THE RISE OF BLOCKCHAIN: AN ANALYSIS OF THE ENFORCEABILITY OF BLOCKCHAIN SMART CONTRACTS*

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ABSTRACT

In recent years, there has been an eruption of interest in 'smart contracts' and their underlying blockchain technology, with several business operators, both private and public, as well as law firms, began to explore and incorporate smart contract and blockchain design and development to the modern-day businesses. The hype over smart contracts is deemed by many as the future means of executing a contract, which would minimize legal costs and time, and, thus, reducing lawyers' role in intermediating commercial and contractual negotiations and disputes handling. While the issues in the business and operation perspective remains whether blockchain, the main smart contract platform, is able to accommodate and guarantee the functionality of smart contracts, the bigger issue of smart contracts for legal practitioners in any jurisdiction is whether they are legally enforceable.

This thesis aims to provide the analysis study of the enforceability of 'smart contracts' under the current Thai legal jurisdiction with comparative study of foreign legal jurisdictions. In order to determine whether the 'smart contract' is enforceable, the focal issues will be (a) formation of contract and (b) required formality. For Thailand, the thesis will explore the existing Thai legislative framework and the extent to which it can accommodate blockchain smart contracts in the area of contract formation and legal formality and written evidence requirement. Specifically, this thesis will focus on the Electronic Transaction Act B.E. 2544 (2001) and its amendment B.E.2551 (2008) as specific laws for electronic communication and the Thai Civil Commercial Code as general law of the formation of contract.

For comparative studies on foreign legal jurisdictions, the laws of the Commonwealth of Australia and the Republic of South Africa will be examined. The author chose to examine the aforementioned jurisdictions as the laws of both jurisdictions are substantially advanced and aim to encourage the business

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community to engage via smart contracts and electronic transactions. Thus, the thesis will aim to analyze and evaluate the existing legislations, case precedents and the developments of those two legal systems, and their impact on facilitating blockchain smart contracts.

The concluding section sets out the core question as to whether a lack of certain rules or mechanism to accommodate the implementation of this technology may leave uncertainty regarding the validity and enforceability of smart contracts under Thai law. Based on the study, it is recommended that Thai ETA will have to be amended by comparing with laws and regulations of foreign jurisdictions to facilitate the full implementation of smart contract in Thailand. The principles that should be incorporated in this specific law are: (1) the default rule to determine the time of dispatch and receipt of electronic communication; (2) the use of an automated message system; and (3) the relevant competent authorities should be compulsory to make available systems in accordance with the law for fulfilling the required formality for the contract to be registered with the competent authority electronically.

Keywords: Blockchain; Smart contract; Formation of Contract; Formality requirement

บทคัดย่อ

ในช่วงระยะเวลาไม่กี่ปีที่ผ่านมานี้ สัญญาอัจฉริยะ(smart contracts) และเทคโนโลยีบล็อกเชน (Blockchain) อันได้รับความสนใจมากขึ้นอย่างล้นหลามจากผู้ประกอบกิจการจากหลากหลายภาคส่วน ทั้งภาครัฐและภาคเอกชน ตลอดจนบริษัทที่ปรึกษากฎหมายต่างก็เริ่มศึกษาสัญญาอัจฉริยะรูปแบบและการพัฒนาบล็อกเชนตลอดจนการนำสิ่งดังกล่าวมาปรับใช้กับธุรกิจของตนในยุคปัจจุบันให้ประสบความสำเร็จ หลายคนมองว่าสัญญาอัจฉริยะอาจกลายเป็นช่องทางในอนาคตในการทำสัญญา ซึ่งจะเป็นการประหยัดค่าใช้จ่ายในด้านกฎหมายและเวลาเป็นอย่างมาก และอาจส่งผลต่อการลดบทบาททนายความในฐานะตัวกลางในการเจรจาธุรกิจและไกล่เกลี่ยข้อพิพาท ในด้านมุมมองทางธุรกิจนั้น มีการตั้งข้อสังเกตว่าบล็อกเชน ซึ่งเป็นเทคโนโลยีรองรับ (technology platform) จะสามารถนำสัญญาอัจฉริยะไปปรับใช้ได้จริงหรือไม่ และจะรับประกันได้หรือไม่ว่าสัญญาอัจฉริยะจะบังคับใช้ได้อย่างมีประสิทธิภาพ อย่างไรก็ดี หากมองในเชิงปฏิบัติในทางกฎหมาย ประเด็นสำคัญที่สุดของการนำสัญญาอัจฉริยะมาใช้บังคับในเขตอำนาจใดๆ คือข้อพิจารณาว่าสัญญาอัจฉริยะมีผลใช้บังคับโดยชอบด้วยกฎหมายหรือไม่

วิทยานิพนธ์ฉบับนี้มีวัตถุประสงค์จะศึกษาเชิงวิเคราะห์ในเรื่องการมีผลใช้บังคับตามกฎหมายของสัญญาอัจฉริยะภายใต้กฎหมายของประเทศไทยโดยเปรียบเทียบกับกฎหมายของต่างประเทศ อนึ่ง ในการจะชี้ขาดว่าสัญญาอัจฉริยะมีผลใช้บังคับได้หรือไม่นั้น ประเด็นสำคัญที่ควรพิจารณา ได้แก่ (ก) การก่อให้เกิดสัญญาและ (ข) แบบสัญญา สำหรับประเทศไทยนั้น วิทยานิพนธ์ฉบับนี้จะศึกษากฎหมายไทยที่ใช้บังคับอยู่ในปัจจุบันและพิจารณาการขยายขอบเขตของกฎหมายนั้นๆ เพื่อให้รองรับการทำสัญญาในรูปแบบสัญญาอัจฉริยะบล็อกเชน ไม่ว่าจะเป็นในแง่ของการก่อให้เกิดสัญญาและแบบของสัญญากฎหมายตลอดจนข้อกำหนดในเรื่องการมีหลักฐานเป็นลายลักษณ์อักษรก็ดี วิทยานิพนธ์ฉบับนี้จะมุ่งเน้นศึกษาพระราชบัญญัติว่าด้วยธุรกรรมทางอิเล็กทรอนิคส์ พ.ศ. 2544 และฉบับแก้ไขเพิ่มเติม พ.ศ. 2551 ซึ่งเป็นกฎหมายเฉพาะทางเกี่ยวกับการสื่อสารทางอิเล็คทรอนิคส์และประมวลกฎหมายแพ่งและพาณิชย์ซึ่งเป็นกฎหมายทั่วไปว่าด้วยการเกิดของสัญญา

ในส่วนของการศึกษาเปรียบเทียบว่าด้วยการมีผลใช้บังคับตามกฎหมายของสัญญาอัจฉริยะภายใต้กฎหมายของต่างประเทศนั้น วิทยานิพนธ์ฉบับนี้จะวิเคราะห์กฎหมายของเครือรัฐออสเตรเลียและสาธารณรัฐแอฟริกาใต้ เหตุผลที่ผู้เขียนเลือกที่จะศึกษาเปรียบเทียบกับกฎหมายของทั้งสองประเทศดังกล่าวนั้น เนื่องจากกฎหมายของทั้งสองประเทศดังกล่าวมีความก้าวหน้าอย่างมากและได้พัฒนาไปในแนวทางที่มุ่งหมายที่จะสนับสนุนให้สัญญาอัจฉริยะและธุรกรรมทางอิเล็กทรอนิกส์สามารถบังคับใช้ได้ในสังคมธุรกิจ ดังนั้น วิทยานิพนธ์ฉบับนี้จึงมีวัตถุประสงค์ที่จะวิเคราะห์และประเมินบทบัญญัติแห่งกฎหมายและการพัฒนาระบบกฎหมายทั้งสองระบบดังกล่าวรวมถึงผลกระทบที่บทบัญญัติเหล่านั้นจะมีผลต่อการสนับสนุนสัญญาอัจฉริยะบล็อกเชน

ในบทสรุปของวิทยานิพนธ์ฉบับนี้ได้มีการตั้งประเด็นคำถามว่าหากไม่มีกฎเกณฑ์หรือกลไกทางกฎหมายใดรองรับการใช้เทคโนโลยีบลอกเชนที่กล่าวมาข้างต้น อาจก่อให้เกิดความไม่แน่นอนเกี่ยวกับความสมบูรณ์และการบังคับใช้ได้ของสัญญาอัจฉริยะบลอกเชนตามกฎหมายไทยหรือไม่ ทั้งนี้ จากการศึกษาครั้งนี้ข้าพเจ้ามีข้อเสนอแนะว่าควรมีการแก้ไขเพิ่มเติมพระราชบัญญัติว่าด้วยธุรกรรมทางอิเล็กทรอนิคส์โดยเปรียบเทียบกับกฎหมายและกฎเกณฑของต่างประเทศเพื่อสนับสนุนให้สัญญาอัจฉริยะใช้บังคับได้จริงในประเทศไทย หลักการที่ควรนำมาบัญญัติไว้ในกฎหมายเฉพาะทางฉบับนี้ได้แก่ (1) หลักเกณฑ์การทำสัญญาเพื่อยกเว้นหลักกฎหมาย (default rule) ว่าด้วยการส่งและการรับสำหรับการสื่อสารทางอิเล็คทรอนิคส์ (2) การใช้ระบบข้อความอัตโนมัติ และ (3) หน่วยงานภาครัฐที่เกี่ยวข้องควรต้องจัดให้มีระบบรองรับการทำธุรกรรมในรูปแบบดังกล่าวตามที่กฎหมายกำหนดเพื่อให้การทำธุรกรรมนั้นสามารถมีผลสมบูรณ์ตามแบบที่กฎหมายกำหนดได้ ทั้งนี้ เพื่อให้มีการจดทะเบียนสัญญากับพนักงานเจ้าหน้าที่โดยผ่านระบบอิเล็คทรอนิคส์ได้นั่นเอง

คำสำคัญ: บลอกเชน,สัญญาอัจฉริยะ, การเกิดของสัญญา, ข้อกำหนดเรื่องแบบของสัญญา

INTRODUCTION

Blockchain smart contracts have received significant attention not only from startups and financial technology ('FinTech') companies but also other businesses across a broad range of industry sectors[1]. Several business operators and tech companies have already commenced the development and implementation of smart contracts in their business operation in recent years[2] with the belief that blockchain technology and smart contracts would enable these businesses, and their clients, to conclude transactions in a much more time and cost-efficient manner; by foregoing intermediaries and, thus, reducing third-party fees and other associated costs.

While it is arguably inevitable that blockchain technologies and smart contracts will play a significant role in the not-so-distant future of business transactions and eventually replace the current methods, there are still questions whether smart contracts will legitimately trump traditional contracts in terms of their full enforceability under each legal jurisdiction. In Thailand, the principal question is whether, under the current legal framework, smart contracts could be considered a legally enforceable agreement giving rise to obligations for the parties involved.

OVERVIEW OF A BLOCKCHAIN SMART CONTRACT

Smart contracts operate mainly on blockchain. Blockchain is a database technology where information is shared across a network of users who each hold a full and updated copy of the records. It refers to a distributed, decentralized ledger that, when combined with a digital transaction validation process, allows for peer-to-peer electronic transfer of an asset without the need for an intermediary, such as a bank.[3] With its key performance characteristics, blockchain enables decentralized transaction because its mechanism is not controlled by a single, centralized party. Blockchain is an immutable database, which means that once the information is added, it cannot be removed or changed. Each update to the blockchain is secured by hash function, which allows the network to immediately detect and reject any attempt to distribute and edit copy. Although blockchains are much more general, this thesis will only focus on their applicability to smart contracts due to the intense interest in smart contracts.

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[1]Norton Rose Fulbright, '*Smart Contracts: coding the fine print*' (2016) A legal and regulatory guide <http://www.nortonrosefulbright.com/knowledge/publications/137955/smart-contracts-coding-the-fine-print> accessed 23 December 2016

[2]Ibid

[3]Alan Cohn, Travis West & Chelsea Parker, 'Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids' (2017) Georgetown Law Technology Review <https://perma.cc/TY7W-Q8CX> accessed 19 June 2017

For smart contracts, there is no legal definition. For the purpose of this thesis, a blockchain smart contract here refers to a contract between two or more parties that is stored and digitally executed on the blockchain using computer programing code.[4] While human involvement is still necessary to define the contract and input the code, the actual execution of the contract is automated based on a defined parameter, such as an event or price.[5]

As opposed to the traditional contracts which are drafted using natural and common language, smart contracts are "drafted" by inputting computer and software codes, comparable to programming languages such as javascript, C++, Go or HTML, in which the rules and consequences would be defined according to the parties' different circumstances in the same way as a typical contract would[6]. The defined code is alike to a series of "If-Then" statements, where the "ifs" are preconditions that must be met in order to trigger the "thens".[7] Once the code has been validly input, the contract is then automatically "executed" by a distributed ledger system in a computer; provided that the terms and conditions of the agreement are met, and there is a set of defined inputs, the smart contract enforces its own terms.

Blockchain smart contract can be considered as a 'paradigm shifter' in the sphere of contracting. It allows not only automation of the process of contractual performance of both parties, but also the automatic process of contract conclusion, i.e. the contract can be concluded by electronic agents employed by the parties. The question arises as to whether smart contract can give rise to legally binding contractual relation and whether the contract is contained in code is sufficient to serve certain specific formalities and written evidence requirement of contract under the laws of Thailand.

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[4]Christopher D.Clark, Vikram A. Bakshi & Lee Braine, 'Smart Contract Templates: Foundations, Design Landscape and Research Direction' (2016) <https://arxiv.org/abs/1608.00771>accessed 10 December 2017

[5]Chamber of Digital Commerce and Smart Contracts Alliance& Deloitte (n13) Chamber of Digital Commerce and Smart Contracts Alliance& Deloitte, 'Smart Contracts: 12 Use Cases for Business & Beyond' (2016) 1(1) <http://www.the-blockchain.com>accessed 23 December 2016

[6]Josh Stark, "How Close Are Smart Contracts to Impacting Real-World Law?" April 11, 2016 CoinDesk <http://www.coindesk.com/blockchain-smarts-contracts-real-world-law/> accessed 13 December 2016

[7]Christopher Burniske, "Bitcoin and Ethereum: How Smart Contracts Work" May 29, 2016 < https://ark-invest.com/research/smart-contracts-work> accessed 11 December 2016

ENFORCEABILITY OF SMART CONTRACTS: COMPARISON BETWEEN THE RELEVANT AREAS OF THAI LAW AND FOREIGN LAWS

In analyzing the enforceability of blockchain smart contracts, the writer explores the existing Thai legislative framework and the extent to which they can accommodate blockchain smart contracts in the area of contract formation and legal formality and written evidence requirement which are the Electronic Transaction Act B.E. 2544 (2001) and its amendment B.E.2551 (2008) as a specific law for electronic communication (the "Thai ETA") and the Thai Civil Commercial Code (the "CCC") as general law of the formation of contract. The writer also conduct comparative studies on enforceability of smart contracts under two different jurisdictions, namely the Commonwealth of Australia and the Republic of South Africa with an aim to analyze and evaluate the existing legislations and developments of those two legal systems, namely, Electronic Transactions Amendment Act of 2011 (the "Australian ETA") and the Electronic Communications and Transactions Act 25 of 2002 (the "ECTA") and their impact on facilitating blockchain smart contracts, with an emphasis on contract formation and legal formality and written evidence requirements.

Formation of contract

The typical approach in determining formation of contract is the offer and acceptance approach. In general, whether or not the parties have reached an agreement, the law looks for an "offer" by one party and an "acceptance" of the terms of that offer by the other. Rules on contract formation often distinguish between "instantaneous" and "non-instantaneous" communications of offer and acceptance; analogously, between communications exchanged between parties present at the same place at the same time and communications made at a distance. In both cases, a contract will be formed when an "offer" has been expressly or tacitly "accepted" by the party or parties to whom the offer was addressed.

In the case of a smart contract, although its performance is automated, such a contract still requires the presence of the intention of its parties in order to become valid. Such intention is manifested at the moment when an individual declares to enter into such an agreement on the terms specified in advance; or in case involving electronic agents, when an individual declares to appoint such agent for conclusion of certain contracts and agrees to be bound by its actions. Similar to the appointment of a natural person as an agent, there should be a kind of fiduciary relation in smart contract whereas the trust is put into the computer algorithm

instead.[8] The person expresses his consent to the terms of the contract and mode of their performance at the moment of the conclusion of contract.

Considering the nature of blockchain smart contract, it is arguable that both rules of instantaneous communication as well as non- instantaneous communication could be applied to blockchain smart contract as nature of instantaneous communication and non- instantaneous communication are existed in this modern mode of communication. If a person sends an offer through blockchain and opposite party replies instantly particularly in the case of follow-on contract that has been entered into by performance of a preceding smart contract, it seems to be instantaneous communication. In contrast, if a person sends an offer through blockchain but opposite party does not reply instantly; then it seems to be non-instantaneous communication in nature. In this regard, an offer is made, and could sit waiting for any amount of time for the counterparty to agree and send their confirmation transaction so an offer could be made and never accepted by the other party. Given there exists the possibility of a time lag between the transmission and the receipt of the message sent through blockchain, in the writer's opinion, it could be implied that it is a non-instantaneous transaction similarly to the declaration of intention by way of email communication as mentioned earlier. Therefore, this kind of communication will become a declaration of intent made to a person at a distance under Section 169 of the CCC and, therefore, takes effect from the time the acceptance reaches the receiver of the intention which also known as the "reception" theory. While, according to the "mailbox rule", which is traditionally applied in most common law jurisdictions including Australia, acceptance of an offer is effective upon dispatch by the offeree (for example, by placing a letter in a mailbox). In turn, South Africa adopts the "information" theory,[9] which requires knowledge of the acceptance for a contract to be formed.

Time of Dispatch and Receipt of Electronic Communications

The laws of all three aforementioned jurisdictions provide rules for both time of dispatch and receipts of electronic communication which are very significant provisions since they will indicate whether the contract is formed or not with the exact time, and also help allocate the risks of the proposed transaction. It should be noted that the Thai ETA and the ECTA use the term "data message" in

[8]Alexander Savlyev, 'Contract Law 2.0: 'Smart' Contracts as the beginning of the end of classic contract law' (2017) Information & Communications Technology Law 116

[9]Rulich Pretorius, 'Law of Contract: Comparison between the South African and English Law of Specific Contracts', (Master in Mercantile Law Thesis, Faculty of Law, University of Pretoria)

relation to this rule which is slightly different from the Australian ETA that uses the term "electronic communication".

For the time of dispatch of electronic communication, the Australia ETA follows the principles set out in the United Nations Convention on the Use of Electronic Communications in International Contracts 2005 (hereinafter referred to as "UN Convention on Electronic Communication or Convention") with the identical wording that the time of dispatch is "the time when [the communication] leaves an information system under the control of the originator or of the party who sent it on behalf of the originator".[10] It also contain the provisions for the situation where the electronic communications has not left an information system under the control of the originator or of the party who sent it on behalf of the originator, in such case, the time of dispatch is "the time when the electronic transaction communication is received by the address."[11] On the other hand, the ECTA of South Africa and the Thai ETA share the same concept based on the UNCITRAL Model Law, with a similar wording that "the dispatch of a data message is deemed to occur when it enters an information system outside the control of the originator".[12] But the ECTA also provides for the consequence in the scenario that the originator and addressee are in the same information system for which the time of dispatch is when the data message is capable of being retrieved by the addressee.[13] It is worth noting that this rule causes difficulties in terms of evidence availability for the originator to prove whether or not an electronic communication has already entered an information system outside the control of the originator. This is because the originator's knowledge of sending the message is limited to only when it left his/her system. Thus, new rules in Article 10 of the Convention has been set to specifically cope with these practical problems and in order to suit with the innovative electronic context. This Article 10 has been adopted by Section 14 and 14A of the Australian ETA. Thus, in order to be more comprehensive regarding time of dispatch and receipt of data message, it would be suitable for Thailand to consider adopting Article 10 of the Convention in its provision similarly to the Australian ETA.

With respect to the time of receipt of electronic communication, both Australian ETA and ECTA define a concept of receipt in a similar manner. Australia ETA uses the exact wording as provided in the UN Convention on Electronic Commerce. Despite certain discrepancies in the terms used in those two laws, they contain the rules of the Convention between delivery of message to a specially designated electronic address, the time of an electronic communication is "the time when the electronic communication becomes capable of being retrieved by the

[10]Section 14(1)(a) of the Australian ETA

[11]Section 14(1)(b) of the Australian ETA

[12]Section 22 of the Thai ETA and Section 23 of the ECTA

[13]Section 23 of the ECTA

addressee" under Section 14A(a) of the Australian ETA and Section 23(b) of ECTA. While pursuant to Section 23 of the Thai ETA, the time of receipt is the time when a data message enters the addressee's information system.

Although the Thai ETA lays out the main principle of time of dispatch and receipt of data message, it is still lacking in terms of some key issues, compared to provisions of the Australian ETA and ECTA. For instance, for the time of dispatch, Section 22 does not indicate a rule for the situation where the data message has not left an information system because the parties exchange data messages through the same information system e.g. the originator and the recipient are within the same intranet. The similar situation may occur in case of smart contract as the communications will be sent in the same system environment that is blockchain network.

Use of Automated Message System for Contract Formation

Currently, several automated message systems or electronic agents are being used increasingly in electronic commerce business industry, including among others a smart contract performed by purporting to enter the parties into other separate "follow-on" contracts. This growing trend has caused debates among the scholars and legal practitioners in various legal jurisdictions to re-examine traditional theories of contract formation to evaluate their sufficiency to contract being generated and executed without human intervention.[14] To accommodate this proliferating form of contractual formation, the UN Convention on Electronic Communication provides a specific provision which states that a contract formed "shall not be denied validity or enforceability on the sole ground that no natural person reviewed or intervened in each of the individual actions carried out by the automated message systems or the resulting contract".[15]

The recognition of the use of an automated message system for the contract formation appears in both the Australian ETA[16] and the ECTA[17]. They confirm the rule that the contract formed though such automated message system or electronic agent shall not be denied its validity or binding solely on the ground that such systems are used and that no natural person reviewed or intervened.

In the context of Thai law, despite the specific provision for such outspoken recognition is absent under the Thai ETA, nothing in the existing provisions seems to preclude the use of fully automated message systems. The closest application may be found in Section 13 of the Thai ETA together with the

[14]Explanatory note by the UNCITRAL secretariat on the United Nations Convention on the Use of Electronic Communications in International Contracts para 208
[15]Article 12 of the UN Convention on Electronic Communication
[16]Section 15C of the Australian ETA
[17]Section 20 of the ECTA

general rule on attribution in Section 15 paragraph 2(2) which could be interpreted to allow for the validity and enforceability of contracts formed through automated message systems in Thai law. Even though no amendment appeared to be needed in respect of the validity of electronic transaction as the law is already recognized the contracts formed by any electronic means, the writer considers that it would be useful to make it clear in the Thai ETA that the absence of human review or intervention in a particular transaction does not impede contract formation. Therefore, it is advisable to embody a specific provision to directly deal with the result of a contract that is formed by the automated message system or electronic agent in the Thai ETA.

Required formalities

Generally, most legal systems follow the general principle of freedom of form and extend it to all contracts falling within its sphere of application including electronic contracting[18]. However, it is recognized that form requirements may exist under the applicable law as writing and signature or registration requirements, for example the sale of immovable properties contract. Even where form requirements as such do not exist, obstacles to the use of data messages may derive from rules on evidence that expressly or implicitly limit the parties' ability to use data messages as evidence to demonstrate the existence and content of contracts.

Under the Australian ETA, in the case where the law requires or permits a person to give information to the authority (Commonwealth entity), it is deemed that the entity's requirement has been met if it is done by way of electronic communication. In other words, by virtue of these Section 9 and 10, people may satisfy the legal requirements of filing or registering with the competent authority electronically. As such, these provisions could facilitate and get rid of potential hindrances to the operation of a smart contract in terms of formalities requirement which require dealing with the competent authorities, such as in the case of the registration of the sale or other disposition of lands.

Unlike the Australian ETA which specifically determines criteria for satisfying form requirements by means of an electronic communication in separate subsections because the nature of the provisions are fundamentally different, ECTA provides a catch-all provision in Section 19 to cover all possibilities in the context of legal requirements. Section 19 (2) of the ECTA states that "an expression in a law

[18]United Nations Commission on International Trade Law, 'Legal aspects of electronic commerce Electronic contracting: background information' (2003) Working Group IV (Electronic Commerce) Forty-second session Vienna, 17-21 November 2003, A/CN.9/WG.IV/WP.104/Add.2 < https://documents-dds-ny.un.org/doc/UNDOC/LTD/V03/878/97/PDF/V0387897.pdf?OpenElement> accessed 20 June 2017

whether used as a noun or verb, including terms "document", "record", "file". "submit", "lodge", "deliver", "issue", "publish", "write in", "print" or words or expressions of similar effect, must be interpreted so as to include or permit such form, format or action in relation to a data message unless otherwise provided for in the ECTA. In this regard, the terms under Section 19 is defined rather broadly, which the writer believes may be interpreted to cover the registration requirement under the law and; thus, the registration with the competent authority e.g. contracts where property is leased for a period longer than 10 years under the ECTA is likely possible under the existing legislation.

For the Thai ETA, in satisfying legal requirements of written documents or evidenced by writing or supported by a document which must be produced if the information is generated in the form of a data message which is accessible and usable for subsequent reference without its meaning being altered, it shall be deemed that such legal requirement has been met.[19] However, documents containing e-signatures (i.e. data message) must also satisfy the characteristics prescribed in Section 9 of the Thai ETA. With regard to the form requirement concerning actions to be done with the competent authority, the Thai ETA provides the legal framework in relation to this matter that if such transaction is made in a form of a data message in accordance with the rules and procedures prescribed by the Royal Decree, it would fall within the application of the Thai ETA to which it shall be deemed to have the same legal effect as the act performed pursuant to the rules and procedures described by the law on that particular matter. The Royal Decree states that the state agency shall make available a system for the documents in the form of data message where certain criteria set forth in the Royal Decree will have to be met.

In respect of the implementation of blockchain smart contracts for the transactions which require by law to be made in writing and duly registered with the competent authority, such as sale and transfer ownership of land and trademark licensing, it seems impossible that a smart contract would meet the required legal formality and thereby have the legal binding effect under the Thai law at this juncture. This is because the Land Department and the Department of Intellectual Property as the respective competent authorities for such transactions have no available procedures to accommodate the online registration of the aforementioned matters.

CONCLUSIONS AND RECOMMENDATIONS

Through the comparative studies on enforceability of smart contracts under two different jurisdictions, namely the Commonwealth of Australia and the Republic of South Africa, the writer has found that the laws of both jurisdictions are substantially developed to accommodate the utilization and execution of blockchain

[19]Section 8 of the Thai ETA

smart contracts under their legal systems. For instance, those two legal systems provide the principle of the use of an automated message system which is necessarily required to determine the legal status of the smart contracts. They also make available the mechanism for submission of the electronic information to the competent officials in order to minimize the obstacles arisen from the legal formality requirements.

After having analyzed the legislation concerning electronic commerce in Thailand, at present, Thai law provides certain provisions dealing with the formation of contracts by the electronic communications, namely the CCC, which is a substantive law governing the principle of the formation of a contract, i.e. offer and acceptance; and the Thai ETA, which provides the rules for the electronic communications that govern the effectiveness of offer and acceptance for purposes of contract formation, such as rules for time and place of dispatch and receipts of electronic communication. In the case of a smart contract, as a non-instantaneous communication, a contract will be formed when an acceptance reaches the offeror. However, under the existing rule for the time of dispatch and receipt, a rule for the situation where the data message has not left an information system under the control of the originator is absent under Thai law unlike in the case of Australian or South African law as earlier discussed. In the case of smart contract, where the communications will be sent through the same system environment (blockchain network), it is rather difficult to determine as to when the contract is actually formed. In this regard, Thailand should amend the Thai ETA by adding a new rule to provide legal consequence in the event the electronic communication has not left an information system using Article 10 of the UN Convention on Electronic Commerce and Section 14(1)(b) of the Australian ETA as model laws.

Moreover, a lack of rules for the use of automated electronic communications may leave uncertainty to the smart contract as to its validity and enforceability under Thai law. Although some commentators may view that Section 13 of the Thai ETA together with the general rule on attribution in Section 15 paragraph 2 (2) could be interpreted to cover a contract concluded by automated message systems or electronic agents, the writer is of the opinion that specific provisions to directly deal with the result of a contract that is formed by the automated message system or electronic agent are crucially required to eliminate the uncertainty and unnecessarily interpretation. Therefore, it is advisable to amend the Thai ETA by adding a new provision directly affirming that lack of direct human review or intervention does not preclude contract formation and a contract so formed shall not be denied validity or enforceability on the sole ground that no natural person reviewed or intervened in each of the individual actions carried out by the automated message system or the resulting contract. (Similar to Article 12 of the Convention and Section 15c of Australian ETA) Also, the concept of the ECTA with regard to the attribution of actions of automated message systems subject to the

capability of the contract terms for being reviewed by a natural person should be added. (Section 20 of the ECTA).

Additionally, for the contracts which require registration with the Government officials or execution in the presence of the government official such as sale and transfer of ownership of land, it seems impossible that a smart contract would meet such required formality and, thus, have legally binding effect under the Thai law. In this regard, although the Thai ETA makes available the principle regarding the electronic transaction or information which are required to be executed or registered by competent officials, the implementation of the law seems to be impracticable due to the relevant competent authorities still have no available procedures to accommodate the online registration of the aforementioned matters as required by Thai ETA and the Royal Decree. Thus, in order to facilitate the full implementation of smart contracts in Thailand, this practical problem should be addressed. In this regard, the relevant competent authorities should be compulsory to make available systems in accordance with the law for fulfilling those requirements electronically.

Therefore, as innovation would often come before regulations, providing recommended solutions to amend the Thai law with respect to contract formalities by pointing out the problems in practice and comparing with proceedings in foreign countries will be the guideline to facilitate the full implementation of smart contracts in Thailand. If successful, the comprehensive amendment of laws and regulations on smart contracts will play a significant role in raising and modernizing the standard of the ease of doing business in Thailand as well as attract investments, both local and foreign, in Thailand and improve the country's economy growth as a whole.

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