ARTICLE

REGULATING BLOCKCHAIN? A RETROSPECTIVE ASSESSMENT OF CHINA'S BLOCKCHAIN POLICIES AND REGULATIONS

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Abstract

Blockchain technology, which has been actualized with the dawn of cryptocurrency use, is now being used in many fields such as finance, supply chain management, healthcare, insurance, entertainment, and intellectual property protection. The experiment and implementation of blockchain technology in many fields necessitate the needfor applicable policies and regulations. Before articulating new policies or regulations, a critical step, as well as a missing step, is to assess how existing policies and regulations work. This article fills the gap by providing a retrospective assessment of China's existing blockchain policies and regulations. It first summarizes China's blockchain policies and regulations, and then assesses the impacts of these policies and regulations. The assessment consists of three steps by asking the following: (1) What were the problems before any policies and regulations were issued? (2) What are the objectives of the existing policies and regulations? (3) Have these objectives been fulfilled? Following this framework, the assessment begins by identifying three major problems in the blockchain space: (1) cryptocurrency and ICOrelated crimes; (2) poor quality of early-staged blockchain products and services; and (3) a lack of consumer and investor protection mechanisms. The assessment then spots two primary objectives market stability and safety, and technology innovation - by examining the government's policy and regulatory reaction to these problems. Each primary objective includes three secondary objectives. These six secondary objectives are used as indicators to assess policy and regulatory impacts, as well as to answer whether the primary objectives have been satisfied.

I. INTRODUCTION

Blockchain technology, also known as blockchain or distributed ledger technology, is a distributed database system. This system creates a timestamped series of immutable and transparent data records that are managed by a cluster of computers not owned by any single entity.¹ It allows for sharing

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¹ DON TAPSCOTT & ALEX TAPSCOTT, BLOCKCHAIN REVOLUTION: HOW THE TECHNOLOGY BEHIND BITCOIN AND OTHER CRYPTOCURRENCIES IS CHANGING THE WORLD 33 (Rprt. ed. 2018).

valuable data in a secure, tamperproof way among untrusted parties and also provides a simple yet ingenious way of passing data in a fully automated and safe manner. Blockchain thus can be used to reduce transaction costs, increase efficiency, and provide accurate records and transparency. These appealing features are valued in many areas; therefore, blockchain has the potential to revolutionize many industries. This potential has extended beyond the bounds of cryptocurrencies and secure payments to give rise to additional applications in supply chain management, social welfare, healthcare, government records, and entertainment industries, among other fields.

Meanwhile, vibrant blockchain applications in various industries present novel problems that require regulatory responses. This urgent need for regulatory responses places policymakers and regulators in a dilemma because legal solutions cannot always keep up with technology development. Regulators, academics, and the business world have been arguing whether new policies or regulations are needed to target blockchain applications. However, to properly understand whether new policies or regulations are needed, a prerequisite is to evaluate how existing policies and regulations work. An *ex post* assessment of the existing rules tells regulators how well or badly they are doing, whether desired outcomes have been achieved, what the problems with the existing policies and regulations are, and what is needed to improve future legislation. A systematic examination of the impacts of the existing regulatory regime also contributes to good governance and reforms.

Any discussion assessing policies and regulations should begin by clarifying key terms and concepts. *Policy* means a high-level overall plan embracing the general goals of a government, and it also refers to the procedures and practices that govern the regulatory process. *Regulation* may take different forms in the social, political, and economic domains. Even if used in the same domain, this concept may have different interpretations in different jurisdictions. In general, *policy* or *regulation* is an effort by a government authority to control certain aspects of the private sector with an attempt to produce outcomes which might not otherwise occur. The relation between policy and regulation is that policy, as a high-level government plan, guides and leads to regulation, which is a more detailed and specific set of rules.

For the purpose of this article, *policy* refers to a high-level government plan, which may or may not be backed by a specific threat of consequence. *Regulations* refer to "rules or norms adopted by government and backed up by some threat of consequences, usually negative ones in the form of penalties."² In the next session explaining China's blockchain regulatory landscape, government whitepapers, working guidance, five-year plans, and joint statements fall into the category of *policies*. Any violation of *policies* may or

² CARY COGLIANESE, MEASURING REGULATORY PERFORMANCE EVALUATING THE IMPACT OF REGULATION AND REGULATORY POLICY (2012), https://www.oecd.org/gov/regulatory-policy/1_coglianese %20web.pdf.

may not result in administrative punishment. Specific blockchain regulations issued by the State Council and the judicial interpretation issued by the Supreme People's Court fall into the category of *regulations*, the violation of which will cause penalties.

To assess the impacts of applicable policies and regulations, the framework this article uses is the regulatory impact assessment (RIA). The Cabinet Office of the UK defines RIA as a tool which informs policy decisions.³ It is an assessment of the impact of policy options in terms of the costs, benefits, and risks of a proposal.⁴ The European Commission, in its Impact Assessment Guidelines, defines RIA as a set of logical steps to be followed when preparing policy proposals.⁵ It is a process that prepares evidence for political decisionmakers on the advantages and disadvantages of possible policy options by assessing their potential impacts.⁶ The Cabinet Office of the UK and European Commission seem to emphasize RIA as a critical tool for assessing policy proposals, since they use RIA before any policy or regulation is adopted or comes into effect.

However, I would argue that RIA is an equally useful tool to assess the actual results of policy or regulation *after* adoption. Therefore, Colin Kirkpatrick and David Parker have a more accurate definition of RIA for this article. They define it as "a method of policy analysis, which is intended to assist policymakers in the design, implementation, and monitoring of improvements to regulatory systems, by providing a methodology for assessing the likely consequences of the proposed regulation and the actual consequences of existing regulations."⁷

The framework of RIA involves both ex-post evaluation of existing policies and regulations, and ex-ante estimation for a proposed policy and regulation. This article concentrates solely on the first part, to present a retrospective assessment of China's existing blockchain policies and regulations. The retrospective assessment consists of three questions: (1) What were the problems before any policies and regulations were issued? (2) What are the objectives of the existing policies and regulations? (3) Have these objectives been fulfilled?

This article proceeds as follows. Part I summarizes the overall blockchain regulatory landscape, which includes the following: (1) some of the most significant policies and regulations published by the executive organ at the central government level— the State Council and its affiliated ministries and commissions, including the Ministry of Industry and Information Technology

³ CABINET OFF., BETTER POLICY MAKING: A GUIDE TO REGULATORY IMPACT ASSESSMENT 5 (2003).

⁴ Id.

⁵ EUR. COMM'N, IMPACT ASSESSMENT GUIDELINES 4 (2009), http://ec.europa.eu/smart-regulation/ impact/commission_guidelines/docs/iag_2009_en.pdf.

⁶ Id.

COLIN KIRKPATRICK & DAVID PARKER, REGULATORY IMPACT ASSESSMENT: AN OVERVIEW 1 (2007).

(MIIT) and People's Bank of China (PBOC); and (2) one judicial interpretation by the judicial organ at the central level — the Supreme People's Court.

Part II presents a retrospective RIA consisting of three steps. It begins by identifying salient problems in the absence of policies and regulations. This article singles out three of the most severe and eye-catching problems in the blockchain space — cryptocurrency and ICO crimes, poor quality of early-staged blockchain products and services, and a lack of consumer and investor protection mechanisms.

The second step is to identify the objectives of existing policies and regulations. The European Commission's RIA system requires that objectives should be "SMART" (specific, measurable, achievable, realistic, and time-dependent)⁸ It also suggests a three-level objective framework: general objectives, specific objectives, and operational objectives. Depending on the need for the regulation, the nature of the institution, and the implementation of the regulation, objectives can also be set in a two-level model: macro-level objectives and micro-level objectives set in a logical order. There should be a connection between different levels of objectives. These requirements and suggestions are the underlying principles for setting out the objectives.

The last step is to examine if these objectives have been fulfilled. This is the process that policymakers need to assess the extent to which the policy is achieving its objectives, and whether the implementation is "on track." It is the preliminary and necessary step to carry out the next step of rulemaking, such as changing certain rules based on the impact assessed or continuing certain rule enforcement to maximize its positive impacts. The following question is how to assess the results of these policies and regulations. The assessment requires identifying indicators of the objectives to provide information in this regard. Indicators could provide a broad outline of possible monitoring and evaluation arrangements, which will be addressed in the last section.

II. CHINA'S BLOCKCHAIN POLICIES AND REGULATIONS

This section introduces China's policy and regulatory landscape in the blockchain industry. With the Chinese State Council embracing blockchain in its 13th Five-Year Plan in 2016 and the wild ride of cryptocurrency attracting the nation's attention in 2017, Chinese policymakers and regulators have been rolling out a series of policies and regulations to set the tone for the blockchain

⁸ EUROPEAN COMMISSION, *supra* note 5, at 28. "SMART": specific, measurable, achievable, realistic and time-dependent. Specific objectives should be sufficiently precise and concrete, and not be open to varying interpretations. Measurable objectives should be measured as to whether the objectives have been achieved, and the measurement can be quantified or based on a combination of description and scoring scales. Achievable objectives have goals that can be achieved through realizable efforts if the regulation requires actions by regulated groups. Realistic objectives should consist of a useful and meaningful target. Time-dependent objectives should achieve goals within a certain amount of time.

industry. Generally, their attitude towards the industry is both pro-blockchain technology and anti-cryptocurrency.

The blockchain regulatory regime consists of government whitepapers, working guidance, five-year plans, specific blockchain regulations, regulatory agencies' joint statements, one leading case, and a judicial interpretation. Owing to the complex and overwhelming rules issued by governments and courts at both the central and local levels, this article narrows the scope of the analysis to: (1) some of the most significant policies and regulations published by the executive organ at the central government level — the State Council and its affiliated ministries and commissions, including the Ministry of Industry and Information Technology (MIIT) and People's Bank of China (PBOC); and (2) one judicial interpretation by the judicial organ at the central level — the Supreme People's Court (SPC). These government agencies possess the authority and have issued the most influential blockchain policies and regulations, which set the tone for the blockchain industry nationwide. In the sections below, the central government agencies are presented in a hierarchy. Policies and regulations issued by them are introduced in a chronological order from the oldest to the newest to show the development of China's attitude towards the blockchain industry.

A. The State Council

The State Council and its affiliated offices have issued multiple important regulations, guidelines, and announcements on the subject of blockchain. Chronologically arranged from the earliest to the most recent, this section presents the most critical output that has had a significant impact on the blockchain industry, including the 13th Five-Year Plan for the Development of Information Technology, Accelerating the Development of Standards for the Blockchain Industry, and Provisions on the Administration of Blockchain Information Services.

1. The 13th Five-Year Plan for the Development of Information Technology. The State Council published its new Five-Year Plan for Economic and Social Development of the People's Republic of China (2016-2020) on March 17, 2016.⁹ The 13th Five-Year Plan sets forth China's strategic intentions and defines its major objectives, tasks, and measures for economic and social development. It defines the "13th Five-Year Plan" as the most critical period for building a moderately prosperous society.¹⁰ The goal of a prosperous

⁹ Guomin Jingji he Shehui Fazhan Di Shisan Ge Wunian Guihua Gangyao (国民经济和社会发展第十 三个五年规划纲要) [Outline of the 13th Five-Year Plan for National Economic and Social Development] (promulgated by St. Council, Mar. 17, 2016), http://www.npc.gov.cn/wxzl/gongbao/2016-07/08/content_1993756.htm [hereinafter 13th Five-Year Plan].

¹⁰ *Id.*

society features innovation as a cornerstone of China's development strategy.¹¹ Under the 13th Five-Year Plan, the government hopes to increase its global innovation ranking from 18th to 15th, the share of research and development (R&D) spending from 6.3% to 12%, and the number of personnel in R&D from 6.2 to 10 by the year 2020.¹² Guided by China's national objective and strategic needs, the nation has set its sights on the blend of world's cutting edge science and technology, acknowledging that technology innovation is the main driver of economic and social development.

Following the new Five-Year Plan, on December 15, 2016, the State Council released an announcement entitled the 13th Five-Year Plan for the Development of Information Technology.¹³ This document notes that building a prosperous society requires information and communication technology to provide a breakthrough in the initial development stage.¹⁴ This includes putting blockchain development on its agenda. The document specifically states that blockchain, along with other technologies, such as the Internet of Things, artificial intelligence (AI), big data, cloud computing, machine learning, and biogenetic engineering, will build an ecosystem whereby everything is interconnected in cyberspace.¹⁵ As a result, the real and digital worlds are converging as one, and the global governance system is encountering profound changes.¹⁶ The document further indicates that the global economy is expected to accelerate the innovation of information technology for the maximum release of the "digital dividend," in response to a "post-financial crisis" era of "growth instability and uncertainty."¹⁷

2. Accelerating the Development of Standards for the Blockchain Industry. On November 12, 2018, the Cyberspace Administration of China (CAC), an office established by the General Office of the State Council, published a document entitled "Accelerating the Development of Standards for the Blockchain Industry."¹⁸ Following its duties of implementing guidelines and policies for Internet information dissemination and promoting the construction of a sound legal system for Internet development, the CAC focuses

¹¹ KATHERINE KOLESKI, U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION STAFF RESEARCH REPORT, THE 13TH FIVE-YEAR PLAN 3 (2017).

¹² Id.

¹³ "Shisanwu" Guojia Xinxihua Guihua ("十三五"国家信息化规划) [National Informationization Plan for the "13th Five-Year Plan"], (promulgated by St. Council, Dec. 15, 2016), http://www.gov.cn/zhengce/ content/2016-12/27/content_5153411.htm [hereinafter National Informationization Plan].

¹⁴ Lester Coleman, *China To Support Blockchain Development Under New Five-Year Plan*, CCN (Dec. 29, 2016), https://www.ccn.com/china-support-blockchain-development-new-five-year-plan.

¹⁵ National Informationization Plan, *supra* note 13.

¹⁶ National Informationization Plan, *supra* note 13.

¹⁷ Coleman, *supra* note 14.

¹⁸ Jiakuai Yanzhi Qukuailian Xiangguan Biaozhun (加快研制区块链相关标准) [Accelerate the Development of Relevant Standards for Blockchain], CHINA DAILY (Nov. 12, 2018), http://cn.china daily.com.cn/2018qklfnzl/2018-11/21/content_37293931.htm [hereinafter Accelerate the Development].

on establishing and implementing guidelines and policies for blockchain technology and articulating appropriate standards for the industry.

This document acknowledges both the standardization work that has already been done and ongoing hurdles that impede China's work in standardization. As of May 2018, 10 international standards have been established, such as terminology and concept, reference architecture, classification and ontology, and data security. Since 2016, China has begun its domestic blockchain standardization work. However, international and domestic standardization of the blockchain industry is still in its infancy. Many critical standards are still being discussed or have yet to come under evaluation. The document also addresses how China faces many problems when developing standards for the blockchain industry.

This document also outlines three principles to accelerate the development of blockchain standards. First, China aims to establish standards based on emergency and maturity. The priority of standardization work will be placed on areas in emergent needs; for example, on data privacy and financial industry. These standards will be applied to more mature projects and industries. Second, China focuses on cultivating blockchain talents and setting examples in various critical industries to support standardization work. Third, China pays close attention to advanced international standards, studies the most successful strategies, and reformulates these international standards and strategies to fit China's situation with an aim to maintain its leadership in technology development within the international community.

3. Provisions on the Administration of Blockchain Information Services. On January 10, 2019, the CAC promulgated the Provisions on the Administration of Blockchain Information Services¹⁹, which came into effect on February 15, 2019. A significant portion of the regulations (18 out of 24 articles) emphasizes the duty of blockchain information service providers (service providers).²⁰

The regulations draw a clear line between service providers and users while concentrating on regulating service providers. Under these regulations, the scope of service providers ranges from content providers to technology providers. Content providers include blockchain media and decentralized applications that provide content or information readable to any user. Technology providers consist of companies that develop websites and companies that provide security and privacy services and programs. Service providers must register with authorities and comply with disclosure requirements. After the authorities' review processes, qualified service

¹⁹ Qukuailian Xinxi Fuwu Guanli Guiding (区块链信息服务管理规定) [Provisions on the Administration of Blockchain Information Services] (promulgated by the Office of the Cent. Cyberspace Affairs Comm'n and Cyberspace Admin. of China, Jan. 10, 2019, effective Feb. 15, 2019) (Chinalawinfo) [hereinafter Provisions on Information Services].

²⁰ Id.

providers will be recorded in the system with an identifiable number and are required to show their qualifications publicly, such as on their websites or applications. Other than service providers' compliance on their end, they must also authenticate users' identities, including users' ID information, mobile phone number, and organization codes, etc. If any client does not provide genuine identity information, service providers should not offer related services. Service providers who do not comply with the regulations would be penalized with fines ranging from RMB5,000 to RMB30,000 or criminal charges, depending on the severity of the offense.

With respect to content, under the regulations, service providers cannot produce, duplicate, publish, or disseminate content that is prohibited by laws and regulations. Otherwise, they should take measures, such as warnings, restrictions, and account closures, as appropriate and eliminate illegal information in time to prevent its dissemination while keeping relevant records and reporting to the authorities. In addition, the regulations briefly indicate that any individuals or agencies who conduct any activity related to blockchain information services should follow these regulations and China's relevant laws. No individuals or agencies should conduct illegal activities. The regulations also encourage self-regulation in various blockchain industries. Organizations that capitalize on blockchain should set up industry criteria, guiding service providers to establish service standards, and promote the construction of the credit evaluation system, bearing responsibility for creating healthy markets, and ensuring blockchain market order.

B. Ministry of Industry and Information Technology

The MIIT is responsible for the administration of China's industrial branches and information industry. The main responsibilities of the ministry are: to determine China's industrial planning, policies, and standards; to monitor the daily operation of industrial branches; to promote the development of major technology equipment and innovation in the communication section; to guide the construction of information system; and to safeguard China's information security.²¹ Following its obligations, the MIIT has issued four documents related to blockchain: the initial (2016) and the most recent (2018) whitepapers on China's blockchain industry, the Development Plan on Software and Information Technology Service Industries (2016-2020), and the Essentials of the Standardization Work in the Information and Software Service Industry in 2018.

1. 2016 Blockchain Technology and Application Development Whitepaper. The earliest national policy in the blockchain industry was entitled "The Blockchain Technology and Application Development

²¹ Ministry of Industry and Information Technology, http://english.www.gov.cn/state_council/2014/ 08/23/content_281474983035940.htm (last visited June 21, 2020).

Whitepaper,"which was published by the MIIT on October 18, 2016.²² This was also the first official guidance on blockchain. Its publication was a joint effort by several public and private companies.

This whitepaper has five major areas of concern. The first regards the domestic and international states of blockchain. The whitepaper evaluates the evolution of blockchain and its applications, proposes the ecological structure of blockchain, and lists seven typical participants, including: open-source communities, industry alliances, key enterprises, startups, investment institutions, financial institutions, and regulatory agencies. It also addresses relevant institutions' attitudes and understanding of blockchain in the UK, US, Russia, and other countries. Moreover, it analyzes the relationship between blockchain and six other next-generation information technologies, namely: cloud computing, big data, Internet of Things, next-generation networks, encryption technology, and AI.

The second area of concern is the proposal of practical use cases for blockchain. By studying more than 200 blockchain applications worldwide, the paper ultimately proposes six use cases, which are described as relatively mature and with great potential.

The third area of concern is a proposal for the roadmap of China's blockchain development. The whitepaper proposes seven technological requirements and architectures according to blockchain's technical features. It also analyzes six critical technologies, such as the consensus mechanism, data storage, and network protocol that are relevant to establish a roadmap for blockchain development in China.

The fourth area of concern aims to propose blockchain standards. Standards cover five categories, including foundation, business and application, process and method, credibility and interoperability, and information security. It provides a preliminary standardization direction for future work.

The last area of concern suggests policy support, technical research, platform establishment, and application examples based on the study of international blockchain applications and use cases, the trend of development, and the current state of blockchain and applications in China.

2. Development Plan on Software and Information Technology Service Industries (2016-2020). On January 12, 2017, the MIIT released the Development Plan on Software and Information Technology Service Industries. ²³ This five-year plan focuses on innovative and inclusive

²² Zhongguo Qukuailian Jishu he Yingyong Fazhan Baipishu (2016) (中国区块链技术和应用发展白皮 书(2016)) [The Blockchain Technology and Application Development Whitepaper (2016)] (2016), CHINA BLOCKCHAIN TECHN. AND INDUS. DEV. FORUM, http://www.cbdforum.cn/bcweb/index/article/rsr-6.html [hereinafter 2016 Whitepaper].

²³ Ruanjian he Xinxi Jishu Fuwuye Fazhan Guihua (2016-2020 Nian) (软件和信息技术服务业发展规划 (2016-2020年)) [Development Plan on the Software and Information Technology Service Industry (Year of 2016-2020)], (promulgated by the Ministry of Industry and Information Technology, Dec. 18, 2016),

development, seeking to establish an internationally competitive industrial ecosystem by 2020.²⁴ In this plan, one of the industrial goals is to expand revenue growth. China seeks to achieve double-digit growth in its software and information service industries by 2020.²⁵ Industrial business revenue should exceed RMB8 trillion (about \$1.2 trillion) with an average annual growth of more than 13% from 2016 to 2020.²⁶ The second goal is to achieve technology innovation. China strives to acquire world-leading innovation capacities in key technological sections, such as blockchain, AI, and virtual reality.

Under these goals, one of the major tasks set by the government is to develop intelligent software, including virtual resource scheduling, data storage processing, massive parallel analysis, distributed memory computing, visualization, and other cloud computing and big data technologies, as well as blockchain technology. Another task is to discover new modes and forms of services and formats in the areas of AI, blockchain, virtual reality, and augmented reality. To properly perform this task, China needs to integrate resources and support key enterprises in these areas.

3. Essentials of Standardization Work in the Information and Software Service Industry in 2018. On March 23, 2018, China's MIIT published the Essentials of Standardization Work in the Information and Software Service Industry in 2018.²⁷ It enumerates a list of goals to foster development in the information and software services sector.²⁸ The first goal is to establish various committees that will work on specific areas. The second goal is to publish standardization systems for the sector. The third goal concerns the implementation of important standards, including standards for blockchain, cloud computing, and big data. The fourth goal is to promote the globalization of standards. China should establish uniform standards regarding blockchain, big data, information technology service, and cloud computing that comply with international practice. The sixth goal is aimed at developing corporate standards. China will, therefore, support a series of corporate standards on

http://www.miit.gov.cn/n1146295/n1652858/n1652930/n3757016/c5465218/content.html [hereinafter Development Plan].

²⁴ *Id.* at 8.

²⁵ China Aims for Double-Digit Growth in Software, IT Service Industry, XINHUA NET, (Jan. 17, 2017), http://www.xinhuanet.com//english/2017-01/17/c_135990830.htm.

²⁶ Id.

²⁷ 2018 Nian Xinxihua he Ruanjian Fuwuye Biaozhunhua Gongzuo Yaodian (2018年信息化和软件服务业标准化工作要点) (Essentials of Standardization Work in the Information and Software Service Industry in 2018) (promulgated by the Ministry of Industry and Information Technology, Mar. 23, 2018), http://www.miit.gov.cn/n1146285/n1146352/n3054355/n3057656/n3057660/c6105131/content.html [hereinafter Essentials of Standardization Work].

²⁸ Id.

blockchain reference architectures, digital format specifications, interoperability, and smart contracts.

4. 2018 China's Blockchain Industry Whitepaper. On May 20, 2018, China's MIIT released its second whitepaper on China's blockchain industry.²⁹ The first, issued in October 2016, featured the first official guideline on blockchain development. The 2018 whitepaper takes a broader view of the subject.

The 2018 whitepaper first analyzes the current stage of blockchain development with a focus on the ecological composition of the industry and the patterns of its specific facets. In general, the blockchain industry is still at an early stage but growing rapidly. As indicated in the whitepaper, by the end of March 2018, the number of companies with blockchain as their main business had reached 456. Business types range from upstream hardware manufacturing, platform services, and security services to the downstream industrial technology application services, investment and financing, media, and human resources. This implies that the blockchain industry has been growing progressively and its development is now being accelerated.

The geographical distribution of the blockchain industry is relatively concentrated. Beijing, Shanghai, Guangdong, and Zhejiang are home to 80% of blockchain startups, and are also cities with most active blockchain entrepreneurship.³⁰ Meanwhile, this whitepaper identifies certain risks that were not appropriately recognized in the past. Legal compliance is problematic for many startups; specifically, ICO is a case in point. Another risk comes from the technology itself, such as the 51% attack factor, security for private keys, and reliability of consensus mechanisms. In addition, market participants' liabilities, data belongings, and high costs of transactions are all issues to be addressed.

In formulating the whitepaper, the MIIT conducted extensive research on blockchain's applications in finance and the real economy. In finance, the MIIT focuses on blockchain's use in supply chain finance, trade finance, the credit system, clearing, point sharing, insurance, and securities. In the real economy, the MIIT has explored blockchain's use in 15 areas, including product traceability, intellectual property (IP) protection, digital evidence, digital identity, and Internet of Things.

The whitepaper also enumerates six tendencies of blockchain development in China: (1) blockchain will be at the forefront of global technology development, opening up new tracksfor international competition; (2) blockchain will become a new industrial hot spot for innovation and start-up

²⁹ 2018 Nian Zhongguo Qukuailian Chanye Baipishu (2018年中国区块链产业白皮书) [The Blockchain Technology and Application Development Whitepaper] MINISTRY OF INDUSTRY AND INFORMATION TECHNOLOGY OF THE PEOPLE'S REPUBLIC OF CHINA (May 21, 2018), http://www.miit.gov.cn/n1146290/n1146402/n1146445/c6180238/content.html [hereinafter 2018 Whitepaper].

³⁰ *Id.* at 5.

businesses, and technology convergence will expand into a new space for applications; (3) blockchain will be widely adopted in the real economy within three years, becoming a pillar of the new Digital China; (4) blockchain will create a new platform economy, opening up a new era of the sharing economy; (5) blockchain will accelerate the process of "credible digitalization," allowing the finance sector to serve the real economy more effectively; and (6) blockchain regulation and its standardization will experience further improvement, and the cornerstone of industrial development will continue to be enriched.

C. People's Bank of China

The People's Bank of China ("PBOC"), as the central bank of China, has the main responsibilities of carrying out monetary policy and regulating financial institutions in mainland China. When the blockchain industry involves financial activities, it may be subject to the jurisdiction of the PBOC. The Guiding Opinions on Promoting the Sound Development of Internet Finance is seen as the "Constitution" for Internet-related businesses in China, including the blockchain business. Specifically, in the blockchain space, the PBOC issued a joint statement with the other six departments banning ICOs, and it has been working on digital currencies.

1. Guiding Opinions on Promoting the Sound Development of Internet Finance. On July 18, 2015, the PBOC and 9 other central government ministries and industry regulators jointly published the Guiding Opinions on Promoting the Sound Development of Internet Finance.³¹

This document highlights the overall requirements for authorities to support Internet finance. In accordance with "encouraging innovation, preventing risks, seeking benefits and avoiding disadvantages, and promoting healthy development," it proposes a series of policies and measures to encourage innovation and support the steady development of Internet finance. ³² Governments at all levels should actively foster innovation in e-finance platforms, products and services, and cooperation between financial actors within the industry. In addition, governments should help expand access to capital for market players. Related fiscal and taxation policies should be enhanced to avoid risks for the industry's development andto support the establishment of infrastructure and credit services.

This document is seen as the "Constitution" for Internet-related businesses in China, including the blockchain business. It clarifies supervisory

³¹ Zhongguo Renmin Yinhang, Gongye he Xinxihua Bu, Gongan Bu Deng Guanyu Cujin Hulianwang Jinrong Jiankang Fazhan de Zhidao Yijian (中国人民银行、工业和信息化部、公安部等关于促进互联 网金融发展的指导意见) [Guiding Opinions of the PBOC, the MIIT, the Ministry of Public Security, et al, on Promoting the Sound Development of Internet Finance] (promulgated by the PBOC et al., July 14, 2015, effective July 14, 2015) (Chinalawinfo) [hereinafter Guiding Opinions].

³² Id.

responsibilities, regulatory requirements, and business boundaries for Internet payment, online lending, equity crowdfunding, Internet fund sales, Internet insurance, Internet trust, and consumer finance. It thus governs the blockchain business as long as blockchain is involved in any of those activities.

2. Announcement on Preventing the Financing Risks of Initial Coin Offerings. On September 4, 2017, the PBOC, along with 6 other departments, jointly issued an accountment on Preventing the Financing Risks of ICOs.³³This document defines ICOs as unauthorized fundraising activities, subject to several financial crimes, such as the illegal sale of tokens, illegal issuance of securities, illegal fundraising, financial fraud, and pyramid schemes. Virtual currencies, cryptocurrencies, or tokens of ICOs are not issued and backed by the government, so they should not be treated like fiat currency either in theirstatus or in circulation. With this, relevant government departments have started to closely monitor ICO-related activities and enforce the applicable law.

This document has clearly banned ICO activities. This ban is applied to individuals and organizations both retroactively and in future activities. Those who have completed ICO fundraising must return funds to all investors. The ban is also effective with respect to token-exchange platforms. Starting from the date of this announcement, platforms shall no longer (1) buy or sell tokens, (2) conduct any exchange business between virtual currencies or tokens and fiat currencies, or (3) provide any information for token trading. Additionally, all banks and financial institutions must refrain from offering any ICO services, such as opening accounts, registration, exchange, clearing, and insurance, etc. In addition, the document warns the public about the risks of token financing and trading.

3. The People's Bank of China Digital Currency Research Institute. Vice Governor Fan Yifei of the PBOC stated that to create a safe, legal, and widely used digital currency, central banks should lead the way.³⁴ The PBOC has been working on digital currencies since 2014, and is creating a digital currency electronic payment, known as DCEP. He further addressed how digital legal tender issued by the central banks could solve many problems (e.g.,

³³ Zhongguo Renmin Yinhang, Zhongyang Wangxinban, Gongye he Xinxihua Bu Deng Guanyu Fangfan Daibi Faxing Rongzi Fengxian de Gonggao (中国人民银行、中央网信办、工业和信息化部等关于防范 代币发行融资风险的公告) [Announcement of the Peoples Bank of China, the Office of the Central Leading Group for Cyberspace Affairs, the Ministry of Industry and Information Technology and Other Developments on Preventing the Financing Risks of Initial Coin Offerings] (promulgated by the PBOC et al., Sept. 4, 2017, effective Sept. 4, 2017) (Chinalawinfo) [hereinafter Accouchement of ICOs].

³⁴ Fan Yifei, *On Digital Currencies, Central Banks Should Lead*, BLOOMBERG OPINION (Sept. 1, 2016) https://bloomberg.com/opinion/articles/2016-09-01/on-digital-currencies-central-banks-should-lead.

credit and synchronization issues) as well as overcome certain challenges (e.g., the operating framework, cryptography, security, and efficiency issues).³⁵

Fan released an article addressing his thoughts on the central bank digital currency ("CBDC") on January 25, 2018.³⁶ Along with other countries' experiments on CBDC, China's central bank indicated several points of interest. First, the CBDC should adopt a two-tier system, which means the central and commercial banks should collaborate on designing, issuing and circulating digital currency, considering the diversity and complexity of economic development, resources, and education levels of the population in different regions. Second, under the two-tier distribution system, China's CBDC should adhere to a centralized delivery model. At the same time, the attribution of the CBDC should be placed in a loosely coupled manner so the degree of dependence on one account is greatly reduced. Third, the design of the CBDC should be careful when implementing smart contracts on the CBDC.

In response to Fan's ideas, Yao Oian, director of the Digital Currency Research Institute, interpreted them from a technology perspective on March 6, 2018. ³⁷ Yao emphasized the issues of loosely coupled accounts and controllable anonymity. He proposed to introduce a digital currency wallet to the traditional bank account system so one account can manage both traditional currency and digital currency. The benefit of the strategy is that it flows into the two-tier system. The CBDC belongs to the M0 category and is tied to the liability of the central bank. Commercial banks still manage the accounts in substance, and they will not be marginalized. In terms of the controllable anonymity of the CBDC, one of the main technical pillars upon which the CBDC operates is cryptography. The problem is that pure anonymity of existing digital assets raises the risk of property loss, but this can be resolved with the CBDC's system, which applies a limited anonymity strategy. On the front end, users can choose whether they want to be anonymous, though on the back end, they can supply their real names. This strategy balances privacy protection and security guarantees.

D. The Supreme People's Court

Thus far, the SPC has issued only one blockchain-related law legalizing blockchain-derived evidence. On September 3, 2018, the SPC issued a judicial

³⁵ Id.

³⁶ Fan Yifei (范一飞), Guanyu Yanghang Shuzi Huobi de Jidian Kaolii (关于央行数字货币的几点考虑) [Some Considerations About the Central Bank Digital Currency], YICAI (Jan. 25, 2018), https://www.yicai.com/news/5395409.html.

³⁷ Yao Qian (姚前), Yanghang Shuzi Huobi de Jishu Kaoliang (央行数字货币的技术考量) [Technical Considerations of the Central Bank Digital Currency], YICAI (Mar. 6, 2018), https://www.yicai.com/news/5404436.html.

interpretation on the hearing of cases by Internet courts.³⁸ Article 11 of the interpretation states that "Internet courts shall recognize digital data that are submitted as evidence if relevant parties collected and stored these data via blockchain with digital signatures, reliable timestamps and hash value verification or via a digital deposition platform and can prove the authenticity of such technology used."³⁹ This is the first time China legalized evidence stored and verified via blockchain. This judicial interpretation originated from a leading case in the Hangzhou Internet Court.⁴⁰

In this case, the court analyzed blockchain's ability to store electronic evidence by taking three factors into account: the qualification of the evidence deposition platform, the reliability of the methods the platform used to generate and store the electronic evidence, and the completeness of the electronic evidence stored with blockchain technology.⁴¹ The court further concluded that "blockchain's nearly immutable and undeletable characteristics ensure the completeness of the electronic data once the data has been stored on the blockchain," and "it is a reliable method to maintain the completeness of the contents."⁴²

III. APPLICATION OF THE MODIFIED REGULATORY IMPACT ASSESSMENT (RIA)

Policies and regulations embrace a number of themes that researchers can analyze via different approaches. For example, the cultural and ideological tension between individualism and communitarianism, the inescapable tradeoffs between efficiency and equity, the contest between economic growth and environmental quality, and further, the debate over regulation and deregulation. This article takes the angle of regulatory assessment through retrospective analysis. It intends to evaluate whether the action (issuing policies and regulations) generated its intended effects. Following the format of the

³⁸ Zuigao Renmin Fayuan Guanyu Hulianwang Fayuan Shenli Anjian Ruogan Wenti de Guiding (最高 人民法院关于互联网法院审理案件若干问题的规定) [Provisions of the Supreme People's Court on Several Issues Concerning the Trial of Cases by Internet Courts] (promulgated by Sup. People's Ct., Sept. 6, 2018, effective Sept. 7, 2018) (Chinalawinfo).

³⁹ Marie Huillet, *China's Supreme Court Rules That Blockchain Can Legally Authenticate Evidence*, COINTELEGRAPH (Sept. 7, 2018), https://cointelegraph.com/news/chinas-supreme-court-rules-that-block chain-can-legally-authenticate-evidence.

⁴⁰ Hangzhou Huatai Yimei Wenhua Chuanmei Youxian Gongsi Qisu Shenzhen Shi Daotong Keji Fazhan Youxian Gongsi Qinfan Xinxi Wangluo Chuanboquan Jiufen An (杭州华泰一媒文化传媒有限公司起诉 深圳市道同科技发展有限公司侵犯信息网络传播权纠纷案) [the Case of Hangzhou Huatai Yimei Ltd. Suing Shenzhen Daotong Technology Development Ltd. regarding the distribution right infringement of online information], the case information is not publicly available on the Court's website. See *Hangzhou Hulianwang Fayuan Shouci Queren Qukuailian Dianzi Cunzheng Falu Xiaoli* (杭州互联网法院首次确认 区块链电子存证法律效力) [*Hangzhou Internet Court's First Confirmation on the Legal Effect of Using Blockchain to Store Electronic Evidence*], XINHUA NET (June 28, 2018), http://www.xinhuanet.com/local/2018-06/28/c_1123051280.htm.

⁴¹ *Id*.

⁴² *Id*.

modified RIA, this article first identifies the problems before any policy and regulation were issued, then analyzes the policy objectives, and further assesses whether the objectives have been fulfilled.

A. What Were the Problems Before Any Policy and Regulation Were Issued?

In the absence of any policy and regulation, the blockchain space experienced a period of wild development and then fell into chaos. Three of the most salient problems in the blockchain space were: cryptocurrency and ICOrelated crimes, poor quality of early-stage blockchain products and services, and a lack of consumer and investor protection mechanisms from the perspective of governance.

1. Cryptocurrency and ICO-related Crimes. Various forms of cryptocurrency and ICO-related crimes appeared unceasingly. The most common types are pyramid schemes and fundraising fraud, also known as ICO fraud.

A pyramid scheme is a business model of recruiting members via a promise of payments or services for enrolling others into the scheme rather than supplying investments or products. The pyramid scheme in the cryptocurrency space starts with an organization that issues cryptocurrencies, and then controls the trading information. In the early stage, the cryptocurrency's value could go very high to attract investors. At one point, directors of the organization (those at the top of the pyramid) would dump all cryptocurrencies, and the cryptocurrency's value would then plunge immediately. As a result, investors would lose all their investments, which are procuredby the directors of the organization.

To benefit from the immediate sale of a large volume of a given cryptocurrency, the first step is to attract more investors or purchasers to increase its value. The organization then rewards those who can recruit purchasers with a certain amount of the cryptocurrency. The more purchasers one recruits, the more cryptocurrency one is rewarded. The cryptocurrency's price will increase as the number of purchasers increases. Thus, that recruiter's profits will increase in terms of the cryptocurrency's volume and value. A purchaser can also become a recruiter to benefit from the next purchaser he or she recruits.

An organization also benefits from membership. In this case, individuals should become members of the organization before purchasing any cryptocurrency, with the membership fee set very high. Once they have purchased the cryptocurrency, the only thing that the members can do is to wait for its value to increase. They are promised that the value will increase multiple times within a short period of time. In reality, however, these organizations will simply collect the membership fees and disappear. For instance, in China, one of the most damaging cryptocurrency pyramid schemes, titled "Internet Gold" ("EGD"), occurred in 2016.⁴³ EGD consisted of three main platforms to perpetrate one overall scheme: 12 recruitment platforms that gathered new members, an online exchange to trade EGD-Super (ES), and an e-commerce website where members could trade their "future vouchers," a form of cryptocurrency, for commodities.⁴⁴ Once a member signed up on one of the recruitment websites, he or she could purchase coupons and was promised higher returns.⁴⁵ Members were divided into 4 hierarchical levels, composed of 20 layers.⁴⁶ They were promised their money back within 20 weeks, with more profit to come if they recruited more members.⁴⁷ By the time the EGD pyramid scheme was taken down, it had already involved over 500,000 members and RMB1.9 billion (about \$275 million).⁴⁸

Another commonly-seen crime is fundraising fraud, which entails illegal possession of others' property, violation of relevant financial laws and regulations, and the use of fraudulent methods to illegally raise funds. Fraudsters frequently use ICOs to commit fundraising fraud. An ICO is the cryptocurrency industry's equivalent to an IPO and helps raise funds. Acompany looking to create a new project may launch one. Interested investors can buy into the offering and receive cryptocurrencies issued by this company. The cryptocurrencies represent certain benefits that investors are entitled to. ICO frauds occur when the company has no intention to fulfill its promises to investors. The sole purpose of raising funds through a fraudulent ICO is to possess funds pooled by investors. Many owners of the company disappear after accumulating a great amount of funds.

Fraudsters are presented with so many opportunities to deceive others due to both the popularity of cryptocurrencies and lay people's lack of knowledge in this space.

Interest in cryptocurrencies began with Bitcoin in 2009. When Bitcoin received enormous attention two years ago because of its dramatic change in value, cryptocurrencies became well-known to the general public. The value of Bitcoin had a humble start in 2009 when one Bitcoin was about \$0.0007. According to Coinbase,⁴⁹ as shown in the chart below, the price remained under \$1K before February 2017, with the exception of November 2013, when it

⁴³ Francisco Memoria, *China Cracks Down on \$1.5 Billion Virtual Currency Pyramid Scheme*, CCN (Jan. 12, 2017), https://www.ccn.com/china-cracks-1-5-billion-virtual-currency-pyramid-scheme. *See also* Cai Changchun, *XuzhouBroke Two New Types Of Network Pyramid Schemes — Network Gold Wanfu Coins Gathered About 12.1 Billion*, PEOPLE'S NETWORK (Dec. 15. 2016), http://finance.people.com.cn/n1/2016/ 1215/c1004-28950967.html.

⁴⁴ *See* Memoria, supra note 43.

⁴⁵ *See* Memoria, supra note 43.

⁴⁶ *See* Memoria, supra note 43.

⁴⁷ *See* Memoria, supra note 43.

⁴⁸ *See* Memoria, supra note 43.

⁴⁹ Bitcoin Price Chart (BTC), COINBASE, https://www.coinbase.com/price/bitcoin (last visited June 21, 2020).

reached \$1,073.16. Later, it rose remarkably from February 2017 to December 2017, when the value increased from around \$1K to \$17.5K in 8 months. Then the value dropped quickly from the peak to around \$8K in two months. These two periods were the most breathtaking time in cryptocurrency history. As of April 19, 2019, the value of a Bitcoin is \$5,285.53, and the market cap of Bitcoin is \$93.31 billion.

The year of 2017 represented a dream run not just for Bitcoin but also for many other cryptocurrencies. For instance, from February to December of that year, the value of Ethereum surged from \$11 to \$1.3K (See Figure 1 below).⁵⁰ The value of Litecoin soared from \$4 to \$287.⁵¹ The price of Bitcoin Cash (BCH), a fork of Bitcoin, increased from around \$200 in August 2017, when it took effect, to \$3.3K in December 2017,⁵² bringing great excitement to the cryptocurrency space in 2017. Many great "fortunate" stories took place. Some people earned their first massive investment return. Some earned their whole year's paychecks by trading cryptocurrencies within a month. Some companies became unicorns soon after they started to provide cryptocurrency-related services, especially trading platforms. Some entrepreneurs received millions of investments when issuing cryptocurrencies. The cryptocurrency market was thriving enormously, which had never occurred before.



FIGURE 1. VALUE OF VARIOUS CRYPTOCURRENCIES

⁵⁰ Ethereum Price Chart (ETH), COINBASE, https://www.coinbase.com/price/ethereum (last visited June 21, 2020).

⁵¹ Litecoin Price Chart (LTC), COINBASE, https://www.coinbase.com/price/litecoin (last visited June 21, 2020).

⁵² Bitcoin Cash Price Chart (BCH), COINBASE, https://www.coinbase.com/price/bitcoin-cash (last visited June 21, 2020).



Source: Coinbase

The thriving cryptocurrency market in 2017 attracted increased speculation, and China soon became the biggest market for cryptocurrency trading. The number of people who invested their hard-earned money in cryptocurrencies grew rapidly. They did so with an unrealistic expectation of being success stories without sufficient knowledge regarding what they invested in. The massive involvement in the cryptocurrency space thus provided unscrupulous actors with ample opportunities to prey on such enthusiasm. Therefore, cryptocurrency and ICO-crimes spread rapidly before any policy and regulation were issued to address these occurrences.

2. Poor Quality of Early-Stage Blockchain Products and Services. Blockchain products and services have been through multiple stages and will keep innovating. Melanie Swan has broken the blockchain revolution into three phases: Blockchain 1.0, Blockchain 2.0, and Blockchain 3.0.⁵³

"Blockchain 1.0 is *currency*, the deployment of cryptocurrencies in applications related to cash, such as currency transfer, remittance, and digital payment systems. Blockchain 2.0 is *contracts*, the entire slate of economic, market, and financial applications using the blockchain that are more extensive than simple cash transactions: stocks, bonds, futures, loans, mortgages, titles, smart property, and smart contracts. Blockchain 3.0 is blockchain *applications* beyond currency, finance, and markets — particularly in the areas of government, health, science, literacy, culture, and art."⁵⁴

Blockchain 1.0 started in 2009 when Bitcoin was invented. Since 2016, China has enacted numerous blockchain-related policies. This was also the period when blockchain development entered the era of Blockchain 2.0.⁵⁵ Before any substantive policies and regulations were issued, there were many effective blockchain products and services that needed to be acknowledged.

⁵³ MELANIE SWAN, BLOCKCHAIN: BLUEPRINT FOR A NEW ECONOMY ix (2015).

⁵⁴ Id. at 9.

⁵⁵ Tim Swanson, *Blockchain 2.0 – Let a Thousand Chains Blossom Let's Talk Bitcoin*, LTB NETWORK (Apr. 8, 2014), https://letstalkbitcoin.com/blog/post/blockchain-2-0-let-a-thousand-chains-blossom.

Some of the most successful cases were cryptocurrency-trading platforms and wallets for cryptocurrency storage. Many platforms' high-volume transactions were very impressive. For example, Huobi.pro, a Chinese cryptocurrency trading platform, broke records with its high transaction volume. Huobi.pro was launched in September 2013. 50 days after its establishment, Huobi.pro's daily transaction amount reached RMB10 million. 130 days later, the number surged to RMB1.5 billion. On February 25, 2014, the number of Bitcoins being bought and sold on Huobi.pro exceeded 260,000, and the transaction amount of Bitcoins reached RMB1 billion, making it the top Bitcoin transaction platform in the world. Its high transaction volume kept breaking records until 2016.

However, the quality of blockchain products and services continued to present problems. The first problem was the quality of the blockchain itself. As defined in the first chapter, a blockchain is a distributed database system maintained by numerous nodes, known as a distributed and fault-tolerant ledger. The most critical principle of blockchains is that they use the Byzantine general protocol as their consensus mechanism, which requires three rounds of votes. Every node is independent and stores the same information, using cryptography. If any so-called "blockchain" deviates from these properties, it should not be treated as a true blockchain.

Two types of problematic "blockchains" have been identified, which can be called fake chains and weak chains. A fake chain directly conflicts with the principle of blockchains. Some "blockchains" use a centralized system to pursue a faster transaction speed. However, such a centralized system directly contradicts blockchains' distributive property. The centralized node is the most vulnerable point of the "blockchain." Once it is attacked, the "blockchain" will crash. Hyperledger can be considered a fake chain because every transaction must go through Zookeeper, a centralized system.

In weak chains, a blockchain system applies a protocol that requires all nodes to trust each other but does not apply Byzantine General protocol. Byzantine General protocol allows 1/3 of the nodes to be untrustworthy, and the system will continue to work. However, a protocol requiring all nodes to be trusted makes a blockchain vulnerable because if one node is lying or attacked, the whole system could crash. This type of protocol can only work in a trusted environment where no node is able to lie. However, the transaction speed is faster because this protocol only requires two rounds of votes, while the Byzantine General protocol requires three rounds.

The second problem with blockchain products and services was their immaturity. Many good ideas for blockchain applications appeared and surpassed applications in cryptocurrencies and the finance industry. In the Blockchain 2.0 era, the next big tier in the development of the blockchain industry, many new products and serviceswere emerging, such as decentralized applications and decentralized autonomous organizations. While Blockchain 1.0 was for the decentralization of money and payments, Blockchain 2.0 was for the decentralization of markets more generally and contemplated the transfer of many other kinds of assets beyond currency.⁵⁶ Blockchain could be used to register, confirm, and transfer all manners of contracts and property. The table below shows blockchain applications beyond cryptocurrency — some of the classes and examples of property and contracts that might be transferred with the blockchain.

Class	Examples
General	Escrow transactions, bonded contracts, third-party
	arbitration, multiparty signature transactions
Financial	Stock, private equity, crowdfunding, bonds, mutual funds,
Transactions	derivatives, annuities, pensions
Public records	Land and property titles, vehicle registration, business
	licenses, marriage certificates, death certificates
Identification	Driver's licenses, identity cards, passports, voter
	registrations
Private records	IOUs, loans, contracts, bets, signatures, wills, trusts,
	escrows
Attestation	Proof of insurance, proof of ownership, notarized
	documents
Physical asset	Home, hotel rooms, rental cars, automibile access
keys	
Intangible assets	Patents, trademarks, copyrights, reservations, domain names

TABLE 1. BLOCKCHAIN APPLICATIONS BEYOND CRYPTOCURRENCY

Source: Blockchain applications beyond currency⁵⁷

In China, many blockchain startups started to explore various blockchain implementations in 2015 and 2016; however, beyond cryptocurrency and payment-related products and services, many implementations were new emerging businesses and had not developed to considerable market size. No representative enterprises nor sound business models had formed. By the end of 2016, around 100 blockchain startups had emerged, and the number of blockchain companies in China has reached 160.⁵⁸ Among all blockchain industries, 46.3% of the blockchain products and services were related to the financial sector; 20.7% were blockchain-hardware services; 7.4% were related to the research and development of blockchain technology; 9.9% were about blockchain subordinate survival, such as blockchain consultant services and

⁵⁶ SWAN, *supra* note 53, at 9.

⁵⁷ SWAN, *supra* note 53, at 10.

⁵⁸ CIO Manage, 2017 Nian Zhongguo Qukuailian Chanye Fazhan Yanjiu Baogao (2017年中国区块链产业发展研究报告) [2017 China Blockchain Industry Development Research Report] 11 (Nov. 16, 2017), available at http://www.cbdio.com/BigData/2017-11/06/content_5629767.htm.

blockchain news services; and 15.7% were other implementations and businesses, such as smart contracts, identity authentication, digital assets, IP protection, digital signature, and domain management.⁵⁹ Other than products and services related to cryptocurrencies or payments, no big name emerged in other areas during this time. The blockchain market still had room for growth.

3. A Lack of Consumer and Investor Protection Mechanisms. Under an overwhelming situation of frauds and crimes and widespread inferior blockchain products and services, consumers and investors were the ones who directly suffered from such chaos. From a governance perspective, they were also left unprotected.

Blockchain has been developed to allow the creation of autonomous virtual corporations, which could be governed similarly to traditional corporations.⁶⁰ Specifically, cryptocurrency holders (investors and consumers) could be treated as traditional shareholders, who could be designed to appoint members of a governing body similar to a board of directors. ⁶¹This governing body then voted to issue currency to an account holder who could then act similarly to a Chief Financial Officer, and pay the salaries of executives, employees, and directors. ⁶² A series of corporate actions could be encoded and executed automatically according to the rules.

However, such blockchain-enabled autonomous virtual corporations presented both on chain and off chain governance issues. On-chain governance "refers to rules and decision-making processes that have been encoded directly into the underlying infrastructure of a blockchain-based system."⁶³ It defines the rules of interaction between participants through the infrastructure within which these interactions take place; these interactions are solely determined by rules embedded within the underlying blockchain code —the so-called rule of code.⁶⁴ Off-chain governance "comprises all other (i.e., non on-chain) rules and decision-making processes that might affect the operations and the future development of blockchain based systems."⁶⁵

Taking The DAO — a decentralized venture capital fund that was meant to be the world's first fully functioning decentralized autonomous organization⁶⁶

⁵⁹ *Id.* at 14.

⁶⁰ Robert, Leonhard, *Corporate Governance on Ethereum's Blockchain* (Jun. 3, 2017), https://papers.ssm.com/sol3/papers.cfm?abstract_id=2977522 (last visited June 21, 2020).

 ⁶¹ Id.
⁶² Id.

⁶³ Wessel Reijers et al., Now the Code Runs Itself: On-Chain and Off-Chain Governance of Blockchain Technology, 37 INT. REV. OF PHILOSOPHY 2 (2019).

⁶⁴ *Id. See also* PRIMAVERA DE FILIPPI & ARRON WRIGHT, BLOCKCHAIN AND THE LAW: THE RULE OF CODE 193 (2018).

⁶⁵ See Reijers et al. supra note 63, at 2.

⁶⁶ Quinn Dupont, *Experiments in Algorithmic Governance: A History and Ethnography of "The DAO," A Failed Decentralized Autonomous Organization*, in MALCOLM CAMPBELL-VERDUYN, BITCOIN ANDBEYOND: CRYPTOCURRENCIES, BLOCKCHAINS, AND GLOBAL GOVERNANCE 157 (Malcolm Campbell-Verduyn. eds., 1st ed.2018).

— as an example, the main problem with on-chain governance is that the system cannot respond to situations that are not coded as rules. Although The DAO encoded rules clearly on its smart contracts regarding how to select a project to invest in and receive returns, it failed to respond when the system was attacked and ethers (cryptocurrencies on The DAO) were drained by hackers. If code was law, as many technology enthusiasts claimed, then The DAO should do nothing to retrieve ethers or refund those who lost their investments, because "The DAO's code controls and sets forth all terms of The DAO creation."⁶⁷However, ethers holders (investors and consumers) would be in jeopardy.

If such non-coded situations are left to off-chain governance, which was the solution for The DAO, the problem further becomes how to balance interest groups. The imbalance of decision-making power may exist between major market players (e.g., miners and protocol developers of Ethereum) and minorities (e.g., who merely hold a limited amount of ethers). The minorities are subject to the danger of being enforced according to others' will. This would compromise the benefit of on-chain governance — which presupposes that no individual or group of individuals should be allowed to enforce their will on others and that individual sovereignty should be minimized in the decision-making process.⁶⁸

In addition, off-chain governance fails to protect investors and consumers because of the unclear legal status of cryptocurrency holders. Many whitepapers do not clearly state the legal status of cryptocurrency holders — it is unclear if they are debtholders or security holders. Many cryptocurrency holders seem like debtholders because they will probably be entitled to future products or services.⁶⁹ However, as debtholders, investors and consumers are at risk because many blockchain promoters did not intend to deliver their promises since 80% ICO projects are scams.⁷⁰ Among those 20% left, many cannot guarantee that promised items and services would be delivered in the future. Some cryptocurrency holders seem like security holders under the analysis of securities law. However, the discussion of treating cryptocurrencies as securities started in July 2017.⁷¹ Prior to that, cryptocurrency holders did not have the protection of securities law.

⁶⁷ SeeAn Open Letter, PASTEBIN (June 18, 2016), https://pastebin.com/CcGUBgDG (last visited June 21, 2020). It should be noted that the authenticity of this letter is disputed, but as DuPont (2017 at 174) notes, it nonetheless reflects the view of many in the Ethereum community at the time.

⁶⁸ Reijers et al., *supra* note 63, at 19.

⁶⁹ Aurelio Gurrea-Martinez & Nydia Remolina, *The Law and Finance of Initial Coin Offerings*, 25 (Ibero-American Inst. for L. and Fin. Working Paper No. 4, 2018; SMU Ctr. for AI & Data Governance Research Paper No. 06, 2019).

⁷⁰ Rouriel Roubini, *Initial Coin Scams*, (May 10, 2018), https://www.project-syndicate.org/commentary/ ico-cryptocurrency-scams-by-nouriel-roubini-2018-05?barrier=accesspaylog (last visited June 21 2020).

⁷¹ The discussion started in the SEC's Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, known as "The DAO report."

Even worse, the agency problem makes investors and consumers even more vulnerable. Most whitepapers do not clearly identify cryptocurrency holders'rights to appoint, remove and remunerate the directors, nor do they cover if and how managers should behave in the interests of cryptocurrency holders.⁷² Moreover, unlike what happens in a typical relationship between directors and shareholders where fiduciary duties may help fill some gaps, blockchain promoters do not usually owe fiduciary duties to cryptocurrency holders.⁷³ Unlike The DAO, cryptocurrency holders in most ICO projects are not provided with the right to participate in governance, nor can they find managers to act in their interests.

B. What Are the Objectives of Existing Policies and Regulations?

Government agencies pursue certain objectives through the articulation of policies and regulations. Given that each government agency has various objectives it seeks to achieve, and some objectives are unique to the concerns of a specific agency, it is impractical to enumerate and evaluate all objectives that all agencies pursue in the blockchain space. Instead, this article singles out two primary objectives shared by all agencies mentioned above: market stability and safety, and technology innovation. The pursuit of these two objectives is justified by China's unique political, economic, and historical backgrounds.

Each primary objective further consists of three secondary objectives. The relation between the primary objective and its three secondary objectives is that the primary objective serves as the overarching theme that connects all secondary objectives, while each secondary objective targets a unique aspect of blockchain that the government seeks to address. It is a general-specific relation.

The secondary objectives under market stability and safety are: (1) reducing cryptocurrency and ICO-related crimes to prevent market turmoil, (2) providing a safer environment for consumers and small and median-sized enterprises (SMEs), and (3) integrating blockchain into existing industries. The secondary objectives under technology innovation are: (1) establishing a blockchain ecosystem, (2) standardizing the blockchain industry, and (3) acquiring world-leading capacities in blockchain. These secondary objectives are derived from the analysis of government whitepapers, working guidance, five-year plans, joint statements, laws, as well as some government actions explained in Part I.

The coming sections explain two primary objectives, six secondary objectives, the justification for the pursuit of these objectives, and the evidence shown in existing regulation provisions, official statements or government actions to prove such a pursuit.

⁷² Gurrea-Martinez & Remolina, *supra* note 69, at 29.

⁷³ Id.

1. Market Stability and Safety. One of the primary policy objectives is to achieve a stable and safe blockchain market. Stability has always been a primary and significant national goal for China. Political stability, economic stability and social stability are commonly seen in many national policies. The main reason is that China is a one-party state, which could be susceptible to severe unrest. Such unrest can be easily caused by economic downturns, social divisions or political upheaval. Blockchain has been claimed by some "liberalist" or anarchist groups as a great system to replace government or reduce the power of government. Its widespread implementation has been seen as a factor resulting in economic, political or social disorder. As can be assumed, China has been very cautious about any technology implementation that could bring adverse impacts on political, economic and social stability. Addressing economic risks and providing a safer environment for market participants to engage in technology evolvement can be a way to prevent such unrest from happening.

As indicated in the "constitution" for any internet-related financial activities, which covers blockchain involvement in finance, the government aims to "prevent risks,""promote the healthy development," and "support the steady development of Internet finance." ⁷⁴ Following this guidance, the government has been proposing a series of policies and regulations and taking measures to achieve the goal. Specifically, it is making efforts to reduce cryptocurrency and ICO-related crimes, provide a safer environment for consumers and SMEs, and integrate blockchain into the existing markets smoothly, which constitute secondary objectives.

a. Reducing Cryptocurrency and ICO-related Crimes to Prevent Market Turmoil. An objective of existing policies and regulations is to address financial crimes, especially cryptocurrency-related crimes, such as the illegal sale of tokens, illegal issuance of securities, illegal fundraising, financial fraud and pyramid schemes.

The reason for this pursuit is that without cracking down cryptocurrency and ICO-related crimes, the market would be in severe turmoil. As analyzed in section II(A), in the absence of policies and regulations, crimes occurred unceasingly due to the heat in the cryptocurrency space. If the situation continues, economic turmoil could be around the corner, because cryptocurrency-related investments of an increasing volume and value have been poured into the risky cryptocurrency and ICO space.

If we review the data with respect to the volume and value of ICO funding in the first three quarters of 2017, the growth is astounding. The comparison of the investment in VC and ICOs leads to a better sense of how large the investment is in ICO markets. VCs are a form of financing that is provided by firms or funds with more sophisticated teams to evaluate financing projects. In

⁷⁴ Guiding Opinions, *supra* note 31. The "constitution" here refers to the Guiding Opinions.

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the first quarter, ICOs and token sales captured a third of VC funding with major rises on the horizon (See Figure 2).⁷⁵ In the second quarter, ICO funding far outweighed VC — token salescomprised over three times as much of project funding as traditional VC (See Figure 3).⁷⁶ In the third quarter, ICO funding hit an all-time high. Q3 saw ICO total funding (\$2.38bn) above total VC funding for blockchain investment (\$1.95 billion) (See Figure 4).⁷⁷ Among all these investments, Chinese investment dominates. For instance, Qtum, a China-based project, raised \$15.43 million in the first round of ICO.⁷⁸

FIGURE 2. VENTURE CAPITAL TOPS \$107M, ICOS FOLLOW WITH A THIRD OF VOLUME, LARGE DEALS ON HORIZON



Source: Coindesk

⁷⁵ CoinDesk, State of Blockchain: Q1 2017, https://www.coindesk.com/wp-content/uploads/2017/06/ state_of_blockchain_q1_2017.pdf.

⁷⁶ CoinDesk, *State of Blockchain: Q2 2017*, https://media.coindesk.com/uploads/2017/09/State-of-Blockchain-Q2-2017-.pdf.

⁷⁷ CoinDesk, *State of Blockchain: Q3 2017 3*, https://media.coindesk.com/uploads/research/state-ofblockchain/2017/q3/sob2017q3.pdf (last visited June 21, 2020).

⁷⁸ Id. at 1.



FIGURE 3. BLOCKCHAIN FUNDING GREW DRAMATICALLY IN Q2, ICOS EXCEEDED VC BY OVER 3X

Source: Coindesk

FIGURE 4. ICO FUNDING RAISED \$1.2BN IN Q3, ICOS EXCEEDED VC BY OVER 10X



Source: Coindesk

The large volume and value of investments do not usually lead to economic turmoil directly, but this can be the case in the cryptocurrency and ICO space. This space is a market filled with speculations. People are engaging in risky cryptocurrency transactions in an attempt to profit from short term fluctuations in the value of cryptocurrencies rather than from the underlying financial attributes embodied in cryptocurrencies such as capital gains, dividends or interests. In fact, many of these cryptocurrencies do not contain any financial attributes. Many so-called "investments" are not necessarily supported by the real economy or real projects. Many involved in this emergent market are with limited expertise and vulnerable to risks. If only a limited number of problematic investments occur, the market would most likely be fine. The problem is that the total investments in cryptocurrency and ICO space have

exceeded the investments in real estate, which is one of the pillar industries of China's economy. If such a large market crashes, the impact on the economy could be devastating.

The risk of market turmoil also explains why tackling cryptocurrency and ICO crimes become a critical government objective. Many government actions and official statements prove the government's firm intention to crack down relevant crimes. For instance, the PBOC, along with six other departments, issued the joint announcement to outlaw ICOs and cryptocurrency trading.⁷⁹ It is also stated that the purpose of this announcement is to "address financial risks."⁸⁰ The MIIT's 2018 Whitepaper also identifies ICO risks and warns market participants to "stay alert to excessive speculation and false publicity" of ICO activities.⁸¹ The CAC's Provisions on the Administration of Blockchain Information Services also shows the agency's intent to manage financial risks and prevent crimes by requiring blockchain service providers to register with authorities and disclose relevant information.⁸² Overall, China has been taking a very strict and cautious attitude towards cryptocurrencies and ICOs.

b. Providing a Safer Environment for Consumers and SMEs. The next objective is to provide a safer environment for blockchain market participants, specifically consumers and SMEs. The reason for this pursuit is that consumers and SMEs are susceptible to risks in the blockchain market. Consumers are usually amateurs and opportunists with limited expertise and information and they actively engage in a speculative market. SMEs are usually small businesses providing single blockchain-related services, such as wallet providers, to consumers and they probably lack funding and resources to protect themselves against economic fluctuation and fraud, and to deal with long-term high costs. If they suffer, the blockchain market would lose order because this market is full of these amateurs, opportunists and small businesses. Therefore, government intervention by providing a safer environment for consumers and SMEs is critical and necessary to form a stable and healthy blockchain market.

This objective is evidenced by various policies and regulations. The CAC seeks to provide a safer environment through compulsory disclosure—that service providers are required to register with the authority and to show their qualifications publicly, as specified in the Provisions on the Administration of Blockchain Information Services.⁸³ In another CAC document, Accelerating the Development of Standards for the Blockchain Industry,⁸⁴ the agency also shows its effort to provide a safer environment by standardizing the blockchain industry. As stated in the document, the purpose of the document is to establish

⁷⁹ Accouchement of ICOs, *supra* note 33.

⁸⁰ Accouchement of ICOs, *supra* note 33.

⁸¹ 2018 Whitepaper, supra note 29, at 10, 11.

⁸² Provisions on Information Services, *supra* note 19.

⁸³ Provisions on Information Services, *supra* note 19.

⁸⁴ Accelerate the Development, *supra* note 18.

and implement guidelines as to who is responsible for disclosure and how to disseminate information. ⁸⁵ It protects consumers by standardizing and qualifying market entry of blockchain product and service providers. Consumers thus could receiverelatively fair treatment regardless of whether they have a sophisticated knowledge of blockchain products and services or not.

The release of The Provisions on the Administration of Blockchain Information Services also shows the government's intention to protect consumers in three major ways. The first is by deterring bad actors or service providers from misconduct that hurts the interests of consumers. Second, as service providers are required to take actions to prevent users from producing, copying and disseminating information prohibited by laws and administrative regulations, this requirement could screen out illegal information and prevent it from reaching consumers, reducing the chances of deception. Third, because both service providers and users are on track — as service providers register with authorities and authenticate users' identities — it is easy to seek legal relief and mitigate damages since there is a clear record of who has done what.

c. Integrating Blockchain into the Existing Market Smoothly. The third objective is to integrate blockchain into existing systems, markets or industries smoothly. It has two implications: (1) Blockchain should be integrated with incumbents, and (2) The process of integration should be smooth.

Integrating blockchain with incumbents indicates that the goal of blockchain implementation is not to replace incumbents entirely but to provide an alternative to solve problems. For instance, cross-border transactions are time-consuming and sometimes expensive in the existing banking systems. Blockchain can provide a faster and cheaper solution by using its peer-to-peer system to transfer money. Banks can adopt blockchain to make cross-border transactions more effective and efficient without being replaced by blockchain.

The blockchain integration process being smooth requires that any integration of blockchain in any industry or market should be stable and not cause severe social, political, or economic upheaval. The idea of integrating blockchain with incumbents is to fulfill its merits of reducing transaction costs, increasing efficiency and providing transparency while preventing potential social unrest due to social change brought by technology, such as automation displacing millions of workers.

This objective is reflected in China's national policies. As previously mentioned, stability has always been China's national policy. Having blockchain integrated into the existing market smoothly is directly in support of stability. Some government actions also prove the government's effort to achieve this objective. For example, China is working on standardizing the blockchain industry, revealing that China aims to incorporate blockchain into

⁸⁵ Accelerate the Development, *supra* note 18.

various industries in a controlled and predictable environment. In such an environment, blockchain participants and blockchain activities have rules and standards to follow, which will reduce the chances of chaos. Moreover, China's ban on ICOs and cryptocurrency exchanges, from another perspective, shows that any unharmonious integration of blockchain that can cause market turmoil is not encouraged and could be punished. Additionally, the SPC's adoption of blockchain to authenticate evidence also indicates the court's attitude to embrace blockchain in the judicial system.

2. Technology Innovation. In addition to market stability and safety, technology innovation is another primary policy objective for the blockchain industry.

Technology innovation is a driving force for economic and social development. In recognizing its dominant role in this field, China has placed technology innovation as a national strategy and major national policy objective. The 18th Central Committee of the Communist Party of China (CPC) proposed to place an innovation-driven development strategy at the core of the overall development of the country, emphasizing scientific and technological innovation as strategic support for improving social productivity and overall national strength.⁸⁶ The Fifth Plenary Session of the 18th Central Committee indicated innovative development as one of the top five development concepts and viewed innovation as the first driving force for development, underscoring comprehensive innovation with science and technology innovation at its core.⁸⁷ In May 2016, the National Science and Technology Innovation Conference released the "Strategy Outline for National Innovation Driven Development"⁸⁸, which fully described the construction of world-power in science and technology.

Under the direction of the national policy objective on technology, blockchain-related policies and regulations pursue the same path of innovation. Technology innovation in the blockchain field possesses distinctive implications owing to the novelty of blockchain and its implementations. Thus, three secondary policy objectives unique to blockchain characteristics are: (1)

⁸⁶ Guojia Chuangxin Qudong Fazhan Zhanlüe Gangyao (国家创新驱动发展战略纲要) [Outline of the Innovation-Driven Development Strategy of China] (promulgated by the Communist Party of China Cent. Comm. & St.Council, Jun 2, 2016) at 1 (Chinalawinfo).

⁸⁷ Zhongguo Gongchandang di Shibajie Zhongyang Weiyuanhui di Wuci Quanti Huiyi Gongbao (Zhaiyao) (中国共产党第十八届中央委员会第五次全体会议公报(摘要)) [Communique of the Fifth Plenary Session of the 18th CPC Central Committee (Excerpts)], CHINA NET (Nov. 30, 2015), http://www.china.org.cn/chinese/2015-11/30/content_37195657.htm.

⁸⁸ Quanguo Keji Chuangxin Dahui, Liangyuan Yuanshi Dahui, Zhongguo Kexie di Jiuci Quanguo Daibiao Dahui Zaijing Zhaokai(全国科技创新大会,两院院士大会,中国科协第九次全国代表大会在京召升) [The National Conference on Scientific and Technological Innovation, the Academicians Conference of the Chinese Academy of Science and the Academicians Conference of the Chinese Academy of Engineering, and the Ninth National Congress of the China Association for Science and Technology were held in Beijing], XINHUA NET (May 30, 2016), http://www.xinhuanet.com/politics/2016-05/30/c_111895652 2.htm.

building a blockchain ecosystem connecting everything in cyberspace; (2) standardizing the blockchain industry; and (3) acquiring leading innovation capacities for blockchain.

a. Building a Blockchain Ecosystem. Establishing a blockchain ecosystem that connects everything in cyberspace is a secondary objective under technology innovation. A sophisticated blockchain ecosystem includes three parts: a technological ecosystem, an industrial ecosystem, and a human ecosystem. The objective of building the blockchain ecosystem can be seen in multiple national policies issued by the State Council, the MIIT, and the CAC.

The blockchain ecosystem has a broad connotation. With respect to the term *ecosystem*, a single or definitive definition does not exist. According to Merriam-Webster, there are two definitions of ecosystem: (1) "the complex of a community of organisms and its environment functioning as an ecological unit"; and (2) "something (such as a network of businesses) considered to resemble an ecological ecosystem, especially because of its complex interdependent parts."⁸⁹ Overall, this term indicates a sense of a community or network that consists of a variety of different but interdependent components, making the community or network run effectively and consistently. This is also my interpretation of a blockchain ecosystem, which can additionally be seen from three perspectives, including that of a technological ecosystem, an industrial ecosystem, and a human ecosystem.

First, a *technological ecosystem* means a community or network that consists of a variety of different but interdependent technologies, making this community or network run effectively and consistently. The development of blockchain itself, as one technology, cannot have a large economic or social impact if it is not supported by or in cooperation with other technologies. For example, without big data, blockchain would not have the source of correct records for any information. Without AI and machine learning, blockchain would not be able to support smart contract transactions relying on patterns and inference without using explicit instructions.

MIIT's 2016 whitepaper reveals that a policy objective in the blockchain industry is to create a technological ecosystem. In designing the roadmap of blockchain development, the whitepaper posits seven technological requirements based on blockchain's features. It also analyzes six critical technologies that are relevant to blockchain innovation, aiming to create a technological ecosystem in developing blockchain in China. Additionally, the 13th Five-Year Plan for the Development of Information Technology is also evidence of this phenomenon. The document specifically states that blockchain, along with other technologies, such as the Internet of Things, AI, big data, cloud computing, machine learning and biogenetic engineering, will constitute an

⁸⁹ Definition of ECOSYSTEM, https://www.merriam-webster.com/dictionary/ecosystem (last visited June 21 2020.).

ecosystem whereby everything is interconnected in cyberspace.⁹⁰ Hence, the direction of future work is to fulfill the goal of establishing such an ecosystem.

Second, an*industrial ecosystem* refers to a community or network that consists of a variety of different but interdependent industries, making this community or network run effectively and consistently. For example, a government's digital identity system built on a blockchain can provide an accurate record of its citizens. Medical professionals can pull information to track a patient's medical history. Insurance companies can review a patient's medical history to offer an appropriate insurance policy. Banks can link a user's credit with the digital identity system, providing credit services for housing businesses. Every industry can make use of products or services provided by the work of other industries, and at the same time, produce useful products or services.

This objective can be seen from the MIIT's Five-Year Plan for the development of the software and information technology service industries. This government plan indicates that China aims at establishing an internationally competitive industrial ecosystem by 2020.⁹¹ China will integrate resources and support key enterprises in various industries to accelerate the formation of an industrial ecosystem. The MIIT's 2018 Whitepaper on China's Blockchain Industry also indicates China's intention to build an industrial ecosystem by studying the current state of blockchain businesses and outlining future plans in expanding applications for different industries and adopting blockchain in the real economy.⁹²

Third, a *human ecosystem* means a community or network that consists of a variety of different but interdependent participants, rendering this community or network running effectively and consistently. Blockchain can empower the real economy by providing a foundation for an ecosystem involving millions of users, investors, entrepreneurs, scientists and developers. For example, a supply chain of organic apples can connect various participants in one blockchain network, including farmers, vendors, distributors, supermarkets and consumers. Each participant performs a duty that can benefit other participants in this community, such as farmers keeping accurate records of every apple on a blockchain or consumers supplying honest feedback for every purchase.

The MIIT's multiple policies signal the objective of blockchain standardization. In its first guidance document on blockchain, the 2016 whitepaper specifically proposed the ecological structure of blockchain and enumerated seven typical participants, including open-source communities, industry alliances, key enterprises, startups, investment institutions, financial institutions and regulatory agencies. In the MIIT's 2018 whitepaper on China's Blockchain Industry, a primary aim is to create a new platform economy,

⁹⁰ National Informationization Plan, *supra* note 13.

⁹¹ Development Plan, *supra* note 23.

⁹² 2018 Whitepaper, supra note 29.

opening up a novel era of the sharing economy and serving more participants on the platform. Besides, the CAC-promulgated Provisions on the Administration of Blockchain Information Services describes the creation of an ecosystem connecting blockchain service providers, users and authorities in a safe and regulated environment. Overall, the government hopes to supply a more effective and efficient blockchain ecosystem connecting everyone on the network.

b. Standardizing the Blockchain Industry. Standardization is also a secondary policy objective under technology innovation. Innovation does not only mean to invent new technologies, products, services or business models; it can also refer to creating standards to address disorder created by those inventions. As a new emerging technology with a disruptive impact, blockchain lacks standards in its applications and implementations. For instance, new concepts continue to emerge endlessly, such as zero-proof-knowledge proof, multi-signature, and cross-chain transactions. There is a dearth of consensus on core concepts and basic technology, making the industry development fragmented.

Other than concepts, the existing blockchain industry also lacks standards with respect to the quality of infrastructure technology, assessment methods for security, reliability and interoperability, and also standardized guidance on the legality of blockchain-related businesses. The consequences of lacking standards are detrimental to blockchain development. Many decentralized applications (DApps) in the market have poor compatibility and interoperability. Some blockchain applications face safety risks with inappropriate methods to prevent or address the risks. The lack of regulatory standards in the blockchain industry also results in criminal conduct, such as scams and fraud *vis-a-vis* ICO activities.

As such, the industry is in need of concrete and practical technical standards. This is especially important for three reasons. For one, standardization in the blockchain industry benefits businesses and corporations. Standards provide guidelines and solutions for blockchain commercialization and ensure efficient business operation productivity. For example, a unified understanding of blockchain technology, a unified API, and a unified development platform would enhance compatibility and interoperability among various systems and decrease operational costs. Second, standardization is also beneficial for consumers. Consumers may lack the expertise to identify the quality of a blockchain product or service. But if a blockchain product or service has been verified by other experts; thus, it is trustworthy, safe and qualified. Third, standards safeguard the proper use of blockchain by law, which ultimately aids regulators in fulfilling their regulatory functions.

Consequently, China's policy indeed reflects the objective of standardizing the blockchain industry. The 2016 blockchain whitepaper specifically identifies one of the major focuses of the blockchain industry being standardization, and

it has also proposed a roadmap for the standardization of blockchain in China.⁹³ In addition, As suggested in Essentials of Standardization Work, one of the major tasks is to carry out standardization research, speeding up the formulation of standards surrounding blockchain technology and applications.⁹⁴ The task includes formulating relevant national standards in a timely manner and also participating in the development of international standards. All these policies signaled the starting point of blockchain standardization in 2016.

c. Acquiring World-leading Innovation Capacities in Blockchain. The last secondary policy objective under technology innovation is to acquire world-leading innovation capacities. Innovation capacities are closely related to the economic and social development of a country and reveal its competitiveness to the world. Aiming to become a world power in science and technology, China has identified goals to enhance its global innovation rankings.

The main reason China has been insisting on pursuing a world-leading position in innovation is owing to a period of China's "humiliating" history, especially the Qing dynasty. By then, China had missed the first and second industrial revolutions, in which innovation brought tremendous fortune and rewrote the history of other industrial countries. By contrast, China's economy, science and technology, among other social and economic developments, lagged behind. Later, China was invaded by the Western world, and the last empire collapsed. With the establishment of a new nation, the Republic of China heeded the lessons from every step of its development. As a well-known phrase in Chinese history textbooks indicates, "Lagging behind invites attacks(落后就要挨打)." China therefore strives to maintain a world-leading position in many aspects, and special attention has been paid to science and technology, which have the power to either strengthen or ruin a country.

The objective is evidenced in the 13th Five-Year Plan. By 2020, the government seeks to increase its global innovation raking from 18 to 15, the share of R&D spending as a percentage of GDP from 2.1 to 2.5, the number of patents filed per 10,000 people from 6.3 to 12, and the contribution rate of technology advancement from 55.3 to 60.⁹⁵ Following the 13th Five-Year Plan, the MIIT also sets goals to bolster technology innovation in its Five-Year Plan for the Development of Software and Information Technology Service Industries.⁹⁶ An ambitious goal is that China should acquire global first-in-class innovation capacities in key technological realms, such as blockchain, AI and

⁹³ 2016 Whitepaper, supra note 22.

⁹⁴ Essentials of Standardization Work, *supra* note 27.

⁹⁵ 13th Five-Year Plan, *supra* note 9.

⁹⁶ Development Plan, *supra* note 23.

virtual reality. To achieve this goal, China has set "three-tier" breakthroughs in science and technology.⁹⁷

Realizing that blockchain and other emerging technologies could formulate a strategic technological advantage, China has prioritized the development of these technologies as the nation's "major objective and task." Systematic steps are being taken to build research institutes and national high-tech hubs, which would greatly facilitate technology innovation. China also encourages different types of entities to conduct innovative research in related areas. Overall, the government provides a policy-friendly environment for blockchain and other cutting-edge technologies' fundamental research, implementation and improvement, fulfilling information technology's role in national objectives and strategies.

C. Have These Objectives Been Fulfilled?

When evaluating whether the objectives have been fulfilled, particular attention should be paid to the impacts that these policies and regulations have generated. Three primary reasons lead to an impact assessment. The first is to learn whether policies and regulations have resolved the issues they were intended to solve and whether they led to new problems. Second, the outcome of the impact assessment can contribute to better decision making. It enables policymakers or regulations to understand what measures are effective or not effective in achieving certain goals, which helps adjust the measures for future pursuits and avoid repeating the same mistakes. Third, an impact assessment enhances legitimacy. It informs the public of the reasons and results for the policies and regulations, serving as a basis for oversight and accountability.

To conduct the impact assessment, six secondary objectives are used as indicators to assess policy and regulatory impacts, as well as to answer whether objectives have been satisfied. These six indicators cover impacts on cryptocurrency and ICO related crimes, environment for consumers and SMEs, blockchain integration, blockchain ecosystem, blockchain standardization and innovation capacity.

1. Impacts on Market Stability and Safety.

a. Impacts on Cryptocurrency and ICO-related Crimes. The most direct effect on cryptocurrency and ICO-related crimes originated from seven government agencies declaring ICOs illegal and requiring them to "cease immediately" as of September 4, 2017. Following the announcement, all exchanged platforms were required to close by September 30 and all exchange activities supporting ICOs were ordered to halt. The announcement shook the cryptocurrency and ICO markets fundamentally and reduced relevant crimes

⁹⁷ Dep't of Int'l Cooperation Ministry of Sci. and Tech, P.R.China, *The Bottleneck is Lack of S&T Innovation*, CHINA SCI. AND TECH. NEWSL., Aug. 15, 2015, at 2, http://www.cistc.gov.cn/upfile/769.pdf.

directly owing to the ban on major activities in the market. However, indirectly, it caused serious adverse effects.

On the one hand, the number of cryptocurrency and ICO-related crimes is decreasing. The ban outlawed ICO and cryptocurrency trading, which directly deterred anyone from participating in any such activities. All exchange platforms ceased their exchange services, which also prevented crimes at their very outset. For example, Huobi shut down its RMB recharge business and stopped registering new users on September 15, then turning to a blockchain-related information provider and research institution. Two other major Chinese cryptocurrency exchange platforms, OKCoin and Bitcoin China, also ceased their RMB-Bitcoin exchange services and shut down all trading functions. These actions indeed created hurdles for those who intended to commit cryptocurrency-related crimes as the transaction of cryptocurrencies became quite inconvenient.

Yet, it appears the ban does not put an end to all crimes. Although exchange platforms were shut down in China, many simply moved their businesses to other jurisdictions that allow cryptocurrency exchanges or ICOs, such as Hong Kong and Japan. They registered with authorities in those jurisdictions and still served the same customers. For instance, the founder of Huobi launched Probu.Pro, starting a new business overseas. Similarly, OKCoin launched an overseas trading platform. They both provide peer-to-peer trading services on digital assets. This means customers can still participate in cryptocurrency trading and ICOs, and therefore the crimes perpetrated on Chinese exchange platforms still exist on overseas platforms.

An irony here is that many cryptocurrency trading platforms metamorphosed into over-the-counter (OTC) versions. OTC originally referred to the process of how securities are traded by companies not listed on a formal exchange, such as the New York Stock Exchange. Instead, securities are traded via a broker-dealer network rather than a centralized exchange. The concept of OTC in the cryptocurrency market is similar, meaning sellers and buyers do not transact cryptocurrencies on exchange platforms directly. Instead, a buyer and seller can negotiate a price first. The seller then puts the coin on the platform and sends the money directly to the seller according to the agreed price. After the seller receives it, the cryptocurrency can be released to the buyer to complete the transaction. Many groups, such as QQ, WeChat (similar to WhatsApp), Telegram, and Slack, with hundreds of members in each group, commence OTC transactions, and it gradually becomes heated. The daily transaction volume could reach millions of Yuan, and thus OTC also provides a channel for criminal engagement.

A further problem is that some social media platforms and non-bank payment institutions leverage the inconvenience in trading cryptocurrencies in China, then provide services for customers to trade cryptocurrencies and participate in ICOs internationally. They indirectly allow cross-border illegal activities to occur, such as cross-border illegal fundraising, money laundering, financial fraud, pyramid schemes, illegal transactions, infringement of personal privacy, manipulation of the market, and illegal issuance of securities. The crimes did not stop; rather, domestic crimes became international crimes. Therefore, the all-out ban on ICOs and cryptocurrency exchanges does not effectively reduce the crimes in these areas.

b. Impacts on Consumers and SMEs. A safer environment for consumers and SMEs is not necessarily guaranteed. Although the environment is getting better due to the ban on relevant activities. Since cryptocurrency and ICO-related crimes still exist, it compromises a safe environment for consumers and SMEs. Even worse, many have suffered great losses. The ban led to a 39% decline in the cryptocurrency market. Exchange platforms had to delist all cryptocurrencies from exchanges, and some cryptocurrency sales, such as those with NEO, were forced to refund initial investors. Other SMEs, such as wallet service providers or media companies, also lost business as more participants were driven out of the market. The consumers (investors) could have lost part or all of what they invested.

Next, to a certain degree, consumers and SMEs are both under the protection of CAC's Provisions on the Administration of Blockchain Information Services, which requires service providers (including some SMEs) to register with authorities and authenticate users' (consumers) identities. This requirement would diminish crimes if properly implemented. According to the most recent CAC announcement, as of February 15, 2019, which was also when this regulation came into effect, 197 service providers had registered with the CAC.⁹⁸ This signals that the market may be safer because if any of these 197 services providers and its consumers conduct any illegal activities, it would be easy to track and hold them accountable.

However, this requirement has severe side effects. Foremost, it fundamentally affects the credibility of blockchain because of the broad scope of service providers, which ranges from content providers to technology providers. In practice, this scope covers not only individuals, institutions, and organizations developing and operating DApps on public chains, such as Ethereum and EOS, but also institutions and organizations that provide BaaS or blockchain underlying technological platforms. It may even include individuals, institutions, or organizations using the blockchain network, then becoming a node. An example would be an individual making use of a Bitcoin wallet and then becoming a node on the Bitcoin network or a regular user as witness nodes on some enterprise chains.

⁹⁸ Office of the Central Cyberspace Affairs Commission and Cyberspace Administration of China, Guojia Hulianwang Xinxi Bangongshi Guanyu Fabu Diyipi Jingnei Qukuailian Xinxi Fuwu Beian Bianhao de Gonggao (国家互联网信息办公室关于发布第一批境内区块链信息服务备案编号的公告) [Announcement of the National Internet Information Office on the Publication of the First Batch of Domestic Blockchain Information Service Filing Numbers] (2019), http://www.cac.gov.cn/1124305122_15539349948 111n.pdf.

Treating all these nodes as service providers and having them assume obligations, as true information blockchain providers do, would force service providers to minimize the chance of ordinary users participating in the authentication within the blockchain network. This would significantly reduce the credibility of the blockchain, which was designed to provide credible information through the work of all nodes on the network. Witnessing data input by each node without a centralized authority is the essential difference between blockchain and other regular databases. In other words, reducing the number of nodes participating in the network would directly reduce the credibility of blockchain.

The second side effect is that regulations increase costs for service providers. The regulation not only requires service providers to not produce, duplicate, publish, and disseminate illegal content, but also take action to prevent users from engaging in such activities and mitigating the effects users have. Actions like warnings, restrictions, and account closures may be easier for service providers. However, eliminating information that has been published may be difficult, as some of the information that has been written on the blockchain is somehow immutable. This could invalidate the information across the whole chain, which means the previously useful information would also be nullified. To avoid this risk, service providers, especially those having real application scenarios, may need to work extra hard to select and allocate certain information on side chains, which is burdensome for many service providers.

The third side effect is that China's Internet censor is increasingly "authoritarian," as criticized by foreign media.⁹⁹ Blockchain has sometimes been used as a way around the country's strict Internet censorship laws. Blockchain users may take some liberty to express themselves, as the network is somewhat anonymous. However, this new regulation seems to deprive users of such freedoms and subject users to strict Internet censorship once again. According to a report from The Verge in late December of 2018, "typically anonymous blockchain users will now have to reveal themselves," which may dissuade activists and politically-minded individuals from speaking freely on any blockchain.¹⁰⁰ Overall, the regulation appears to be genuinely stringent.

Last but not least, from a governance perspective, the situation of consumers, who are also cryptocurrency holders and could be treated as shareholders in a corporate setting, is not improved, because existing policies and regulations do not shed much light on protecting consumers and investors via both on-chain and off-chain governance.

⁹⁹ Rachel McIntosh, China's Internet Censor Tightens Grip on Blockchain Companies, FIN. MAGNATES (Nov. 1, 2019), https://www.financemagnates.com/cryptocurrency/news/chinas-internet-censor-tightens-grip -on-blockchain-companies (last visited June 21, 2020).

¹⁰⁰ See id.

c. Impacts on the Smooth Integration of Blockchain. Following the twodimension analysis of the smooth integration of blockchain in the previous section, its impacts should also be determined from these two dimensions. One is whether blockchain has been integrated into the existing markets or industries, and the other is whether this integration process is smooth.

Blockchain has indeed been integrated into many areas. For instance, in the legal sphere, the SPC has allowed the use of blockchain to authenticate evidence. This law does not imply replacing existing methods of validating evidence or changing the burden of proof on either party but suggests that the court apply a new tool to ease the burden of proof for the parties. In the insurance industry, blockchain has been applied to a mutual insurance project, Xianghubao, launched by Ant Financial and Trust Mutual Life Insurance. Through the mutual insurance platform, users can share risks and expenses. Many other examples exist and keep evolving.

While the scope of integration is wide, the level of integration may vary. A number of cases of blockchain integration may be mature and put into use, while some cases may still reside at the incubation or experiment stage. For example, the PBOC opened up a new research institute to develop its own digital currency. This move is not to replace the existing monetary system as claimed by some but to experiment with how digital currency can have a role in the economy. There has not been great progress in creating the central bank's digital currency. The integration of blockchain into the existing monetary system or economy is still a long way away.

The process of integration is smooth in most scenarios, but that may not be the case in the cryptocurrency-related field. In many situations, such as the three examples earlier, exploring blockchain's use cases or putting blockchain into use is a stable and smooth process. However, cryptocurrency-related usage, such as when employing cryptocurrencies for fundraising, has not been calm. After the announcement of an all-out ban on ICOs and cryptocurrency exchanges, it sparked a sell-off in cryptocurrencies, which were once extremely popular, has suddenly become taboo. Many companies providing cryptocurrency services went bankrupt. Investors suffered great losses and entrepreneurs left. The whole cryptocurrency market was nearly frozen, though market reactions towards the regulation were foreseeable.

2. Impacts on Technology Innovation.

a. Impacts on the Blockchain Ecosystem. To determine whether China has established a blockchain ecosystem, three elements should be taken into consideration – the industrial ecosystem, the technological ecosystem, and the human ecosystem.

First, the industrial ecosystem has already been formed preliminarily. Encouraged by the MIIT's Five-Year Plan, which claims that China will integrate resources and support key enterprises in blockchain, many new

blockchain startups emerged in 2018. According to the 2018 whitepaper on China's Blockchain Industry, as of 2017, the number of blockchain companies is already at 434, which is 178 more than in 2016.¹⁰¹ The blockchain industry initially formed a scale. According to the 2018 Blue Paper on China's Blockchain Industry Development, published by the Lianta Think Tank, as of October 31, 2018, the number of blockchain companies was 484,¹⁰² exceeding by even more the total number of blockchain companies established by the end of 2017 (See Figure 5).

FIGURE 5. IN RECENT FIVE YEARS, THE NUMBER OF NEWLY ESTABLISHED COMPANIES AND FINANCING EVENTS IN CHINA'S BLOCKCHAIN INDUSTRY



Source: 2018 Whitepaper

These new blockchain companies cover a large variety of industries. The number of blockchain companies providing public chain services is 55, constituting 15% of all newly founded blockchain companies in 2018.¹⁰³ This was followed by firms supplying media services and cryptocurrency-trading exchanges at 44 (12%) and 27 (7%), respectively.¹⁰⁴ All newly emerging companies were divided into seven categories: (1) industry service institutions, such as media companies, communities, human resource institutions, industry associations, and research institutions; (2) financial services, such as payments, supply chain finance, insurance, securities, credits, exchanges, and wallets; (3) real economy, including digital identity, Internet of Things, and digital

¹⁰¹ 2018 Whitepaper, supra note 29.

¹⁰² Lianta he Zhongguo Guoji Jingji Jishu Hezuo Cujinhui Qukuailian Jishu yu Yingyong Gongzuo Weiyuanhui (链塔和中国国家经济技术合作促进会区块链技术与应用工作委员会) [Lianta Think Tank & Blockchain Technology and Application Working Committee of China Association for Promoting International Economic & Technical Cooperation], 2018 Nian Zhongguo Qukuailian Chanye Fazhan Lanpishu (2018年中国区块链产业发展蓝皮书) [2018 China Blockchain Industry Development Blue Book] 1 (2018).

¹⁰³ *Id.* at 2.

¹⁰⁴ *Id.* at 2.

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evidence; (4) social applications, like games, travel, and entertainment; (5) public goods, including education; (6) application development, such as smart contracts, distributed computing, and data services; and (7) infrastructure development platforms, like public chains, side chains, and private and enterprise chains.¹⁰⁵ Table 2 below highlights the distribution of new blockchain industries in 2008.

Industry service	Media platforms (44), communities (10), human
institutions	resource institutions (2), industry associations and
	research institution (1)
Financial services	Credit clearing (4), payments (23),
	Supply chain finance (4), insurance (4), securities
	(9), credit reporting (4), exchanges (27), wallets (8)
Real economy	anti-counterfeits (6), digital identity (4), Internet of
	things (5), marketing (4), intellectual property
	protection (4), digital evidence (1), health(4),
	energy (1), agriculture (2), e-commerce (7)
Social applications	Games (15), social media (11), travel (6),
	entertainment (6), AI (7), real estate (2),
	transportation (2), gambling (5)
Public goods	Culture and education (5)
Application	Smart contracts (15), distributed computing (3),
developments	data services (20), BaaS (3), technical solutions
	(18), mining services (6)
Infrastructure	Public chains (55), side chains (1), cross chains (1),
development platforms	private and enterprise chains (1)
1 1	

TABLE 2. THE DISTRIBUTION OF NEW BLOCKCHAIN INDUSTRIES IN 2008

Source: Block Tower

Following the preliminary formation of the industrial ecosystem, both the technological ecosystem and human ecosystem formed accordingly and spontaneously. As can be assumed, these three ecosystems are interconnected. As the industrial ecosystem covers various industries, it mingles professionals with diverse backgrounds, building communities that connect blockchain participants, such as lawyers, bankers, regulators, blockchain product consumers, blockchain scientists, developers, and entrepreneurs. This connectivity helped create a human ecosystem. Accordingly, a mature industrial ecosystem is inseparable from technical support, inevitably requiring support from other technologies (e.g. AI, Internet of Things, and cloud

computing) to collect and analyze data. It also necessitates upstream services and downstream infrastructures to support the entire ecosystem. Every step requires multiple technologies to perform their unique duties, making the whole blockchain ecosystem run efficiently.

In general, there was a boom in blockchain entrepreneurship in 2018. The blockchain ecosystem formed initially. Blockchain products and services cover many industries, linking up various technologies and connecting participants in the blockchain field accordingly. However, although the development of the blockchain ecosystem is wide horizontally, it is not deep vertically. In particular, this issue refers to the development of blockchain in many industries not yet being sophisticated, systematic, and comprehensive.

For instance, information fragmentation is still a matter being dealt with for the cooperation among different parties in one industry. In healthcare, blockchain has been used to record the medical history of patients. However, this information might not be shared by all medical institutions. As a result, doctors from another hospital may not know a patient's medical history and therefore make less informed medical decisions. Researchers may not have the correct medical information to conduct medical research. Insurance companies may not have the complete and concrete medical history of a potential customer to make a proper assessment of insurance policies. Thus, although China has established a blockchain ecosystem in a preliminary sense, a comprehensive and sophisticated blockchain ecosystem continues to be far off.

b. Impacts on Standardization of the Blockchain Industry. After the establishment of the China Blockchain Technology and Industry Development Forum in 2016, China began to standardize the blockchain industry and has made progress. However, as of now, blockchain standardization work is still in the incubation period. Most of the key standards require development and several hurdles still impede China's standardization work, slowing industrial-scale development.

There are three major forms of progress. First, China commenced proposing standardization frameworks on blockchain technology and blockchain business, thereby offering guidance on subsequent standardization work. Next, following the principle of "emergency first, maturation first," China published the corporate standard, "Blockchain Reference Architecture," and the industry standard, "Blockchain Data Format Specification." The Blockchain Reference Architecture defines blockchain-related terms, specifies the reference architecture, typical features, and patterns for blockchain and distributed-accounting technology, and describes the blockchain ecosystem, as well as the role and functions of each player within the ecosystem.

Following the Blockchain Reference Architecture, China also developed the "Blockchain System Functional Test Plan" to provide system testing and quality control for blockchain applications in various industries and has evaluated blockchain systems of 12 institutions. Through the tests, the plan helps to advance research in the blockchain industry. Combined with relevant blockchain standards, China seeks to improve the comprehensive competitiveness of the blockchain industry and lay the technical foundation for accelerating industrialization.

Second, China promotes the establishment of an independent blockchain open-source community. Since June 2016, China Electronics Technology Standardization Institute has been reaching out to open-source communities, such as the Linux Foundation, Hyperledger, and Ethereum, consulting the community's establishment. In October 2016, China set up the Open-Source Working Group, consisting of many key enterprises, like Wanda Technology, Wanxiang Holdings, Ant Finance, and Weizhong Bank. They took the lead in promoting domestic open-source work beginning with outstanding open-source projects selected from the blockchain development competition. In August 2017, the secretary of the forum held a blockchain open-source community conference, where many rules and regulations in the open-source community, operational plans, and further development were discussed. The forum council also published "China Blockchain Technology and Industry Development Forum – Bylaws for the Open Source Community." These bylaws are based on the Blockchain Reference Architecture and have played a positive role in building the blockchain ecosystem in China.

Third, China has been participating in the formulation of international standards. In April 2016, the Australian Standardization Association submitted a proposal to establish a blockchain technology committee to develop blockchain standards for interoperability, terminology, privacy, security, and auditing to the ISO. The proposal was adopted in September 2016, and the ISO established the Blockchain and Distributed-Accounting Technology Standardization Committee TC307. As of May 2018, ISO/TC307 has 35 participating members and 12 observing members, three working groups on foundation, smart contract and security, and privacy and identity authentication, and three research groups on use cases, interoperability, and governance. The Committee held three meetings in April, November, and May 2018, and China participated fully and acted in a primary role at each meeting. Chinese experts mainly participated in the work of reference architecture, classification, and ontology research, and were responsible for drafting the research report on new blockchain project proposals. At the second meeting, China was selected as a co-author on three projects - international standards of reference architecture on blockchain and distributed-leger technologies, technical standards on classification, and technical standards on ontology. This laid a solid foundation for China to participate in the future and lead the work on international standardization.

Thus, all the evidence shows that China has started blockchain standardization work both domestically and internationally. However, the standards in the domestic and international blockchain fields remain in an incubation period. Most of the key standards are at the development stage, such as terminology and concepts, classification, reference archeology, and ontology. Many other standards have not yet even begun to be developed.

With this, China still faces many issues in standardization work. For one, most domestic blockchain projects continue to be at the concept formation or development phases, lacking successful cases for large-scale applications and implementations. Although the application of blockchain is expanding from finance to supply chain, social welfare, entertainment, and other fields, many of these applications are still immature. A variety of industries and application scenarios remain underdeveloped. At the same time, there are still quite a few misunderstandings in the applications of blockchain. Therefore, in the process of formulating standards, extra effort should be exerted to identify the risks and avoid using cases that may cause misunderstandings.

In addition, China still lacks blockchain experts in standardization work domestic and international standardization work has just started. As such, China has just started cultivating and training talent and practitioners in the blockchain field. In terms of ISO/TC 307 international standardization work, China continues to require more professionals who understand the technology and are familiar with international standardization workflow.

c. Impacts on World-leading Innovation Capability. To determine whether China has obtained world-leading capacity in the blockchain space, a closely related element is the nation's overall innovation capacity. In addition to that, specific indicators in the blockchain field can be used to answer the question.

According to the 2018 National Innovation Index Report, published by the Chinese Academy of Science and Technology for Development (CASTED), China ranked 17th in the world in terms of innovation capability.¹⁰⁶ The report is made up of five primary indicators — the inputs of innovation resources, knowledge creation, enterprise innovation, innovation performance, and innovation environment, described subsequently.¹⁰⁷

The ranking of each indicator is described in Table 3. Each major indicator consists of secondary indicators. For example, the index of innovation resources consists of five secondary indicators; i.e., gross domestic expenditures on R&D as a percentage of GDP, total R&D personnel per thousand members of the population, tertiary enrollment, information level, and R&D expenditure as a percentage of the world's total. The report looked at 40 countries, representing over 98% of the global expenditure on R&D, and used

 $^{^{106}\,}$ China Academy of Science and Technology Development Strategy, National Innovation Index Report 12 (2018).

¹⁰⁷ *Id.* at 91. Innovation resources reflect a country's resources input in innovation activities, the supply of innovation talents and investment in innovation infrastructure. Knowledge creation reflects a country's capability of R&D output and knowledge dissemination. Enterprise innovation reflects the intensity, efficiency and industrial technologies of enterprises in carrying out innovation activities. Innovation performance shows the effect and impact of a country's innovation activities. Innovation environment, which consists of 10 secondary indicators (based on the survey indicators in the annual Global Competitiveness Report of the World Economic Forum), describes the external software and hardware environment underpinning a country's innovation activities.

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the common method of benchmarking analysis to calculate the National Innovation Index.

Indicators	Ranking
Innovation resources	25
Knowledge creation	7
Enterprise innovation	11
Innovation performance	18
Innovation environment	16

TABLE 3. RANKINGS OF CHINA'S INNOVATION CAPABILITIES

Source: 2018 National Innovation Index Report

As an emerging new technology, innovation in the blockchain field is closely related to China's innovation capability. For example, part of the R&D will flow into the blockchain industry, and part of the knowledge creation — IPs and SCI papers — will also emanate from the blockchain industry. However, owing to the lack of statistics, there are no concrete numbers on the innovation capability of blockchain as the National Innovation Report Index has. With limited data available, inspired by both Chinese and international theories and methodologies for evaluating national competitiveness and innovation, this article selects indicators from two aspects- input and output. Input indicators consist of the total amount invested in the blockchain industry and policy support, while output indicators are the number of blockchain patents and research papers.

The first indicator is the total amount invested in the blockchain industry. According to the 2018 China Blockchain Industry whitepaper, from January 2018 to December 2018 there were 433 deals in China worth a total exceeding RMB13.5 billion (around \$1.985 billion).¹⁰⁸ In 2018, there were 269 new blockchain startups, 162 of which had received investment.¹⁰⁹ According to Crunchbase news, a little more than five months into 2018, the reported dollar volume invested in VC rounds raised by blockchain companies worldwide was near \$1.3 billion and the number of deals was 220 (excluding ICOs).¹¹⁰ Although the data on the total amount invested and the number of deals worldwide throughout the year of 2018 is lacking, it is fair to conclude that total

¹⁰⁸ 2018 Whitepaper, supra note 29.

¹⁰⁹ 2018 Whitepaper, supra note 29.

¹¹⁰ Jason Rowley, *With at Least \$1.3 Billion Invested Globally in 2018, VC Funding for Blockchain Blows Past 2017 Totals*, TECHCRUNCH (May 21, 2018), http://social.techcrunch.com/2018/05/20/with-at-least-1-3billion-invested-globally-in-2018-vc-funding-for-blockchain-blows-past-2017-totals (last visited June 21, 2020).

capital invested in China and the number of deals in China constituted more than 50% of the total capital and deals worldwide (See Table 4).

IN CHINA			
	Venture investment in	January to May	January to
	blockchain	2018	December 2018
Worldwide	Total capital invested	\$1.3 billion	-
	The number of deals	Roughly 220	-
China	Total capital invested	-	Roughly
			\$1.985billion
	The number of deals	-	433

TABLE 4. VENTURE INVESTMENT IN THE BLOCKCHAIN INDUSTRY WORLDWIDE AND

Source: TechCrunch

Furthermore, China has launched many blockchain industry funds. As of December 2018, nine provincial (municipal) governments across the country have introduced blockchain industry funds based on their own conditions, totaling nearly RMB40 billion. Among them, Hangzhou Xiong'an Global Blockchain Innovation Fund was the earliest fund in the country. The funds initiated by Hangzhou, Nanjing, and Henan have all reached RMB10 billion, making them the largest blockchain industry funds. With the support of these industry funds, blockchain applications and implementations in these provinces and cities become easier and more feasible, bolstering blockchain innovation.

The second indicator is policy support. Among countries racing to develop blockchain policy, China, including the central government and local governments, has issued 119 policies on blockchain according to the 2018 China Blockchain Industry whitepaper, with 35 policies issued in 2018 alone.¹¹¹ This high number of policies demonstrates that China attaches major significance to the development of blockchain. There is no concrete number as to how many policies other countries have issued, but the attitude of policy support can be concluded from the policies already issued in those countries. While some countries are seen as very policy friendly to the blockchain, such as Singapore and Switzerland, others are being very cautious, such as the U.S. and the U.K., while Chinese regulators and policymakers' attitudes are very clear. They acknowledge the difficulties and uncertainties concerning blockchain regulation and take a very supportive stance on the further development of the technology, but ban cryptocurrency activities rigorously.

In terms of output indicators, the number of blockchain patents is important. The World Intellectual Property Organization (WIPO) recently reported that there were at least 1,060 patents for blockchain that were approved in

¹¹¹ 2018 Whitepaper, supra note 29.

2018.¹¹² China was the top nation for receiving patents with 790 patents approved, followed by the United States with 762 approvals, South Korea with 161 approvals, and Australia with 132 approvals.¹¹³ In 2017, China also filed the most blockchain patents with the WIPO. According to Thomson Reuters, "Fifty-six percent (226) of blockchain patent applications last year [2017] came from China; 22 percent (91) from the United States, highlighting the ongoing "land grab" for IP rights. The number of patent applications from China quadrupled last year."¹¹⁴In third place is Australia at 13 blockchain patents, though "of the top nine filers of blockchain patents between 2012 and 2017, six were Chinese, led by Beijing Technology Development".¹¹⁵

	Number of blockchain patents filed		
	2016	2017	Total number by
			2018
China	59	226	790
United States	21	91	762
Australia	19	13	132

TABLE 5. NUMBER OF BLOCKCHAIN PATENTS FILED

Source: Thomson Reuters

At the WIPO Blockchain Workshop in April 2019, a patent landscape report capturing patent applications within the field of blockchain technology between 2013 to 2018 was presented. The report identified Alibaba (a Chinese Internet giant), Bank of America, and IBM as some of the largest patentees in the area.¹¹⁶ A report published by IPRdaily portrayed the top 100 companies with blockchain patents published by August 2018.¹¹⁷ Alibaba is the world's leading enterprise for the number of blockchain patents published, with the PBOC's Digital Currency Research Institute the fifth. Out of the top 10 companies, five were Chinese and three were from the U.S. (see Table 6). In

¹¹² WIPO: China Leads in Number of Blockchain Patents, ASIA BLOCKCHAIN REV. (Mar. 27, 2019), https://www.asiablockchainreview.com/wipo-china-leads-in-number-of-blockchain-patents (last visited June 21, 2020).

¹¹³ See id.

¹¹⁴ In Rush for Blockchain Patents, China Pulls Ahead, THOMSON REUTERS (Mar. 26, 2918), https://blogs. thomsonreuters.com/answerson/in-rush-for-blockchain-patents-china-pulls-ahead (last visited June 21, 2020).

¹¹⁵ Laura Noonan, *China leads blockchain patent applications*, FIN. TIMES (Mar. 25, 2018), https://www.ft.com/content/197db4c8-2e92-11e8-9b4b-bc4b9f08f381(last visited June 21, 2020).

¹¹⁶ WIPO Blockchain Workshop Probes Business and IP-Administration Uses, WIPO (May 8, 2019), https://www.wipo.int/cws/en/news/2019/news_0005.html (last visited June 21, 2020).

¹¹⁷ 2018 Nian QuanQiu Qukuailian Zhuanli Qiye Paihangbang (TOP100) (2018年全球区块链专利企业 排行榜(TOP100))[2018 Global Blockchain Patent Enterprise Rankings (TOP100)], IRP DAILY, http://www.

iprdaily.cn/news_19746.html (last visited June 21, 2020).

2017, out of the top 100 companies, 49 were from China with Alibaba again ranking top while 23 were from the U.S. 118

Companies	Country of	Number of	Ranking
	origin	blockchain patents	
Alibaba	China	90	1
IBM	US	89	2
MasterCard	US	80	3
Bank of America	US	53	4
Bank of China	China	44	5
Nchain	UK	43	6
Coinplug	South Korea	41	7
Tencent	China	40	8
Fuzamei	China	39	9
Technology			
Weichain	China	38	10

Table 6. TOP 10 COMPANIES WITH THE NUMBER OF BLOCKCHAIN PATENTS

Source: WIPO

The third indicator is the number of blockchain papers published in the EI database. According to the data from Lianta, a Chinese think tank, the top 10 institutions publishing blockchain papers are located across the globe with four institutions from Europe, four from the U.S. and only one from China (See Table 7).

Name	Counts
ETH, Zurich, Switzerland	25
NEC Laboratories	11
Computer Science Department, Cornell University,	11
Ithaca, NY, United States	
Beihang University, Beijing, China	10
Newcastle University, Newcastle Upon Tyne, United	9
Kingdom	
University of Athens, Athens, Greece	9
Data61, CSIRO, Sydney, Australia	8
University College London, London, United Kingdom	8
Microsoft Research	8

TABLE 7. NUMBER OF BLOCKCHAIN PAPERS PUBLISHED IN THE EI DATABASE

¹¹⁸ See id.

Stanford University, California, United States	7	
Source: Lianta		

In conclusion, although four indicators do not sufficiently capture all aspects of the blockchain industry and the state of blockchain development, they can, to some extent, explain China's innovation capability in blockchain. From the data available and the analysis presented herein, it can be concluded that China's overall innovation capability is at the medium-to-high level globally. China is in a leading position among other developing countries. China's ability to innovate has seen very significant progress, but there is room to improve. In the blockchain field specifically, China is a leader in the number of blockchain patents, the amount of capital invested and the number of deals in blockchain, and great policy support. However, Chinese blockchain research, i.e., research papers, is not as robust as other indicators in the global rankings.

IV. CONCLUSION

With the Chinese State Council embracing blockchain in its 13th Five-Year Plan and the wild ride of cryptocurrency attracting the nation's attention in 2017, Chinese policymakers and regulators have rolled out a raft of policies and regulations to create a safe and stable market for blockchain development and promote innovation. Regulators are eager to lay out the framework and standards that will accelerate industry adoption of blockchain technology and build a blockchain ecosystem while protecting and educating investors amid the nascent and unregulated cryptocurrency ecosystem. Generally, Chinese policymakers and regulators' attitudes toward blockchain and its related businesses are pro-blockchain technology at the same time anti-cryptocurrency.

It has been at least four years since China started issuing policies and regulations consistently and regularly in the blockchain field. We have already witnessed a portion of the impacts of some policies and regulations meant for the blockchain industry, yet other policies and regulations' impacts may be hard to estimate. After assessing the impacts that a number of these policies and regulations generated, it is fair to conclude that some of the objectives of the existing policies and regulations were fulfilled while others were not. Some new questions were raised especially under the guidance of the first objective - market stability and safety. In terms of technology innovation, China's overall innovation capability is at the medium-to-high level globally. While China is in a leading position among other developing countries, there is room to improve, and it can benefit from policy support in this area. It is recommended that China consider continuity in learning how policies and regulations can guide and affect the blockchain industry, and thus adopt better adjustments to mitigate any issues regarding blockchain policies and regulations.

The scope of this article is limited; thus, it gives room for future research. This article analyzes the impacts of blockchain policies and regulations from

two angles — market stability and safety and technology innovation. Future research can analyze impacts from different angles, such as equability, social justice, international cooperation, and many more. Analyzing impacts from more angles can help grasp a bigger picture of how policies and regulations can affect and shape blockchain development in different areas. Moreover, the article solely focuses on the impact assessment of China's policies and regulations and does not address situations in other jurisdictions. It would be valuable to study experience in other jurisdictions from a comparative view to offer applicable experience in certain jurisdictions and to fulfill the potential of blockchain.