting Defendant's Motion To Dismiss dated 22 July 2016, 7, available at www.miamiherald.com/latest-news/article91701087.ece/BINARY/Read%20the%20ruling%20(.PDF) accessed 23 July 2017.

65   *Ibid*, 6.

66   *Ibid*, 7.

67   *Ibid*, 5.

68   *Ibid*, *Florida v Espinoza*, Appellate Court Case Number #3D16-1860.

69   *Ibid.*

transmission or an MSB.[70]

The 2016 Florida state ruling in *Florida v Espinoza*,[71] whereby Judge Pooler ruled that bitcoin was property and not money,[72] contrasts with the 2014 US federal ruling in *United States v Faiella, aka 'BTCKING', and Charlie Shrem*,[73] the first notable US federal prosecution for operating an unlicensed bitcoin MSB resulting in custodial sentences for the defendants. In that case, District Judge Jed S Rakoff ruled that bitcoin clearly qualifies as 'money' or 'funds' under plain-meaning definitions.[74] Judge Rakoff cited the US SEC case of *SEC v Shavers*,[75] where the SEC charged Shavers with running a bitcoin-denominated Ponzi scheme. In that case, Federal Judge Amos Mazzant ruled that 'bitcoin is a currency or form of money'[76] and agreed with the SEC that the bitcoin-denominated offered by Shavers 'met the definition of an investment contract under US federal law'[77] and, as such, are securities.[78]

Differing treatment is also evident in the EU. The German Federal Financial Supervisory Agency ('BaFin') has deemed bitcoin a type of financial instrument known as a unit of account,[79] whereas the Bank of Finland has publicly stated that it is not a payment instrument or currency and more comparable to a commodity,[80] whereas the Central Bank of Slovenia states that it is not a financial instrument[81] and the Dutch central bank, De Nederlandsche Bank (DNB), has stated that bitcoin fails 'to fully fulfil the three functions of money: medium of exchange, store of value and unit of account'.[82] The latter classification by DNB takes its cue from the ECB's 2015 analysis of bitcoin failing to meet all three of these money functions.[83] This is a significant departure from the ECB's 2012 digital money definition as 'a type of unregulated digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community'.[84] The ECB has stated that, from a legal perspective, bitcoin is neither a currency nor money because it is neither widely used to exchange value nor is it minted such as coins or banknotes.[85] Further, because it is not recognised by law in Europe, it can only be used as contractual money and is not subject to the current EU financial sector legislative frameworks, namely the Electronic Money Directive 2009[86] and

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70   FINCeN Administrative Ruling FIN-2014-R011 dated 27 October 2014 on the Application of Money Services Business regulations to the Rental of Computer Systems for mining virtual currency dated 04/29/2014; FINCeN Administrative Ruling FIN-2014-R011 dated 27 October 2014 on the Application of FinCEN's Regulations to Virtual Currency Trading Platform; FINCeN Administrative Ruling FIN-2014-R012 on the Application of FinCEN's Regulations to a Virtual Currency Payment System; FINCeN Administrative Ruling FIN-2015-R001 dated 14 August 2015 on the Application of FinCEN's Regulations to Persons Issuing Physical or Digital Negotiable Certificates of Ownership of Precious Metals.

71   *Florida v Espinoza*, Case No FL14-2923 (Fla 11th Cir Ct) (22 July 2016).

72   *Ibid*, 6–7.

73   39 F Supp 3d 544, 545 (SDNY 2014).

74   *Ibid*, Memorandum order dated 19 August 2014 at 545.

75   No 4:13-cv-416, 2013 WL 4028182 (ED Tex 6 August 2013).

76   *Ibid*, 568.

77   US Title 15, Commerce and Trade, US Code s 77b.

78   *SEC v Shavers* No 4:13-cv-416, 2013 WL 4028182 (ED Tex 6 August 2013) at 569.

79   Banking Act of the Federal Republic of Germany (Kreditwesengesetz – KWG), s1(11); 'Bitcoins: Supervisory assessment and risks to users' (December 2014), available at www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2014/fa_bj_1401_bitcoins_en.html accessed 6 July 2017.

80   Kati Pohjanpalo, 'Bitcoin judged commodity in Finland after failing money test' *Bloomberg* (20 January 2014) www.bloomberg.com/news/articles/2014-01-19/bitcoin-becomes-commodity-in-finland-after-failing-currency-test accessed 22 August 2016.

81   Nermin Hajdarbegovic, 'Slovenia Clarifies Position on Cryptocurrency Tax', *Coindesk* (24 December 2013) www.coindesk.com/slovenia-clarifies-position-cryptocurrency-tax/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+CoinDesk+%28CoinDesk+-+The+Voice+of+Digital+Currency%29 accessed 22 August 2016.

82   De Nederlandsche Bank (DNB), 'Virtual currencies are not a viable alternative' (8 May 2014), available at www.dnb.nl/en/news/news-and-archive/dnbulletin-2014/dnb307263.jsp accessed 6 July 2017.

83   See n 10 above, 2.1 p 23.

84   *Ibid* at 2.1, p 13.

85   *Ibid* at 2.1, p 24.

86   Council Directive (EC) 2009/110/EC of the European Parliament and of the Council of 16 September 2009 Article 2(2), available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:267:0007:0017:EN:PDF accessed 6 July 2017.

Payment Services Directive 2007 (the 'PSD'),[87] as discussed below.

The differing approaches on a global scale are evident as some financial regulators deem bitcoin a commodity, treat it as a security,[88] recognise it as a financial instrument[89] or describe it as an asset.[90] Several financial regulators have remained silent on bitcoin's legal status, while others have positively affirmed it has no legal status,[91] does not fall within regulatory scope[92] or its use is restricted based on foreign exchanges' laws.[93] Some regulators have issued warnings regarding bitcoin, reciting current law but stopping short of stating its (business) use is illegal.[94] While others have gone as far as to ban the use of bitcoin[95] or any activity by regulated financial institutions,[96] whether by indirectly or directly providing customers with bitcoin, trading with it, using it, storing it, providing bitcoin related product or services, using bitcoin pricing or using it as a means of investment for trusts and funds.[97]

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87   Council Directive (EC) 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC.

88   See n 29 above.

89   BaFin has classified bitcoin as a type of financial instrument known as a unit of account, pursuant to the Banking Act of the Federal Republic of Germany (Kreditwesengesetz or KWG), s1(11); 'Bitcoins: Supervisory assessment and risks to users' (December 2014), available at www. bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2014/fa_bj_1401_bitcoins_en.html#doc7858622bodyText2; Israel's Law for Supervision of Regulated Financial Services, 5776-2016 passed into law in 2016 classifies virtual currency as a financial instrument under s 1(7)(7) (in Hebrew), available at www.justice.gov.il/SitePages/OpenFile.aspx?d=4A49CqZQMS1fP4a9tebtosTNiz26wc1la9Kw6rahytE%3 accessed 7 July 2017.

90   'Superintendencia Financiera de Colombia carta circular 29', (26 March 2014) (in Spanish), available at www.superfinanciera.gov.co/jsp/loader.jsf?lServicio=Publicaciones&lTipo=publicaciones&lFuncion=loadContenidoPublicacion&id=10082781 accessed 7 July 2017.

91   'Notice to the public regarding possible risks in decentralized virtual currencies (such as Bitcoin)', joint press release by the Bank of Israel, the Capital Market, Insurance and Savings Department, the Israel Tax Authority, the Israel Securities Authority and the Israel Money Laundering and Terror Financing Prohibition Authority (19 February 2014), available at www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/19-02-2014-BitCoin.aspx accessed 7 July 2017.

92   Central Bank of Kenya, 'Caution to the public on virtual currencies such as bitcoin', public notice (December 2015), available at www.centralbank.go.ke/images/docs/media/Public_Notice_on_virtual_currencies_such_as_Bitcoin.pdf; Danish Financial Supervisory Authority, 'Advarsel mod virtuelle valutaer (bitcoin m.fl.)' (in Danish, 'Warning against virtual currencies (bitcoin and others)'), available at www.finanstilsynet.dk/da/Nyheder%20og%20presse/Pressemeddelelser/Arkiv/Presse-2013/Advarsel-mod-virtuelle-valutaer-bitcom-mfl-2013; Financial Superintendence of Colombia, 'Riesgos de las operaciones realizadas con "Monedas Virtuales"' (in Spanish, 'Risks of operations carried out with "Virtual Currencies"') Circular Letter (26 March 2014), available at www.superfinanciera.gov.co/jsp/loader.jsf?lServicio=Publicaciones&lTipo=publicaciones&lFuncion=loadContenidoPublicacion&id=10082781; Department of Business and Industry, Growing Business In Nevada, 'Nevada Financial Institutions Division Issues Consumer And Investor Guidance On Virtual Currency' press release (24 April 2014), available at http://business.nv.gov/News_Media/Press_Releases/2014/FID/Nevada_Financial_Institutions_Division_issues_consumer_and_investor_guidance_on_virtual_currency; Department of Labor, Licensing and Regulation Maryland, 'Virtual Currencies: Risks for Buying, Selling, Transacting, and Investing - Advisory Notice 14-01 – Attention Maryland Residents (24 April 2014), available at www.dllr.state.md.us/finance/advisories/advisoryvirtual.shtml; Central Bank of Malaysia, 'Statement on Bitcoin' (2 January 2014), available at www.bnm.gov.my/index.php?ch=en_announcement&pg=en_announcement&ac=49&lang=en; Bank of Finland, 'Bitcoin involves risks' (14 January 2014), available at www.suomenpankki.fi/en/media-and-publications/news/2014/bitcoin-involves-risks all accessed 26 September 2017.

93   Central Bank of Iceland states that bitcoin is not legal tender or a recognised currency and cross-border transfers based on virtual currency transactions are restricted based on the Icelandic Foreign Exchange Act, no 87/1992: 'Significant risk attached to use of virtual currency' (19 March 2014), citing Art 5, para 1 of the Act on the Central Bank of Iceland, No 36/2001, available at www.cb.is/publications/news/news/2014/03/19/Significant-risk-attached-to-use-of-virtual-currency accessed 22 August 2017.

94   Central Bank of the Russian Federation, 'On the use of "virtual currencies" when making transactions, in particular Bitcoin', (in Russian) (27 January 2014), available at www.cbr.ru/press/PR.aspx?file=27012014_1825052.htm accessed 7 July 2017; Central Bank of Cyprus, 'Attention to the risks associated with virtual currencies' (7 February 2014), available at www.centralbank.cy/en//announcements/07022014 accessed 13 September 2017.

95   By resolution 044/2014, the Central Bank of Bolivia expressly prohibited use of any currency not issued or regulated by states, countries or economic areas, stating that virtual currencies such as bitcoin are not so issued or regulated, available at www.bcb.gob.bo/webdocs/01_resoluciones/044%202014.PDF (in Bolivian); Ecuador issued the Organic Monetary and Financial Code 2014, which stipulates by Article 94 that the Central Bank of Ecuador is the only entity that is authorised to provide and manage national or electronic coins, and by Article 98 prohibits the issue, reproduction and total or partial simulation and circulation of currency and money other than by the Central Bank of Ecuador, 'Código Orgánico Monetario y Financiero, Segundo Suplemento del Registro Oficial No 332 de 12 de septiembre de 2014', available at www.asambleanacional.gob.ec/es/system/files/ro_codigo_organico_monetario_y_financiero.pdf; 'Superintendencia Financiera de Colombia carta circular 29', (26 March 2014) (in Spanish), available at www.superfinanciera.gov.co/jsp/loader.jsf?lServicio=Publicaciones&lTipo=publicaciones&lFuncion=loadContenidoPublicacion&id=10082781 all accessed 7 July 2017.

96   Ibid.

97   People's Bank of China, Ministry of Industry and Information Technology of China, China Securities Regulatory Commission, China Banking Regulatory Commission and the China Insurance Regulatory Commission Notice on the Prevention of Risks Associated with Bitcoin (Bank Notice (2013) No 289) (December 2013), English translation, available at www.btcchina.com/page/bocnotice2013 accessed 26 September 2017.

Securities versus commodities versus e-money

Although the SEC itself has not opined on the legal definition of bitcoin as a security, it has issued several public warnings on its use.[98] It has taken various actions against parties for their wrongful conduct in bitcoin offerings. In *SEC v Shavers*[99] and *SEC v Homero Joshua Garza, GAW Miners, LLC and ZenMiner, LLC,*[100] the SEC took action against the offering of bitcoin-denominated unregistered securities and running a Ponzi scheme; in the Matter of Erik T Voorhees[101] for operating an unregistered bitcoin investment scheme. By its order, a VC is defined as 'a digital representation of value that can be digitally traded and functions as a medium of exchange; a unit of account; and/or a store of value, but does not have legal tender status (that is, when tendered to a creditor, is a valid and legal offer of payment) in any jurisdiction'.[102] By contrast, Asian regulators, such as the Monetary Authority of Singapore, have issued public notices that bitcoin is not a security.[103] Like the US, Europe has not taken an official position. The European Securities Market Authority (ESMA) has publicly commented on bitcoin's application to the securities market,[104] engaging in public consultations in 2016 on the usefulness of DL technology, such as blockchain, to the securities markets, and issuing its 2017 report[105] on the same. The recent ESMA consultation and report focuses on the use of the technology post-trade and how that activity would fit within the existing EU securities regulatory framework, especially under the European Market Infrastructure Regulation,[106] the Settlement Finality Directive[107] and the Central Securities Depositories Regulation.[108]

The US and China have taken more of a commodity view of bitcoin, whereas Europe has taken more of the currency view. The People's Bank of China deems bitcoin a specially designated virtual commodity or good.[109] Similarly, the Hong Kong Monetary Authority has stated bitcoin is not a legal tender but an unregulated virtual 'commodity'.[110]

By its September 2015 order against Coinflip, Inc d/b/a Derivabit,[111] the US CFTC found for the first time that bitcoin and other virtual currencies are properly defined as commodities under US

98   SEC, 'Investor Alert: Ponzi Schemes Using Virtual Currencies', available at www.sec.gov/investor/alerts/ia_virtualcurrencies.pdf accessed 22 August 2017.

99   No 4:13-cv-416, 2013 WL 4028182 (E.D Tex) (6 August 2013).

100   Case 3:15-cv-01760 (D Conn) (1 December 2015).

101   Order Instituting Cease-And-Desist Proceedings Pursuant to Section 8A of the Securities Act of 1933, Making Findings, and Imposing a Cease-And-Desist Order, Admin. Pro File No 3-15902, release No 9592 (3 June 2014), available at www.sec.gov/litigation/admin/2014/33-9592.pdf accessed 17 June 2017.

102   *Ibid*, 2.

103   MoneySense, 'Initial Coin Offerings, Digital Tokens and Virtual Currencies', available at www.mas.gov.sg/moneysense/understanding-financial-products/investments/consumer-alerts/virtual-currencies.aspx accessed 10 July 2017.

104   ESMA, Discussion Paper: The Distributed Ledger Technology Applied to Securities Markets' (2 June 2016), available at www.esma.europa.eu/sites/default/files/library/2016-773_dp_dlt.pdf accessed 10 July 2017.

105   ESMA, 'Report: The Distributed Ledger Technology Applied to Securities Markets' (2 February 2017), available at www.esma.europa.eu/sites/default/files/library/dlt_report_-_esma50-1121423017-285.pdf accessed 11 October 2017.

106   Regulation (EU) No 648/2012 on OTC derivatives, central counterparties and trade repositories (EMIR) – 4 July 2012.

107   Directive 2009/44/EC on settlement finality in payment and securities settlement systems and Directive 2002/47/EC on financial collateral arrangements as regards linked systems and credit claims.

108   Regulation (EU) No 909/2014.

109   People's Bank of China, Ministry of Industry and Information Technology of China, China Securities Regulatory Commission, China Banking Regulatory Commission and the China Insurance Regulatory Commission Notice on the Prevention of Risks Associated with Bitcoin (Bank Notice (2013) No 289) (December 2013), English translation, available at https://exchange.btcc.com/page/bocnotice2013 accessed 17 June 2017.

110   Hong Kong Monetary Authority, 'The HKMA reminds the public to be aware of the risks associated with Bitcoin' (11 February 2015), available at www.hkma.gov.hk/eng/key-information/press-releases/2015/20150211-3.shtml accessed 10 July 2017.

111   *In re Coinjlip, Inc, d/b/a Derivabit*, and Francisco Riordan, CFTC Docket No 15-29, 2015 WL 5535736 (17 September 2015), available at www.cftc.gov/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfcoinfliprorder09172015.pdf accessed 10 July 2017.

federal law (the 'Coinflip Order').[112] The case involved a risk management platform facilitating bitcoin options and futures contracts whereby the strike and delivery prices were denominated in US dollars, but premiums and payments of settlement of the option contracts were to be paid using bitcoin. The US commodity view was reinforced by the CFTC in June 2016 *In re BFXNA INC d/b/a Bitfinex*[113] (the 'Bitfinex Order'). By its order, the CFTC clarified three crucial points. First, that bitcoin and other cryptocurrencies are commodities as defined under US federal law.[114] Second, commodity derivatives based on any crypto currency, including bitcoin or any platform offering the same, are subject to US federal regulatory jurisdiction, namely CFTC jurisdiction.[115]

By contrast, one month after the Coinflip Order, in the European October 2015 case of *Skatteverket v David Hedqvist*,[116] the Court of Justice of the European Union (CJEU) held that bitcoin was not a security,[117] was not tangible property,[118] was a means of payment[119] and its purchase and sale in exchange for traditional fiat currency fell within the added tax exemption of financial transactions relating to 'currency [and] bank notes and coins used as legal tender'.[120] In other words, the ECJ sided with David Hedqvist and not the Swedish tax authority, which took the view that bitcoin is not a currency but rather a tradeable commodity, similar to gold, and therefore outside the scope of the value added tax (VAT) exemption for financial transactions concerning currency.

Yet, for some time, there was confusion in Europe as to whether legally bitcoin was e-money, falling under the scope of the Electronic Money Directive 2009[121] and PSD.[122] The implication being that, if bitcoin fell outside the scope of these directives, bitcoin businesses would not be required to licence or be captured by this regulation, which also precludes payment institutions from issuing electronic money. 'Electronic money' is defined as electronically, including magnetically, stored monetary value represented by a claim on the issuer, which is issued on receipt of funds for the purpose of making payment transactions as defined in point 5 of Article 4 of the PSD, and is accepted by a natural or legal person other than the electronic money issuer.[123] The ECB clarified this position in 2012,[124] stating that bitcoin did not qualify as 'electronic money' under the Electronic Money Directive 2009 because it does not satisfy all three criteria of electronic money, namely electronic storage, issuance upon receipt of funds and acceptance as a means

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112 *Ibid*, the CTFC referring to the Commodity Exchange Act, as amended (the 'Act'), 7 USC sections 6c(b) and 7b-3(a)(1) 2012 p 3: 'Section 1a(9) of the Act defines "commodity" to include, among other things, "all services, rights, and interests in which contracts for future delivery are presently or in the future dealt in". 7 US Code § 1a(9). The definition of a "commodity" is broad. See, eg, *Board of Trade of City of Chicago v SEC*, 677 F 2d 1137, 1142 (7th Cir 1982). Bitcoin and other virtual currencies are encompassed in the definition and properly defined as commodities.'

113 Order Instituting Proceedings Pursuant to Sections 6(c) and 6(d) of the Commodity Exchange Act, as Amended, Making Findings and Imposing Remedial Sanctions, CFTC Docket No 16-19 (2 June 2016) www.cftc.gov/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfbfxnaorder060216.pdf accessed 10 July 2017.

114 S 1a(9) of the Commodity Exchange Act (7 US Code s 1a(9)).

115 *Ibid*, n 113 at 6–7, citing also In re TeraExchange LLC, Order Instituting Proceedings Pursuant to Sections 6(c) and 6(d) of the Commodity Exchange Act, Making Findings and Imposing Remedial Sanctions, CFTC Docket No 15-33, 2015 WL 5658082, [Current Transfer Binder] (CCH) if 33,546 (CFTC 24 September 2015).

116 Request for a preliminary ruling under Article 267 TFEU, from the Högsta förvaltningsdomstolen (Supreme Administrative Court, Sweden), made by decision of 27 May 2014, received at the Court on 2 June 2014, in the proceedings, C-264/14 (22 October 2015).

117 *Ibid*, para 55.

118 *Ibid*, para 22.

119 *Ibid*, para 52.

120 Para 44, the CJEU referring to Art 135(1)(e) of Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax (OJ 2006 L 347 – the 'VAT Directive').

121 Art 2(2) Directives 2009/110/EC of the European Parliament and of the Council of 16 September 2009.

122 Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC.

123 Directive 2009/110/EC of the European Parliament and of the Council of 16 September 2009 on the taking up, pursuit and prudential supervision of the business of electronic money institutions amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC Art 2(2).

124 ECB, 'Virtual Currency Schemes' (October 2012), available at www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf accessed 10 July 2017.

of payment by a legal or natural person other than the issuer.[125] The ECB also clarified that bitcoin falls outside of the scope of the PSD.[126] Further, in 2015, the ECB stated that VC is neither money, currency or a currency from a legal perspective.[127] Moreover, in August 2016, the EBA stated the currency denomination that has been associated with bitcoin suggests an analogy to fiat currencies that is unwarranted.[128] Yet, no legal position has been taken at the EU level on the legal status of bitcoin. EU Member States are free to legislate and regulate on a national level in accordance with their interpretation of EU directives. Subsequently, some EU Member States have reinforced the distinction between bitcoin and e-money under their national law. None have positively affirmed that bitcoin is e-money under the Electronic Money Directive 2009.

The confusion between bitcoin and e-money has arisen elsewhere. For example, in 2015, Brazil enacted Law No 12,865,[129] which specifically referenced regulation of electronic currency defined as resources stored on a device or electronic system that allows the end user to perform a payment transaction. However, while the definition appeared to cover bitcoin, the Central Bank of Brazil later distinguished electronic currency from VC, stating that the latter was not electronic currency under Brazilian law.[130]

AML regulation

In June 2015, the Financial Action Task Force (FATF), the intergovernmental policy body that targets money laundering and terrorist financing, published AML guidance that VC exchanges should be registered and/or licensed with supervisory authorities, and comply with AML regulations including customer identification obligations. The 2015 FATF guidance has formed the basis for bitcoin exchanges to self-regulate with voluntary AML compliance programmes or, where required, to register with supervisory bodies around the world, except for, notably, in the US, where they are obliged to register in any event due to MSB laws.

In the EU, the 2015 FATF guidance also set the basis for measures taken under 4AMLD, which is the preventative money laundering legal framework of the UK. The measures were proposed in July 2016 to direct all EU Member States to require both bitcoin exchanges and bitcoin wallets to be licensed or supervised by EU Member States for AML purposes, meaning that they would have to put in place AML/counter terrorist financing (CTF) policies and procedures and adhere to reporting requirements.

In 2016, Japan amended its primary AML law, the Act on Prevention of Transfer of Criminal Proceeds[131] and its Payment Services Act,[132] to bring VC exchange services within scope. By these amending acts, the laws of Japan define 'virtual currency' and 'virtual currency exchange services', and require registration of the latter. VC exchange service providers are designated as a 'specified

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125   *Ibid*, 43.

126   *Ibid*.

127   *Ibid*, 23.

128   Opinion of the European Banking Authority on the EU Commission's proposal to bring virtual currencies into the scope of Directive (EU) 2015/849 (4AMLD).

129   Banco Central Do Brasil, 'SPB (Sistema de Pagamentos Brasileiro): The Brazilian Payments System – Regulates the payment schemes and payment institutions which hereby become part of the Brazilian Payments System (SPB)' available at www.bcb.gov.br/Pom/Spb/Ing/InstitucionalAspects/Law12865.pdf accessed 10 July 2017.

130   Banco Central Do Brasil, 'Policy Statement Nr. 25,306, of February 19th, 2014', available at www.bcb.gov.br/pom/spb/ing/IComunicado25306.pdf accessed 10 July 2017.

131   Act on Prevention of Transfer of Criminal Proceeds (Act No 22 of 2007).

132   Payment Services Act (Act No 59 of 2009).

business operator'.[133] The change requires bitcoin exchanges to register with Japan's Financial Services Agency (FSA) and satisfy AML, capital, asset segregation, audit and other requirements.

Legislative and regulatory policy shift

There appeared to be an informal policy shift from 2013, when central banks across the globe issued consumer warnings about bitcoin. Although there remains the one-off bitcoin-specific regulatory framework, the central bank attitude has changed from primarily one of concern to recognition of the blockchain as a cheap global payments technology. In 2016, there were at least three major events signalling this change. In April 2016, the first EU Parliament blockchain exposition was held to discuss virtual currencies as the future of money, trusting the blockchain and regulation.[134] In June 2016, 25 central banks met at the ECB to discuss developments, trends, impact on the financial industry and regulation of digital innovations and, specifically, the blockchain.[135] In June 2016, the World Bank, International Monetary Fund and US Federal Reserve held the largest meeting to date, of 90 banks, to discuss the bitcoin blockchain network.[136] The attitude of the central banks sets the basis for legislative and regulatory change with respect to bitcoin and inclusion in the legal rules that govern the finance and financial services sector.

The UK has adopted a 'wait and see' approach, consulting with the public in 2015 on benefits and risks with a focus on the regulatory approach. The UK Treasury concluded that, due to the nascency of the technology, a framework for best practice standards for consumer protection would be appropriate to 'address the risks identified but without imposing a disproportionate regulatory burden on the industry'.[137] It also stated its intention to apply AML laws to bitcoin exchanges[138] and appears to have taken this step by expanding the definition of money service businesses by virtue of the Money Laundering Regulations 2017 to include 'an undertaking which by way of business operates a currency exchange office, transmits money (or any representation of monetary value) by any means or cashes cheques which are made payable to customers'.[139] Since 2016, the UK Financial Conduct Authority (FCA) has also taken steps to grant payment licences to (Fintech) companies, which use the bitcoin blockchain network as their core infrastructure, classifying their regulatory permissions as payment instrument issuances;[140] traditional payment instruments being credit and debit cards, and cheques.

US federal and state regulations have worked at cross purposes, particularly in the context of MSB laws. Perhaps for this reason and because of the general heavy regulatory approach taken in the US to Fintech as a whole, it now recognises the need to play catch up to Europe, which has, to date, fostered

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133   Japan Financial System Council, 'Strategies for Reforming Japanese Payment Systems: Final Report', 29, 2(2) referring to the Act on Prevention of Transfer of Criminal Proceeds (Act No 22 of 2007) Art 2 (2), available at www.fsa.go.jp/en/refer/councils/singie_kinyu/20160621-2/01.pdf accessed 11 July 2017

134   Gabrielle Patrick, 'Europe's Regulatory Blockchain Shift on Display at Private Parliament Event', Coindesk (29 April 2016) www.coindesk.com/the-eu-regulatory-blockchain-shift accessed 11 July 2017.

135   Gabrielle Patrick, 'Blockchain and Payments Infrastructure: A Regulator's Dilemma?' Coindesk (19 June 2016) www.coindesk.com/blockchain-payments-infrastructure-regulators-dilemma accessed 11 July 2017.

136   Michael del Castillo, '90 Central Banks Seek Blockchain Answers at Federal Reserve Event', Coindesk (6 June 2016), available at www.coindesk.com/central-banks-blockchain-federal-reserve accessed 11 July 2017.

137   'Digital currencies: response to the call for information', HM Treasury (March 2015), www.gov.uk/government/uploads/system/uploads/attachment_data/file/414040/digital_currencies_response_to_call_for_information_final_changes.pdf accessed 22 August 2016, 4.5.

138   *Ibid* at 4.2.

139   The Money Laundering, Terrorist Financing and Transfer of Funds (Information on the Payer) Regulations 2017, R3(1).

140   Examples are Epiphyte (UK) Ltd (FCA reference number 763127), https://register.fca.org.uk/ShPo_FirmDetailsPage?id=001b000003YB01dAAD; Luno Money Limited (FCA reference number 764299), https://register.fca.org.uk/ShPo_FirmDetailsPage?id=001b000003YDzVLAA1; SETL Payments Limited (FCA reference number 900689), https://register.fca.org.uk/ShPo_FirmDetailsPage?id=001b000003WiKnJAAV all accessed 11 July 2017.

a more open Fintech innovation environment. In July 2016, a US Congressional bipartisan bill was introduced to promote, inter alia, the use of blockchain technology. The bill is titled 'Expressing the sense of the House of Representatives that the United States should adopt a national policy for technology to promote consumers' access to financial tools and online commerce to promote economic growth and consumer empowerment'.[141]

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141   H.Res 835, 114th Cong.

Part 2: Innovation and new models

The United Nations Global Compact released a project report in February 2017 titled 'Global Opportunity Report 2017',[142] which states that 'blockchain technology and artificial intelligence are the backbones of two of the four top opportunities this year, illustrating that all industries, including water, education, IT, and energy, will not just be disrupted by technological innovations – they'll be entirely overtaken and reshaped'. According to the report, technological innovations will redefine business and therefore every industry will need to take their technology innovations to the next level to capitalise on future market opportunities.

The blockchain innovation is significant. It enables parties to contract and enforce terms between each other without the need of a central trusted party. It provides interoperability between systems that do not otherwise speak to each other. These features enable more dynamic interparty behaviour. This has triggered a wider examination of digitisation, especially digitisation of documents that previously could not be shared between parties with a certain level of validation, integrity, speed and certainty. Legal and regulatory frameworks will have to adapt to a significantly more digitised world, where value and data are transferred more quickly, cheaply and freely.

Rule of law versus rule of code: is code law?

Some legal scholars believe that the first commercial law was enshrined in writing nearly 3,000 years ago.[143] If so, this would be the first known written law of humankind documenting customs of commerce and trade: Rhodian law around 900 BC.[144] Law itself can be described as 'a body of rules aiming at the prevention or orderly settlement of conflicts'.[145] Today, we have developed a technology whereby a law itself may potentially be comprised of rules of software code, not of human customs reduced to writing and the human readable text of legislative frameworks used today. It is currently being debated as to whether that truly can be the case. This is because it is arguable that no software code can be free of bugs, in which case a contract can never be truly governed by the code and there will be a need for a human arbitrator to determine disputes arising when software bugs occur. To encode law into software is to usurp the human prerogative to resolve legal disputes. In other words, a human will have to determine what should happen in the event of an error, flaw, failure or fault in a computer program or system that causes it to behave in an unintended way or produce an incorrect or unexpected result.

Traditionally, legal rules are provided by the legislative framework, meaning a code of law and regulation. However, the digital world and bitcoin have drawn attention to the rules that may potentially govern both their operation and legality, meaning the rules of algorithms encoded by the software. These rules set the foundation for new types of governance models or mechanisms that are not yet recognised in law. The rules need to be understood to determine current or future legality or illegality. Potentially they represent an alternative to human-driven organisational governance to fully digital, self-regulating organisational mechanisms. Take, for example, the April 2016 launch of DAOhub.org. This initiative is the first very widely and publicly discussed DAO because it obtained

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142 'Global Opportunity Report 2017' Global Opportunity Network (2017), www.globalopportunitynetwork.org/report-2017 accessed 15 February 2017.

143 Geoffrey Brice and John Reeder, *Brice on Maritime Law of Salvage* (5th edn, Sweet & Maxwell 2011) 6, paras 1–13; Richard Lowndes, *Remarks On The English And Foreign Laws And Usages Relating To General Average*, 1844, 4.

144 *Ibid.*

145 Hermann Kantorowicz, *The Definition of Law* (Cambridge University Press 1958) 12.

crowdfunding by selling digital tokens reportedly with a trading value in excess of US$168m.[146] This made it the largest crowdfunding project at that time. The concept of the DAO was the creation of organisational governance rules that are 'formalised, automated and enforced using software'.[147] To determine legality or illegality of the activity associated with the DAO under US federal securities law, the SEC considered the rules governing how the DAO would work. By its July 2017 report, the SEC investigated the 'new paradigm'[148] of the DAO and provided guidance. The SEC compared traditional companies and DAOs stating the requirement that US federal securities laws apply to the 'offer and sell securities in the United States, regardless whether the issuing entity is a traditional company or a decentralized autonomous organization'.[149]

It can be said that the bitcoin blockchain network was the first DAO. Its bitcoin protocol is the governing rule set that enable the participants, the miners, to decide what it should look like. There have been others such as Dash, with a 2015 proposal for a decentralised governance mathematically enforceable, fully transparent and resistant to human error.

Automated governance

A potentially attractive premise of a DAO is the organisation's automated governance or self-governance. In other words, by codifying rules and decision-making, there is potentially no need for human governance. A DAO's governance rules are formalised, automated and enforced using software.[150] Its actions are determined and implemented by a decentralised consensus of computer nodes as opposed to the present-day centralised company model by which the company is run by central management, for example, directors and officers. This means that a DAO can be programmed to operate autonomously, potentially without human involvement. Its rule set can provide for direct, real-time control of funds and automated actions, such as the creation of child DAOs. In doing so, the DAO offers the possibility of accountable and transparent organisational models, unlike any entity recognised by any state companies' legislative framework.

Code is law

'Code' or 'computer code' is a term for the text that describes a computer program. Law includes a substantive and procedural set of rights, rules, measures, principles and responsibilities that are collated into statutes or exist through precedents. The concept of computer code as law can be explored in the following scenario, where the code was the contract and the law for the DAO and implications where code is flawed.

The DAO is a third-party application, which runs on Ethereum. Ethereum is an application platform that runs its own blockchain: the Ethereum blockchain. It is a smart contracts and decentralised applications platform, whose architecture was inspired by the bitcoin blockchain network. Ether is the native currency of Ethereum and was used to purchase DAO tokens during

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146   Cade Metz, 'The Biggest Crowdfunding Project Ever—the DAO—Is Kind of a Mess' *Wired* (6 June 2016), www.wired.com/2016/06/biggest-crowdfunding-project-ever-dao-mess accessed 11 July 2017.

147   Christoph Jentzsch, 'Decentralized Autonomous Organization To Automate Governance: Final Draft – Under Review', white paper, 1, available at https://download.slock.it/public/DAO/WhitePaper.pdf accessed 20 June 2017.

148   US SEC, Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, Release No 81207 (25 July 2017) 2, available at www.sec.gov/litigation/investreport/34-81207.pdf accessed 30 July 2017.

149   *Ibid*, 18.

150   See n 151 above.

the DAO's creation phase. In June 2016, Ethereum announced that the DAO had been attacked and that the attacker found and exploited a vulnerability in the DAO's code whereby an attacker was able to collect DAO tokens many times over in a single transaction (the DAO 'June 2016 Incident').[151] This resulted in the collection of 7 million DAO tokens with a potential equivalent value of at least US$50m.[152] Ethereum core developers did not intend for the DAO's code to be used in this way and subsequently a new version of transaction history was created. This version did not recognise the incident so that the DAO tokens never left the original holders. By comparison, the original version remains to date, so that, in effect, there are currently two versions of transaction history. This incident raised questions of whether code can truly be law, since law and the rule of law arguably suggest certainty, finality and predictability.[153] This is further discussed below.

When the DAO was in the process of being created, its rules were explained on the DAOhub.org website, emphasising that the terms are set forth in the software code itself. It suggests that the terms governing the DAO creation are secondary to the software code's functionality:

> 'The terms of The DAO Creation are set forth in the smart contract code existing on the Ethereum blockchain at 0xbb9bc244d798123fde783fcc1c72d3bb8c189413. Nothing in this explanation of terms or in any other document or communication may modify or add any additional obligations or guarantees beyond those set forth in The DAO's code. Any and all explanatory terms or descriptions are merely offered for educational purposes and do not supersede or modify the express terms of The DAO's code set forth on the blockchain; to the extent you believe there to be any conflict or discrepancy between the descriptions offered here and the functionality of The DAO's code at 0xbb9bc244d798123fde783fcc1c72d3bb8c189413, The DAO's code controls and sets forth all terms of The DAO Creation.'[154]

With respect to terms governing DAO token creation, it was further stated that 'the software code currently available at https://github.com/slockit/dao is the sole source for the terms under which DAO tokens may be created'.[155]

The DAO's software code itself contains the following rules:

```
contract DAOInterface {

    // The amount of days for which people who try to participate in the

    // creation by calling the fallback function will still get their ether back

    uint constant creationGracePeriod = 40 days;

    // The minimum debate period that a generic proposal can have

    uint constant minProposalDebatePeriod = 2 weeks;
```

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151   Vitalik Buterin, 'Critical Update Re: DAO Vulnerability' Ethereum (17 June 2016), available at https://blog.ethereum.org/2016/06/17/critical-update-re-dao-vulnerability accessed 11 July 2017.

152   Wolfie Zhao, '$7 Million Lost in CoinDash ICO Hack', *Coindesk* (17 July 2016), www.coindesk.com/7-million-ico-hack-results-coindash-refund-offer accessed 17 July 2017

153   President's Message, 'Certainty and Finality in the Law', Wong Meng Meng, Senior Counsel, President, The Law Society of Singapore, available at www.lawgazette.com.sg/2012-05/408.htm accessed 11 July 2017.

154   Explanation of Terms and Disclaimer https://webcache.googleusercontent.com/search?q=cache:GO2L7cHbdL0J:https://forum.daohub.org/tos+&cd=2&hl=en&ct=clnk&gl=uk accessed 18 June 2016; Matt Levine, 'Blockchain Company's Smart Contracts Were Dumb' *Bloomberg* (17 June 2016), www.bloomberg.com/view/articles/2016-06-17/blockchain-company-s-smart-contracts-were-dumb accessed 11 July 2017.

155   *Ibid.*

```
// The minimum debate period that a split proposal can have

uint constant minSplitDebatePeriod = 1 weeks;

// Period of days inside which it's possible to execute a DAO split

uint constant splitExecutionPeriod = 27 days;

// Period of time after which the minimum Quorum is halved

uint constant quorumHalvingPeriod = 25 weeks;

// Period after which a proposal is closed

// (used in the case `executeProposal` fails because it throws)

uint constant executeProposalPeriod = 10 days;

// Denotes the maximum proposal deposit that can be given. It is given as

// a fraction of total Ether spent plus balance of the DAO

uint constant maxDepositDivisor = 100;


// Proposals to spend the DAO's ether or to choose a new Curator

Proposal[] public proposals;

// The quorum needed for each proposal is partially calculated by

// totalSupply / minQuorumDivisor

uint public minQuorumDivisor;

// The unix time of the last time quorum was reached on a proposal

uint public lastTimeMinQuorumMet;
```

The implication of the software code itself being the contractual terms of the DAO creation means that, arguably, subject to a legislative framework, the code governs activity and, by extension, the rights and liabilities arising therefrom. This is unlike the traditional legal model whereby the human readable terms and conditions govern the activity giving rise to legal rights and obligations. This is significant because, as the technology is being developed, there is an opportunity to set legal rule sets by lines of software code in absence of binding precedent. The June 2016 incident explores this paradigm. Following the incident, a new version of transaction history was created. This means that new rules were created to convert the DAO to a withdrawal-only contract,[156] allowing an effective withdrawal of funds – that is, DAO tokens – to be redeemed for Ether at the original rate of 1ETH to 100 DAO tokens. The result was a new Ethereum blockchain with rewritten rules converting the DAO to an Ether reclaim action. The specification proposed for the hard fork was implemented as follows:

'The DAO (0xbb9bc244d798123fde783fcc1c72d3bb8c189413), its ExtraBalance (0x807640a13483f8ac783c557fcdf27be11ea4ac7a), all children of the DAO creator (0x4a574510c7014e4ae985403536074abe582adfc8) and the ExtraBalance of each child are encoded

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156   Vitalik Buterin, 'Hard Fork Completed' Ethereum (20 July 2016), https://blog.ethereum.org/2016/07/20/hard-fork-completed accessed 12 July 2017.

into a list L at block 1880000. The contents of L can be viewed here. At the beginning of block X (X = 1920000, on July 20 or 21 depending on your time zone), all ether throughout all accounts in L will be transferred to contract account C, which is at (0xbf4ed7b27f1d666546e30d74d50d173d20bca754). You can verify the solidity source code of C on etherscan. From this contract, DAO token holders can submit their DAO in order to withdraw ETH at a rate of 1 ETH = 100 DAO. The extra balance, as well as some additional ether that remains due to complications in the interactions between the re-entrancy exploit and the splitting mechanism, will be withdrawable by the DAO curator to be distributed as appropriate to cover all edge cases.'[157]

The June 2016 incident raises questions of governance: whether immutability is truly a feature of the technology, whether contracts settled on the Ethereum blockchain are truly final and irreversible, and whether the rubric of code is law is now undermined. This latest development does in fact appear to undermine the code is law rubric based on three factors: immutability, finality and censorship resistance of the ledger created by software code. At a minimum, it has potentially set the precedent or confirmed the hypothesis that decentralised systems need to be managed with the same human intervention as needed in traditional centralised systems. Indeed, the opinion of blockchain legal expert Patrick Murck is that: 'code is law for machines, law is code for people' and that there should not be a misapplication of machine governance to social systems.[158]

To summarise, we are seeing a potential shift to coding contracts. Questions arise as to how legal contracts can be expressed, implemented and enforced in and using software. The code may be viewed as an expression of contractual or legal intent. In turn, this raises questions about the continuous intersect between traditional contracts and the digital world, including how contracts can be both program- and user-readable, and enforceable.[159] However, even if traditional terms and conditions provide that the code controls, especially in event of unprecedented or complex disputes, human arbitration at this time will be needed.

The financial sector

DL technology can be used as the next generation of financial sector infrastructure, as a programmable, cryptographically-secure system of trust. Its use will potentially reinvent the financial sector ecosystem, transforming the type of financial products and services that may be offered, as well as the way that commercial entities operate. For example, the blockchain can be an open repository infrastructure for access to data and transaction history versus today where information is fragmented. Use of the technology will require adaptation and creation of appropriate legal and regulatory frameworks.

New payment and settlement rails

The blockchain can be used as payments infrastructure without the need of central third parties to clear and settle payments. Settlement of any transaction is usually achieved through a series of legal agreements between organisations. This requires a high degree of pre-negotiated trust. The blockchain can enable transaction flows between several counterparties and across multiple layers

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157   Jeffrey Wilcke, 'To fork or not to fork' Ethereum (15 July 2016), https://blog.ethereum.org/2016/07/15/to-fork-or-not-to-fork accessed 12 July 2017.

158   Patrick Murck, 'Who Controls the Blockchain?' *Harvard Business Review* (April 2017), https://hbr.org/2017/04/who-controls-the-blockchain accessed 30 July 2017.

159   Ian Grigg, 'Financial Cryptography in 7 Layers' (1998–2000), http://iang.org/papers/fc7.html; Ian Grigg 'The Ricardian Contract', http://iang.org/papers/ricardian_contract.html both accessed 8 August 2017.

of counterparties without pre-negotiated trust. At the same time, transactions can be validated and settled simultaneously using the blockchain. This also enables a potentially unexplored microtransaction market.

Blockchain base money and state digital currencies

Several central banks worldwide continue to study the benefits, risks and implications of issuing a central bank cryptocurrency. In the US, there has been regulatory discussion about 'Fedcoin', a cryptocurrency issued by the US Federal reserve whose value is pegged to the US dollar at the rate of 1:1.[160] The implications being that the ordinary person would be provided with an innovative, fast and cheap payments option with the public potentially shifting out of private bank deposits and shrinking the banking industry as we know it.[161]

In the UK, there has been similar discussion about using the blockchain as financial market infrastructure. The Bank of England continues its research on whether universal access to electronic central bank money is desirable. It has indicated the start of an 18-month work plan to determine whether it should issue its own digital currency. A potential benefit of such digital currency would give companies – or, *in extremis*, individuals – the ability to have constant access to central bank money in a digital format and interest-bearing access to its balance sheet.[162] This would mean reduced friction, settlement costs and transactional opacity. Research is being conducted because the Bank of England recognises that bitcoin 'has shown that it is possible to transfer value securely without a trusted third party'[163] and because the technology could be used as a new method of settlement in central bank money. The Bank of England states that its own digital currency could be possibly issued in addition to cash and is examining how this could work and the wide-ranging implications for monetary policy and financial stability.[164] The research will address fundamental questions on the central bank's role, the current set up of fractional reserve banking and that a view will have to be taken on whether the Bank of England should issue base money on a blockchain.[165] There has also been research on how to implement a cryptocurrency framework in which central banks maintain complete control over the monetary supply such as the RSCoin framework.[166] The potential implications of a central bank cryptocurrency are that, on the one hand, the ordinary person could: (1) make payments and store value the electronic equivalent to banknotes, denominated in the national currency; (2) pay others in real time with full and final settlement electronically; yet, on the other hand, it would (3) fundamentally change the structure of the financial system;[167] and (4) allow the central bank to maintain control of access to base money and transactions.

A few central banks have gone further than preliminary research. In 2016, the Bank of Canada

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160 J P Konig, 'Fedcoin' (19 October 2014), https://jpkoning.blogspot.co.uk/2014/10/fedcoin.html accessed 12 July 2017.

161 *Ibid.*

162 John Barrdear and Michael Kumhof, 'The macroeconomics of central bank issued digital currencies' (2016) Bank of England Staff Working Paper No 605, www.bankofengland.co.uk/research/Pages/workingpapers/2016/swp605.aspx accessed 11 July 2017.

163 Bank of England, 'One Bank Research Agenda: Discussion Paper' (February 2015), www.bankofengland.co.uk/research/Documents/onebank/discussion.pdf accessed 11 July 2017.

164 Bank of England, 'Digital Currencies', www.bankofengland.co.uk/research/Pages/onebank/cbdc.aspx; Bank of England, 'Digital Currencies research questions' (July 2016), www.bankofengland.co.uk/research/Documents/onebank/cbdc.pdf both accessed 11 July 2017.

165 Bank of England, 'Economic Research Lead, Digital Currencies Team job: IRC10923 Description' (2016) www.boe-careers.co.uk/OA_HTML/OA.jsp?page=/oracle/apps/irc/candidateSelfService/webui/VisVacDispPG&OAHP=IRC_EXT_SITE_VISITOR_APPL&OASF=IRC_VIS_VAC_DISPLAY&akRegionApplicationId=821&transactionid=1663941280&retainAM=N&addBreadCrumb=RP&p_svid=10923&p_spid=1292276&oapc=8 accessed 11 July 2017.

166 George Danezis and Sarah Meiklejohn, 'Centrally Banked Cryptocurrencies' (2015), available at https://eprint.iacr.org/2015/502.pdf accessed 11 July 2017.

167 Victoria Cleland, 'Digital future for sterling: assessing the implications', Bank of England (5 July 2017), www.bankofengland.co.uk/research/Documents/onebank/vclelandglobalpublicinvestor2017.pdf accessed 11 July 2017.

experimented in limited scope with a wholesale payment system, which could be used to issue, move and settle central bank assets via a digital currency called CAD-Coin.[168] CAD-Coin is a deposit receipt, giving the holder a transferable claim on its value in central bank money and requiring a legal structure that supports a full and irreversible transfer of the underlying claim on central bank money.[169] The Bank of Canada research stated in June 2017 that its research on whether it should issue a digital currency is still underway.[170]

In 2015, Ecuador's Central Bank issued Resolution 064-2015-M[171] requiring Ecuadorian banks to adopt its state digital currency by incorporating themselves in the new electronic payment system as 'macro-agents'.[172] The system was viewed by many as supplanting bitcoin in preference of state digital currency. The system is regulated by Ecuador's Organic Monetary and Financial Code, which permits the Central Bank to back the digital currency with liquid assets. However, the system does not appear to have been adopted as expected due to the absence of backing of the digital currency with real dollars.[173]

New decentralised securities ecosystem

Today's securities life cycle is marked by inefficiencies and growing complexity driving substantial costs and lengthy processing times. A high degree of duplication of processes increases error rates, manually intensive processes and intermediaries in the ecosystem. The blockchain and other DLs offer to slash frictions in the securities transaction lifecycle. As an example, the inefficiencies of clearing and settling over-the-counter (OTC) trades is but one instance of the wider complexity of today's securities markets:

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168   James Chapman, Rodney Garratt, Scott Hendry, Andrew McCormack and Wade McMahon, 'Project Jasper: Are Distributed Wholesale Payment Systems Feasible Yet?' *Financial System* (June 2017), 59, available at www.bankofcanada.ca/wp-content/uploads/2017/06/fsr-june2017.pdf#page=59 accessed 17 July 2017.

169   Rod Garratt, 'CAD-coin versus Fedcoin', R3 Report (15 November 2016), 2, https://static1.squarespace.com/static/55f73743e4b051cfcc0b02cf/t/593aa218e3df28fc70a4c7f3/1497014809042/Cad-coin+versus+Fedcoin-rg.pdf accessed 17 July 2017.

170   Carolyn Wilkins, 'Canada explores digital currency: Fintech collaboration vital to unlock promise' Bank of Canada Global Public Investor (12 June 2017), 94, www.bankofcanada.ca/wp-content/uploads/2017/07/fintech-collaboration-vital-unlock-promise.pdf accessed 17 July 2017.

171   'Resolución No 064-2015-m Refórmense Las Normas Para La Gestión De Dinero Electrónico' (in Spanish), available at www.juntamonetariafinanciera.gob.ec/PDF/resolucion252m-2016.pdf?dl=0 accessed 17 July 2017.

172   Belén Marty, 'Ecuadorian Banks Must Adopt Official Electronic Currency or Else' *PanAm Post* (31 May 2015), https://panampost.com/belen-marty/2015/05/31/ecuadorian-banks-must-adopt-official-electronic-currency-or-else accessed 11 July 2017.

173   Ben Schiller, 'Ecuador Is The World's First Country With A Public Digital Cash System' *Fast Company* (8 October 2015), www.fastcompany.com/3049536/ecuador-is-the-worlds-first-country-with-a-public-digital-cash-system accessed 17 July 2017.
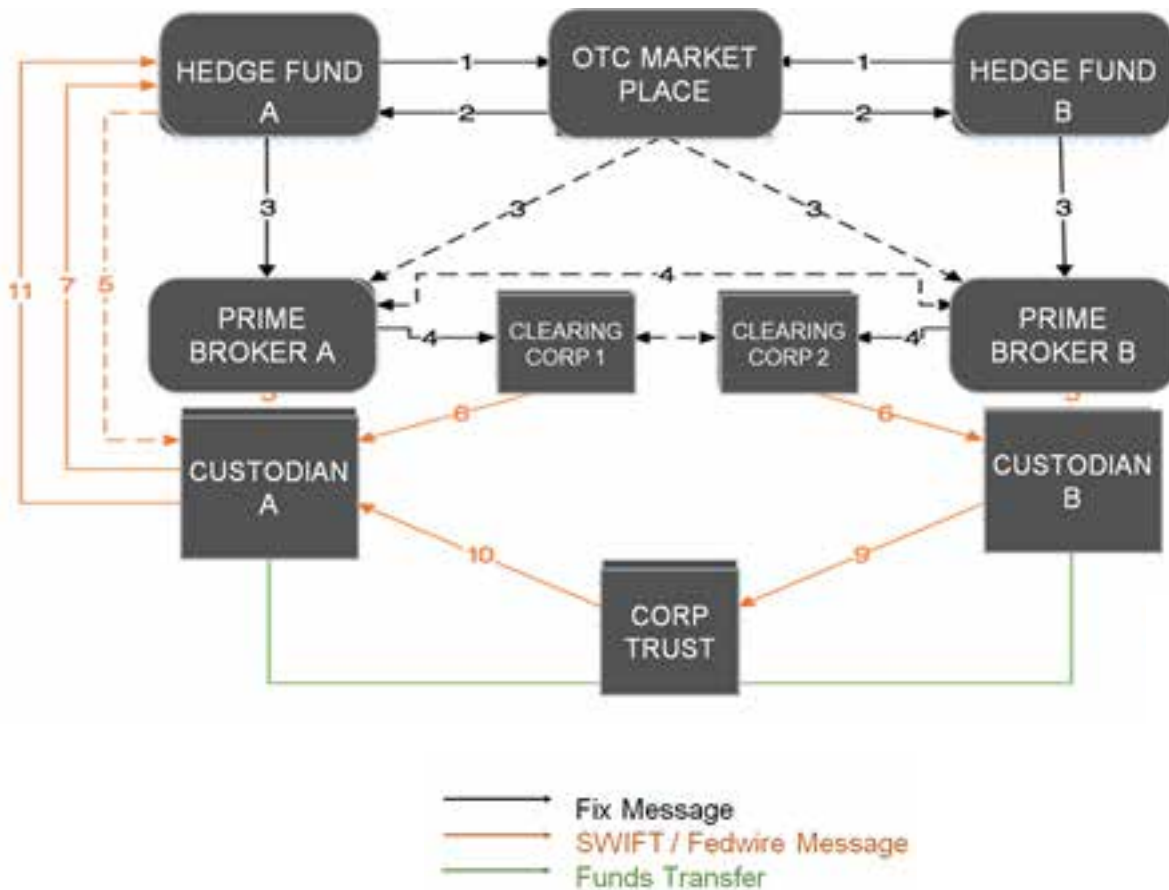
Example: OTC Clearing & Settlement via CCP © Epiphyte Corporation 2015.

Regulators have strongly emphasised that there must be a wider adoption of electronic trading, faster and automated affirmation/confirmation of trades, improved settlement systems, wider adoption of portfolio reconciliation and facilities to collateralise counterparty exposures.[174] The blockchain and decentralised ledger networks can, in many instances, not just solve these problems but restructure trading such that the aforementioned problems do not arise. Smart tokens/contracts can be traded, stored, recorded and tracked on the network as a global, open, shared database. The technology provides the opportunity to reshape the securities life cycle from the issuance of privately held stock through to post-issuance trade and settlement. For example:

a. **Self-executing, programmable, digital contracts as a new type of financial instrument.** 'Smart securities', which include programmable versions of traditional securities issued on a DL network, act autonomously, thereby reducing/eliminating traditional mid/back-office functions.

b. **Instantaneous or near instantaneous post-trade clearing and settlement (T+0).** Current post-trade clearance and settlement dates of transaction date plus one day ('T+1'), plus two days ('T+2') and plus three days ('T+3') can potentially be reduced to mere minutes or seconds ('T+0').

c. **Automated clearing and settlement upon trade execution.** This can include use of decentralised ledgers for both clearing (it should be mentioned that the need for 'clearing' as it is traditionally understood is obviated in DL structured trading) and settlement of securities in delivery-versus-payment (DVP) mode, which should be achieved for transactions in secondary markets and for

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174   'Recommendations for securities settlement systems and Recommendations for Central Counterparties', European Central Bank and Committee of European Securities Regulators ECB-CESR (2009), 10, www.ecb.europa.eu/pub/pdf/other/pr090623_escb-cesr_recommendationsen.pdf accessed 10 July 2017.

issuance/redemption of securities.[175]

d. **P2P settlement of securities trades, which can include a simultaneous exchange of assets.**
    With lowering of costs and increased liquidity potentially offered by use of DL networks,
    a new type of decentralised trading marketplace may emerge, eliminating high-frequency
    trading and creating the first 'provably dark' dark pools.

e. **Trading platforms with built-in escrow and clearing functionality.** In August 2015, smart securities
    were issued for the first time on the blockchain network using Symbiont's trading platform,
    demonstrating the ability to trade securities with live transactions in a completely decentralised
    and P2P environment.[176]

f. **Automated corporate actions.** Corporate actions such as the payment of dividends and coupons
    can be completely removed from a manual, paper intensive process to full automation.

g. **Bilateral, automated securities lending.** In many cases, there is no automated linkage between
    a lender's account and corresponding collateral. The technology could be used to potentially
    transform the collateral posted by an investor to borrow securities into a digital token that could
    be used for other transactions, reducing manual intervention.

There is potential significant impact in all stages of the securities' life cycle:

•   **Issuance of securities** on DLs as cryptographically secured assets, with potential of automated
    collateralisation of assets post-issuance.

•   System-wide **dematerialisation** or elimination of paper-based securities. Smart securities can be
    enforced by collateral rather than traditional legal recourse dependent on paper-based documentation
    architecture. For example, elimination of the International Swaps and Derivatives Association master
    agreement, schedule, credit support annex and confirmations, which collectively constitute a single
    standard form contract and set out material terms for OTC derivatives transactions.

•   **Recording and tracking** of ownership of securities and related assets or actions with increased
    transparency. For example, with corporate actions/events where there is no current efficient
    system to track events such as dividend/interest payments, convertible securities and redemption
    of corporate bonds. With respect to ownership of borderline securities (eg, depositary receipts)
    double counting of ownership can be eliminated where the original underlying security is not yet
    acquired but an associated depository receipts is issued.[177]

•   **Initial public offering of stock**, particularly small and medium-sized enterprise (SME) stock,
    previously hampered by friction costs.

•   Cryptographically secured direct **registration of securities**, with issuer automatically sending all
    information, dividends and other communications directly to buyer/designated custodian.

•   **Buy and sell trades** without brokers or other intermediaries. By P2P or decentralised trading there
    will be increased liquidity and a larger secured lending market.

•   Cryptographically secured **distribution of securities**.

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175   *Ibid*, 45, para 2.

176   'Symbiont Issues First ever Smart Securities™' PR Newswire, available at www.prnewswire.com/news-releases/symbiont-issues-first-ever-smart-securities-300123160.html accessed 12 July 2017.

177   'Handbook on securities statistics' International Monetary Fund (2015), 19, available at www.imf.org/external/np/sta/wgsd/pdf/hss.pdf accessed 12 July 2017.

- **Settlement finality** in real time[178] by legally accountable system validators.

- **Enhanced cross-border clearing and settlement**, with reduced fees, back-office facilities, opportunity costs, increased efficient use of collateral and lower incidence of failed trades.

- **Streamlined and automated flow of instructions and messages**.

- **Automated payment of dividends** and other programmable behaviour.

- **Elimination of intermediaries**, particularly automated programmable behaviour to replace clearinghouses, prime brokers, central securities depositories and settlement services.

Smart securities can also ensure increased transparency in:

- retail and institutional trade;

- availability/pricing of issued securities;

- increased visibility during current opaque periods such as ownership of the security between issuance and ex dividend payment date; and

- sectoral composition of assets/liabilities in support of the 'from-whom-to-whom framework'[179] to assess financial flows and positions.

To date, there has been much focus on tokenisation of assets as a solution to leveraging the several potential benefits of decentralised ledger networks for an enhanced securities transaction life cycle. However, the problem of identifying an appropriate mechanism that delivers real-world fiat currency to a designated party once a bid and offer has been matched to settle the trade is equally important, and has received less attention. An appropriate legal framework would be required to support this.

ICOs

There has been an increasing use of ICOs to raise significant capital. ICOs are essentially a sale or distribution of virtual tokens issued on a blockchain. The tokens can be purchased or acquired in exchange for fiat currency (eg, US dollars) or cryptocurrency (eg, bitcoin or ether). New models have emerged whereby tokens are sold or distributed for the purpose of development of software, platforms or other projects; or as de facto shares with a right or expectation of a return on investment, dividends or share in future profits. After they are issued, the virtual tokens may be resold in a secondary market on VC exchanges or other platforms. In the US, the SEC has described this as a 'new investment space' using new technology that presents both opportunities for fair and lawful as

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178   'Recommendations for securities settlement systems and Recommendations for Central Counterparties', European Central Bank and Committee of European Securities Regulators ECB-CESR (2009), 10, www.ecb.europa.eu/pub/pdf/other/pr090623_escb-cesr_recommendationsen.pdf, 46, para 2 accessed 11 October 2017.

179   Recommendation 15 of the G20 data gap initiative, which states that: 'The IAG, which includes all agencies represented in the Inter-Secretariat Working Group on National Accounts, to develop a strategy to promote the compilation and dissemination of the balance sheet approach (BSA), flow of funds, and sectoral data more generally, starting with the G-20 economies. Data on nonbank financial institutions should be a particular priority. The experience of the ECB and Eurostat within Europe and the OECD should be drawn upon. In the medium term, including more sectoral balance sheet data in the data categories of the Special Data Dissemination Standard could be considered.' 'The Financial Crisis and Information Gaps: Report to the G-20 Finance Ministers and Central Bank Governors' (2009) 8; the IAG comprises the Bank for International Settlements, European Central Bank, Eurostat, IMF, OECD, United Nations and World Bank, available at www.imf.org/external/np/g20/pdf/102909.pdf accessed 12 July 2017.

well as improper use.[180] Subsequently, financial regulators have issued warnings and guidance to the public on ICOs.[181]

Insurance

Similarly, the blockchain and DL technology provides the opportunity to reshape the insurance sector, from the assessment of risk to post-assured claims settlement. For example, the blockchain can be used as a cross-industry, distributed registry with external and customer data to:

1. validate authenticity, ownership and provenance of goods as well as authenticity of documents and data;

2. verify a person's digital identity, perform checks for police theft reports/claims history and detect patterns of fraudulent behaviour related to a specific identity;

3. prove date and time of policy issuance or purchase of a product/asset; and

4. confirm subsequent ownership and location changes.

An insurer may also attempt to offer settlement as a service whereby the settlement is achieved through the blockchain's decentralised consensus mechanism. In other words, today's contracts that achieved consensus between parties can be replaced by a digital distributed network, which enforces agreed terms and rejects deviations from such terms. This allows for the possibility of self-executing and settlement of insurance claims. Another example is the potential to transform transaction processing. For example, a transaction can be processed quickly and almost instantaneously between an assured, the insurance provider, the reinsurer and the recessionary reinsurer to capital markets.

Trade finance

Trade finance is an area where the use of the blockchain and DL technology seems to be extremely suited and useful. Trade finance relates to the process of financing certain trade activities and includes lending, issuing letters of credit, factoring, export credit and insurance. It involves multiple parties (eg, importers and exporters who want to trade with each other, the financing institutions, insurers and credit agencies). Consequently, an immense amount of paperwork is generated (eg, bills of lading and letters of credit), which is processed manually creating a high degree of inefficiency and susceptibility to fraud. These paper-heavy and manual processes can be fully digitised and efficiencies removed while at the same time reducing documentary fraud and increasing transparency. For example, smart contracts, which enable self-executing legal contracts, can help automate processes and reduce costs, while the blockchain can provide assurance, authenticity and timestamped verification of inventories and products in the supply chain. The blockchain can provide a single, immutable trade record verified by all transaction parties. As stated by the EBA, the technology can potentially 'transform trade finance' and 'the auditability of information' exchanged via the technology 'can also help

180   US SEC, 'Investor Bulletin: Initial Coin Offerings' (25 July 2017), www.sec.gov/oiea/investor-alerts-and-bulletins/ib_coinofferings accessed 30 July 2017.

181   Monetary Authority of Singapore (10 August 2017) available at www.mas.gov.sg/News-and-Publications/Media-Releases/2017/Consumer-Advisory-on-Investment-Schemes-Involving-Digital-Tokens.aspx; the Canadian Securities Administrators (24 August 2017) (in Chinese) available at ww.osc.gov.on.ca/documents/en/Securities-Category4/csa_20170824_cryptocurrency-offerings.pdf; the People's Bank of China (30 August 2017) available at www.nifa.org.cn/nifa/2955675/2955761/2967610/index.html and (04 September 2017) available at www.circ.gov.cn/web/site0/tab6554/info4080736.htm; the Securities and Futures Commission of Hong Kong (5 September 2017) available at www.sfc.hk/edistributionWeb/gateway/EN/news-and-announcements/news/doc?refNo=17PR117 all accessed 25 September 2017.

provide a stable basis for legal recourse related to financing'.[182] This is important because the trade finance system relies on letters of credit and is quite open to abuse from fraudsters.[183] Yet, there is no formal international standard or legal rule on the implementation and interpretation of letters of credit.[184] This has caused discrepancies in case law and, coupled with the occurrence of fraud, the whole trade finance system is undermined.[185] In fact, the most important issue in the field of letters of credit law is said to be fraud that remains unsolved, with national courts requiring different standards in letter of credit fraud cases,[186] creating different outcomes across the globe.[187] Moreover, a lack of legal and regulatory harmonisation across jurisdictions has been identified by the International Chamber of Commerce's 2016 and 2017 Global Surveys[188] as a challenge in the sector with differing legal and regulatory requirements increasing the cost and complexity of compliance.[189] Use of the blockchain and DL technology has the potential to minimise instances of documentary fraud, while at the same time helping to create international legal trade finance standards and driving down costs.

Beyond financial services

Smart contracts and dynamic behaviour

Today, the status quo is that pre-negotiated trust is required for parties to transact with each other. This means that, typically, intermediaries are required to establish trust and reduce risk between counterparties to a transaction. For example, in stock markets, there is a 400-year-old practice of transferring and recording ownership of stocks.[190] This is done via a stock transfer agent, the central registrar needed to cancel a share certificate for an investor that sold shares, and substitute the new share owner's name on the official master shareholder listing.[191] However, with decentralised smart contracts, these parties can transact with each other as complete strangers and at arm's length. The blockchain provides trust between parties without the need for the intermediary and act as an immutable record of transactions and ownership. The smart contracts can self-perform and self-enforce contractual terms by its code. This sets the stage for contracts being treated with more fluidity as 'a dynamic expression of negotiation, commitment and events, rather than the more static interpretation of "the four corners of the page" or the performing code within a machine'.[192] Potentially, as contracts become more dynamic and self-executing, they can provide a new level of reliability and verifiability for digital contract signatures. Dynamic multi-signature permissions

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182 'Applying Cryptotechnologies to Trade Finance: Information Paper', Euro Banking Association (EBA) Working Group on Electronic Alternative Payments, Version 1.0, May 2016, 10, 17, www.abe-eba.eu/downloads/knowledge-and-research/EBA_May2016_eAPWG_Applying_cryptotechnologies_to_Trade_Finance.pdf accessed 3 August 2017.

183 Nevin Meral, 'The Fraud Exception in Documentary Credits: A Global Analysis', 2012/2 Ankara Bar Review 48, available at www.ankarabarosu.org.tr/siteler/AnkaraBarReview/tekmakale/2012-2/2.pdf accessed 15 September 2017.

184 *Ibid.*

185 *Ibid.*

186 Gao Xiang and Ross P Buckley, 'A comparative analysis of the standard of fraud required under the fraud rule in letter of credit law', (2003) Duke J Comp & Int'l L 13, 293.

187 Nevin Meral, 'The Fraud Exception in Documentary Credits: A Global Analysis', 2012/2 Ankara Bar Review 48, available at www.ankarabarosu.org.tr/siteler/AnkaraBarReview/tekmakale/2012-2/2.pdf, 64 accessed 11 October 2017.

188 'Rethinking Trade & Finance' ICC Banking Commission (2016), available at http://store.iccwbo.org/content/uploaded/pdf/ICC_Global_Trade_and_Finance_Survey_2016.pdf; 'Rethinking Trade & Finance' ICC Banking Commission (2017), available at https://cdn.iccwbo.org/content/uploads/sites/3/2017/06/2017-rethinking-trade-finance.pdf both accessed 3 August 2017.

189 *Ibid*, at 73 and 59, respectively.

190 Jeff Desjardins, 'New technology could change the way the stock market operates', (Business Insider UK) 23 April 2017, http://uk.businessinsider.com/blockchain-could-change-the-way-the-stock-market-operates-2017-4 accessed 3 August 2017.

191 *Ibid.*

192 Ian Grigg, 'EOS - An Introduction' (2017) 4, http://iang.org/papers/EOS_An_Introduction.pdf accessed 3 August 2017.

have also been described as 'a more natural way to express ownership and control policies'.[193] From a global perspective, these possibilities magnify the varying levels of legal acceptance across jurisdictions of electronic and digital signatures: in many places, handwritten signatures are primarily accepted and, in others, the law surrounding the effect and validity of electronic signatures remains somewhat unclear.[194]

Programmable assets and registries

In many jurisdictions, there is a need for a standardised property rights regime. Land title systems in many places are paper-based and plagued with deficiencies. The use of the blockchain and DL technology can potentially provide a transparent method of record-keeping as an infrastructural bolster to guarantee and enforce property rights, while at the same time reducing costs and administrative headache. Jurisdictions have reportedly started to experiment with blockchain-driven land-titling services (eg, the sale and purchase of land, mortgages and registration of new land title).[195] The timestamping feature of the blockchain and its immutable nature makes it attractive as a digital registry and more so as a registry for digital assets and rights. Effective August 2017, the US state of Delaware signed law amendments into its corporation law to 'provide specific authority for Delaware corporations to use networks of electronic databases (examples of which are described currently as "distributed ledgers" or a "blockchain") for the creation and maintenance of corporate records, including the corporation's stock ledger'.[196] In the gaming, music and other entertainment sectors, which heavily rely on content and intellectual property rights, the blockchain can be potentially transformative as these sectors are often heavily reliant on manual and labour intensive processes to record legal and digital rights.

New gaming models

Blockchain technology can remove inefficiencies in the gaming sector around payments, revenue sharing arrangements, fraud and ownership of assets. Consequently, existing gaming modes are evolving and new ones will likely emerge. For example:

ASSET REGISTRY

As described above, the blockchain can be used to register and record digital assets such as in-game assets. These are virtual items that are purchased for use, typically within electronic and video games. Examples include digital weapons, pets, mounts and skin customisations. Use of the blockchain enables gamers to buy, sell or exchange in-game assets freely and ownership of their assets immutably recorded without reliance on the game's servers for proof of ownership. This is currently being done by multiplayer games such as *Beyond The Void*, which uses the Ethereum blockchain.[197]

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193 'Dynamic Account Permissions', Bitshares, available at https://bitshares.org/technology/dynamic-account-permissions accessed 15 September 2017.

194 Stephen Mason, *Electronic Signatures in Law* (3rd edn, Law Practitioner Series, Cambridge University Press 2012), 153.

195 Laura Shin, 'The First Government To Secure Land Titles On The Bitcoin Blockchain Expands Project' *Forbes* (7 February 2017), www.forbes.com/sites/laurashin/2017/02/07/the-first-government-to-secure-land-titles-on-the-bitcoin-blockchain-expands-project/#75cd94ca4dcd; Meghna Bal, 'Securing property rights in India through distributed ledger technology' Observer Research Foundation (5 January 2017), www.orfonline.org/research/securing-property-rights-in-india-through-distributed-ledger-technology both accessed 8 August 2017.

196 An Act To Amend Title 8 Of The Delaware Code Relating To The General Corporation Law, 2017 DE SB69, https://legis.delaware.gov/BillDetail/25730 accessed 8 August 2017.

197 *Beyond The Void* game is available at https://www.beyond-the-void.net accessed 13 July 2017.

On the gaming side, the technology disintermediates large distribution platforms, allowing gamers to directly compensate developers for their games and cutting costs. On the gambling side, new gambling models have emerged. The Isle of Man Gambling Supervision Commission has formally permitted such models briefly described below:[198]

- Bitcoin to fiat conversion prior to play: in this model, the operator uses an exchange as an interface between players who deposit bitcoins on its platform. The player deposits with the exchange and the exchange passes the fiat equivalent to the operator for gambling;

- Bitcoin-in, bitcoin-out, P2P: in this model, players may deposit bitcoins and use them to play against other players with the same deposit arrangements. Play may be competitive (eg, poker) or passive (pool betting and Parimutuel).

- Bitcoin-in, bitcoin-out, against the house: in this model, players may deposit or pay for gambling against an operator and winnings are drawn against the operator's funds rather than those of other players.

Digital identity

Secure identity management is critical for the professional legal services sector. The UN Commission on International Trade Law (UNCITRAL) Working Group IV (Electronic Commerce)[199] is investigating the legal issues related to identity management and trust services. It is scoping out the need for providing an enabling legal framework to facilitate cross-border recognition of digital identity credentials or assertions to promote confidence in the use of identity management systems and transactions.

Access control of blockchain applications requires, among other things, authentication of a user's identity and proof of their authority level for the required operation. Authentication requires identity management of all entities involved (usually people, organisations, devices and software) to a given, internationally-defined level of assurance (LoA).[200] Authentication across communities of multiple authorities or organisations requires federated identity management (FIM), which can be developed to share identity information across online entities and trust domains.[201] Blockchain technology facilitates secure storage and exchange of identity data, such as fingerprints, facial patterns and voice, through public and private key encryption and data hashing stored on the blockchain.[202] In May 2017, the UN World Food Programme (UNWFP) deployed a programme relying on digital identity and blockchain-enabled coupons to make distribution of aid to refugees faster, cheaper and more secure.[203] The programme used the Ethereum blockchain and eye scanning hardware to verify about 10,000 refugees and issue cryptographically unique coupons, which were used to purchase food from local supermarkets.[204]

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198   Isle of Man Gambling Supervision Commission Practice note (1 February 2017), 1.

199   UNCITRAL Working Group IV (Electronic Commerce), see www.uncitral.org/uncitral/en/commission/working_groups/4Electronic_ Commerce.html accessed 11 October 2017.

200   LoA is used to describe the US government's four identity authentication assurance levels, which are used for e-government transactions. The four levels describe the degree of certainty regarding the degree of certainty that the individual provides in digital credentials. See www. identity.psu.edu/wp-content/uploads/sites/3053/2014/06/LoA-Final-Report.pdf accessed 4 February 2017.

201   'Federated Identity Management: IT Glossary' (Gartner), www.gartner.com/it-glossary/federated-identity-management accessed 10 August 2017.

202   'Identity Management on the Blockchain' ShoCard (8 October 2016), https://shocard.com/cpt_news/identity-management-on-the-blockchain accessed 10 August 2017.

203   UNWFP 'Blockchain Against Hunger: Harnessing Technology In Support Of Syrian Refugees' (30 May 2017), www.wfp.org/news/news-release/blockchain-against-hunger-harnessing-technology-support-syrian-refugees accessed 13 July 2017.

204   Michael del Castillo, 'A Branch of the UN Just Launched Its First Large-Scale Ethereum Test', *Coindesk* (1 May 2017), www.coindesk.com/the-united-nations-just-launched-its-first-large-scale-ethereum-test accessed 13 July 2017.

Part 3: Impact on the legal sector, profession and services

Increasing use of the blockchain and other DL technology will impact the legal sector in three main ways: the law, legal profession and legal services will change and adapt to unprecedented technological innovation. Indeed, law associations around the world continue to emphasise that there is ongoing technological change and the need for lawyers to keep abreast of technological benefits and risks. The Law Society of England and Wales, in its 2017 report titled 'Capturing Technological Innovation in Legal Services', refers to bitcoin as a new innovation, how the legal sector is increasingly engaging with advanced automation and that law firms are pushing the boundaries of how technology can engage with complex legal concepts.[205] In the US, the American Bar Association's (ABA) Model Rules of Professional Conduct, Rule 1.1 Comment 8 states that legal practitioners are obliged to 'keep abreast of changes in the law and its practice, including the benefits and risks associated with relevant technology'.[206] There is an expectation that lawyers be technologically competent in order to be able to represent their clients dutifully and assist in securing access to justice.

The main aspects of the legal sector that will be impacted are of three main categories:

- computational law, meaning how legal rule and decision-making processes can be computerised and automated;

- legal infrastructure, meaning the tools, systems and processes that facilitates the daily functioning of a legal system; and

- legal information retrieval, meaning accessing legally relevant information more efficiently.

The several potential effects of this technology on the legal profession and services is described below.

The legal profession

Due to changing client needs and expectations, lawyers have had to make strategic changes to their staffing, service delivery, use of technology, business models and pricing. These changing needs may see the role of the legal practitioner evolve, likely to require lawyers to work more closely with technologists and/or have at least basic coding knowledge and programming skills in order to draft and then code the terms of a contract. At the very least, the blockchain innovation may result in law firms beginning to employ candidates from science, technology, engineering and mathematics (STEM) or with coding and programming backgrounds.[207] Law firms around the globe are even developing innovation labs and in-house technology for the legal sector in order to boost their competitive advantage against other firms.[208] Similarly, legal practitioners also have begun to explore the applications of blockchain to

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205   'Capturing Technological Innovation in Legal Services report', Law Society of England and Wales (25 January 2017), www.lawsociety.org.uk/support-services/research-trends/capturing-technological-innovation-report accessed 13 July 2017.

206   'Comment on Rule 1.1: Client-Lawyer Relationship', American Bar Association Model Rules of Professional Conduct, www.americanbar.org/groups/professional_responsibility/publications/model_rules_of_professional_conduct/rule_1_1_competence/comment_on_rule_1_1.html accessed 10 August 2017.

207   Kristen Silverberg, Conan French and Dennis Ferenzy, 'Getting Smart: Contracts on the Blockchain', Institute of International Finance (11 May 2016), www.iif.com/publication/research-note/getting-smart-contracts-blockchain accessed 10 August 2017.

208   Ron Friedmann, 'Will Blockchain Affect Your Practice or Firm? (Perspective)', Bloomberg Law (17 August 2016), https://bol.bna.com/will-blockchain-affect-your-practice-or-firm-perspective accessed 10 August 2017.

different business functions and recently announced that they will accept bitcoin as payment.[209]

Legal professionals can expect to be confronted by more clients with issues arising from the use of such decentralised ledger technology. The creation of courts such as the Intellectual Property Enterprise Court and the Technology and Construction Court, both in the UK, demonstrates the need for arbitrators with tailored and specialised knowledge to respond to the growing number of technology-related disputes.[210] Moreover, new DL technology models, such as EOS, which is a platform for decentralised applications, have an arbitration mechanism embedded in the software design.[211] As a result, law graduates may seek to expand their cross-disciplinary knowledge and gain coding skills in order to maintain a competitive advantage in an increasingly competitive and dynamic industry. Conversely, non-lawyers may seek to expand their legal knowledge as there is a crossover between sectors and to fulfil roles that are not reserved for legal practitioners.

Blockchain can provide legal institutions the opportunities to rethink the functioning of their processes and infrastructures in place. Bar councils, bar associations and law societies around the world will need to explore the unique interoperability feature of blockchain technology to develop a collaborative, secure, decentralised communications platform for information-sharing between jurisdictions, and facilitate international cooperation in fighting cybercrime affecting the legal profession.[212] Information-sharing can be wide-ranging – from legal practitioner credentialing to court ruling and judgments, to other types of cooperation – and may encourage more push towards globalisation of legal practices.

Legal services

It is probable that the software and database tools lawyers use in their practices will incorporate blockchain technology, so the way that legal services are provided will inevitably change. For example, contract drafting may be somewhat displaced by smart contracts, as mentioned above. There may be an enhanced role for creating and mediating legal structures within which smart contracts will operate. By extension, legal services that deliver ready-made contracts may change. As an example, the timestamped creation of a contract online (with electronic signatures) that can be amended using the blockchain and provision of the additional service of reviewing the contract history. Another example is the enablement of high-volume, low-value services, which may have been previously cost-prohibitive. For example, legal advice charged by the minute or documents provided at a small cost but because of the number that can now be provided and managed, it may open up a new microtransaction legal services delivery channel.

Service of documents

Service of legal documents and sharing of confidential information between parties to litigation, among legal representatives and with courts and clients, remains one of the most basic and yet fundamental daily practices in law firms. In an increasingly technological world, the greatest opportunity cost is time. Traditional means services such as postal and personal service and delivery

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209   Kevin Helms, 'Int'l Law Firm Expands Blockchain Practice, Accepts Bitcoin', Bitcoin.com (10 August 2016), https://news.bitcoin.com/law-firm-blockchain-practice accessed 10 August 2017.

210   'Intellectual Property Enterprise Court', GOV.UK, www.gov.uk/courts-tribunals/intellectual-property-enterprise-court accessed 10 August 2017.

211   Ian Grigg, 'EOS - An Introduction' (2017) 4, http://iang.org/papers/EOS_An_Introduction.pdf accessed 3 August 2017.

212   Anurag Bana and David Hertzberg, 'Data Security and the Legal Profession: Risks, Unique Challenges and Practical Considerations', (2015) 16 BLI 247.

are quickly becoming outdated, time-consuming and inefficient. More contemporary means of file-sharing and information transfer – such as email, Dropbox and Google Drive – are being used, but are vulnerable to hacks and security compromise. The popular file-sharing database Dropbox has been hacked in the past, with more than 68 million users' passwords being leaked. Perhaps of greater concern, intermediary servers like these have unrestricted access to all uploaded information, meaning that information is never really limited to the uploader and the party granted with access.

In the case of *MKM Capital Pty Ltd v Corbo & Poyser*, the Australian Capital Territory Supreme Court judge permitted service of notice of default judgment via Facebook, where it could be proven that personal identification information matched the Facebook profile. However, substituted service by Facebook was not permitted by Ryrie J in *Citigroup Pty Ltd v Weerakoon*, because the court noted the 'uncertainty of Facebook pages' and the 'fact that anyone can create an identity that could mimic the true person's identity… does not show… with any real force that the person who created the Facebook page might indeed be the defendant'. Although social media bears evidential uncertainty, the use of blockchain may be able to overcome these downfalls. Blockchain technology can provide a secure, speedy, immutable and timestamped means of information sharing, which may potentially revolutionise service of documents and sharing of confidential information between users. Facebook and other social media intermediaries have unrestricted access to whatever is posted by users. The decentralised and encrypted nature of blockchain technology ensures security without having to rely on an intermediary, such as Facebook or Dropbox, which has ultimate control and access to its users' data. Keybase is an application that facilitates encrypted file-sharing using blockchain technology, and Storj is another application that facilitates decentralised, encrypted end-to-end file storage. Moreover, Proof of Existence uses blockchain technology to provide timestamping and document authentication, whereby a cryptographic hash of the original file is stored on the blockchain to detect any tampering or changes to the document. The Blockchain Apparatus pilot program is also used to notarise and timestamp documents. These projects, which run on blockchain technology, may hold the potential to revolutionise confidential document-sharing between parties in litigation, clients and lawyers, courts and representatives, and provide a secure and immutable record for the substituted service of legal documents.

Estates and trusts

DL technology and smart contracts have the potential to be used in trust creation and estate administration. The division of assets in an estate could potentially be cryptographically and securely coded into the blockchain which, upon the passing of the testator and the registration of the death certificate, the terms of the will or trust could self-execute to disburse the assets. The piloted service Blockchain Apparatus advertises the potential to administer and execute will documents without human involvement, even allowing for revisions of the documents, which are stored in their own original state, to preserve the right to amend.[213] Although blockchain is unable to remove all the legal disputes around the creation of a will, such as issues regarding ambiguous terms and claims that the testator was under duress, it has the potential to streamline and expedite the estate administration process and 'make it much easier for a genuine will to be upheld, for a bogus challenge to be dismissed, and for courts to come to factual findings much more quickly'.[214]

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213   Scott Fargo, 'Blockchain Apparatus Launches a New Trusted Will System' Inside Bitcoins (9 April 2015), http://insidebitcoins.com/news/blockchain-apparatus-launches-a-new-trusted-will-system/31516 accessed 9 August 2017.

214   Victoria Lemieux, 'Blockchain for Recordkeeping: Help or Hype?' ResearchGate (October 2016), www.researchgate.net/profile/Victoria_Lemieux/publication/309414363_Blockchain_for_Recordkeeping_Help_or_Hype/links/580f539408ae009606bb62f6.pdf accessed 9 August 2017.

The need for wills and estate lawyers will likely endure, as they are required to draft and encode these legal documents. However, the digitisation of the industry and the increasing use of pre-drafted will templates may put pressure on these practitioners to become technologically literate in order to remain relevant and competitive.

Evidence

DL technology, through its immutable storage capability, has the potential to act as an authentication service. Binded,[215] Monegraph[216] and Verisart[217] are new technological solutions that allow users to create permanent records of digital content such as photographs and text, which serve the function of copyright and storage of original, authentic materials.[218] The immutable, timestamping features of blockchain-powered applications may have the ability to prevent evidence from being tampered with, and could potentially be used to protect the integrity of evidence before a court.

Discovery

Document discovery is one of the most critical aspects of pre-trial litigation. The process of disclosure or 'discovery' is governed by rules of evidence and court rules subjective to the relevant jurisdiction of the applicable law. If an application for discovery is granted by a court, parties and legal representatives involved in litigation may be obligated to provide the other side with all documents that are relevant to a fact in issue.[219] Currently, this is a lengthy process involving the exchange of documents and each party taking control of disclosed documents on their centralised systems. However, blockchain and DL technology could be used to allow disclosure to be undertaken on a secure and shared platform, access to which is limited to the trusted parties. It will also keep a permanent record of any interaction with the data.

Title registry and cross-border asset transfer

Currently, transfers of title or ownership of property or land must be registered with the office of state revenue or land titles in each jurisdiction, with lawyers drawing up the corresponding legal instruments for their exchange. Blockchain technology eliminates the need for the middleman or titles registry facilities by keeping an immutable and secure record of all the transfers in ownership of the particular asset. This may be of particular utility when assets are being transferred across borders where financial institutions and frameworks differ. Title over the asset can be transferred between users through ColoredCoins,[220] which is an open source bitcoin protocol where each coloured token represents a different asset (eg, house, boat, car) that can be exchanged between users.[221] For the exchange of property or assets, title deeds can be hashed, whereby they are converted into mathematical codes and securely stored on the blockchain.[222] The use of blockchain technology

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215   See https://binded.com.

216   See https://monegraph.com.

217   See www.verisart.com.

218   Lance Koonce, 'Seismic Shifts: blockchain technology and the law', Legal IT Today (15 September 2016), 28.

219   Colin Loveday and Nicholas Mavrakis, 'Litigation and Enforcement in Australia: Overview' Thomson Reuters Practical Law (2016), http://uk.practicallaw.com/4-502-1038?source=relatedcontent accessed 28 January 2017.

220   See http://coloredcoins.org accessed 11 October 2017.

221   Tim Swanson, 'Smart Property, Colored Coins and MasterCoin', CoinDesk (22 January 2014), www.coindesk.com/smart-property-colored-coins-mastercoin accessed 9 August 2017.

222   Alexander Shelkovnikov, 'Blockchain applications in the public sector' (Deloitte, 2016), www2.deloitte.com/content/dam/Deloitte/uk/Documents/Innovation/deloitte-uk-blockchain-app-in-public-sector.pdf accessed 9 August 2017.

in this area will likely reduce today's need for land title registry offices, increase the security and expediency of title transfer processes and reduce human error. Moreover, the entire title's registry process – for property transfers, liens and searches – could be simplified with smart contracts self-enforcing compliance. For example, upon the repayment of a loan, instructions to remove a lien can be carried out and validated or, if a person attempts to incorrectly register a title to land, it can be invalidated based on the blockchain's immutable record.

Billing structures

The use of the blockchain ledger could provide practitioners with a legitimate record of billable time and improve transparency by allowing clients to track and monitor the inflow and outflow of trust monies and disbursements made in their matter. A trend that may pick up pace soon is the concept of alternative fee arrangements (AFAs), which is an alternative to the traditional billable hour scheme.[223] Small and medium-sized non-litigation law firms may have a preference in adopting this arrangement as it is more predictable and stable for billing purposes. It will be helpful for clients to anticipate future legal costs and blockchain technology could assist in managing and transferring the value in this arrangement. Data can be pegged to the blockchain, which interconnects the lawyer and the client through its interoperability system. Fee payment is done via designated milestones once accomplished. The rise of blockchain technology and new disruptive business models will likely inspire law firms to move away from the billable hour scheme to implement a fee structure that encourages innovation and competitive flexibility.[224]

Dispute resolution and arbitration

The use of the blockchain will necessarily create new types of disputes and the mechanisms to resolve them. For example, following the DAO June 2016 incident (referred to in Part 2 above) the protocol was changed, in what is referred to as a hard fork, thereby invalidating all transactions determined by some as an attack. However, the alleged attacker has reportedly characterised the incident as use of an 'explicitly coded feature as per the smart contract terms',[225] where the hard fork would amount to seizure of their legitimate and rightful assets, claimed legally through the terms of a smart contract and that potentially legal action would follow.

Blockchain-enabled dispute resolution can be in the form of an arbitration agreement embedded in the software (eg, a smart contract) or that exists separately but in parallel to such software. Especially when using smart contracts, there is the possibility of non-human arbitration whereby disputes are resolved based on inputs received by oracles. Using the EOS example,[226] alternatively, there can be a human arbitrator who determines disputes based on software users' prior consent to such dispute resolution mechanism. Whether disputes are resolved by human or non-human arbitrators, blockchain-enabled mechanisms may inevitably lead to new or revised arbitration rules.

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223   Ilina Rejeva, 'Alternative Fee Arrangements: A Comprehensive Guide for Law Firms' (LegalTrek, 16 September 2015), https://legaltrek.com/blog/2015/09/alternative-fee-arrangements-a-comprehensive-law-firm-guide accessed 9 August 2017.

224   Ralph Baxter, 'A Framework for Success: The 21st Century Law Firm Business Model', Thomson Reuters (24 November 2015), http://legalexecutiveinstitute.com/a-framework-for-success-the-21st-century-law-firm-business-model accessed 9 August 2017.

225   'An Open Letter To the DAO and the Ethereum community' (2016), https://steemit.com/ethereum/@chris4210/an-open-letter-to-the-dao-and-the-ethereum-community accessed 9 August 2017.

226   *Ibid.*

Escrow services

Use of blockchain and other decentralised ledger technology may lead to complete automation of certain escrow functions typically performed by lawyers. For example, in a multi-signature transaction, where more than one digital signature is required to approve a transaction, there can be two parties that contractually agree that a payment or other event will occur as a condition precedent to the happening of a verifiable event. It is agreed that a third party will digitally sign the transaction in favour of the appropriate party upon verification of the event while, at the same time, that third party does not take control or custody of the digital asset.

New law practices

Because DL technology represents a significant departure from traditional operating models, new DL legal practices have emerged for new and existing models and provide legal and regulatory analysis and support. A common practice is regulatory analysis to determine how a business fits or does not fit into the existing legal and regulatory framework. As DL technology continues to blossom, its impact will arguably creep into various legal disciplines, similar to how the internet became inserted into the modern-day law practice. As is happening now, more and more clients will demand sophisticated legal advice related to their complex use of blockchain technologies to evolve their businesses.

The legal sector

Shift to client do-it-yourself lawyering?

Because of the potential for significant automation, many standard commercial and civil actions can be simplified to significantly reduce legal costs. One example is to decentralise the drafting of legal documents whereby users can access a global inventory of legal forms, clauses and use cases to apply to their own needs. This also can be used by lawyers themselves, the law firm or the sole practitioner, who otherwise may not have access to such global databases, whether due to cost prohibition or otherwise. Another example is that, because the blockchain and DL technology can 'algorithmically enforce private agreements',[227] the role that lawyers play in assisting clients to assert and enforce contractual legal rights may change. This would be an extension of what we have begun to see as the use of open source principles to significantly reduce the inefficiencies and costs of conventional lawyering.

Recognition and enforceability in absence of legal precedent

It is very foreseeable that there will be continuing friction between traditional systems and new, blockchain-enabled models, for which arguably there are no legal precedents. This creates both opportunity and risk, as with all new forms of technology. As models are created, the law will probably have to play catch-up and a determination made if these new models will be recognised upon (significant) usage and risk: the extent to which data and value/funds can potentially be lost.

A DAO is a clear example of the many challenges of legal recognition and enforceability that new technology brings. First, it illustrates what may, in the future, be a new form of legally-recognised

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227   Patrick Murck, 'Who Controls the Blockchain?' Harvard Business Review (April 2017), https://hbr.org/2017/04/who-controls-the-blockchain accessed 30 July 2017.

entity. Because its participants communicate with each other via the rule set of a computer network protocol, with no legal corporate charter, but with the prospect of automated- and self-governance, there is arguably no legal recognition or precedent for it. On the face of it, it has no legal personality or existence.[228] By its July 2017 report, the SEC described the DOA as a 'virtual' organisation embodied in computer code and executed on a distributed ledger or blockchain'[229] and that it was an unincorporated association.[230] Second, the sale of the DAO tokens raises the question of whether the sale or distribution of such virtual tokens constitutes securities subject to securities laws. By its report, the SEC left this question open, concluding that, whether or not a particular transaction involves the offer and sale of a security – regardless of the terminology used – will depend on the particular facts and circumstances, including economic realities, of the transaction.[231] As aforementioned, the self-governing software mechanism for the actions taken by a DAO and the raise of capital by sale of its tokens could not have been contemplated prior to the blockchain and pushes the boundaries as to what the law can support, recognise, regulate and protect.

Ongoing analysis, modernisation and adaptation of existing legal and regulatory frameworks

Necessarily, a blockchain-enabled world requires ongoing analysis, modernisation and adaptation of existing legal and regulatory frameworks. The current letter of the law should be reviewed where new models and implications are not captured and, where appropriate, more emphasis placed on the spirit of the law and policy goals. For example, current financial frameworks presume that payment and settlement finality requires at least three parties (transferor, transferee and central counterparty), and cannot occur between two parties without the central counterparty. Yet, due to the risk of loss or value and data, financial services providers who use DL technology for payment and settlement of transactions may need to be captured under regulatory frameworks to maintain policy goals of consumer protection, market stability and AML controls. This would mean appropriate changes to existing and, if necessary, introduction of legislation and regulation. Beyond financial services, legal framework adaption has already started. This is illustrated by the US state of Delaware amending its corporation law to allow companies to maintain records, including its stockholding, on the blockchain,[232] effectively giving rise to 'blockchain shares'. This will likely pave the way for other legislative changes.

A second look at jurisdiction and cross-jurisdictional issues

Both the functionality and the potential use of the blockchain invites an examination of legal jurisdiction and governing law. There are two aspects: the legal jurisdictional challenges that arise from the use of cross-border technology and the potential for the technology to enable standardisation towards inter-jurisdictional legal harmonisation.

Multi-signature transactions illustrate the complexity of application of national laws to cross-border activities. These are transactions that involve more than two parties' digital signature approval before settlement can happen. For example, when spending funds come from a bitcoin

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228   David Harrison 'Decentralized Autonomous Organizations' Allen & Overy, (May 2016) 6, available www.allenovery.com/ SiteCollectionDocuments/Article%20Decentralized%20Autonomous%20Organizations.pdf accessed 30 July 2017.

229   US SEC, Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, Release No 81207 (25 July 2017) 1, available at www.sec.gov/litigation/investreport/34-81207.pdf accessed 30 July 2017.

230   *Ibid.*

231   *Ibid,* 17.

232   An Act To Amend Title 8 Of The Delaware Code Relating To The General Corporation Law, 2017 DE SB69, https://legis.delaware.gov/ BillDetail/25730 accessed 8 August 2017.

wallet address, more than one signature by an applicable private key paired with that wallet address are required before any funds can be spent. This means that no one individual can transact from this wallet address unless all required digital signatures are obtained. A typical example is that two out of three digital signatures are required to effect a transaction. One implication is that the holders of the various keys are legal or natural persons, all resident in differing jurisdictions and providing their signatures from differing jurisdictions. Consequently, governing law in the event of a dispute may be complex and extremely challenging.

The European Commission has commented that use of an inherently cross-border technology, such as the internet, does not mean that national (or European) borders and jurisdictions simply disappear, much like they did not disappear when other cross-border activities (eg, international trade, the telephone system, radio and television) became widespread.[233] This logic applies to bitcoin, the blockchain and DL technology. Yet, their intrinsic digital and cryptographically verifiable nature calls for more thorough reflection on how legal rules can apply. This especially since extraterritorial application of national law has historically led to a number of contradictory legal decisions based on various interpretations of the 'geographies' of the physical or logical structure of the technology (eg, in the case of the internet, the location of the servers where the information is stored or of the cables where it transits).[234]

A recurring challenge of international relationships is the differing legal approaches that may be taken to resolve disputes. This is exemplified by multi-party relationships where parties conduct activities in a range of jurisdictions where each party may be reluctant to agree to their contract being governed by the law of the other. The use of the blockchain and DL technology may alleviate this friction by triggering a digitisation era. It may usher in standardisation of processes, mechanisms and contracts. This potentially will minimise divergence in legal treatment of documents across jurisdictions and help foster inter-jurisdictional legal harmonisation, for example in trade finance, as discussed above, .

Fitting a square peg in a round hole

While the DL technology sector matures, questions of new types of duties and obligations arise. There has been continuing discussion and assessment of new blockchain driven models and current models utilising the technology. From a legislative and regulatory standpoint, parallels can be drawn from existing frameworks. Yet, in many ways, this is somewhat attempting to fit a square peg in a round hole and remains a grey area. For example:

- Does the law need to recognise digital assets (eg, bitcoin) as money, a commodity, property, an instrument, or a unit of value or exchange, especially as there seems to be a mismatch between a general lack of recognition on the one hand and, on the other, regulation of Fintech companies that use digital assets to facilitate or make international payments?

- Does a DAO run afoul of securities laws; do its creators or promoters bear any liability for loss of value by its users; is there any duty owed to users (ie, token-holders) who may not understand or be fully aware of risks and responsibilities; and, especially if yes, is or should this type of mechanism be captured by regulation?

- Do new crowdfunding models, such as ICOs, whereby tokens are typically sold to raise funds, require recognition by existing frameworks and to what extent does 'caveat emptor' apply?

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233   European Commission, 'Digital Single Market Factsheet: Internet Policy and Governance in plain language' (23 May 2014), 10: Internet and Jurisdiction, https://ec.europa.eu/digital-single-market/en/news/internet-policy-and-governance-plain-language accessed 31 July 2017.

234   *Ibid.*

- Is there or should there be a legal or statutory duty with respect to use of open source software whereby substantial (sensitive) data, value or funds of a third party can be exposed or lost?

- Even where some jurisdictions have answered (eg, by policy, guidance, legislation or regulation) the above or analogous questions, does there need to be an inclusive and forward-looking reflection on the evolution of jurisdictional principles in the age of blockchain and DL technology in order to avoid creating a patchwork of inconsistent laws across the globe?

'RegTech' and regulatory oversight

The blockchain and DL technology can potentially transform regulatory supervision and oversight as it exists today. It can significantly increase transparency and optimise regulatory oversight. DLs can potentially act as a supervisory and oversight tool that can be leveraged by regulators who are charged with protection and promotion of sector markets. The technology can be used by regulators to obtain unprecedented detection of patterns of behaviour, issues or violation of legal rules. This represents a shift from having to rely on institutions to provide data. Regulators will be able to monitor and view activity and behaviour in real time with cryptographic verifiability. They can also use the technology to ensure external data consistency and lineage, for disaster recovery purposes, and to substantially enhance their monitoring and oversight functions. As examples, in financial markets, this can be for AML, know your customer (KYC) compliance, market manipulation or insider trading.[235] For road traffic and safety authorities, this can be to track points on or rescind a driver's license if too many points accumulate.[236]

Law enforcement opportunities and challenges

The blockchain creates an immutable and unchangeable record of transactions. This allows for forensic analysis of transaction history and behaviour in a way not previously possible. The open and voluminous nature of data held within the blockchain means that a variety of valuable insights can be gained by law enforcement agencies to support efforts against money laundering and other serious crimes. However, the challenge is that this may require more training and policing by law enforcement agencies of transactions in current circumstances where they are playing catch-up to the technology. For example, it is understood that, as at 2015, the UK's Suspicious Activity Report system, run by the Financial Crime Unit, received 350,000 submissions relating to blockchain transactions yet there was only one successful conviction.

Conclusion

The legal profession and legal services should be shaped around the people and organisations that they serve. The application of blockchain and DL technology has potentially far-reaching application, both for the legal profession and its clients. This innovation as a P2P ledger without third-party verification and enablement of self-enforcing behaviour through smart contracts is very significant. It potentially reduces or eliminates manual, paper-intensive processes prone to human error, the cost of and intermediaries themselves, and multiple versions of truth or events between parties. For this

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235   ESMA 'The Distributed Ledger Technology Applied to Securities Markets Report' (7 February 2017), www.esma.europa.eu/sites/default/files/library/dlt_report_-_esma50-1121423017-285.pdf accessed 25 July 2017

236   Michael del Castillo, 'Deloitte Opens Ethereum Identity Platform to Blockchain Developers', *Coindesk* (9 November 2016), www.coindesk.com/deloitte-opens-ethereum-identity-platform-blockchain-developers accessed 25 July 2017.

reason, the blockchain and DL technology can potentially transform almost every sector where value and information are traded and transferred. This includes the legal sector itself. There are practices of law and legal services where highly sophisticated technologies are in use today and others where delivery has remained the same for decades. Yet, the law, the legal profession and legal services will naturally change and evolve as they are directly or indirectly impacted by new technology, especially if fundamental, as the blockchain appears to be.

Appendix: List of acronyms and abbreviations

Acronyms

4AMLD	EU Fourth AML Directive
ABA	American Bar Association
AFAs	alternative fee arrangements
AML	anti-money laundering
CFTC	US Commodity Futures Trading Commission
CJEU	Court of Justice of the European Union
CTF	counter terrorist financing
DAO	decentralised autonomous organisation
DL	distributed ledger
DNB	De Nederlandsche Bank (Dutch Central Bank)
DVP	delivery-versus-payment
EBA	European Banking Authority
ECB	European Central Bank
ESMA	European Securities Market Authority
EU	European Union
FATF	Financial Action Task Force
FCA	UK Financial Conduct Authority
FIM	federated identity management
FSA	Japan's Financial Services Agency
GST	Goods and Services Tax
ICOs	initial coin offerings
IRS	US Internal Revenue Service
KYC	know your customer
LoA	level of assurance
MSB	money services business
NYDFS	New York's Department of Financial Services
OTC	over-the-counter
P2P	peer-to-peer
PSD	Payment Services Directive 2007
PSD2	revised Payment Services Directive
SEC	Securities Exchange Commission

SME	small and medium-sized enterprises
STEM	science, technology, engineering and mathematics
UIGEA	Unlawful Internet Gambling Enforcement Act 2006
UK	United Kingdom
UKGC	UK Gambling Commission
UN	United Nations
UNCITRAL	UN Commission on International Trade Law
UNWFP	UN World Food Programme
US	United States
VAT	value added tax
VC	virtual currency

Abbreviations

BaFin	German Federal Financial Supervisory Agency
California BitLicense Bill	California AB-1326 Digital Currency Bill
FinCEN	US Financial Crimes Enforcement Network
Fintech	financial technology
NY BitLicense Regulations	New York BitLicense Regulatory Framework
VC Regulations	revised Payment Services Act of Japan, together with relevant regulations