

Survey on Blockchain Technologies and Related Services FY2015 Report

28 April 2016

**Information Economy Division
Commerce and Information Policy Bureau**

The Aim of the Survey

Background

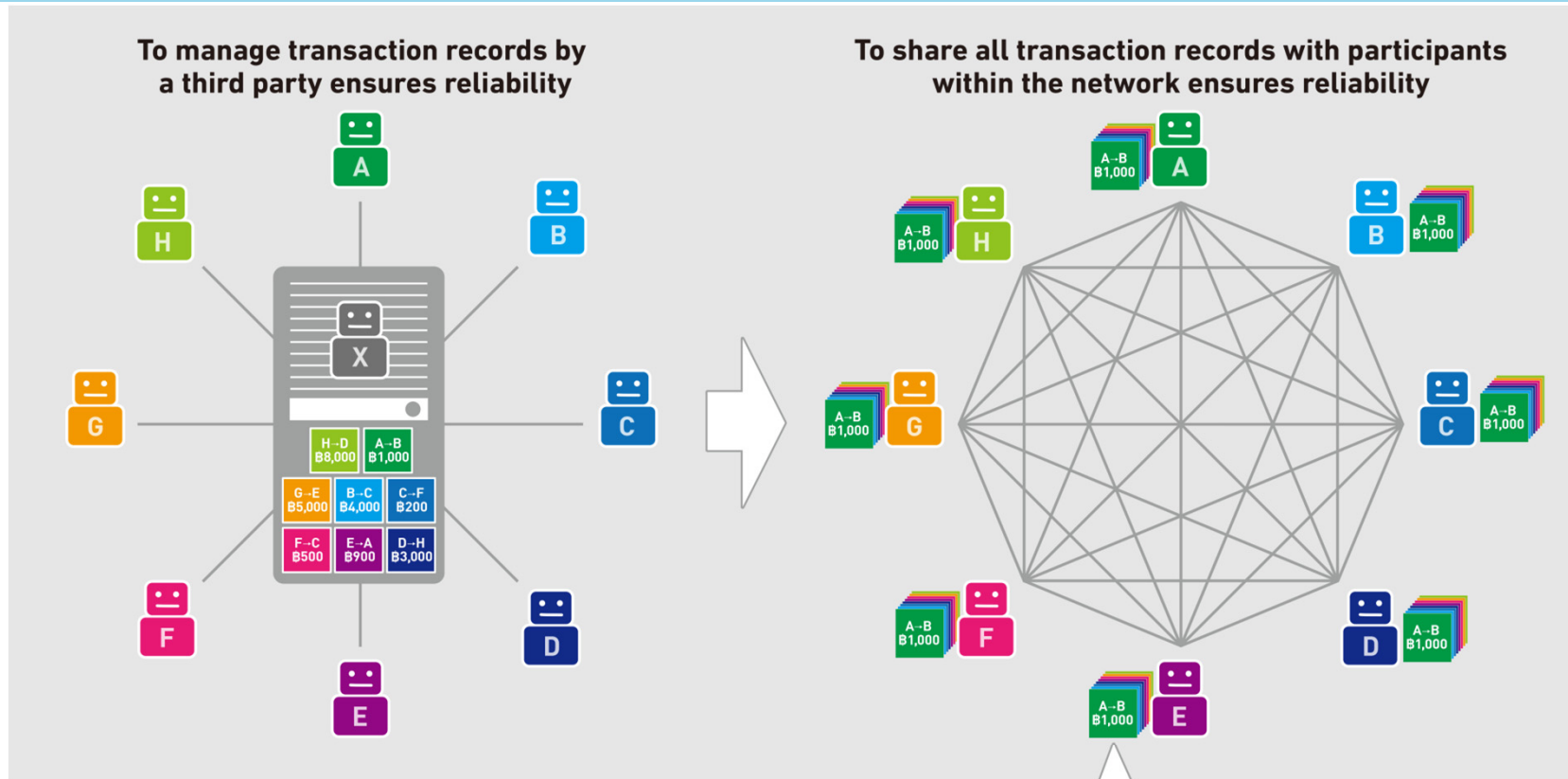
- As Bitcoin has received global attention, blockchain technology is believed to be applied not only for financial but also for non-financial industries. It has the potential to be the next-generation platform in all industries.
- It is said that blockchain technology has 3 merits compare to present centralized management IT systems.
 1. Hard falsification
 2. No downtime in effect
 3. Inexpensive systems
- The Ministry of Economy, Trade and Industry (METI), Japan, identifies the potential impact and releases this information to the public.

Purpose

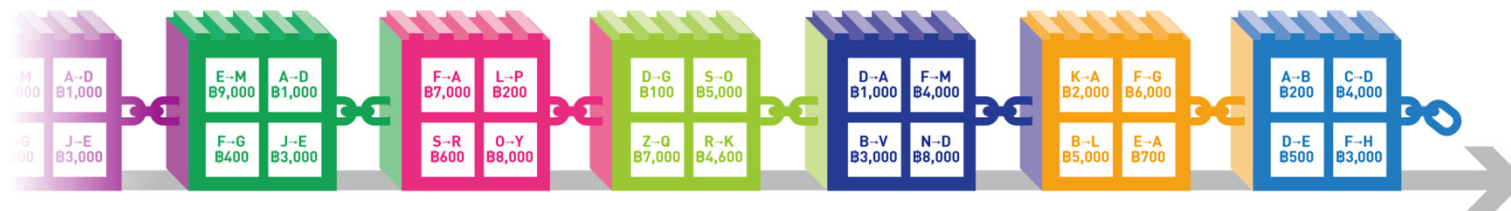
- Comparing and analyzing details of numbers of blockchains and advantages/issues therein
- Ascertaining promising fields in which the technology should be utilized
- Ascertaining the impact of the technology on society and the economy
- Developing policy guidelines for encouraging industries to utilize the technology in the future

What is Blockchain?

- Blockchain enables transaction between individual participants without a third party.



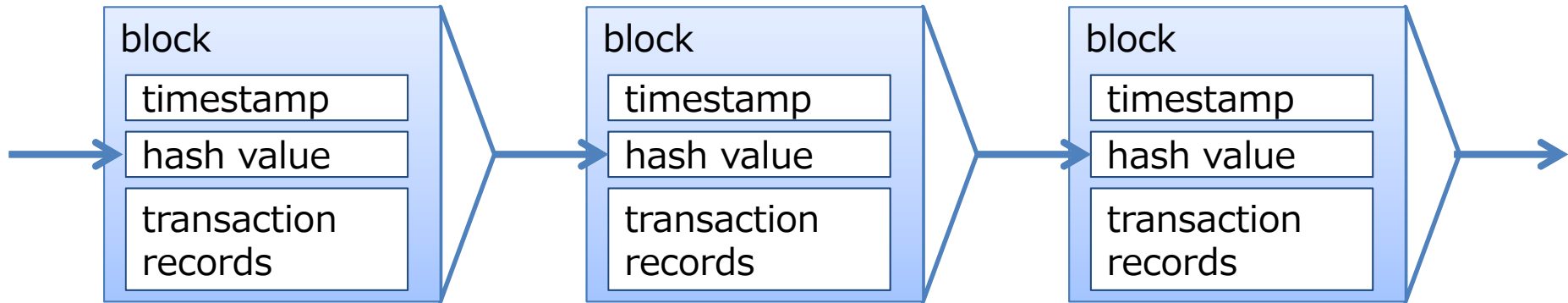
Blockchain: Transaction records are stored in blocks, and these are added to a chain of existing blocks. It is hard to falsify because blocks are connected by cryptographic technology.



Blockchain technology

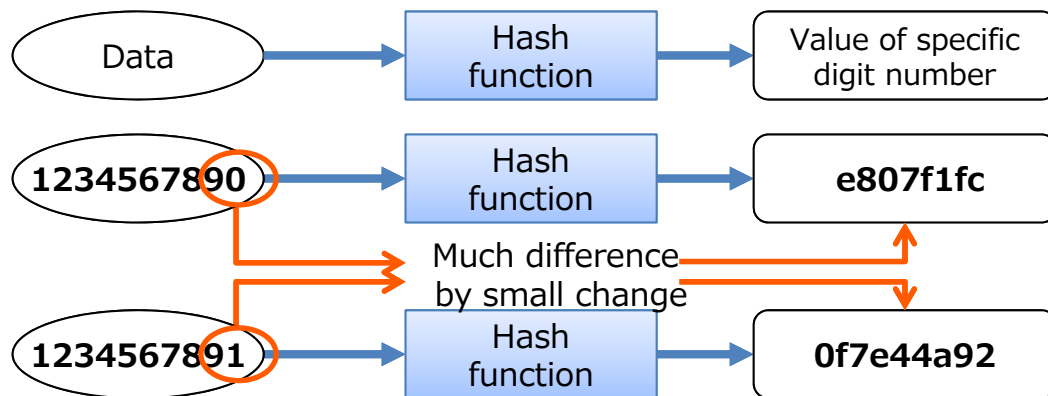
- It was developed for the Bitcoin system and is based on cryptographic technology.

Blockchain conceptual image



- Transaction records are stored in blocks, and these are added to a chain of existing blocks.
- Participants within the network approve the creation of a new block.

Hash value (cryptographic technology)

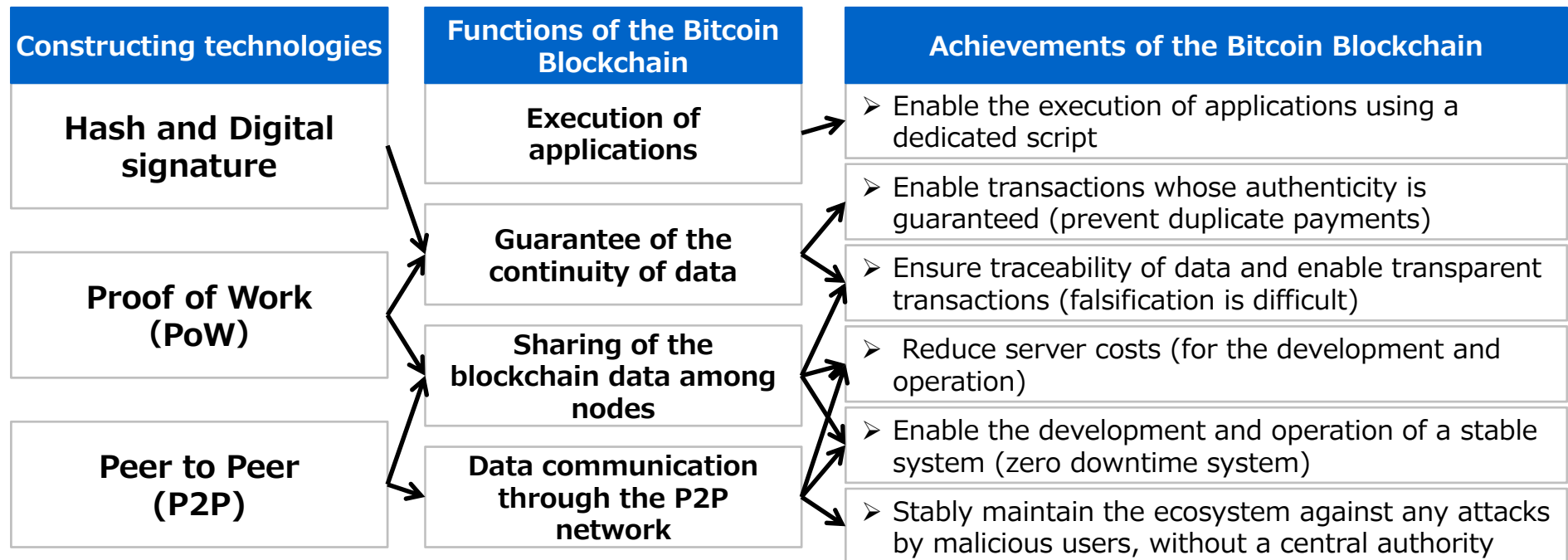


Transaction records

In Bitcoin, transaction data such as 5 BTC from A address to B address

Functions and Challenges of Bitcoin Blockchain

- There are feasible matters and challenges relating to several industrial fields.



【Challenges】

1. It takes a long time to create and add a new block to the chain

It is not applicable for real-time data processing because it takes from a few seconds to 10 minutes to create and add a new block to the chain.

2. There are a limited number of transactions per specified time

Number of transactions per second is worse than present settlement system like VISA because blockchain specification provides a limitation of block data volume, and an delay to create new blocks.

3. There is no method of applying to real business

There is no SLA (Service Level Agreement) because there are not enough examples for business applications/services

Recent Trends of Blockchain Technology

- Improvement and progress of blockchain technology have been provided along three axes*.

① Generalization/ Diversification of objects handled by blockchain

Shortening of time to create new block		Record / Transaction of [Value (Numeric) Information]	Record / Transaction of [Property rights] or [Rights to enjoy service]	Registration of [Processes] and [contracts]	
	PoW	Bitcoin • Abra • Openbazaar • Everledger • Ascribe • BitHealth • Filament ...	"altcoin" • Litecoin • Monacoin ...	Counterparty • Swarm • Getgems • Storj ...	Colored Coins • Swarm • Colu • Votosocial ...
Improve of consensus algorithms	Nxt • Voxelnauts Orb Peercoin Ripple Stellar		NEM Bitshares mijin	Ethereum • Augur • Filament ... Possible to construct blockchain system freely Eris • Everledger	

Omni
Possible to issue unique tokens

③ Condition setting for joining P2P network



(*) Three Axes

- extend the objects handled by blockchain from only numeric information to rights and/or conditions of contracts, etc.
- improve consensus algorithms to shorten time to create new blocks.
- select who can join the network to shorten time to create new blocks and mitigate load

Case Examples Which are Utilizing Blockchain Technology

- While Improving Bitcoin blockchain, various case examples which are utilizing blockchain technology (so-called "bitcoin 2.0") have been offered for non-financial industries.

<p>Finance</p> <p>Payment (SETL, FactoryBanking)</p> <p>FX·Remittance·Saving (Ripple, Stellar)</p> <p>Stock exchange (Overstock, Symbiont, BitShares, Mirror, Hedgy)</p> <p>Bitcoin trading (itbit, Coinffeine)</p> <p>Social banking (ROSCA)</p> <p>Remittance for immigrants (Toast)</p> <p>Remittance for Developing countries (Bitpesa)</p> <p>Remittance for Muslim (Abra, Blossoms)</p>	<p>Point/Reward</p> <p>Gift card exchange (GyftBlock)</p> <p>Reward for Artists (PopChest)</p> <p>Prepaid card (BuyAnyCoin)</p> <p>Reward Token (Ribbit Rewards)</p> <p>Finance Arrangement</p> <p>Artist equity trading (PeerTracks)</p> <p>Cloud funding (Swarm)</p> <p>Communication</p> <p>SNS (Synereo, Reveal)</p> <p>Messenger (Getgems, Sendchat)</p>	<p>Asset mgmt</p> <p>Bitcoin asset mgmt (Uphold(Bitreserve))</p> <p>Land registration (Factom)</p> <p>Storage</p> <p>Data storage (Stroj, BigchainDB)</p> <p>Authentication</p> <p>Digital ID (ShoCard, OneName)</p> <p>Certification Of Authenticity (Ascribe/VeriSart)</p> <p>Verification of medicine (Block Verify)</p> <p>Sharing Services</p> <p>Ride sharing service (La'ZooZ)</p>	<p>Distribution mgmt</p> <p>Supply chain mgmt (Skuchain)</p> <p>Tracking mgmt (Provenance)</p> <p>P2P market place (OpenBazaar)</p> <p>Gold storage (Bitgold)</p> <p>Diamond ownership (Everledger)</p> <p>Digital asset mgmt & trading (Colu)</p> <p>Contents</p> <p>Media streaming (Streamium)</p> <p>Games (Spells of Genesis, Voxelnauts)</p> <p>Future prediction</p> <p>Future / Market prediction (Augur)</p>	<p>Public sector</p> <p>Visualization of civic budget (Mayors Chain)</p> <p>Voting (Neutral Voting Bloc)</p> <p>Virtual nation/ Space dvlpmt (BitNation/Spacechain)</p> <p>Basic incomes (GroupCurrency)</p> <p>Medical</p> <p>Medical information (BitHealth)</p> <p>IoT</p> <p>IoT (Adept, Filament)</p> <p>Mining chip (21 Inc, Bitfury)</p>
--	--	--	---	---

Demonstration Experiments Using Blockchain

- Large overseas companies have been conducting various demonstration experiments using blockchain technology.
- Domestic companies are becoming gradually active to publish results of their research and demonstration experiments.

R3 CEV

42 global financial institutions compose a consortium to construct private distributed ledgers and to conduct several demonstration experiments.

NASDAQ Chain, etc.

Nasdaq announced “Nasdaq Linq” as a blockchain based system for transaction and registration of private security.

Linux Foundation IBM, etc.

Linux Foundation announced “Open ledger project” which is utilizing blockchain technology to develop a framework based on open source distributed ledger and to train/cultivate its engineers.

NTT Service Evolution Laboratories

NTT Service Evolution Laboratories announced its research result regarding a content license management system using blockchain technology as a simple and convenient solution for movie content license management technology.

Nomura Research Institute

Nomura Research Institute (NRI) has been conducting demonstration experiment using blockchain technology to apply business operation of securities, while collaborating with SBI Sumishin Net Bank and Dragonfly FinTech to promote materialization of its application of the technology.

Estimated Size of Market Which Blockchain Technology Can be Effectively Applied

- Possibility to affect broad and various business domains.

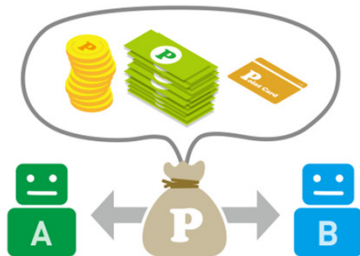


Possibility to change society through blockchain technology



(*) Described amount of money is the estimated size of market which blockchain technology may affect.

01 Providing infrastructure for circulation of value and platform for loyalty point program

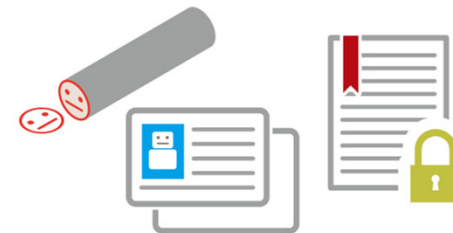


Local currency Electronic Coupon Loyalty point program

Distribute and manage local currency issued by local municipalities, etc. on blockchain

Market size
1 Trillion Yen

02 Decentralization of issuance of entitlement certificate, etc.

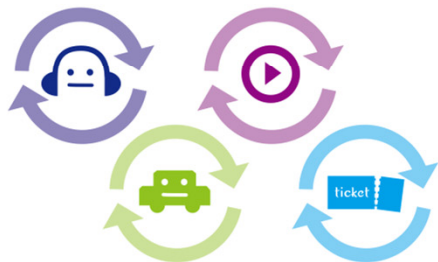


Land Registration Electronic medical chart Various registration (Birth/Marriage/Change of address)

Register, bulletin and manage information regarding present state and/or right of land on blockchain.

Market size
1 Trillion Yen

03 Minimization of idle assets to realize highly efficient sharing economy



Digital content Ticket service C2C auction

Register the right to use assets, etc. and record feedback comments from users and providers on blockchain.

Market size
13 Trillion Yen

04 Realization of transparent, highly efficient, highly reliable supply chain

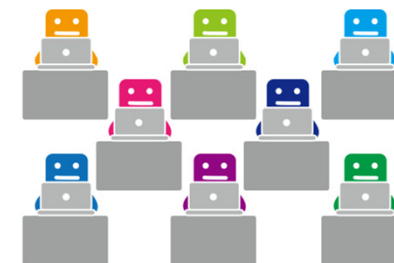


Retail Jewelry Management Authenticity Certification of art objects, etc.

Track the whole process of distribution from raw materials to point of sale by blockchain

Market size
32 Trillion Yen

05 Total automation and streamlining of processes and contracts



Will/Bequest IoT Power supply service

Pre-register the conditions of contracts and processes which will be enforceable in future on blockchain.

Market size
20 Trillion Yen

Impacts on Socioeconomy Possibly Caused by Blockchain Technology

- Possibility to affect and change industrial structure.

Providing infrastructure for circulation of value and platform for loyalty point program

- ※ ● Loyalty points may have a larger influence on the overall economy than its amount of issuance because it can be used for payments for entities which are not the issuer of the points and may circulate in the market like legal currency.
- Therefore, there is a possibility to implement a monetary policy conducted by private sector.

※ some examples of possible change in industrial change due to blockchain technology

Decentralization of issuance of entitlement certificate, etc

- IT systems for land registration and patent filing/registration etc., can be replaced by open and decentralized systems. Possibility to reduce operational cost of local municipality and government.
- Possibility to change and/or replace the process of identity confirmation.

Minimization of idle assets to realize highly efficient sharing economy

- Other than minimization of idle assets, management of right to enjoy services can be dramatically efficient. Eventually, C2C transactions can be completed without any platformer of sharing economy.
- “Prosumer” can be communized due to disappearance of boundaries between producer and consumer.

Realization of transparent, highly efficient, highly reliable supply chain

- Inventory information which is currently fragmented by retailers, wholesales and manufacturers and information of hot-selling products which is currently dominated by retailers can be shared among all stakeholders and can be utilized to realize a highly efficient supply chain while strengthening negotiation power of manufacturers.
- After-sales services can be easier due to the technology to track the product life cycle and manufacturers can change business from a selling out model to a service provider model.

Total automation and streamlining of processes and contracts

- Large portion of back-office operations (payments, enforcement of contract, workflow for request for decision, etc.) can be replaced.
- Combination of IoT and micropayment of Smart Contract may enables to create mechanism to share the cost of public services which reflects beneficiaries-pay principle more properly. (ex. Tax levy mechanism based on the amount of trash, utilization volume and/or use frequency of roads)

Things Required for Policy

- To promote implementation of the technology to society, it is not only required to support demonstration tests conducted by the private sector, but also to conduct demonstration by the government itself to make its usability public.

- ① **Promoting demonstration tests in the private sector to verify new business in which blockchains are utilized, and accumulating and broadly publicizing the results and challenges thereof, thereby facilitating the development of markets.**

ex : Demonstration experiments such as a point program in a limited area, an electric ticket service using blockchain technology. And formulate a standardized Service Level Agreement (SLA) for IT system/service using blockchain technology, etc.

- ② **Encouraging the verification of blockchains from the aspects of mathematics and information theory, which have been lacking areas, while taking advantage of the existing accumulated technologies, e.g., cryptography.**

ex : Academic networks among research institutions and researchers, etc.

- ③ **Advancing the introduction of blockchains into administrative areas, while further enhancing and promoting the efficiency of administrative services, thereby exercising leadership and showing a role model in the field.**

ex : document management, patent registration, land registration, voting, levy, marriage registration, birth registration, etc.

- ④ **Revising the related regulations or rules if necessary so as to smoothly implement blockchains in society.**

ex : Consumption Tax Act (taxation on virtual currency, etc.), Act on Settlement of Funds (International payment), electronic signature law (clarification of legal admissibility of evidence), etc.