

# What Does the CISG Have to Say About Smart Contracts? A Legal Analysis

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## Abstract

*Smart contracts—contracts written into lines of code that automatically execute all or parts of an agreement—are a relatively new technology, which has raised many questions regarding their validity and formation. This Comment looks at smart contracts under the lens of the United Nations Convention on Contracts for the International Sale of Goods (CISG) and analyzes what its provisions have to say on the validity and formation of a contract. This analysis is written from the internationalist perspective, which favors applying the CISG to issues it addresses even in cases where domestic law might apply. Moreover, this Comment argues that a smart contract used as an international sales contract, which embodies an entire agreement within its code, is valid under the CISG because it can meet the formation requirements of the Convention. More specifically, such a contract can show some clear indication of the parties’ intent, and include an offer, an acceptance, and some sufficiently definite indication of the goods, price, and quantity. In addition, smart contracts have the potential to promote international trade, an outcome that is consistent with the goal of the Convention’s creation. The purpose of this analysis is to address legal issues unique to smart contracts and to reduce legal uncertainty by filling an interpretational gap regarding the CISG’s applicability to smart contracts.*

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## I. INTRODUCTION

A smart contract is a set of computer code that “automatically executes all or parts of an agreement and is stored on a blockchain<sup>1</sup>-based platform.”<sup>2</sup> In addition, it lies on a spectrum between an agreement that is entirely in code and the mere automated performance of a traditional paper contract.<sup>3</sup> Because smart contracts are designed to reduce transaction costs by making it difficult and costly for parties to breach an agreement,<sup>4</sup> interest in smart contracts is on the rise as more businesses seek to use smart contracts for boosting efficiency in international trade.<sup>5</sup> In addition, an increasing number of experts are writing about the promise of smart contracts to reduce transaction costs in international trade.<sup>6</sup> According to Ramesh Gopinath, the IBM Vice President of Blockchain Solutions, the current supply chain system is inefficient as it relies on the physical movement of a huge number of paper documents “for shipping transactions.”<sup>7</sup> This system is “very vulnerable to fraud, human error and inadvertent delays.”<sup>8</sup> Wolfgang Lehmacher, the Head of Supply Chain and Transport Industries at the World Economic Forum, sees blockchain and smart contracts as the solution to these transaction costs because of the potential of the technology to make payments and collaboration between traders easier and more transparent.<sup>9</sup> Emmanuelle Ganne, former counselor to the World Trade Organization (WTO) Director-

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<sup>1</sup> Blockchain is the most well-known type of electronic records system that enables multiple participants to “collectively create, maintain, and update a shared set of authoritative records (the ‘ledger’).” See MICHAEL RAUCHS ET AL., CAMBRIDGE CENTRE FOR ALT. FIN., DISTRIBUTED LEDGER TECHNOLOGY SYSTEMS: A CONCEPTUAL FRAMEWORK 24 (2018), <http://perma.cc/W4N6-TW5J>; Most of today’s smart contracts are based on or tied to blockchain technology. See Scott A. McKinney et al., *Smart Contracts, Blockchain, and the Next Frontier of Transactional Law*, 13 WASH. J. L. TECH. & ARTS 313 (2018).

<sup>2</sup> Stuart D. Levi & Alex B. Lipton, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, HARVARD LAW SCHOOL FORUM ON CORPORATE GOVERNANCE AND FINANCIAL REGULATION (May 26, 2018), <http://perma.cc/UM6E-8WU8>.

<sup>3</sup> See Chelsea Chan, *The Power and Pitfalls of Smart Contracts: A Recap*, LAWTECH.ASIA (Apr. 24, 2018), <http://perma.cc/LRQ6-57LQ>.

<sup>4</sup> Charlotte R. Young, *A Lawyer’s Divorce: Will Decentralized Ledgers and Smart Contracts Succeed in Cutting Out the Middleman*, 96 WASH. U. L. REV. 649 (2018).

<sup>5</sup> See, for example, Ian Allison, *94 Companies Join IBM and Maersk’s Blockchain Supply Chain*, COINDESK (Aug. 9, 2018), <http://perma.cc/9B6W-W8ST>; see also Sumeet Chatterjee, *HSBC Says Performs First Trade Finance Deal Using Single Blockchain System*, REUTERS (May 14, 2018), <http://perma.cc/7JZW-P65K>.

<sup>6</sup> See Allison, *supra* note 5; Chatterjee, *supra* note 5.

<sup>7</sup> Lisa Froelings, *Blockchain Technology Can Accelerate International Trade Flows, Say Industry Experts*, COINTELEGRAPH (Nov. 19, 2017), <http://perma.cc/PV68-PHVX>.

<sup>8</sup> *Id.*

<sup>9</sup> See *id.*

General, published a full report in a WTO publication on the power of blockchain and smart contracts to revolutionize international trade.<sup>10</sup>

Of course, a lot of the talk about the benefits of blockchain and cross-border smart contracts may just be hype created by an increasing number of startups in the blockchain industry. As one industry insider noted, all the promising benefits of smart contracts for international trade will take time “because the existing financial infrastructure has been in place for decades and because it is hard to get competing institutions to cooperate.”<sup>11</sup> But the legal and business industries have responded to the hype in hopes of benefitting from its promise. For example, IBM and Maersk have made joint investments to deliver blockchain to the shipping industry (although they are currently struggling to sign up carriers as the unprecedented nature of the blockchain venture leaves many businesses hesitant).<sup>12</sup> In addition, LegalZoom has partnered with a blockchain company to use smart contracts to compose its legal documents, ranging from wills and trusts to trademarks and copyrights.<sup>13</sup>

However, the use of smart contracts for business agreements has raised important questions concerning their legal validity that currently do not have a direct answer in available case law or in relevant international legal texts. There are many different types of smart contracts, which lie on a spectrum of possibilities.<sup>14</sup> On one end of the spectrum is a smart contract that has a code that includes all of the terms of a contract, and a “running program referring to that code is a complete contract undergoing performance.”<sup>15</sup> On the other end is a smart contract that simply digitizes simple performances such as payment and operates together with the terms of an associated traditional paper contract. Given the broad range of possibilities for what a smart contract can be, questions arise as to exactly when along the spectrum a smart contract becomes legally binding.<sup>16</sup> This question often turns on the applicable law determining the issue and the factual circumstances of the case.

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<sup>10</sup> See EMMANUELLE GANNE, WORLD TRADE ORGANIZATION, CAN BLOCKCHAIN REVOLUTIONIZE INTERNATIONAL TRADE? (2018) <http://perma.cc/P9FY-AF8D>.

<sup>11</sup> Rebecca Liao, *How Blockchain Could Shape International Trade*, FOREIGN AFF. (Aug. 16, 2017), <http://perma.cc/F34C-R4R8>.

<sup>12</sup> See Anujit Kumar Mukhopadhyay, *Maersk and IBM Team up to Deliver Blockchain to the Shipping Industry*, BLOCKTELEGRAPH (Oct. 14, 2018), <http://perma.cc/ZU5S-KY9X>.

<sup>13</sup> Mike Dalton, *LegalZoom Will Use Smart Contracts In Legal Documents*, UNHASHED (Sept. 18, 2018), <http://perma.cc/BDP8-EGHU>.

<sup>14</sup> R3 & NORTON ROSE FULBRIGHT LLP, CAN SMART CONTRACTS BE LEGALLY BINDING CONTRACTS? 13 (2016) <http://perma.cc/KP7M-FEBM>.

<sup>15</sup> *Id.*

<sup>16</sup> *See id.*

I focus on the U.S. legal context for smart contracts in international trade. Although it does not directly address the formation of smart contracts in international trade, the U.N. Convention on Contracts for the International Sale of Goods (CISG or the Convention) generally governs the formation of many international contracts for goods by international traders whose countries have also adopted the Convention.<sup>17</sup> The Model Law on Electronic Commerce (MLEC), which governs electronic communications in international trade, also applies to smart contracts and was adopted by the U.S. in 1999.<sup>18</sup> However, model laws are not considered binding at an international level, so I mainly analyze smart contracts under the CISG, which previous scholars have ignored.<sup>19</sup>

Thus, in this Comment, I seek to fill in the interpretational gap for the CISG's applicability to smart contracts in an attempt to reduce the legal uncertainty and confusion that surround smart contracts. The value of U.S. international trade is trillions of dollars, and many developing countries depend on trade with the U.S.<sup>20</sup> But without an international legal framework, legal ambiguities surrounding smart contracts may discourage entrepreneurs from developing this technology and thereby deter increasing trade flows and enhancing trade efficiency.<sup>21</sup>

Thus, due to the ambiguity of smart contract use and the possibilities of a breach, it is important to discuss what exactly the CISG has to say about smart contracts. Moreover, smart contracts may help reduce the transaction costs of international trade and thereby promote it.

In this Comment, I argue that smart contracts can, like traditional contracts, meet the contract formation requirements of the Convention's provisions and thus are valid under the CISG. I also argue that smart contracts are consistent with the principles and goals underlying the creation of the CISG. Section II introduces the current technology of smart contracts and how it can be used for international sales agreements. Section III lays out the provisions of the CISG as well as examining the issue of validity in Article 4 of the Convention. In Section IV, I analyze the validity of smart contracts under the provisions laid out in Section III.

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<sup>17</sup> See Albert H. Kritzer, *The Convention on Contracts for the International Sale of Goods: Scope, Interpretation and Resources*, CORNELL REV. CONVENTION ON CONT. FOR INT'L SALE GOODS 147 (1995), <http://perma.cc/W4ZW-7278>.

<sup>18</sup> See Aahere Mukherjee, *Smart Contracts—Another Feather in UNCITRAL's Cap*, CORNELL INT'L L.J. ONLINE (2018), <http://perma.cc/52Z5-DPGY>.

<sup>19</sup> See José Angelo Estrella Faria, *UNCITRAL: Model Laws as Tools for Legal Harmonization*, <http://perma.cc/7RE3-7W8R>.

<sup>20</sup> See *Total Value of U.S. International Trade from 2000 to 2016* (in billion U.S. dollars), STATISTA (2018), <http://perma.cc/8CLG-TKTE>.

<sup>21</sup> See R3 & NORTON ROSE FULBRIGHT LLP, *supra* note 14.

## II. SMART CONTRACTS: A BREAKDOWN

### A. Definitions and Existing Framework

The term “smart contract”—first proposed by Nick Szabo—refers to “a set of promises, specified in digital form, including protocols within which the parties perform on these promises.”<sup>22</sup> Simply put, a smart contract is a software program that can “automatically execute, verify and enforce the performance” of transactions (such as releasing payment), which are triggered by events (receipt of goods).<sup>23</sup> These events are pre-defined by its software code written in programming languages, such as Solidity.<sup>24</sup> When the transactions constitute fulfillment of a “set of promises” agreed upon by the parties, there may be a legally enforceable contract.<sup>25</sup> Moreover, smart contracts are distinguished from electronic contracts because the “actual agreement is automated and embodied in computer code, rather than in words.”<sup>26</sup> Because smart contracts are automated programs, a transaction under a smart contract, once initiated and all conditions are met, is typically unstoppable by any party to the smart contract.<sup>27</sup> While this immediate and unstoppable execution may reduce transaction costs, an “emergency exit” has been recently developed that can stop the execution of a smart contract once triggered.<sup>28</sup>

The automated and contractual aspects of a smart contract are often compared to that of a vending machine. For example, the typical vending machine follows an “if . . . then” code, with the following terms: if you put the required amount of money in the machine and press the button(s) associated with a Dr Pepper, then the underlying code in the machine will ensure that, after checking

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<sup>22</sup> Nick Szabo, *Smart Contracts: Building Blocks for Digital Markets*, EXTROPY (1996) (partial rewrite), <http://perma.cc/ZZ49-PBFK>.

<sup>23</sup> Jeffrey Neuburger, *The Cross-Industry Promise of Blockchain*, NEW MEDIA AND TECHNOLOGY LAW BLOG (Mar. 15, 2017), <http://perma.cc/K76E-LAZ6>. See also Megan Frydel, *How to Use Ethereum Smart Contracts*, BITEMYCOIN (Sept. 21, 2018), <http://perma.cc/F88N-JEYF>.

<sup>24</sup> See Virginia Cram-Martos, UN/CEFACT Project Leader and Domain Coordinator for Int’l Trade Procedures, Address at the UNCTAD eCommerce Week (Apr. 20, 2018); see also Ethereum, *Introduction to Smart Contracts*, SOLIDITY (2016-2018), <http://perma.cc/G5WS-2LZC>.

<sup>25</sup> Richard Holden & Anup Malani, *Can Blockchain Solve the Holdup Problem in Contracts?* 15 (U. of Chi. Coase-Sandor Inst. For L. & Econ. Research Working Paper No. 846, 2018); see also Josh Stark, *Making Sense of Blockchain Smart Contracts*, COINDESK (June 7, 2016), <http://perma.cc/M2XV-JVLT>.

<sup>26</sup> Mukherjee, *supra* note 18.

<sup>27</sup> Philipp Paech, *Law and Autonomous Systems Series: What is a Smart Contract*, OXFORD BUSINESS LAW BLOG (July 9, 2018), <http://perma.cc/NBD4-4URY>.

<sup>28</sup> *Controlling Autonomy: A New Tool to Stop Smart Contracts Once Executed*, CONSENSYS MEDIA (Aug. 8, 2018), <http://perma.cc/2LKW-KHW8>.

that the money is valid and sufficient, you get your Dr Pepper.<sup>29</sup> Moreover, the machine will deliver the drink without the need of an intermediary to double-check or execute the transaction.<sup>30</sup> It is this ability to perform transactions independently that makes the contract “smart.”

Blockchain-based smart contracts involve more than just the “if . . . then” code found in vending machines. As defined by the European Central Bank (ECB), a blockchain is a digital “ledger (book of records) of all transactions,” which are organized and combined in “blocks” that are “chained” or linked together on a decentralized database.<sup>31</sup> This digital record is shared or distributed instantaneously across a network of participating users, also known as “nodes,” and every transaction that is recorded by blockchain is transparent to these users—making transparency an important feature of blockchain.<sup>32</sup> This distributed ledger can also be permissioned and private, meaning that the membership of users who can view and participate in a particular distributed ledger can be restricted, as opposed to permissionless and public ledgers that are open to everyone.<sup>33</sup> Moreover, there is only one source of accurate data (known as the “golden” version); because blockchain uses a consensus technique that ensures that every participating user agrees on the record, there are no “multiple competing sets of records.”<sup>34</sup>

Blockchains have a neutral and immutable aspect in the sense that in order for anyone to make any change to past digital records, a “vast majority of users in the network would need to agree on the change and be willing to spend resources to update all subsequent blocks of the chain.”<sup>35</sup> Because such changes involve a lot of time and money, require a majority consensus, and are immediately transparent to all participants in the ledger, once a transaction is recorded by the blockchain, it is often considered irreversible or “locked in.”<sup>36</sup> This permanency feature explains why blockchain is sometimes described as a “digital stone,”

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<sup>29</sup> Nik Custodio, *Smart Contracts for Dummies*, FREECODECAMP (May 26, 2017), <http://perma.cc/J5YD-2UAG>.

<sup>30</sup> Kevin T. McCarthy, *Unanswered Legal Issues: Blockchain “Smart Contracts,”* FOR THE DEFENSE 14 (Mar. 2018), <http://perma.cc/8LHV-D8B4>.

<sup>31</sup> EUROPEAN CENTRAL BANK, *VIRTUAL CURRENCY SCHEMES – A FURTHER ANALYSIS* 33 (2015), <http://perma.cc/JN7K-L6K3>.

<sup>32</sup> INT’L SWAPS & DERIVATIVES ASSN. & LINKLATERS, *SMART CONTRACTS AND DISTRIBUTED LEDGER – A LEGAL PERSPECTIVE* 7 (2017), <http://perma.cc/KC6H-GDWG>.

<sup>33</sup> *See id.* at 8.

<sup>34</sup> *Id.* at 7.

<sup>35</sup> Jay Chang, *Blockchain: The Immutable Ledger of Transparency in Healthcare Technology*, MEDIUM (Aug. 23, 2017), <http://perma.cc/7NWQ-DENZ>.

<sup>36</sup> Christian Shearer, *Building a Network of Trust using Blockchain Technology*, MEDIUM (Feb. 1, 2018), <http://perma.cc/5P6U-ZSL9>.

referring to the way that carvings on stone are physically permanent.<sup>37</sup> The irrevocability, neutrality, and transparency of blockchain contribute to the widespread trust in the integrity of its ledgers and decrease opportunities for fraud.<sup>38</sup> This integrity is maintained by the structure of blockchain technology, which acts “independent[ly] of intermediaries and third-party guarantors.”<sup>39</sup>

Because the code of smart contracts is embedded in blockchain, the code of a smart contract and each transaction that occurs under it are supposed to carry all of blockchain’s characteristics of immutability, neutrality, and transparency.<sup>40</sup> There is only one “golden” version of the code that is locked in and transparent to all.<sup>41</sup> The agreed terms of the smart contract apply to all participating users, irrespective of their real world position or authority.<sup>42</sup>

To give an idea of what a typical smart contract looks like in action, consider the following example:

[S]ay that Company A agrees to purchase 500 widgets from Company B. The parties then translate this agreement into blockchain coding. The block of coding states, “if Company B delivers 500 widgets to Company A by December 1, 2017, at 5:00 PM ESD, then Company A delivers \$10,000 USD to Company B.” The blockchain can then be linked to sources known as “oracles.” An oracle is an outside source that provides information to the blockchain smart contract . . . In our hypothetical smart contract . . . the oracles would be Company A’s computerized delivery database and the two companies’ bank accounts. Once Company B’s delivery of 500 widgets is confirmed in Company A’s system, the blockchain will automatically trigger Company A’s bank account to transfer \$10,000 to Company B’s bank account without any required action by the parties or any verification by a third-party clearinghouse.<sup>43</sup>

As is demonstrated by this example, the first step in a smart contract is often the agreement between the two parties, which the software code will be based on. This agreement should include set conditions that establish what events will trigger a particular transaction. The next step is related to cryptography, or the “practice of secure communication,” aimed at preventing third parties from

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<sup>37</sup> Custodio, *supra* note 29.

<sup>38</sup> See Eric Piscini et al., *Blockchain: Democratized Trust*, in *TECH TRENDS 2016: INNOVATING IN THE DIGITAL ERA* 80–95 (2016), <http://perma.cc/4Y79-2B3B>.

<sup>39</sup> Muhammad Raza, *What Are Smart Contracts and How Are Enterprises Using Them?*, *BMCBLOGS* (July 31, 2018), <http://perma.cc/8HMJ-RH4L>.

<sup>40</sup> See ISDA & LINKLATERS, *supra* note 32.

<sup>41</sup> USAVE, *The Golden Blockchain: Building Trust in the Gold Ecosystem*, *MEDIUM* (Aug. 24, 2018), <http://perma.cc/4GGA-AZZZ>.

<sup>42</sup> See Raza, *supra* note 39.

<sup>43</sup> McCarthy, *supra* note 30.



reading the content of the communication.<sup>44</sup> If a participant wants to initiate a transaction or send a message to the other participant(s), he or she must authorize the transaction before it is automatically enforced.<sup>45</sup> Blockchain uses public key encryption infrastructure (PKI) for authorization, which relies on two keys: the public key, which is derived from a participant's account address, and the private key, which acts as a participant's electronic signature.<sup>46</sup> Every participant has a unique key that he or she uses to "initiate transactions on that distributed ledger," which is then checked against a "signing authority list" stored in the digital ledger.<sup>47</sup> Participants can use the public key to "verify that the smart contract transaction was initiated by the initiator in possession of the private key and to authenticate the message contents."<sup>48</sup> This authentication system does away with the need for third-party verification systems. Once the transaction is authenticated and the code is executed, the digital ledgers are updated to reflect the performance of the transaction. Finally, it is very important that the oracles, whose role is to "feed information from the outside world into the ledger to facilitate smart contract enforcement," are a trustworthy third party that can transmit "accurate and trustworthy data in a secure manner."<sup>49</sup>

## B. Broad Range of Smart Contracts

Of course, the above example is by no means the only manner in which a smart contract may be executed. There are many different types of transactions a smart contract can perform, as well as many different types of smart contracts. Smart contracts lie on a broad spectrum of possibilities.<sup>50</sup> On one end of the spectrum is a smart contract with a code that "constitutes the entirety of the terms of a contract, and a running program referring to that code is a complete contract undergoing performance."<sup>51</sup> These type of smart contracts are meant to "model commercial relationships" for simple transactions such as automatic payments or

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<sup>44</sup> Bisade Asolo, *Blockchain Public Key & Private Key Explained*, MYCRYPTOPEDIA (Nov. 1, 2018), <http://perma.cc/6QME-KDRR>.

<sup>45</sup> BITFURY GROUP LIMITED, PUBLIC VERSUS PRIVATE BLOCKCHAINS PART 1: PERMISSIONED BLOCKCHAINS (2015), <http://perma.cc/XV92-QL48>.

<sup>46</sup> INT'L SWAPS & DERIVATIVES ASS'N & LINKLATERS, *supra* note 32, at 21.

<sup>47</sup> *See id.*

<sup>48</sup> SMART CONTRACTS ALLIANCE & DELOITTE, CHAMBER OF DIGITAL COMMERCE SMART CONTRACTS: 12 USE CASES FOR BUSINESS & BEYOND 44 (2016), <http://perma.cc/9B8J-FW2M>

<sup>49</sup> *See id.*

<sup>50</sup> R3 & NORTON ROSE FULBRIGHT LLP, *supra* note 14.

<sup>51</sup> *See id.* at 13.

asset transfers.<sup>52</sup> On the other end is a smart contract that simply digitizes simple performances such as payment and operates in conjunction with the terms of an associated written contract.<sup>53</sup> Somewhere in between is a ‘split’ smart contract model under which “non-human performance is encoded into computer code, and wider human obligations, remedial and other provisions are written into natural language, the two components operating together as a cohesive contract.”<sup>54</sup>

In addition to the existence of many types of smart contracts, there is also a large range of possibilities for the type of contractual clauses that will be incorporated into the agreements. However, not all clauses can be automated or subject to self-execution, so some may be more suitable to automation in smart contracts than others. Such clauses are called “operational clauses,” which “generally embed some form of conditional logic,” and include:

A clause that requires an amount to be payable on a payment date equal to the product of a calculation amount, a floating rate (plus or minus a spread) and a day count fraction; [a] clause that requires an amount to be payable on an exercise date equal to the number of options exercised multiplied by a strike price differential; [a] clause that provides that one party to the contract pays the other an amount equal to the difference between the settlement price and a forward price, with the party required to make such payment being determined by whether the settlement price exceeds the forward price or vice versa; and a clause that requires a party to transfer assets on a particular date that have a value equal to the amount by which a required credit support amount is less than the value of collateral provided, subject to certain formulaic haircuts and adjustments.<sup>55</sup>

These clauses embed conditional logic in the sense that a specified time or event will trigger or require a corresponding action.<sup>56</sup> On the other hand, non-operational clauses do not embed conditional logic and “relate to the wider legal relationship between the parties.” This includes examples such as dispute resolution clauses or choice of law clauses, a statement to the effect that that “a party’s obligations under the legal agreement constitute legal, valid and binding obligations,” and representations in relation to acting in good faith and acting in a “commercially reasonable manner.”<sup>57</sup>

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<sup>52</sup> CARDOZO BLOCKCHAIN PROJECT, “SMART CONTRACTS” & LEGAL ENFORCEABILITY 4 (2018), <http://perma.cc/NW8C-XJXV>.

<sup>53</sup> *See id.*

<sup>54</sup> R3 & NORTON ROSE FULBRIGHT LLP, *supra* note 14, at 13.

<sup>55</sup> INT’L SWAPS & DERIVATIVES ASS’N & LINKLATERS, *supra* note 32, at 10.

<sup>56</sup> *Id.*

<sup>57</sup> *Id.* at 11.

Finally, given the broad range of smart contracts and the different types of agreements that can be embedded therein, questions have arisen as to exactly when along the spectrum is a smart contract considered valid and binding.<sup>58</sup> This question often turns on the applicable law determining the issue and the factual circumstances of the case. Thus, in Section III we turn to exploring the default applicable law for international sales contracts of commercial goods between signatory countries: the U.N. Convention on Contracts for the International Sale of Goods (CISG).

### C. Hacks and Emergency Stops

The “DAO Hack” is the most famous example of a successful hack of a smart contract.<sup>59</sup> The DAO, a venture capital fund that operated through smart contracts, raised over \$150 million in digital coins that it stored in smart contracts with investors who could collectively vote on how these funds would be spent.<sup>60</sup> However, a hacker managed to steal the equivalent of \$79.6 million in digital currency by exploiting a “bug”<sup>61</sup> in the programming code underlying the smart contracts.<sup>62</sup> The smart contract’s irreversible nature made it hard for programmers to stop the hacker’s attack.<sup>63</sup> Even heavily tested codes may contain bugs that are not known until a hacker’s attack reveals it.<sup>64</sup>

To minimize the risks of hacking, computer programmers have developed an “emergency stop” or a “circuit breaker,” which halts the execution of the smart contract if a bug is discovered or in the case of a security emergency such as a hack.<sup>65</sup> The ability to implement an emergency stop is incorporated into the smart contract’s code and can be triggered by pre-authorized participants of the smart contract.<sup>66</sup> However, triggering emergency stops are not costless because

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<sup>58</sup> R3 & NORTON ROSE FULBRIGHT LLP, *supra* note 14.

<sup>59</sup> Samuel Falcon, *The Story of the DAO—Its History and Consequences*, MEDIUM (Dec. 24, 2017), <http://perma.cc/98RT-ADXA>.

<sup>60</sup> Joon Ian Wong, *A \$79 Million Cryptocurrency Heist Just Happened, and It’s Threatening the Future of Blockchains*, QUARTZ (June 17, 2016), <http://perma.cc/CJ7U-76Q9>.

<sup>61</sup> A bug is a technical flaw in a smart contract’s programming code that creates a loophole for a hacker to exploit. *See* RAUCHS, *supra* note 1.

<sup>62</sup> *See* Falcon, *supra* note 59.

<sup>63</sup> *See id.*

<sup>64</sup> *See Emergency Stop*, SOLIDITY-PATTERNS (2018), <http://perma.cc/NL6H-7R6C>.

<sup>65</sup> *See* Maximilian Wöhrer & Uwe Zdun, *Smart Contracts: Security Patterns in the Ethereum Ecosystem and Solidity*, INST. ELEC. & ELEC. ENG’R 5 (2018), <http://perma.cc/MZ9A-KFZ7>.

<sup>66</sup> *See id.*

executing transactions on blockchain costs money and parties may choose to spend extra time and money to upgrade the contract to remove the bug.<sup>67</sup>

### III. U.N. CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS (CISG)

International trade transactions involve multiple actors and complex processes and require the submission of a multitude of paper documents.<sup>68</sup> For example, the typical international trade transaction involves processes related to customs and border procedures, commercial transactions, and trade financing, including a host of documents related to each of those processes.<sup>69</sup> Moreover, trade finance is usually a labor-intensive process, with the average transaction involving more than twenty people.<sup>70</sup> The paper- and labor-intensive process of international trade increases administrative costs and are “prone to error, losses and fraud.”<sup>71</sup> As a result, a number of logistics and transportation companies as well as governments have started to investigate how blockchain and digitalizing trade “could be used to cut paperwork and enhance processes involved in the export of goods.”<sup>72</sup> For example, Maersk, a leading player in the transport and logistics industry, has been working actively with IBM to develop a blockchain-based trade platform, which involves the “the automation of various business processes such as import and export clearance via smart contracts.”<sup>73</sup> The goal of this platform is to cut costs by reducing the need for bank intermediaries by automatizing money transfers between parties’ bank accounts and reducing the exchange of paper documents as information will be digitized and available to all the players involved in the trade transaction.<sup>74</sup>

Since smart contract technology is still being developed and has yet to be tested on a wide-scale, global trade basis, its level of efficiency remains uncertain.

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<sup>67</sup> See Gideon Greenspan, *Smart Contracts: The Good, the Bad and the Lazy*, MULTICHAIN (Nov. 2, 2015), <http://perma.cc/466C-GL8Q>; see also Danny Ryan, *Costs of a Real World Ethereum Contract*, HACKERNOON.COM (Aug. 10, 2017), <http://perma.cc/HW4N-3HJY>.

<sup>68</sup> GANNE, *supra* note 10.

<sup>69</sup> *See id.*

<sup>70</sup> INTERNATIONAL CHAMBER OF COMMERCE, 2018 GLOBAL TRADE – SECURING FUTURE GROWTH (2018), <http://perma.cc/4XLC-SUBZ>.

<sup>71</sup> Ganne, *supra* note 10, at 19.

<sup>72</sup> *See id.*

<sup>73</sup> *See id.* at 42.

<sup>74</sup> See Michael del Castillo, *IBM-Maersk Blockchain Platform Adds 92 Clients As Part Of Global Launch*, FORBES (Aug. 9, 2018), <http://perma.cc/QN57-77HF>; see also Michael White, *Digitizing Global Trade with Maersk and IBM*, BLOCKCHAIN PULSE: IBM BLOCKCHAIN BLOG (Jan. 16, 2018), <http://perma.cc/DQV2-WF54>.

Additionally, and importantly, the legal status of smart contracts also remains contested.

However, the Convention on Contracts for the International Sale of Goods (CISG) is the default rule with respect to most international sales contracts between CISG-signatory parties, it is therefore worth exploring what the CISG has to say about the legality of smart contracts.

### A. Background of the CISG

The U.N. Commission on International Trade Law (UNCITRAL)—a commission that was created to promote the harmonization of international trade law—developed the text of the CISG, which was later adopted by sixty-two countries, including the U.S., at the Vienna Convention in 1980.<sup>75</sup> The U.S. ratified the CISG in 1986, and the CISG continues to be federal law today.<sup>76</sup> The CISG also remains the default contract law in “seventy-eight other countries, known as ‘Contracting States’ to the Convention,” including the Republic of Korea, China, Mexico, Switzerland, and Italy.<sup>77</sup>

As a result of the U.S. ratification of the CISG, the CISG is the default contract law for contracts between the U.S. and other Contracting States and is federal law that “preempts all conflicting state law.”<sup>78</sup> Of course, under Article 6, parties may “exclude the application of this Convention or . . . derogate from or vary the effect of any of its provisions.”<sup>79</sup> However, unless the parties expressly waive or opt out of the application of the CISG, most courts will hold that the CISG applies to the contract for the sale of international goods if the parties are from different States that have ratified the CISG or the parties included the CISG in the choice of law clause of the contract. Moreover, the failure to negotiate out or to select the CISG as a choice of law in the contract may have unfavorable consequences for one or both of the parties. For example, in *Filanto, S.p.A v. Chilewich International Corp.*,<sup>80</sup> the plaintiff unexpectedly found out that his contract was subject to the provisions of the CISG. He was ultimately barred from

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<sup>75</sup> See United Nations Convention on Contracts for the International Sale of Goods art. 7, Apr. 11, 1980, 14 U.N.T.S. 3 [hereinafter CISG], <http://perma.cc/AH4F-XVYP>; see also Kina Grbic, Comment, *Putting the CISG Where It Belongs: In the Uniform Commercial Code*, 29 TOURO L. REV. 173, 176 (2012–2013).

<sup>76</sup> Grbic, *supra* note 75; Thomas J. Drago & Alan F. Zoccolillo, *Be Explicit: Drafting Choice of Law Clauses in International Sale of Goods Contracts*, METRO. CORP. COUNS. 9 (May 2002), <http://perma.cc/U9E8-LXKZ>.

<sup>77</sup> Grbic, *supra* note 75.

<sup>78</sup> See *id.*

<sup>79</sup> CISG, *supra* note 75, at art. 6.

<sup>80</sup> *Filanto, S.p.A v. Chilewich Int'l Corp.*, 789 F. Supp. 1229 (S.D.N.Y. 1992).

initiating a breach of contract suit that would not have happened had he expressly opted out of the CISG's terms.<sup>81</sup> In the context of U.S. law, if the parties exclude the CISG, then the Uniform Commercial Code (UCC) governs certain contracts for the sale of goods.<sup>82</sup>

The CISG was created with two goals in mind: 1) to ensure legal certainty and 2) to promote international trade.<sup>83</sup> It aims to achieve these two goals by promoting uniformity in its application, meaning that the interpretation of its provisions should not be "influenced by the concepts used in the legal system of the country of the forum."<sup>84</sup> This autonomous style of interpretation will ideally avoid the legal uncertainty of applying a particular national law that one party may be unfamiliar with.<sup>85</sup> This clarity in turn will promote international trade, as parties will in theory have an incentive to contract and trade because the CISG, unlike national laws, "does not favor any party to the transaction that it governs," especially because it "combines both common law and civil law elements."<sup>86</sup> As the CISG states in its Preamble, "the adoption of uniform rules which govern contracts for the international sale of goods and take into account the different social, economic and legal systems would contribute to the removal of legal barriers in international trade and promote the development of international trade."<sup>87</sup>

Moreover, the CISG "reflects compromises between common-law and civil-law traditions as well as between developing and developed and controlled economy and free-economy countries. It incorporates these compromises in order to facilitate subsequent adoptions of the Convention throughout the world and to

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<sup>81</sup> See *Asante Techs., Inc. v. PMC-Sierra, Inc.*, 164 F. Supp. 2d 1142 (N.D. Cal. 2001).

<sup>82</sup> See Jennifer E. Hill, *The Future of Electronic Contracts in International Sales: Gaps and Natural Remedies under the United Nations Convention on Contracts for the International Sale of Goods*, 2 NW. J. TECH. & INTELL. PROP. 1, 14 (2003).

<sup>83</sup> See *id.*

<sup>84</sup> See CISG, *supra* note 75, at art. 7., which states that:

In the interpretation of this Convention, regard is to be had to its international character and to the need to promote uniformity in its application and the observance of good faith in international trade. Questions concerning matters governed by this Convention which are not expressly settled in it are to be settled in conformity with the general principles on which it is based or, in the absence of such principles, in conformity with the law applicable by virtue of the rules of private international law.

See also UNCITRAL, *The UNCITRAL Digest of Case Law on the United Nations Convention on the International Sale of Goods*, U.N. Doc. No. A/CN.9/SER.C/DIGEST/CISG/7 (June 8, 2004).

<sup>85</sup> Grbic, *supra* note 75, at 178.

<sup>86</sup> See *id.*

<sup>87</sup> CISG, *supra* note 75, at Preamble.

make it more useful in meeting varying needs of ratifying states.”<sup>88</sup> In the context of international trade, industrialized countries continue to have more bargaining power than developing countries, and UNCITRAL sought to provide a neutral set of laws that developing countries (which also helped to draft the Convention) would approve of and adopt.<sup>89</sup> As explained by UNCITRAL, small and medium-sized companies located in developing countries often do not have access to a lawyer when negotiating a contract.<sup>90</sup> Because these companies “may also be the weaker contractual parties and could have difficulties in ensuring that the contractual balance is kept,” the aim of the CISG was to level the playing field in contractual law by creating a “fair and uniform regime.”<sup>91</sup>

Finally, the CISG is divided into three parts: Part I introduces the scope of application and general provisions, Part II describes the formation of a contract, and Part III describes more detailed rules for issues that often arise in contracting.<sup>92</sup>

## B. The Broad Scope of the CISG’s Provisions

This Subsection focuses mostly on the provisions of the CISG from Section II (Art. 14-24), but also includes some discussion on articles in Section I and Section III, to show the rules covering contract formation by means of offer and acceptance. The CISG’s provisions regarding offer and acceptance is especially critical to the analysis below that smart contracts can be valid under the CISG.

1. To constitute an offer, a proposal should be sufficiently definite, indicate intention to be bound, and be addressed to at least one person.

Article 4 broadly defines the two main areas of contract law that the CISG covers: “the formation of the contract of sale and the rights and obligations of the seller and the buyer arising from such a contract.”<sup>93</sup> This Comment mainly focuses on the formation of the contract as it more directly relates to the validity of a contract. To understand contract formation under the CISG, one must start with

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<sup>88</sup> Louis F. Del Duca & Patrick Del Duca, *Practice Under the Convention on International Sale of Goods (CISG): A Primer for Attorneys and International Traders*, 27 UNIFORM COM. CODE L.J. 331 (1995), 29 UNIFORM COM. CODE L.J. 99 (1996), <http://perma.cc/C4RG-XBF9>.

<sup>89</sup> Uche Anyamele, *The United Nations Convention on Contracts for the International Sale of Goods: A Proposal for Nigeria*, IICL PACE LAW CISG DATABASE (2011), <http://perma.cc/3Q6S-97K4>.

<sup>90</sup> CISG, *supra* note 75.

<sup>91</sup> *See id.*

<sup>92</sup> *See Hill, supra* note 82.

<sup>93</sup> CISG, *supra* note 75, at art. 4.

Article 14, which introduces the requirements of offer and acceptance for the formation of a contract.

Under Article 14 of the CISG, a “proposal for concluding a contract” constitutes an offer if: 1) there is an offer addressed to at least one specific person; 2) the offeror has indicated an intention to be bound in the event of acceptance; and 3) the offer is sufficiently definite because it indicates the goods and expressly or implicitly makes provisions for determining quantity and price.<sup>94</sup> If the proposal addresses an indefinite group of people, then Article 14 requires “a clear indication of whether it is an offer.”<sup>95</sup> Otherwise, the proposal will be treated as merely an invitation to make an offer. With respect to the sufficient definiteness requirement, Article 14 allows the offeror to “implicitly fix[] or make[] provisions for determining the price.” An offeror’s communication may be an “offer” even if it referred to the price as being listed in a catalog if there had been prior course of dealings or the usage of trade recognizes the price as being set out in the catalog.<sup>96</sup>

Finally, there is also a subjective element to the formation of contracts under Article 14 of the CISG, as it requires some manifestation of the readiness of the offeror to be bound by the offer in case of an acceptance. Article 8 explains how this intent can be shown:

[S]tatements made by and other conduct of a party are to be interpreted according to the understanding that a reasonable person of the same kind as the other party would have had in the same circumstances. In determining the intent of a party or the understanding a reasonable person would have had, due consideration is to be given to all relevant circumstances of the case including the negotiations, any practices which the parties have established between themselves, usages and any subsequent conduct of the parties.<sup>97</sup>

According to Article 8, the offeror’s intent to be bound can be proven by all the relevant extrinsic evidence outside of the four corners of the document, even taking into account the statements and the conduct of the parties both during negotiations leading up to formation of the contract as well as after the contract

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<sup>94</sup> CISG, *supra* note 75, at art. 14.

<sup>95</sup> Belkis Vural, *Formation of Contract According to the CISG*, 6 ANKARA B. REV. 125, 130 (2013).

<sup>96</sup> Peter Winship, *Formation of International Sales Contracts under the 1980 Vienna Convention*, 17 INT’L LAW. 1, 6 (1983); *see also* CISG, *supra* note 75 at art. 9, which states:

This use of prior dealings and trade custom is also made possible by Article 9, which states: (1) The parties are bound by any usage to which they have agreed and by any practices which they have established between themselves. (2) The parties are considered, unless otherwise agreed, to have impliedly made applicable to their contract or its formation a usage of which the parties knew or ought to have known and which in international trade is widely known to, and regularly observed by, parties to contracts of the type involved in the particular trade concerned.”

<sup>97</sup> CISG, *supra* note 75, at art. 8.



is alleged to have been performed. In addition, the parties' intent to be bound can also be shown by usages and practices that parties have established between themselves or that are regularly observed in their particular industry.<sup>98</sup> But in circumstances where there are no indications of the parties' intent, the court or arbitrator should "apply the objective criterion of an understanding that a reasonable person would attribute to the statements and conduct of the party, i.e., to the contract, in the equivalent circumstances."<sup>99</sup> Moreover, while the fundamental elements (goods, quantity, and price) of the contract under Article 14 must be determined in the offer for the offer to be "sufficiently definite," non-fundamental elements under Article 8 can be "derived from the parties' statements and behavior, or determined by a court, arbitrator or third person."<sup>100</sup>

Finally, under Article 15 of the CISG, "[a]n offer becomes effective when it reaches the offeree."<sup>101</sup> In the context of electronic communications, the term "reaches" in Article 15 "corresponds to the point in time when an electronic communication has entered the offeree's server."<sup>102</sup>

2. To constitute an acceptance, the offeree's statement or conduct should indicate assent to the offer.

Under Article 18 of the CISG, an offeree's acceptance is "[a] statement made by or other conduct of the offeree indicating assent to an offer."<sup>103</sup> Therefore, absolute silence or the offeree's failure to follow up on an earlier expression of interest does not count as acceptance.<sup>104</sup> Moreover, an acceptance becomes effective "the moment the indication of assent reaches the offeror . . . within the time [the offeror] has fixed or, if no time is fixed, within a reasonable time" and

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<sup>98</sup> Explanatory Note by the UNCITRAL Secretariat on the United Nations Convention on Contracts for the International Sale of Goods, U.N. Doc. V.89-53886 (June 1989), <http://perma.cc/8JX8-X34Y>.

<sup>99</sup> *Article 8: Interpretation of Party's Statements or other Conduct*, IICL PACE LAW CISG DATABASE (2009), <http://perma.cc/WV8A-NE5G>.

<sup>100</sup> *Guide to Article 14: Comparison with Principles of European Contract Law (PECL)*, IICL PACE LAW CISG DATABASE (2007), <http://perma.cc/4VT4-P8AE>.

<sup>101</sup> CISG, *supra* note 75, at art. 15.

<sup>102</sup> *CISG-Advisory Council Opinion no 1: Electronic Communications under CISG*, IICL PACE LAW CISG DATABASE (2006), <http://perma.cc/9YXE-Q6JX>. The CISG Advisory Council (The CISG-AC) is an entity composed of an independent group of experts that was founded in 2001 by Professor Albert Kritzer of the Institute of International Commercial Law. The primary purpose of the CISG-AC is to "issue opinions relating to the interpretation and application of the Convention on request or on its own initiative."

<sup>103</sup> CISG, *supra* note 75, at art. 18.

<sup>104</sup> *Legislative History 1980 Vienna Diplomatic Conference: Summary Records of Meetings of the First Committee*, IICL PACE LAW CISG DATABASE (2014), <http://perma.cc/D5DP-LR8A>.

thus concludes the offer.<sup>105</sup> The purpose of this requirement is to ensure that the offeror has the opportunity to learn of the offeree's acceptance of his offer.<sup>106</sup> In the context of electronic communication, an acceptance becomes effective when "an electronic indication of assent has entered the offeror's server, provided that the offeror has consented, expressly or impliedly, to receiving electronic communications of that type, in that format, and to that address."<sup>107</sup>

3. An offeree's acceptance is not subject to any form requirements and may be proven by any means.

Under Article 11 of the CISG, oral agreements not evidenced by writing for the sale of goods are still enforceable. As Article 11 states: "A contract of sale need not be concluded in or evidenced by writing and is not subject to any other requirement as to form. It may be proved by any means, including witnesses."<sup>108</sup> Therefore, Article 11 does not contain any particular form requirements for the formation of contracts or acceptances, meaning that the formation of contract will be decided on the basis of the substance of the agreement rather than its form.<sup>109</sup> Recognizing that some Contracting States have domestic laws that require writing formalities for proving the existence of a contract, Article 96 of the CISG allows countries to make a reservation to the applicability of Article 11's provisions.<sup>110</sup> However, even though U.S. contract law typically requires contracts to be concluded in writing, the U.S. did not make a reservation to Article 11 under Article 96.<sup>111</sup>

Due to the lack of form requirements, we can also infer that a contract "may be concluded or evidenced by electronic communications."<sup>112</sup> Because the article does not prescribe a particular form, the CISG also allows parties to conclude their contracts electronically, even though "[t]he issue of electronic communications beyond telegram and telex was not considered during the drafting of the CISG in the 1970s."<sup>113</sup> Moreover, under Article 13 of the CISG,

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<sup>105</sup> CISG, *supra* note 75, at art. 18(2).

<sup>106</sup> CISG-Advisory Council, *supra* note 102.

<sup>107</sup> *See id.*

<sup>108</sup> CISG, *supra* note 75, at art. 11.

<sup>109</sup> *See id.*

<sup>110</sup> *See* Axel H. Baum, *Checklist on the CISG*, in GUIDE TO PRACTICAL APPLICATIONS OF THE UNITED NATIONS CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS (Albert H. Kritzer ed., 1994) (adapted excerpt), <https://perma.cc/6ZE8-EETH>. *See also* CISG, *supra* note 75, at art. 96.

<sup>111</sup> *See* Alicia Journey, *Who's Afraid of the CISG?— Contracts for the International Sale of Goods*, SMITH DEBNAM ATTORNEYS AT LAW (July 8, 2008), <http://perma.cc/NP7Y-Q6EV>.

<sup>112</sup> CISG-Advisory Council, *supra* note 102.

<sup>113</sup> *Id.*

the term “writing” includes telegram and telex.<sup>114</sup> Therefore, as a consequence of Article 13, a contract may also be concluded or accepted by telegram and telex.<sup>115</sup> Article 13 shows how broad the CISG’s definition of “writing” is, which will be important for the analysis below when considering whether smart contracts fall within the Convention’s scope.

4. Unlike the U.C.C., the CISG does not have a parol evidence rule or a perfect tender rule.

Under U.C.C. § 2-202, the parol evidence rule prohibits the introduction of evidence outside of the “four corners” of a clear contract to prove the intent of the parties that otherwise conflicts with the contract’s express terms.<sup>116</sup> Under U.C.C. § 2-601, also known as the “perfect tender rule,” the buyer may reject the goods if they do not conform precisely to the contract.<sup>117</sup> In contrast to the parol evidence rule of the U.C.C., Article 8 of the CISG, as mentioned above, allows the parties’ intentions to be bound by the contract to be proven by all the relevant extrinsic evidence outside of a written contract.<sup>118</sup> Moreover, the CISG standard of “substantial deprivation” for breach of contract is much lower than the perfect tender rule.<sup>119</sup> Favoring performance, the CISG requires a fundamental breach of the contract that would substantially deprive the parties of their entitlements under the contract.<sup>120</sup> As a vaguer standard than the “perfect tender rule,” the substantial deprivation rule of the CISG allows more flexibility for different circumstances and makes it harder for the parties to breach.<sup>121</sup>

Due to these differences between the CISG and the U.C.C., a smart contract under the CISG is much more likely to be enforced. For example, in the event that a smart contract under the CISG is hacked due to its faulty coding, it would be easier for the parties to prove their intent to contract by pointing to other circumstances, such as prior dealings or negotiations.<sup>122</sup> By contrast, if the faulty smart contract code itself led to the breach, a party to a U.C.C.-governed smart

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<sup>114</sup> CISG, *supra* note 75, at art. 13.

<sup>115</sup> CISG-Advisory Council, *supra* note 102.

<sup>116</sup> See U.C.C. § 2-202 (AM. LAW INST. & UNIF. LAW COMM’N 1977). See also *The Parole Evidence Rule*, UNIV. N.M. JUD. EDUC. CTR., <http://perma.cc/H3LM-WFCH>.

<sup>117</sup> See U.C.C. § 2-601 (Am. Law Inst. & Unif. Law Comm’n 1977); See also Aditi Ramesh, Petra Ghicu & Cara Putman, *CISG v. UCC: Key Distinctions and Applications*, 7 BUS. & MGMT. REV. 459, 464 (June 2016).

<sup>118</sup> See CISG, *supra* note 75, at art. 8.

<sup>119</sup> See *id.* at art. 25.

<sup>120</sup> See *id.*

<sup>121</sup> See Ramesh et al., *supra* note 117, at 465.

<sup>122</sup> See CISG, *supra* note 75, at art. 8.

contract would have a harder time showing its intent by simply referring to the “four corners” of the code alone.<sup>123</sup> A party to this contract could argue that the intention to be bound cannot be found in the code itself as it was intentionally made vulnerable to hacking. Furthermore, in the event that a glitch or a hack of the smart contract code leads to a less than optimal performance, it would be much easier to back out of the contract under a perfect tender rule than under a substantial deprivation rule.

In sum, under the Convention’s offer and acceptance requirements, broad definition of writing, liberal evidence rules, and tendency toward enforcement, a smart contract is likely to be considered valid under the Convention.

### C. Limitations on the Scope of the CISG

The CISG only applies to contracts of the international sales of goods that are between parties whose places of business are in different Contracting States.<sup>124</sup> The nationality of the parties to the contract in question is irrelevant when deciding whether the places of business are in different states: only the location of the parties’ places of business is taken into account in determining the application of the CISG to the contract.<sup>125</sup> Moreover, the CISG generally applies to contracts governing the commercial sale of goods,<sup>126</sup> but excludes coverage of consumer sales and of “goods bought . . . by auction; on execution or otherwise by authority of law; of stocks, shares, investment securities, negotiable instruments or money; of ships, vessels, hovercraft or aircraft; of electricity.”<sup>127</sup>

Article 4 of the CISG limits its applicability to the validity of the contract, stating: “*except as otherwise expressly provided in this Convention, it is not concerned with: the validity of the contract or of any of its provisions or of any usage.*”<sup>128</sup> Because “validity” is not defined in Article 4 or in any of the CISG’s other provisions, it is

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<sup>123</sup> Under the revised Article 9 of the U.C.C., security interests are allowed to be created through electronic records and signatures, suggesting an openness in the U.C.C. to electronic methods of contracting. See Margo H. K. Tank et al., *A Brief Guide to Using Electronic Signatures in Securities Transactions*, 6 PRAC. COMPLIANCE & RISK MGMT. SEC. INDUSTRY 23, 26 (2013), <http://perma.cc/2C5W-UZZ5>; U.C.C. § 1-201 (AM. LAW INST. & UNIF. LAW COMM’N 1977) (in which “writing” is defined as including “printing, typewriting, or any other intentional reduction to tangible form”) (emphasis added).

<sup>124</sup> See CISG, *supra* note 75, at art. 1.

<sup>125</sup> See *id.*

<sup>126</sup> See Fritz Enderlein & Dietrich Maskow, *International Sales Law: United Nations Convention on Contracts for the International Sale of Goods: Convention on the Limitation Period in the International Sale of Goods*, OCEANA PUBLICATIONS 28 (1992), <http://perma.cc/6WVH-GZSE>.

<sup>127</sup> CISG, *supra* note 75, at art. 2.

<sup>128</sup> *Id.* at art. 4 (emphasis added).

left to the various domestic courts to determine the definition of validity.<sup>129</sup> As a result of the ambiguity of Article 4, legal scholars and domestic courts of different Contracting States have taken different approaches to interpreting the validity question of Article 4. While some approve of a broad interpretation of Article 4, arguing that issues of validity should only be determined by domestic law, others apply a narrower interpretation, allowing the CISG's provisions to displace domestic law even on issues that in domestic law are usually considered relevant to the validity of a contract.<sup>130</sup>

1. Under a broad interpretation of Article 4, all issues of validity are determined by domestic law.

One approach taken by scholars and courts is to simply disregard the CISG on all matters regarding contract validity. Under this approach, validity is “determined exclusively by domestic law.”<sup>131</sup> For example, in *Geneva Pharmaceuticals Tech. Corp. v. Barr Laboratories Inc.*, the Canadian defendant, who rejected a contract with the plaintiff, argued that there was no breach of contract because there was a lack of consideration.<sup>132</sup> Without looking at what the CISG had to say on the issue of consideration, the U.S. District Court for the Southern District of New York concluded that domestic law should govern this issue, stating that “[u]nder the CISG, the validity of an alleged contract is decided under domestic law . . . [b]y validity, the CISG refers to any issue by which the domestic law would render the contract void, voidable, or unenforceable.”<sup>133</sup>

2. Under the narrow “internationalist” interpretation of Article 4, legal issues addressed by the CISG's provisions are determined by the CISG.

An alternative approach is to construe Article 4 of the CISG narrowly in light of Article 7, the legislative intent of the CISG's drafters, and the “except as otherwise expressly provided” clause in Article 4(a). This Comment adopts this approach for the analysis of smart contract validity under the CISG's provisions.

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<sup>129</sup> See Ulrich Drobniq, *Substantive Validity*, 40 AM. J. COMP. L. 635, 636 (1992).

<sup>130</sup> See generally Ulrich G. Schroeter, *The Validity of International Sales Contracts*, in BOUNDARIES AND INTERSECTIONS: THE 5TH ANNUAL MAA SCHLECHTRIEM CISG CONFERENCE 95 (Ingeborg Schwenzer & Lisa Spagnolo eds., 2014).

<sup>131</sup> Patrick C. Leyens, *CISG and Mistake: Uniform Law vs. Domestic Law: The Interpretative Challenge of Mistake and the Validity Loophole*, in REVIEW OF THE CONVENTION ON CONTRACTS FOR INTERNATIONAL SALE OF GOODS (CISG) 2003–2004, 3 (Michael Maggi & Patrice Fraccio eds., 2005), <http://perma.cc/6GXG-9XT4>.

<sup>132</sup> *Geneva Pharms. Tech. Corp. v. Barr Labs., Inc.*, 201 F. Supp. 2d 236, 283–84 (S.D.N.Y. 2002).

<sup>133</sup> *Id.* at 282.

First, the legislative history of the CISG reveals that its drafters created Article 4's validity provision to be ambiguous to achieve a compromise so as to avoid the postponement of reaching an agreement on the draft. At the same time, however, the drafters "did not intend for the validity exception to provide *carte blanche* for applying domestic public policy laws to international transactions."<sup>134</sup> After all, the overarching purpose of the CISG was to promote uniformity in the application of its laws.<sup>135</sup> The goal of uniformity, however, would be undermined if courts can apply domestic rule of law in place of the CISG whenever they determine that the issue in question concerns validity.<sup>136</sup> Moreover, Article 7 of the CISG calls for a "detached characterisation of validity that is committed to the unification purposes of the CISG." Scholars under this narrow interpretive view agree that this provision applies not only to the interpretation of the CISG's rules governing the formation of the contract but also to the scope of the CISG's application contained in Article 4.<sup>137</sup>

Second, proponents of the narrower interpretation of Article 4 tend to construe the "except as otherwise expressly provided in this Convention" clause in Article 4(a) to refer to the preemption of domestic validity rules whenever an issue is addressed or settled in the Convention through its provisions or general principles.<sup>138</sup> This preemption may include issues considered pertaining to the validity of a contract, such as the formation of a contract.

Given the underlying drafters' intent of promoting uniformity in interpretation and Article 7's requirement for interpreting the CISG in light of this goal, scholars and courts under this narrow view of Article 4 engage in an "internationalist interpretation" of the CISG.<sup>139</sup> This interpretative approach involves looking at the CISG first, without regard for the domestic law, to see whether the facts and the legal issue(s) of the case come under the scope of and are settled by the CISG.<sup>140</sup> If both criteria are met, then the "except as otherwise expressly provided in the Convention" clause of Article 4 applies, and "the issue is a non-validity one and domestic remedies are displaced" by the CISG.<sup>141</sup> For example, because a form requirement for contracts is excluded by Article 11, courts cannot apply domestic form requirements. Conversely, "for issues which

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<sup>134</sup> Nir Bar & Natanella Har-Sinay, *Contract Validity and the CISG: Closing the Loophole* § 3 (Jan. 19, 2008), <http://perma.cc/QFG3-WP6K>.

<sup>135</sup> *See id.*

<sup>136</sup> *See* Schroeter, *supra* note 130, at 97, 104.

<sup>137</sup> Leyens, *supra* note 131.

<sup>138</sup> *See id.*

<sup>139</sup> *See id.*

<sup>140</sup> *See* Schroeter, *supra* note 130, at 103.

<sup>141</sup> *See* Leyens, *supra* note 131.

are not addressed by any provisions of the Convention, reference must be made to domestic law.”<sup>142</sup>

The preceding two Sections provided a general introduction to smart contracts and a broad overview of the background and provisions of the CISG. The following Section focuses especially on the Convention’s provisions governing contract formation to show that some smart contracts are valid under the CISG.

#### IV. ANALYSIS OF SMART CONTRACTS UNDER THE CISG

Smart contracts on blockchain platforms are a relatively new technology and there is a broad range of possibilities for what a smart contract can be. Because UNCITRAL has yet to address whether the CISG applies to smart contracts, there is uncertainty as to if and when, along a spectrum of possibilities, a smart contract is a valid contract under the CISG. Smart contracts that are referenced by and incorporated in a fully-developed written agreement are easier to analyze for validity because the scrutiny can focus on the traditional contract elements of the written agreement. Thus, this Comment focuses on the following question: In the context of smart contract use for international trade transactions, can a smart contract at the far end of the other side of the spectrum—the smart contract whose code constitutes the entirety of the agreement—be a valid contract under the CISG? This Comment argues that a smart contract whose code constitutes the entirety of the agreement can be valid under the CISG because it can meet the offer and acceptance requirements of the CISG.

For the sake of simplicity, the following analysis will be centered around a hypothetical smart contract that contains the following agreement translated into code: if Company B delivers one hundred electric motors to Company A by December 23, 2018, at 5:00 PM (Central Time), then Company A delivers \$1,000 USD to Company B.<sup>143</sup> In addition, this hypothetical smart contract falls within the scope of the CISG under Article 1 and the parties have not indicated the governing law of their contract. Furthermore, in the event of a dispute, the contract is litigated in a U.S. court.<sup>144</sup>

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<sup>142</sup> Bar, *supra* note 134, at 3.

<sup>143</sup> This hypothetical is a modified version of the example provided in McCarthy, *supra* note 30, at 14.

<sup>144</sup> I focus on the U.S. court system because—especially given the influence of American jurisprudence and the fact that America is the world’s largest exporter and importer of many different goods—its decisions will likely influence the way smart contracts are handled in the legal realm worldwide. *See, for example, A Look at How America Benefits from International Trade*, NORWICH U. ONLINE (July 11, 2016), <http://perma.cc/D2YG-F77U>. *See also, for example, THE LAW LIBRARY OF CONGRESS, THE IMPACT OF FOREIGN LAW ON DOMESTIC JUDGMENTS* 28 (Mar. 2010), <http://perma.cc/YC5K-AKUR> (“[f]oreign cases are commonly used in the domestic judgments of courts in England and

In arguing that smart contracts are “valid” under the CISG, I define “validity” in this Comment as “formation validity.”<sup>145</sup> In other words, as long as the smart contract meets the contract formation requirements of the CISG, and would not otherwise be void under domestic law on non-formation matters, then that smart contract should be held as legally binding in a U.S. court.

#### A. Contract Validity under Article 4

Before discussing the validity of smart contracts under the CISG, it is important to first resolve the ambiguity of contract validity created by Article 4. In this Subsection, I will argue that the internationalist approach to Article 4, which treats legal issues addressed by the CISG as being determined by its provisions and not by domestic law, is the appropriate framework for analyzing smart contract validity for contracts made under the circumstances laid out in the hypothetical above.

1. The majority of scholars and judicial precedent favors the internationalist approach to Article 4.

Because the hypothetical smart contract will be litigated in a U.S. court in the event of a dispute, it is appropriate to consider how U.S. courts approach Article 4’s validity clause. With the exception of *Geneva Pharmaceuticals* mentioned in Section III, U.S. courts have tended to follow the approach of the majority of scholars who favor the internationalist approach.<sup>146</sup> For example, John O. Honnold, a renowned scholar of commercial law and the former Secretary of UNCITRAL, argued that Article 8 of the CISG, which requires courts to give “due consideration” to all the relevant facts and circumstances in determining the parties’ intent,<sup>147</sup> should preempt the domestic parol evidence rule.<sup>148</sup> This argument was based on Honnold’s view that “the Convention displaces domestic law governing validity issues if its provisions and general principles address the issue and provide a solution on the same operative facts.”<sup>149</sup> Because the CISG addressed whether intent to be bound by the contract and its terms can be shown

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Wales” and “Indian legislation is under the strong influence of British and American law, and judges often rely on foreign court rulings in interpreting domestic statutes and international instruments”).

<sup>145</sup> I focus on formation validity because my main purpose in this Comment is to show that smart contracts could meet the formation requirements for traditional paper contracts under the CISG. Other issues related to validity, such as coercion or duress, are beyond the scope of this Comment.

<sup>146</sup> See Leyens, *supra* note 131.

<sup>147</sup> CISG, *supra* note 75 at art. 8.

<sup>148</sup> See Marlyse McQuillen, *The Development of a Federal CISG Common Law in U.S. Courts: Patterns of Interpretation and Citation*, 61 U. MIAMI L. REV. 509, 520–21 (2007).

<sup>149</sup> Henning Lutz, *The CISG and Common Law Courts: Is There Really A Problem?*, 35 VICTORIA U. WELLINGTON L. REV. 711, 723 (2004).



by evidence outside of a written document, Honnold concluded that the CISG displaced the parol evidence rule.<sup>150</sup>

U.S. Courts followed Honnold's interpretation of Article 8. For example, the Eleventh Circuit in *MCC-Marble Ceramic Center, Inc. v. Ceramica Nuova D'Agostino S.P.A.*<sup>151</sup> held that Article 8 of the CISG rejected the parol evidence rule. The court maintained that because Article 8 did not require that a contract be evidenced in writing, it was clear that the CISG demanded the consideration of parol evidence to the extent that it revealed the intent of the parties.<sup>152</sup> In addition, in *Asante Technologies v. PMC-Sierra*,<sup>153</sup> when the parties disputed whether the CISG or state law was applicable to their case, the Ninth Circuit held that the preemption of state law by the CISG was consistent with the congressional intent of ratifying the CISG. The Ninth Circuit further supported this point by pointing to the goal of the Convention to develop uniform international contract law, arguing that it would be frustrated if state law could override any of its provisions.<sup>154</sup> The Ninth Circuit also used academic commentary to bolster its arguments.<sup>155</sup>

Therefore, given that U.S. courts tend to follow the internationalist approach of the majority of scholars in considering Article 4's validity clause, it is appropriate to also take the internationalist approach to the hypothetical smart contract above, which is also situated in the context of the U.S. court system.

## 2. A broad interpretation of Article 4 is inconsistent with the intent of Congress.

In U.S. law, the issues of contract formation and validity are often intertwined. To give an example, it sometimes requires a written instrument to prove the parties' "intention to create legal relations"—an important element of contract formation.<sup>156</sup> In fact, the majority of states require contracts to be in writing for sales of goods worth at least \$500.<sup>157</sup> Without such a written instrument to show that the parties intended to be legally bound, the agreement may be held unenforceable, or invalid. However, this written requirement directly conflicts with Articles 8 and 11 of the CISG, which permits contracts to form without a

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<sup>150</sup> *See id.*

<sup>151</sup> *MCC-Marble Ceramic Ctr. v. Ceramica Nuova D'Agostino S.P.A.*, 144 F.3d 1384, 1390 (11th Cir. 1998).

<sup>152</sup> *See id.* at 1389.

<sup>153</sup> 164 F. Supp. 2d at 1142.

<sup>154</sup> *See id.* at 1151.

<sup>155</sup> *See id.*

<sup>156</sup> Nadia Evans, *First Principles of Contract Formation*, 6 CORP. & COM. DISP. REV. 1, 18 (Mar. 2018), <http://perma.cc/VSX4-2R3L>.

<sup>157</sup> U.C.C. § 2-201 (Am. Law Inst. & Unif. Law Comm'n 1977).

written instrument and allows an offeror's intention to be bound to be evidenced by facts and circumstances outside of a written document pertaining to the agreement.<sup>158</sup>

Under the broad interpretation of Article 4, where validity is determined only on the basis of domestic law, a contract that lacks a written instrument when domestic rules require it would be held invalid even though Articles 8 and 11 do not require a written instrument for any contract under its scope. This would make Articles 8 and 11 completely inapplicable to most international sales contracts. However, this outcome would be inconsistent with the intent of Congress in adopting and ratifying the CISG. As mentioned above, Article 96 of the CISG allows countries to make a reservation to Article 11, but the U.S. never made this reservation.<sup>159</sup> Congress' silence means the courts' approach is instructive. Given that the U.S. courts have tended to gravitate toward the narrower interpretation of Article 4's clause on validity, the internationalist approach to Article 4 is better than the broader approach in considering the validity of smart contracts in the U.S. legal system.

## B. Formation Validity of Smart Contracts: The Offer

The provisions of the CISG embody "a liberal approach to contract formation and interpretation, and a strong preference for enforcing obligations and representations customarily relied upon by others in the industry."<sup>160</sup> It is in light of this broad approach to contract formation and to enforcement of contract obligations that the validity of smart contracts will be considered in this Comment.

Because contract formation under the CISG is based on the offer and acceptance model, I will begin by exploring whether a proposal to make a contract that is written in code form in a smart contract would constitute an offer under the requirements of Article 14.

To recap, under Article 14 of the CISG, a proposal to enter into an agreement becomes an offer when there is an offer addressed to at least one specific person, the offeror has indicated an intention to be bound by the agreement upon acceptance, and the offer is sufficiently definite because it indicates the goods, quantity, and price.<sup>161</sup> To go back to our hypothetical smart contract above, Company A is making an offer to Company B to pay \$1,000 for 100 of Company B's electronic motors if the motors are received by a certain time.

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<sup>158</sup> See CISG, *supra* note 75, at arts. 8, 11.

<sup>159</sup> See *Jurney*, *supra* note 111.

<sup>160</sup> *Geneva Pharms.*, *supra* note 132, at 281.

<sup>161</sup> See CISG, *supra* note 75, at art. 14.

1. It is possible for an offer written entirely in code to be addressed to a specific person.

A proposal to create a contract that is written entirely in code can be addressed to at least one specific person, and this can be accomplished by sending direct messages to the other party in the blockchain-based platform or by email. First, offers directed to a person or a group of people can be translated into code.<sup>162</sup> For example, AXA, a French insurance firm, is currently testing a product called Fizzy, which “will store and process payments” via smart contracts built on Ethereum’s blockchain.<sup>163</sup> If a customer buys flight-delay insurance on the Fizzy platform, a smart contract will be created that will automatically compensate them in the event of a flight delay.<sup>164</sup> Presumably, if smart contract codes could not handle offers addressed to specific customers, then it would not be possible for AXA to test automated payments via smart contracts to specific customers based on certain conditions.

However, to make it even clearer that Company A’s offer is specifically addressed to Company B, Company A can send its proposal in code form directly to Company B. Imagine that Company A and Company B already have account addresses on a blockchain-based platform due to a prior smart contract agreement. Some blockchain-based platforms will allow Company A to copy and paste its coded proposal to initiate a new smart contract into a message system and send it directly to Company B’s address.<sup>165</sup> There are, of course, other ways for Company A to send its proposal in code form to Company B. For example, Company A could simply copy and paste the code into an email and send it to the appropriate email address of an executive working for Company B. The moment that this message reaches Company A’s server is the moment that the offer becomes effective.<sup>166</sup>

2. The offeror can indicate an intention to be bound both in and outside of a smart contract.

Under the CISG, the parties’ intentions are of paramount importance in contract formation, so much so that the Convention allows the parties to “vary the effect” of the other provisions on contract formation as long their intentions

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<sup>162</sup> See Cardozo Blockchain Project, *supra* note 52, at 6–8. See also Ricardo Corin, et al., *A Secure Compiler for Session Abstractions*, 16 J. COMPUTER SEC. 1, 1–5 (2008).

<sup>163</sup> Maria Terekhova, *AXA Turns to Smart Contracts for Flight-Delay Insurance*, BUSINESS INSIDER (Sept. 15, 2017), <http://perma.cc/UC3T-MRED>.

<sup>164</sup> See *id.*

<sup>165</sup> See *Address-to-Address-Messaging*, GITHUB, <http://perma.cc/A4T4-TNCP>.

<sup>166</sup> See CISG-Advisory Council, *supra* note 102.

to be bound by the contract are clear.<sup>167</sup> Conversely, even if an offer is sufficiently definite and is addressed to at least a specific person, a proposal to create a contract will not be considered an offer if it cannot be shown that the offeror intended to be bound by the proposal.<sup>168</sup> This is because “a proposal does not always aim at concluding a contract but may perhaps be aimed at taking up negotiations on a sale.”<sup>169</sup> Thus, if an offeror can show its intention to be bound by a proposal to contract even though the proposal is in pure code form, then it will be easier to argue that it is an offer under Article 14.

Article 8 allows the offeror’s intent to be bound to be proven by “*all relevant circumstances*,” including the statements and the conduct of the parties before and after the contract has been performed.<sup>170</sup> Prior usages and practices established between the parties or industrial practices can also prove an intent to be bound. Thus, Company A may be able to show that it intended to be bound by its proposal to Company B by pointing to prior agreements with similar arrangements. For example, if Company A had made the same offer laid out in the hypothetical above once before and had performed the contract, then it can use this fact as evidence of its intention to be bound by subsequent similar agreements. In addition, if it becomes industrial practice to send serious offers in pure code form, then this could also be used to show that Company A made an offer in accordance with Article 14’s requirements.

Another way to show the offeror’s serious intent to contract is through the setting up of the smart contract between Company A and Company B. As mentioned above, smart contracts are self-executing contracts, and once certain conditions are met, the transactions that the smart contract was encoded to perform are typically unstoppable without an emergency stop mechanism.<sup>171</sup> Thus, if a smart contract is set up between Company A and Company B according to the agreement laid out in the hypothetical above, then once Company B sends Company A one hundred motors by the specified time, the smart contract will automatically execute the terms of the agreement and \$1,000 will be sent from Company B’s account to Company A’s account. Thus, if Company A knew or should have known the self-executing nature of smart contracts, the very act of setting up a smart contract between Company A and Company B can be used to prove Company A’s intent to make a legally binding offer.

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<sup>167</sup> See Larry A. DiMatteo et al., *The Interpretive Turn in International Sales Law: An Analysis of Fifteen Years of CISG Jurisprudence*, 24 NW. J. INT’L L. & BUS. 299, 341 (2004).

<sup>168</sup> See Fatma Esra Güzeloğlu, *The CISG: What Differentiates a Valid and Binding Offer from a Mere Proposal?*, GÜZELOĞLU ATT’Y L. 1, 3 (Apr. 13, 2016), <http://perma.cc/NE2H-9DTC>.

<sup>169</sup> *Id.*

<sup>170</sup> See CISG, *supra* note 75, at art. 8 (emphasis added).

<sup>171</sup> See Jeremy M. Sklaroff, *Smart Contracts and the Cost of Inflexibility*, 166 U. PA. L. REV. 263, 273 (2017).

Finally, Company A can also show its serious intent to make an offer by not incorporating an emergency stop in the smart contract code that would have allowed it to halt a smart contract mid-transaction even when it could have.<sup>172</sup> This shows that Company A may have been trying to signal to Company B that it was committed to its offer by setting up a smart contract that was unstoppable once certain agreed upon conditions were met.

3. It is possible for an offer written entirely in code to be sufficiently definite.

An offer written in smart contract code can indicate the goods, quantity, and price that the parties agree to in the contract. For example, currently, smart contracts are used for selling digital tokens in exchange for money or other types of tokens.<sup>173</sup> These smart contracts indicate the price the offeror is willing to sell the tokens for, the goods that are to be transferred (tokens), and the amount of the tokens to be transferred.<sup>174</sup> Similarly, the hypothetical offer above includes the price (\$1,000), goods (electronic motors), and quantity (one hundred motors). Thus, it is possible for offers written entirely in code to be sufficiently definite.

### C. Formation Validity of Smart Contracts: The Acceptance

Under Article 18 of the Convention, an acceptance is any statement or conduct by the offeree that indicates an assent to the offer.<sup>175</sup> One of the clearest ways that Company B can show through its conduct that it understood and assented to Company A's offer is by performing according to the terms of the contract without conditioning its assent on additional terms. For example, Company B could accept Company A's offer by delivering the one hundred electronic motors before December 24<sup>th</sup> without indicating it wanted the price for the motors to be higher.

Another way Company B could show that it assented to sending the electronic motors according to the terms of Company A's smart contract is by "provid[ing] its digital signature utilizing a cryptographic [private] key" to sign the transaction before the offer expires on the 23<sup>rd</sup> of December.<sup>176</sup> Under the

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<sup>172</sup> See Emergency Stop, *supra* note 64.

<sup>173</sup> See Julian Jarvis & Ch'ng Li-Ling, *Raising Capital in the Digital World*, THE BUSINESS TIMES (Sept. 27, 2018), <http://perma.cc/F83L-BBPT>.

<sup>174</sup> See Sebastián Brocher, *Building a Non-Fungible Token Sales Smart Contract*, MEDIUM (Sept. 4, 2018), <http://perma.cc/9ZUJ-MXKJ>.

<sup>175</sup> See CISG, *supra* note 75, at art. 18(1).

<sup>176</sup> Alan Cohn et al., *Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids*, 1 GEO. L. TECH. REV. 273, 288 (2017). See also Kevin Werbach & Nicolas Cornell, *Contracts Ex Machina*, 67 DUKE L.J. 313, 368 (2017) ("The fact that parties submit their cryptographic private

Convention, “signing” a smart contract with a code-based digital signature is as valid as signing a traditional contract with a real or electronic signature. First, under Article 18(2), an acceptance becomes effective and the contract is concluded when “the indication of assent reaches the offeror . . . within the time [the offeror] has fixed or, if no time is fixed, within a reasonable time.”<sup>177</sup> As stated by Article 11, a contract does not need to be concluded by writing but can be “proved by any means.”<sup>178</sup> Considering that “any means” refers to a broad range of methods to concluding a contract, signing a contract using code-based technology should be able to fall under this category. Second, an acceptance may be effective when “an electronic indication of assent has entered the offeror’s server” as long as the offeror has had the opportunity to access this indication of assent by the offeree.<sup>179</sup> As the offeror and party to the smart contract, Company A will be able to access and see all digital signatures and signed transactions by other participants in the smart contract.<sup>180</sup> Thus, as Company A is able to view Company B’s digital signature and because Company A initiated the wholly code-based agreement, Company A should have adequate notice of and access to Company B’s acceptance in the form of a digital signature.

#### D. Electronic Contracts under Article 13

Even if smart contracts can meet the Convention’s formation requirements, some scholars still raise doubts about whether a smart contract can even be considered a legal contract given its unique technological character. First, smart contracts were invented long after the Convention was signed, raising concerns about whether the Convention applies to smart contracts even if the original drafters did not contemplate their use in the text.<sup>181</sup> Second, some scholars argue that smart contracts are not legal contracts because they are not agreements between people but rather merely an enforcement mechanism of an underlying agreement.<sup>182</sup> To address these two concerns, it is important to first consider Article 13 and the interpretation of its scope.

Although neither the Convention nor its drafters explicitly considered or mentioned smart contracts, the text and legislative history of Article 13, case law,

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keys to commit their resources to the smart contract is proof of such an intent [of acceptance]”); BLUECOAT, A MAGNITUDE OF CHANGE 66 (2018), <http://perma.cc/7HJ2-42VX>.

<sup>177</sup> CISG, *supra* note 75, at art. 18(2).

<sup>178</sup> *Id.* at art. 11.

<sup>179</sup> CISG-Advisory Council, *supra* note 102.

<sup>180</sup> *See* Shearer, *supra* note 36.

<sup>181</sup> *See* Hill, *supra* note 82, at 3.

<sup>182</sup> *See* Werbach at 339, 372–73, *supra* note 176.

and subsequent UNCITRAL legislative texts all suggest that smart contracts are legal contracts and included within the scope of the CISG.

First, Article 13 states that “[f]or the purposes of this Convention ‘writing’ includes telegram and telex.”<sup>183</sup> The use of the word “includes” suggests that other forms of communication—including electronic forms of communication—may be considered a “writing” that can be used to prove that there was a contract.<sup>184</sup> The few cases that have considered Article 13 have interpreted it to include more than just telegram and telex. For example, in one case decided by the Supreme Court of Egypt, the Court concluded that the definition of writing under Article 13 was “flexible enough to include telex, fax, e-mail and other electronic means of communication.”<sup>185</sup>

Should smart contracts be considered a form of electronic communication? According to the authors of *Contracts Ex Machina*, Werbach and Cornell, smart contracts do not really communicate anything as they are not themselves legal agreements between actual people.<sup>186</sup> Instead, Werbach and Cornell contend that the actual parties to a smart contract are cryptographic keys, and that the power of the performance of the smart contract is given entirely to the “machine” of the smart contract technology because of its self-executive nature.<sup>187</sup>

UNCITRAL’s legislators, however, take a different view. First, the UNCITRAL Model Law on Electronic Commerce with Guide to Enactment 1996 states that data messages—defined as encompassing “all types of messages that are...in essentially paperless form” and generated automatically by computers—should be treated as “‘originating’ from the legal entity on behalf of which the computer is operated.”<sup>188</sup> Thus, the cryptographic keys that the parties use to indicate their assent to the smart contract should be treated as originating from the parties because it is on their behalf that the smart contract is operating.<sup>189</sup> Moreover, if the power of the performance of the smart contract is given entirely to the “machine” of the smart contract technology, it is given because the parties

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<sup>183</sup> CISG, *supra* note 75, at art. 13 (emphasis added).

<sup>184</sup> *See id.* at Art. 11.

<sup>185</sup> Hossam A. El-Saghir, *The Interpretation of the CISG in the Arab World*, in CISG METHODOLOGY 355, 365 (Andre Janssen & Olaf Meyer eds., 2009), <http://perma.cc/YU7G-QWTP>.

<sup>186</sup> *See* Werbach, *supra* note 176, at 372.

<sup>187</sup> *See id.* at 371.

<sup>188</sup> UNCITRAL, MODEL LAW ON ELECTRONIC COMMERCE WITH GUIDE TO ENACTMENT 1996, 26–27 (1999), <http://perma.cc/U8VR-D9TF>. Although the MLEC is not a binding international instrument, it can be used as a tool for interpreting the CISG.

<sup>189</sup> Smart Contracts Alliance, *Smart Contracts: Is the Law Ready?*, CHAMBER OF DIGITAL COMMERCE 16 (2018).

assented to this type of arrangement by agreeing to the protocol<sup>190</sup> that would automatically and irrevocably enforce the terms of the agreement embodied by the code.<sup>191</sup> Thus, the execution of the smart contract communicates the agreement of the parties to the underlying agreement embodied within the smart contract code.

In addition, under the MLEC, electronic data interchange (EDI)—the closest technological equivalent to the smart contract—is considered a form of electronic communication whose data messages are not automatically treated as invalid merely because they are in electronic form.<sup>192</sup> In an electronic data interchange, the electronic exchange of business documents between business partners is automated by computers.<sup>193</sup> One example of an EDI is when a computer user clicks the “I accept” button to a digital contract in order to begin a relationship with an online retailer.<sup>194</sup> Werbach and Cornell attempt to distinguish EDIs from smart contracts by noting that, although electronic in form, the substance and execution of EDIs depend on humans, while the substance and execution of smart contracts depend on machines.<sup>195</sup> However, the substance and execution of smart contracts also depend to some extent on human beings. The immutability of a particular smart contract depends on its protocol, which in turn is determined by its participants.<sup>196</sup> As mentioned above, parties can create smart contracts that enable emergency stops in case something goes wrong.<sup>197</sup> A smart contract is created to be immutable for parties that want the extra security that the terms of the smart contract will be enforced.<sup>198</sup> Moreover, the execution of the smart contract still depends on the actions of its participants. In the above example, Company B could indicate acceptance by signing the transaction with a private key, which would set the transactions in the smart contract in motion.<sup>199</sup>

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<sup>190</sup> A “protocol” in the smart contract context refers to “technology-enabled, rules-based operations” which “enables actions to be performed, such as the release of payment.” The parties can determine the protocol that will be incorporated in their smart contract prior to initiating the contract.

<sup>191</sup> *See id.*

<sup>192</sup> *See* UNCITRAL, *supra* note 188, at 4–5.

<sup>193</sup> *See* Werbach, *supra* note 176, at 320 n.28.

<sup>194</sup> *See id.* at 320–21.

<sup>195</sup> *See id.* at 322.

<sup>196</sup> *See* Michiel Mulders, *Smart Contract Safety: Best Practices & Design Patterns*, SITEPOINT (Aug. 23, 2018), <http://perma.cc/DP6S-Q47H>.

<sup>197</sup> *See id.*

<sup>198</sup> Marcin Zduniak, *Blockchain Immutability: Behind Smart Contracts*, ESPEO BLOCKCHAIN (May 29, 2018), <http://perma.cc/9Z3F-T6KL>.

<sup>199</sup> *See* Cohn, *supra* note 176, at 279.



Furthermore, legislative history suggests that Article 13 expressly included telegram and telex as writings to emphasize that a particular form of a contract was not required under the Convention and to include two forms of communication that facilitated international trade due to their ability to enhance the speed of communication between the parties.<sup>200</sup> As I will explain in the next Section, including smart contracts under Article 13 would be consistent with the drafter's intent, because smart contracts can facilitate trade by quickly communicating information from the sellers to the buyers.

### E. Legal Issues Unique to Smart Contracts

Smart contracts are unique from traditional paper contracts and EDIs because they can be designed to immediately and irrevocably perform contracts.<sup>201</sup> The potential irreversibility of smart contract transactions helps to reduce the transaction costs of monitoring performance and reduces the possibility of a breach.<sup>202</sup> Once set in motion and without an emergency stop mechanism in place, the transactions that a smart contract was encoded to perform are typically unstoppable.<sup>203</sup> This immediacy and irrevocability also distinguishes smart contract transactions from purchases on Amazon, which are based on executory contracts—when you buy something from Amazon, you are promising Amazon to pay your credit card issuer in exchange for that item, and the transfer of money does not take place immediately.<sup>204</sup> Thus, if you purchase a book on Amazon, you can still prevent a transfer of money from your bank account by cancelling the order.<sup>205</sup> By contrast, initiating a smart contract by agreeing to pay for something is instantly and irreversibly enforced, making the smart contract an essential component of the enforcement of the agreement itself.<sup>206</sup>

The irrevocable aspect of smart contract performance and the potential for hackers to exploit its bugs have led some scholars to argue that the code cannot reflect the agreement of the parties.<sup>207</sup> For example, Professor Adam Kolber of Brooklyn Law School contends that the code cannot be the entire contract

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<sup>200</sup> See Hill, *supra* note 82, at 16–17.

<sup>201</sup> See Sklaroff, *supra* note 171.

<sup>202</sup> See Hoi Tak Leung, *Smart Contracts: Can Code Ever Be Law?*, ASHURST (Mar. 1, 2018), <http://perma.cc/36UQ-39Y3>.

<sup>203</sup> See *id.*

<sup>204</sup> See Werbach, *supra* note 176, at 341, 349.

<sup>205</sup> See *id.* at 349.

<sup>206</sup> See *id.*

<sup>207</sup> See, for example, Adam J. Kolber, *Not-So-Smart Blockchain Contracts and Artificial Responsibility*, 21 STAN. TECH. L. REV. 198 (2018).

because such an agreement is “limited by the efficacy of the code itself.”<sup>208</sup> If a smart contract’s code has a bug that ends up being hacked, then arguably the code does not reflect the parties’ agreement because the parties intended for the smart contract to be performed without being exploited by hackers.

To get around this issue, parties can incorporate an emergency stop mechanism in the smart contract so that the code reflects the parties’ intention to be bound and to prevent any potential hacks. Even if the parties fail to incorporate an emergency exit functionality, parties can point to other circumstances outside of the code to prove their intention to be bound by the code but not by the hacking event.<sup>209</sup> For example, absent a showing of bad faith, parties could show how much they invested in creating precise computer code that was rigorously tested for reliable smart contracting.<sup>210</sup> Moreover, the parties could point to prior dealings that were successfully carried out and similar to the smart contract in question, as well as show how they were severely harmed by the hacking itself.

#### F. Formation Validity of Smart Contracts: A Policy Rationale

Having established that smart contracts with coded terms that represent the whole agreement can be valid under the Convention’s formation requirements, I will address why having this broad approach to the legality of smart contracts is consistent with the goals and principles under which the CISG was created. As stated above, the ultimate goal of the CISG was to promote international trade, and one of the ways they sought to accomplish this was to establish a uniform and fair legal regime for international sales contracts.<sup>211</sup> UNCITRAL hoped that such a legal regime would especially benefit small enterprises as well as traders from developing countries, who typically have a hard time achieving a “contractual balance” with much stronger parties.<sup>212</sup> Including smart contracts within the scope of the Convention would strengthen a uniform and fair regime for contract law because of the potential for smart contracts to strengthen the negotiation power of smaller businesses.

For example, smart contracts can be coded to quickly trace and keep track of products along the supply chain, which would allow producers from developing countries to negotiate higher prices as it could “make it easier for them to prove

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<sup>208</sup> *Id.* at 222.

<sup>209</sup> *See* CISG, *supra* note 75, at art. 8.

<sup>210</sup> *See* Sklaroff, *supra* note 171, at 291–92, 294.

<sup>211</sup> *See* United Nations Convention on Contracts for the International Sale of Goods (Vienna, 1980), UNCITRAL, <http://perma.cc/AH4F-XVYP>.

<sup>212</sup> *Id.*

the quality of their products.”<sup>213</sup> Having stronger negotiating power would empower these developers to demand better terms in their contracts and assert their contractual rights.<sup>214</sup> Recently, Oxfam, a global organization that works with local communities to fight poverty, launched a pilot program using smart contract technology to help rice exporters in Cambodia to increase transparency and traceability in the supply chain.<sup>215</sup> This greater traceability is in turn expected to help “empower” the rice exporters in negotiating better prices, not only because it gives them better proof of quality but also because it attracts more competition for their products.<sup>216</sup>

Moreover, if agreements in smart contracts are held as valid contracts under the Convention, then parties will be more likely to consider smart contracts as an alternative way to carry out agreements, an outcome that is consistent with the Convention’s goal of promoting international trade. As mentioned above, international trade, as it is currently carried out, is a complex and inefficient process with huge transaction costs due to its paper and labor-intensive nature.<sup>217</sup> In certain Asian countries, high transaction costs create more serious barriers to trade than import tariffs do.<sup>218</sup> In addition, among transaction costs, information costs are regarded as one of the most problematic trade barriers, especially when trading partners come from different cultural backgrounds or the partnership is new.<sup>219</sup> These information costs reduce trade flows in part because they create barriers to entry, as trading partners tend to form long-term partnerships to avoid the informational costs involved in starting a new one.<sup>220</sup>

Given that transaction costs reduce trade flows by creating barriers to it, if smart contract technology can reduce some of these transaction costs, it is likely that this will promote international trade. Smart contract technology promises to reduce some of the transactional costs mentioned above by improving the traceability and transparency of transactions to reduce informational costs,

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<sup>213</sup> Ganne, *supra* note 10, at 80. See also Lory Kehoe et al., *When Two Chains Combine: Supply Chain Meets Blockchain*, DELOITTE (2017), <http://perma.cc/VX9L-3NXH>.

<sup>214</sup> See Ganne, *supra* note 10, at 85.

<sup>215</sup> See Sok Chan, *Blockchain Tech to Link up Local Farmers and Foreign Buyers*, KHMER TIMES (Mar. 12, 2018), <http://perma.cc/H5SB-576K>.

<sup>216</sup> See *id.*

<sup>217</sup> See Ganne, *supra* note 10, at 19.

<sup>218</sup> See generally Prabir De, *Trade, Infrastructure and Transaction Costs: The Imperatives for Asian Economic Cooperation*, 21 J. ECON. INTEGRATION 708 (2006).

<sup>219</sup> See Torsten Amelung, *The Impact of Transaction Costs on the Direction of Trade: Empirical Evidence for Asia Pacific*, 147 J. INST. & THEORETICAL ECON. 716, 719 (1991).

<sup>220</sup> See *id.*

automating processes to reduce labor costs, and digitizing all processes to reduce the reliance on documents.<sup>221</sup>

The counterargument to this is that the success of smart contract technology is not guaranteed, and the current risk of creating an agreement through a largely-untested smart contract outweighs its benefits. However, as the history of automobiles and laptops has taught us, technology and business can evolve to turn what was once considered a passing trend to a widely-used product.<sup>222</sup> Moreover, smart contract technology has evolved quickly in the past few years, responding rapidly to inefficiencies in the system. For example, less than two years after a hacker exploited a loophole in a smart contract's code that allowed it to steal digital tokens, programmers developed an "emergency exit" option for users to halt smart contract transactions that transfer funds to the wrong party.<sup>223</sup> Thus, aside from the inevitable kinks that must be ironed out once smart contract use becomes widespread, it is possible for smart contracts to evolve and adjust to the needs of contracting in the international trade industry.

## V. CONCLUSION

To conclude, a smart contract whose code constitutes the entirety of the agreement can be valid under the CISG because it can meet the Convention's requirements for offer and acceptance under Article 14 and Article 18. Even if offerors use pure programming language to communicate a proposal to contract, they can still address specific people in the proposal, show an intention to be bound by the offer upon acceptance, and indicate the goods, quantity, and price they are willing to agree to in the proposal. Offerees can indicate their acceptance to the offer by performing according its terms or by providing their digital signature. Furthermore, smart contract technology has the potential to promote international trade by reducing transactional costs, and confirming smart contracts as a valid alternative to traditional contracts would increase their use, an outcome that is consistent with the goal of the creation of the Convention.

Smart contracts will continue to change and evolve as logistics and transportation companies pour money into developing them for practical use.<sup>224</sup> Because smart contracts reduce transaction costs and enhance trade efficiency, it is possible that smart contract use for international trade agreements will become pervasive in the future. Thus, is it likely that a future UNCITRAL convention will

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<sup>221</sup> See Ganne, *supra* note 10, at 53.

<sup>222</sup> See Phil Edwards, 7 *World-Changing Inventions People Thought Were Dumb Fads*, VOX (June 29, 2015), <http://perma.cc/5BK9-RFL3>.

<sup>223</sup> See Emergency Stop, *supra* note 64; CONSENSYS, *supra* note 28.

<sup>224</sup> See Ganne, *supra* note 10, at 92.

specifically addresses smart contracts and their formation, just as the UNCITRAL created the Electronic Communications Convention (E.C.C.) to address the rise of the use of emails in international trade.<sup>225</sup> Until then, the topic of smart contract validity remains largely unexplored. UNCITRAL and other commentators have discussed smart contract validity under the E.C.C.,<sup>226</sup> but the E.C.C. has not been adopted by the U.S.<sup>227</sup>

Smart contracts can function in a similar way to traditional contracts because they can meet the formation requirements for regular contracts under the CISG. Thus, I suggest that UNCITRAL should address smart contracts by treating them as traditional contracts, either by expressly including computer programming language as a part of its definition for “writing” in Article 13 of the CISG, or by creating a new Convention specifically addressing smart contracts that includes most of the same formation requirements that are found in the CISG.

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<sup>225</sup> See United Nations Convention on the Use of Electronic Communications in International Contracts (New York, 2005), UNCITRAL, <http://perma.cc/4Z4Y-6TUG>.

<sup>226</sup> See, for example, Sara Hourani, *Cross-Border Smart Contracts: Boosting International Digital Trade through Trust and Adequate Remedies*, UNCITRAL (2017), <http://perma.cc/6YZ7-DNBD>.

<sup>227</sup> See United Nations Convention on the Use of Electronic Communications in International Contracts, *supra* note 225.