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# INTERNATIONAL LAW AND ITS DISCONTENTS: STATES, CYBER-WARFARE, AND THE PROACTIVE USE OF TECHNOLOGY IN INTERNATIONAL LAW

ZEINA ABU-MEITA\*

*Technology enables trans-jurisdictional activity, both legal and illegal, by people, organisations, and governments. Technology is advancing much faster than the international laws that must cope with such progression. Blockchain technology is examined as an opportunity for the law to catch up with technological advancements rather than fall further behind them. Governments and corporations have made several disconnected attempts to harness the unique properties of blockchain technology to promote electronic voting and asset registration. The benefits of incorporating blockchain technologies may have the potential to alleviate some of international law's current discontents.*

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## I INTRODUCTION

Technology typically advances ahead of the law's ability to deal with its implications; the term 'law lag' describes this phenomenon.<sup>1</sup> The issue of technology outpacing the law has been identified in cases dating back to early problems with Copyright law in the 1800's.<sup>2</sup> Since then, the pace at which technology has advanced has accelerated exponentially, and technology in the late 20<sup>th</sup> and early 21<sup>st</sup> centuries has developed far quicker than law has been able to. Technology's global reach means that it must be dealt at an international law level and, as a result, trans-jurisdictional complexity arises. The distinction between public and private international law adds yet another layer of difficulty to the issue of law catching up with global technological advancements.

Civil war, regional conflict, and international disputes create complications that public international law must react to. The transnational character of internet-based technologies has unavoidable implications for public international law. In 'traditional' warfare, there is large-scale mobilisation of local physical forces tying the instigating state to a local action. However, cyberwarfare is characterised by intangible actions, untraceable or obfuscated responsibility, and unexpectedly widespread consequences.

Similarly, disputes between legal entities in different legal jurisdictions create complications that private international law must deal with. These disputes are often commercial and/or contractual in nature.

One emerging internet-based technology, known as blockchain technology, poses unique three-fold benefits to international law. Its rapid uptake in the international finance industry will need to be dealt with under private international law. Blockchain technology has potential for espionage and cyberwarfare meaning it will need to be dealt with under public international law. The ability to code for non-repudiable 'smart contracts', as discussed later, provides a new medium in which contractually binding agreements can be written, actioned, and enforced; blockchain technology will directly impact the operations of basic contract law internationally.

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<sup>1</sup> Lyria Bennett Moses, 'Recurring Dilemmas: The Law's Race to Keep up with Technological Change' (2007) 2007(2) *University of Illinois Journal of Law, Technology & Policy* 239.

<sup>2</sup> L R Patterson, *Copyright in Historical Perspective* (Vanderbilt University Press, 1968) 214.

The current international law literature on blockchain technology tends to reflect the mindset of how it should be *dealt* with on an international level. It treats blockchain technology like any other new technology, as something separate from the operations of the law, to be dealt with reactively after its legal implications become apparent. This paper proposes that international law should actively *incorporate* the use of blockchain technology — that it should proactively utilise emerging technology with direct applications to legal processes, in order to future-proof itself from whatever new technological or geo-political situation should arise. For example, when discussing the evolution of law globally and whether the internet is eroding state sovereignty specifically, Schultz argues in the negative, using the example of the Dutch revolt in the Thirty Years War in Westphalia.<sup>3</sup> He explains that the resulting treaties and principles of sovereignty, along with the equality of states which emerged, have led to a natural fragmentation of internet law today. However, one thing missing from this analysis is the impact of the technology from this time and its effect on the law. Modern law graduates would think no more of composing new laws or treaties in a real-time collaborative cloud-based document, than the authors of the Westphalian treaty thought of using the leading-edge calligraphy techniques of the time. The construction medium is inevitably a part of the message. However, the ramifications of instant global availability, collaboration and feedback, online translation services, social media, and the possibility of near-instant global counteraction, cannot be ignored.

The nature of any current international treaty cannot stand if it reflects the territoriality and technology of a pre-internet world, much less a 17<sup>th</sup> century one. As put eloquently by Svantesson: 'whatever the status of territoriality principle *de lege lata*, it is unsustainable as the jurisprudential core of our thinking on jurisdiction *de lege ferenda*'.<sup>4</sup> The international community needs to find ways to use these technologies as part of the mechanism of international law so that they can govern the world as it is today and tomorrow, otherwise global users of leading-edge technologies will always have an edge over outdated territorial laws and processes.

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<sup>3</sup> Thomas Schultz, 'Carving up the Internet: Jurisdiction, Legal Orders, and the Private/Public International Law Interface' (2008) 19(4) *European Journal of International Law* 799.

<sup>4</sup> Dan Jerker B Svantesson, *Private International law and the Internet* (Wolters Kluwer, 3<sup>rd</sup> ed, 2016).

It is the applicability of blockchain technology to legal processes that hints at the possible compatibility with international laws' existing structure, rather than simply being yet another technology that must be dealt with. As an illustrative example, with the continuing refugee crisis in Europe, blockchain technology may aid and streamline the implementation of different facets of international law, while creating development of legal structures for those technological advances — just as Africa has done to lead the world in mobile electronic payments.<sup>5</sup> Africa leads precisely due to their lack of access to the payments infrastructure incumbent in Western countries, which forced them to innovate. In the same way, blockchain technology promises to provide the means which allows refugee populations to leapfrog Western countries in digital identity, electronic legal infrastructure, electronic property rights, and universal financial access.<sup>6</sup> With blockchain technology, international law can co-evolve alongside technology, rather than waiting passively while technology takes other directions and then trying to reactively regulate against their uses. International law will no longer be seen as ineffective due to its slow process, but rather will be at the active forefront of development.

For the purpose of this paper, international law is broadly defined as a body of protocols or rules, established by customs or treaties, and recognized by nations as binding in relation to their dealings with each other.<sup>7</sup> Some issues surrounding cyber-warfare and international law may cross into private international law, which is observed in this paper as a body of rules used to resolve legal disputes between private individuals who cross international boundaries. However, the specific focus here will primarily be on public international law — the laws, rules, and principles that deal with the conduct of nation states (and some international organisations) among themselves.

This paper will begin with an overview of the issue on technological advancements outpacing legal developments. Firstly, it will describe the unique properties of blockchain technology which can bridge this gap, and provides specific examples to highlight these properties. This is followed by a brief overview of governments trialing legal blockchain

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<sup>5</sup> 'Massive Drop in Number of Unbanked, says New Report', *The World Bank* (Web Page, 15 April 2015) <<http://www.worldbank.org/en/news/press-release/2015/04/15/massive-drop-in-number-of-unbanked-says-new-report>>.

<sup>6</sup> Zeina Abu-Meita and Nick Inglis, 'Financial Equality, the Ignored Human Right: How e-Currencies Can Level the Playing Field' (2019) *Griffith Journal of Law & Human Dignity, Special Issue: Law and Human Dignity in the Technological Age* 105.

<sup>7</sup> *Macquarie Dictionary* (7<sup>th</sup> ed, 2017) 'international law'.

technology and a discussion of where the responsibility for future updated developments of this technology lies in international law.

## II BLOCKCHAIN TECHNOLOGY AND INTERNATIONAL LAW

Blockchains are electronic, distributed ledgers of asset ownership and asset transfers whose records cannot be modified once recorded.<sup>8</sup> Blockchain technology was developed for crypto-currencies; digital currencies that use encrypted tokens as money, the most famous of which is Bitcoin. Being purely electronic, they exist only as computer files. When distributed, these files exist on multiple internet-connected computers anywhere in the world at once. As they are transaction ledgers, the only modifications allowed to them are the appending of new transactions — they are otherwise immutable. The prevention of any deletion or modification of existing transaction records is built into the blockchain design.

Blockchains can be privately distributed within some (potentially trans-national) organisations, or publicly distributed outside of any organisation. Both public and private blockchains can be global and trans-jurisdictional, making them suitable subjects for potential regulation in public and private international law. However, forward-thinking legal experts have recently argued that this technology can also be incorporated into the infrastructure of various aspects of international law itself, specifically including international warehouse receipts,<sup>9</sup> data flows,<sup>10</sup> security holdings and transactions,<sup>11</sup> international arbitration,<sup>12</sup> as well as the issues discussed later regarding land titles, electronic voting, intellectual property, and citizenship.

While some could argue that a single hegemonic power is preferable over a distributed system for establishing and maintaining order and stability in a commercial, or legal system, there are three counterpoints worth considering. Firstly, a hegemony is the

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<sup>8</sup> Caitlin Moon, 'Blockchain 101 for Lawyers: Part 1', *Law Technology Today* (Web Page, 10 January 2017) <<http://www.lawtechnologytoday.org/2017/01/blockchain-101-for-lawyers-part-1/>>.

<sup>9</sup> Marek Dubovec and Elias Adalberto, 'A Proposal for UNCITRAL to Develop a Model Law On Warehouse Receipts' (2017) 22(4) *Uniform Law Review* 716.

<sup>10</sup> Stan Sater, 'Blockchain and the European Union's General Data Protection Regulation: A Chance to Harmonize International Data Flows' (2017) *SSRN Electronic Journal* 612.

<sup>11</sup> Philipp Paech, 'Securities, Intermediation and the Blockchain — An Inevitable Choice between Liquidity and Legal Certainty?' (2016) 21(4) *Uniform Law Review* 612.

<sup>12</sup> Ibrahim Shehata, 'Smart Contracts & International Arbitration' (2018) *Social Science Research Network* 1-25.



centralisation and monopolisation of power, and economists from Adam Smith onwards have long associated monopolisation with lack of growth, lack of diversity, and economic inefficiency.<sup>13</sup> Secondly, the internet itself is a living example of an open, decentralised system which is now vital to so many aspects of life and business and which could only have taken the form it has without centralised control. Thirdly, the nature of international law is itself decentralised, with sovereign countries seeking to interoperate rather than cede legal control to some higher transnational entity. A distributed, trans-jurisdictional, and immutable ledger of transactions with non-repudiable smart contracts thus lends itself to applications in both private and public international law.

Technically, Casey and Vigna describe a blockchain as a ‘distributed, append-only ledger of provably signed, sequentially linked, and cryptographically secured transactions which is replicated across a network of computer nodes, with ongoing updates determined by software-driven consensus’.<sup>14</sup> Briefly, a blockchain can be broken down into five things:

**1. A transaction ledger** that logs the transaction of digital tokens. The digital tokens can represent many things including but not limited to:

- Money: such as Bitcoin, a crypto-currency.<sup>15</sup>
- Debt instruments: such as digital commercial paper being implemented by Monax.<sup>16</sup>
- Equity instruments: including shares of companies, being implemented by Funderbeam — an online primary stock market based out of Estonia.<sup>17</sup>
- A vote: entities such as the NASDAQ (National Association of Securities Dealers Automated Quotations — an American stock exchange) are using the voting aspect for shareholders of firms.<sup>18</sup>

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<sup>13</sup> Adam Smith, *Wealth of Nations an Inquiry into the Nature and Causes of the Wealth of Nations*, Mobi Classics (MobileReference, 2010) 83.

<sup>14</sup> M J Casey and P Vigna, *The Truth Machine: The Blockchain and the Future of Everything* (HarperCollins Publishers, 2018) (*‘Casey and Vigna’*).

<sup>15</sup> Jerry Brito and Andrea Castillo, *Bitcoin: A Primer for Policymakers* (Mercatus Center, 2013) (*‘Brito and Castillo’*).

<sup>16</sup> Nina Kilbride, 'Monax Commercial Paper Bundles: Toolkit for Financial Engineering Monax' (Webpage, 2016) <<https://monax.io/2016/03/31/commercial-paper-intro/>>.

<sup>17</sup> 'Discover, Invest In, and Trade Growth Companies', *Funderbeam* (Web Page, 2019) <<https://markets.funderbeam.com>>.

<sup>18</sup> Richard DeMarinis, 'Is Blockchain the Answer to e-Voting? NASDAQ Believes So' NASDAQ (Web Page, 23 January 2017) <<http://business.nasdaq.com/marketinsite/2017/Is-Blockchain-the-Answer-to-E-voting-Nasdaq-Believes-So.html>>.

- Or the registration of an electronically notarised document: such as a property record or a birth certificate. Estonia uses the Blockchain for their e-Notary system.<sup>19</sup>

**2. A distributed transaction ledger** is not owned by or controlled by any bank, exchange, corporation, or government, and existing on any number of public or private machines which all participate in copying and updating the ledger.<sup>20</sup> This is important because corporations are unable to exclude low-income earners from having access, and governments cannot exclude or discriminate against vulnerable groups, minorities, or any other group that is at risk of being marginalised.

**3. A validated transaction ledger.** Being distributed, there is no single entity which everyone must trust to validate transactions. Blockchain technology relies on the participating machines to perform cryptographic validation of incoming transactions and to achieve peer to peer consensus on the results, ensuring no one machine, or minority of machines, can append invalid transactions onto the blockchain.<sup>21</sup> Participation in this scheme is encouraged via game-theoretic economic incentives — essentially the awarding of tokens in that blockchain's native electronic currency for fair and efficient transaction validation.<sup>22</sup> While the details of the various schemes for this — notably 'proof of work' and 'proof of stake' — are out of scope for the current paper, the information is readily available.<sup>23</sup>

**4. An unalterable transaction ledger.** As the ledger is replicated on any number of uncontrolled public machines, the consensus mechanism between these machines also ensures that no alteration to existing transaction records made on a minority of machines can be propagated to the rest.<sup>24</sup> Anyone who tries to alter a transaction record on one machine finds their change 'voted down' by the rest. Existing transaction and ownership

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<sup>19</sup> 'Estonia E-Residency Program & Bitnation Dao Public Notary Partnership', *Bitnation* (Web Page, 2019) <<https://bitnation.co/blog/pressrelease-estonia-bitnation-public-notary-partnership/>>.

<sup>20</sup> *Brito and Castillo* (n 15).

<sup>21</sup> *Ibid*; Satoshi Nakamoto, 'Bitcoin: A Peer-to-Peer Electronic Cash System', *Bitcoin* (Web Page, 2008) <<https://bitcoin.org/bitcoin.pdf>> ('Nakamoto').

<sup>22</sup> See generally Brian Curran, 'What is Game Theory? And How Does It Relate To Cryptocurrency?' *Blockonomi* (Web Page, 21 March 2019) <<https://blockonomi.com/game-theory/>>. See, eg, Amir Haleem et al, 'Helium: A Decentralized Wireless Network' (2018) *Helium Systems Inc.*

<sup>23</sup> *Casey and Vigna* (n 14) gives a good overview. For the original technical source documents, see Leslie Lamport, Robert Shostak and Marshall Pease, 'The Byzantine Generals Problem' (1982) 4(3) *ACM Transactions on Programming Languages and Systems* ('Lamport, Shostak and Pease') and Nakamoto (n 21).

<sup>24</sup> *Nakamoto* (n 21) 8.

records, therefore, are highly ‘tamper proof’ or ‘hacker resistant’, resulting in immutability and reliable non-repudiation.

**5. A transaction ledger that is either opaque or transparent.** A private blockchain’s transactions are visible to all participants, and a public blockchain’s transactions are visible to all. The identities of the parties involved are either private and encrypted as they are in Bitcoin or are publicly verified and readily identifiable as they are with the NASDAQ / Estonian consortium. NASDAQ wants shareholders of its listed firms to be able to participate in company voting electronically and are using the ID technology developed by the Estonian government, and Blockchain, to do it.<sup>25</sup>

#### *A Voting, Smart Contracts, And Global Intellectual Property*

Electronic ‘opinion polls’ and social feedback buttons have become a standard when interacting with web-based systems. However, NASDAQ’s proposal for blockchain-based electronic voting for shareholders<sup>26</sup> — where the results of voting will affect company-level strategies to which boards will be held accountable, takes this technology to the level of a binding contract. In blockchain, these purely electronic contracts are known as ‘smart contracts.’<sup>27</sup> Blockchain rules around ownership, transfer, and voting rights which apply to the digital tokens easily transfer to use in smart contracts. A smart contract is a contract in digital form whereby promises are digitally coded and, therefore, able to be digitally enacted and enforced. Raskin purports that smart contracts relate to contract law arguing that they should be treated as, essentially, a new form of contract but also reviews more speculative proposals — such as, the use of smart contracts for Distributed Autonomous Organizations, taxation, property rights, and the encoding of constitutional principles into smart weapons.<sup>28</sup> This can revolutionise the current issues in international investment law by creating a globalised and uniform system that is, at current, fraud proof and transparent.

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<sup>25</sup> DeMarinis, Richard, ‘Is Blockchain the Answer to e-Voting? *NASDAQ Believes So*’ NASDAQ (Web Page, 23 January 2017) <<http://business.nasdaq.com/marketinsite/2017/Is-Blockchain-the-Answer-to-E-voting-Nasdaq-Believes-So.html>>.

<sup>26</sup> Ibid.

<sup>27</sup> Caitlin Moon, ‘Blockchain 101 for Lawyers: Part 2’, *Law Technology Today* (Web Page, 31 January 2017) <<http://www.lawtechnologytoday.org/2017/01/blockchain-lawyers-101-part-2/>>.

<sup>28</sup> Max Raskin, ‘The Law and Legality of Smart Contracts’ (2017) 1(2) *Georgetown Law Technology Review* 304 (‘Raskin’).

### B Land Titles

The Republic of Georgia has partnered with a company using Blockchain technology to register land titles for the National Agency of Public Registry (NAPR), an office of the Georgian Ministry of Justice.<sup>29</sup> State sovereignty in international law is paramount when matters of international conflict and legality of war are being contemplated and debated at the United Nations. The blockchain technology's ledger in Georgia's case, creates a space for tracking and registering land titles that can be used as evidence of state boundaries in state sovereignty cases. Raskin argues that property rights rely on trust, and while this may not be such an issue in the 'developed' world, it certainly is an issue for the majority of the world.<sup>30</sup> This is particularly evident in regions currently under sovereignty or border disputes. Crimea, Kashmir, Western Sahara, West Papua, and Palestine would be able to establish 'facts on the ground' using 'facts in the cloud' to assert their boundaries in international negotiations regarding state boundaries and state sovereignty over specified areas of land. One key feature of blockchain technology is that it does not require ongoing central involvement — a necessary feature when attempting to counteract colonisation. A second key feature of blockchain technology is that the system itself is resilient against colonisation. Blockchain technology would allow property ledgers to be transparent enough for it to be accessible to view, and opaque enough for ledgers to be unalterable by colonising or outside forces. International law is still mired by problems as a result of colonisation and decolonisation efforts. A blockchain-based property system would put little or no cost on a potentially non-existent public purse and excel where the central evidence of legally binding title is being hidden, obfuscated, altered, or destroyed, with the only remaining evidence existing in the personal records of displaced people. This use of blockchain put power and control back into the hands of the states and citizens affected by the colonialist past. Average citizens could also use blockchain technology to register their personal properties in conflict zones where becoming a refugee may render them unable to access such documents later. This would provide refugees, and states that temporarily home

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<sup>29</sup> Stan Higgins, 'Republic of Georgia to Develop Blockchain Land Registry', *Coindesk* (Web Page, 22 April 2016) <<https://www.coindesk.com/bitfury-working-with-georgian-government-on-blockchain-land-registry/>>; Laura Shin, 'Republic Of Georgia To Pilot Land Titling On Blockchain With Economist Hernando De Soto, BitFury', *Forbes* (Web Page, 21 April 2016) <<https://www.forbes.com/sites/laurashin/2016/04/21/republic-of-georgia-to-pilot-land-titling-on-blockchain-with-economist-hernando-de-soto-bitfury/#622d1f6044da>>.

<sup>30</sup> *Raskin* (n 28).

refugees, a ledger of properties that could be used for reparations and repatriations. Additionally, Griggs points out that even in developed countries, while the use of blockchain-based property systems might only prevent 50% of the kinds of fraud that occur, this is still a significant improvement.<sup>31</sup> Similar to Raskin, Griggs highlights that it is the 'new players' who are most likely to benefit, in contrast to established developed countries who are likely to offer the most resistance.<sup>32</sup>

### *C People and Citizenship*

In an ever-globalised world, human beings can be logged onto a blockchain for a universal birth certificate, which would alleviate issues of statelessness and refugees lacking identity documents. Just as Nansen passports were used to identify stateless refugees between 1922 and 1938,<sup>33</sup> the European 'refugee crisis' could be streamlined with electronic documentation for people who are forced to flee at a moment's notice without official documentation. An electronic blockchain-technology-based version of the Nansen Passport, an 'e-Nansen', could be used for this purpose. It would also prevent fraudulent refugee claims, and enable the collection of valuable population data that is otherwise difficult to obtain or verify.

Never before have Palestinians been counted as a single national group because of the diasporic nature of their population. The benefit of using blockchain technology here is that it is trans-jurisdictional and international in the same sense of the law and would encapsulate these populations. Moreover, Nomadic tribes in the Western Sahara could use blockchain technology to map out land usage and no longer be confined by the global northern and western definitions of permanent residence in a specific physical area. The land on which they roam can be mapped out and claimed. No longer will *Sahrawis* be restricted in their quest for statehood because of their traditional semi-permanent nomadic lifestyle.

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<sup>31</sup> Lynden Griggs et al, 'Blockchains, Trust and Land Administration — The Return of Historical Provenance' (2017) 6 *Property Law Review* 180.

<sup>32</sup> *Ibid.*

<sup>33</sup> Otto Hieronymi, 'The Nansen Passport: A Tool of Freedom of Movement and of Protection' (2003) 22(1) *Refugee Survey Quarterly* 36.

## III TAKING ADVANTAGE OF TECHNOLOGY

Blockchain technology was developed for the Bitcoin crypto-currency, which quickly gained notoriety as a tool utilised by the criminal world for illegal purchases,<sup>34</sup> and money laundering.<sup>35</sup> Thus, criminals were using technology before it was being used and understood by the law, lawyers, and law enforcement; a situation that is only now being addressed with blockchain's uptake in the finance industry as previously mentioned with NASDAQ. As well as its use in global finance, global property, and global IP, another reason why the law and legal profession must come to terms with, and embrace, blockchain technology is the potential to be used in the military — in both cyber and traditional warfare. The Blockchain algorithm itself came about as a solution to the 'Byzantine Generals' problem. The 'Byzantine Generals' problem explained in computer science as a military scenario, where a group of commanders must coordinate an attack solely through a messenger, while defending their coordination efforts against traitors.<sup>36</sup> As such, the blockchain algorithm is almost purpose-built for coordinating cyber and drone attacks (which may violate international law) by hackers. As with Bitcoin, any such violations of international law will go unaddressed so long as violators are using technology that is ahead of the current law.

Blockchain's attributes of openness, inalterability, and non-repudiation make it as suitable for legal purposes as it is for financial and military purposes. As mentioned earlier, there are potential counterarguments arguing that a closed, centrally controlled system is more suitable for international law on the grounds that a distributed system is not viable, possible, or suitable. These arguments are nullified by the economic arguments against monopolies, the counter-examples of the Internet and the World Wide Web, and the fact that international law is already by nature a decentralised system of interoperating, autonomous parties. Blockchain technology does of course have plenty of detractors. A recent review of blockchain security found several examples of various

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<sup>34</sup> A good account of Silk Road's drug business can be found in: Eileen Ormsby, 'Dealer's Chance: The Dark Web, Bitcoin and the Fall of Silk Road' (2019) 64(1) *Griffith Review* 184.

<sup>35</sup> For a review of literature and analysis on Bitcoin for money laundering see generally Rolf van Wegberg, Jan-Jaap Oerlemans and Oskar Van Deventer, 'Bitcoin Money Laundering: Mixed Results? An Explorative Study On Money Laundering of Cybercrime Proceeds Using Bitcoin' (2018) 25(2) *Journal of Financial Crime* 419.

<sup>36</sup> *Lampport, Shostak and Pease* (n 23).

blockchain security breaches.<sup>37</sup> However, as computer worms, such as Stuxnet, and spyware, such as Pegasus, demonstrate, critical government and commercial computer systems that run traditional, non-distributed, commercial, and 'secure' software, are already vulnerable and security issues are hardly a unique characteristic of blockchain systems. Given that security is a leading design aspect of blockchain technology, rather than a non-functional desirable feature added on later, the likely outcome is that the designs will improve with time, as will security. Taking a different approach, Forbes gave a negative opinion on blockchain, questioning its core purpose.<sup>38</sup> However, each of its eight reasons are lacking justification. For instance, reason 2, 'End users don't want to use blockchain'<sup>39</sup> is a straw man. End users of traditional software don't want to use relational databases either, but they do. End users of either systems use apps. Further, reason 6, 'performance issues' is simply a problem inherent in many software systems, which can and should be fixed.<sup>40</sup> And reason 7, 'immutability isn't always a good thing',<sup>41</sup> is an excellent case for not using blockchain technology for everything, but there is no case for not using it, particularly for financial and evidential issues where immutability is paramount.

Given this, it would serve the legal field well to foster and stay abreast of the many currently disparate attempts being made to use blockchain technology to solve legal problems. The hope is that these attempts will culminate to enable international law to address the 'law lag', to stay in pace with, or even surpass technology's military uses. As will be described in the next example and next section below, the goal should be for international law and blockchain technology to be used and developed simultaneously.

For example, in 2007 many of Estonia's government institutions were shut down for three weeks due to a massive cyber-attack (allegedly by the Russian government). In the wake of the attack, NATO developed the Tallinn Manual on the international law

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<sup>37</sup> Mike Orcutt, 'How Secure is Blockchain Really?', *MIT Technology Review* (Web Page, 25 April 2018) <<https://www.technologyreview.com/s/610836/how-secure-is-blockchain-really/>>.

<sup>38</sup> Jason Bloomberg, 'Eight Reasons to Be Skeptical About Blockchain', *Forbes* (Web Page, 31 May 2017) <<https://www.forbes.com/sites/jasonbloomberg/2017/05/31/eight-reasons-to-be-skeptical-about-blockchain/#1793d3c85eb1>>.

<sup>39</sup> *Ibid.*

<sup>40</sup> *Ibid.*

<sup>41</sup> *Ibid.*

applicable to Cyber Warfare,<sup>42</sup> named after Estonia's capital: Tallinn. Shortly after the announcement of the launch of NATO's second version of this document,<sup>43</sup> Microsoft's Chief Legal Officer called for the creation of a 'digital Geneva Convention'<sup>44</sup> to help provide parameters on offensive cyber operations and address a rapidly growing area of concern. An independent review of the legal and technical requirement was shortly followed by the identification of Blockchain as a highly applicable technology for implementing the digital Geneva Convention.<sup>45</sup> This convention would be designed to protect civilians' electronic rights in cyberspace from nation-state attacks. Similar to the original Geneva Convention, the digital proposal would require participating states to sign-on to the network and digitally sign their cyber-attacks or run the risk of being held responsible for violating the convention, should any unsigned attacks be traced back to them. However, this idea is highly problematic. Given the 'arms race' already being waged between cyber attackers and defenders, it is possible that such an agreement would actually encourage attackers to find new ways to attack undetectably, untraceably, or to make 'false flag' attacks. In other words, a convention of this form relies completely on inter-party trust (the antithesis of what the blockchain is actually for).

A better convention might involve countries committing to two ideas: firstly, putting people's information — for example, their identity and property information — onto a blockchain-based 'self-sovereign' system described by Bert et al,<sup>46</sup> making attacks such as denial of service or identity and asset theft more difficult. Secondly, putting the log files of critical network infrastructure onto blockchains, making attacks more traceable. These two measures rely on mutual distrust which follows the design of blockchain technology and would see nations applying money and effort to cyber-defence ahead of cyber-attack.

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<sup>42</sup> Kristy Raidma, 'Tallinn Manual — The International Law in Cyberspace', *Estonian World* (Web Page, 15 July 2013) <<http://estonianworld.com/security/tallinn-manual-the-international-law-in-cyberspace/>>.

<sup>43</sup> CCDCOE, *Tallinn Manual 2.0 On the International Law Applicable to Cyber Operations* (2<sup>nd</sup> ed)

<sup>44</sup> Brad Smith, 'The Need for a Digital Geneva Convention' *Microsoft* (Web Page, 14 February 2017) <<https://blogs.microsoft.com/on-the-issues/2017/02/14/need-digital-geneva-convention/#sm.001hyuheo1049czppez2qitwbu5q3>>.

<sup>45</sup> Jovan Kurbalija, 'Digital Geneva Convention: Multilateral Treaty, Multistakeholder Implementation', *Diplo* (Web Page, 23 February 2017) <<https://www.diplomacy.edu/blog/digital-geneva-convention>>; Luke McNamara, 'Blockchain's Potential Role in Constraining Future Cyber Conflict' *The Cipher Brief* (Web Page, 11 May 2017) <<https://www.thecipherbrief.com/blockchains-potential-role-in-constraining-future-cyber-conflict-2>>.

<sup>46</sup> Alistair Berg et al, 'The Institutional Economics of Identity', (2018) *Social Science Research Network* 1-20.



## IV WHO IS ULTIMATELY HELD RESPONSIBLE?

Historically, the law has always lagged behind technological advances. Inventors create technologies for their own purposes. Others than using this technology to commit fraud or violence, and if technology uses the internet, they are able to commit these acts across international borders as easily as within them. Only afterwards are international laws developed prescribing fair use and users of this technology. Further, as the speed of technological innovation accelerates, the complexity of the legal issues increases. There are three problems here: firstly, as long as international law lags behind what is technologically possible, there is the potential for people to operate outside the law until the law catches up months or, more often, years later. Secondly, as long as the law, particularly international law, is technologically reactive rather than proactive, the gap between what technology enables and what the law handles will only widen. Thirdly, by the time the law catches up with technology, technology has moved on. The potential exists for people, corporations, or governments to continue to operate outside international law by remaining at the cutting edge of technology.

The question of responsibility comes in two parts. The first looks at questions of who is responsible for violations of international law could be more readily answered by the existence of extra-governmental, extra-corporate, blockchain-based ledgers of property and asset ownership, refugee status, select transaction records etc., acting as a kind of international 'electronic notary'. The nonrepudiation inherent in such a system would make issues of ownership and transaction participation transparent and undeniable, assisting in the legal determination of violations of international law and human rights.

The second question of who is responsible for creating this extra-governmental, extra-corporate electronic notary, must be addressed. The rate of technological change makes it impractical to hold governments, states, or international legal bodies responsible for its implementation. Similarly, the amount of vested interest in current ledgers makes it impractical to assume that the task should be left to profit-driven financial institutions. Rather, a) this endeavour must start within academia, through a collaboration between legal and computer science researchers providing thoroughly developed legal and technical foundations, and taking the form of an academically moderated 'open source' movement. Further, b) it must propagate via grassroots adoption by those people who

stand to benefit most from its existence, with the ability to incorporate or interoperate with existing legal/technical frameworks. Finally, c) it must gain acceptance through legal precedent via its use in legal actions, assisted by suitably accredited expert witnesses. The system needs to resemble the internet itself, with its value coming from, going to, and growing with its number of users. Governments, states, and corporations who are keen to appear progressive will then see the value and follow in adoption and regulation.

## V CONCLUSION

The creators of international law cannot wait for technology to be created, have ramifications, and then adapt international law to the consequences. This method has proven to be recurrently inadequate. The law should develop a proactive and symbiotic relationship with technology, so that they develop alongside each other. Thus, blockchain's properties provide an unprecedented opportunity for the law to, for once, be 'ahead of the game' rather than behind it.

At its core, properly implemented blockchain solutions can offer the capability to openly verify secure transactions of any kind, which can be the great equaliser in international law across many fields. Just as social media gave a voice to those who did not have access to audiences, Facebook and Twitter became the great equaliser of their voices. No longer are people relying on the media to cover a story, instead it has become easier to open Facebook and livestream the event to the world. Hashtags have brought about real change. Blockchain too may equalise voices of states that lack power or influence on an international law front. Decolonising states has been a slow and difficult process. Embracing technology in international law will not only create a system for international law to flourish and grow, it will force technology to take the law into account, which may be the key to completing decolonisation.

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