

**Realizing a Reliable Fourth Industrial Revolution**  
**「Blockchain Technology  
Development Strategy」**

**June 2018**



**Ministry of Science and ICT**

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# I. Background

- The global blockchain market is expected to grow by **more than 10 times in the next 5 years**
  - ※ By '25, 10% of the total global production will be saved using blockchain technology ('16, WEF)  
Blockchain associated markets will grow to 176 billion USD by '25 and 3.1 trillion USD by '30 ('17, Gartner)
  - **Countries around the world** are attempting **integration into various fields** such as finance, logistics, and medicine considering the growth potential of blockchain technologies and are actively pursuing **technological development**
    - ※ IBM has carried out more than 100 projects in '17 / US and UK has increased investments in technological development since '16 / Blockchain patent applications (Jan. '18, Korean Intellectual Property Office): US 497, China 472, Korea 99, Japan 36, etc.
- Blockchain is a technology that not only simplifies procedures and reduces costs but also **reinvents the way we work**; hence its high growth potential as it improves **social benefits**
  - There were disputes in our society due to the recent overheating of cryptocurrency, but small and medium-sized enterprises and software/communication companies in Korea are **continuously working on promoting the blockchain market**

SMEs specializing in blockchain	SW, communication, internet portal companies
<p><b>(B Company)</b> Various practical experiences such as development of independent blockchain software, acquisition of GS certification, electronic voting, over-the-counter stock trading, etc., attracted 5 billion KRW in VC investments</p> <p><b>(C Company)</b> 2nd in the world in blockchain patents (44 patents), cooperating with the financial sector for self-identification, overseas remittance, etc.</p>	<p><b>(Samsung SDS/LGCNS)</b> Developed independent blockchain SW and applied to subsidiaries, tested multiple times for marine logistics, etc.</p> <p><b>(SKT/KT)</b> Composed a dedicated organization, applied blockchain technologies to mobile ID verification, electronic document management, etc.</p> <p><b>(Naver/Kakao)</b> Established a blockchain technology subsidiary</p>

- Blockchain, which first appeared in 2009 as the configuration technology of Bitcoin, is **still in its early development stage**; currently, developer-oriented **technological progress\*** is actively being carried out
  - \* **1st generation** (cryptocurrency/'09~'14) → **2nd generation** (smart contract, decentralization app/'15~current) → **3rd generation** (scalability, interoperability/future)
  - In the event of lagging behind in the race for developing blockchain technologies, there is **risk of becoming dependent on global companies** such as the computer operating system (99%) or database (90%) sectors
  - For the development of blockchain technologies, cases of **enhancing social benefits** and **business model innovations** must be presented to promote the **early formation** of blockchain markets, and it is also necessary to support actively the **development of foundational technologies** and **fostering of personnel** needed by domestic companies

Blockchain is a **field that Korea can excel in** as we have **strengths in ICT technologies**  
 ⇒ **Assertive policies are needed** to secure national competitiveness in advance

## II. Changes that Blockchain Technology will Bring

- The strength of blockchain technologies lies with reducing transaction costs and preventing data forgery and tampering, and it can be combined with **various industries** to enhance **efficiency** and create **new economic value**

<p><b>① Financial sector</b></p> <ul style="list-style-type: none"> <li>• Transaction of unlisted stocks</li> <li>• Indemnity insurance claims</li> </ul>	<p><b>② Medical sector</b></p> <ul style="list-style-type: none"> <li>• Personal medical information management</li> <li>• Share genetic information</li> </ul>	<p><b>③ Contents sector</b></p> <ul style="list-style-type: none"> <li>• Digital sound source distribution</li> <li>• Photo copyright management</li> </ul>
<p><b>④ Public sector</b></p> <ul style="list-style-type: none"> <li>• Distribution of electronic certificates</li> <li>• Online voting</li> </ul>	<p><b>⑤ Logistics·distribution sector</b></p> <ul style="list-style-type: none"> <li>• Personal customs clearing</li> <li>• Diamond distribution</li> </ul>	<p><b>⑥ Energy sector</b></p> <ul style="list-style-type: none"> <li>• Power trading between neighbors</li> <li>• EV charging</li> </ul>

- ① **Finance**: Changed the role of financial institutes as representative third-party trusted institutes

- o Groundbreaking changes to the financial industry are expected due to blockchain, “**Most banks will disappear within the next 10 years.**” (David Yermack, professor at New York University, '18)

<b>Safely and quickly trade unlisted stocks</b> (US NASDAQ, '15)
<p>△ Unlisted stocks trade money and stocks between <b>buyers and sellers</b> (direct trade or wire transfer) or get traded through an <b>intermediary</b>, and it takes <b>2~3 days</b> for settlement and reflection in the books</p> <p>☞ By applying blockchain technologies in over-the-counter stock transactions, the time it takes for the transaction can be shortened to <b>within 10 minutes</b>, and the company issuing the stocks can identify stockholder status and investment capital flow in real-time</p>

<b>Easy claims for indemnity insurance</b> (Kyobo Life, '17)
<p>△ Due to the inconvenient procedure in receiving medical record copies, etc. from hospitals and submitting them to insurance companies, there are <b>many cases of giving upon claiming insurance money</b> when the amount is small</p> <p>※ Rate of not claiming insurance money for medical treatment costing less than 10,000 KRW is <b>51.4%</b> ('15 survey of Korea Insurance Research Institute)</p> <p>☞ When an indemnity insurance subscriber pays fees to hospitals, the hospital and insurance company can <b>share treatment records in real-time*</b> that can allow <b>automatic insurance claims</b> without submitting documents</p> <p>* Insurance claims and transmission of medical records occur instantly through blockchain-based integrated certification</p>

② **Medical:** Secure personal medical sovereignty, promoting industries associated with health care

- o Safely and conveniently use personal medical information using blockchain to promote the creation of new health care businesses centered on medical information entity

<b>Medical information platform managed by individual users</b> (M Company, developing in '18)
<p>“People don’t go to just one hospital, but it is difficult for medical institutes to share data.”- CEO of M Company</p> <p>△ Hospitals <b>manage medical information independently</b>, and examination results of individuals are offered in DVD (i.e.: CT, MRI) or print-outs (i.e.: blood tests), <b>making it difficult to store and use</b></p> <p>* In the case of medical information exchange projects between medical institutes, they cannot be viewed by patients and it is possible in 1,322 hospitals out of the approximately 30,000 hospitals and clinics ('17)</p> <p>☞ As medical information can be managed directly through individual smart phones, it is possible to <b>prevent overlapping tests</b> and <b>systematically manage medical information</b> such as when and where examinations and treatments were received</p>

③ **Contents:** Present plans for the changing contents distribution system and to protect copyrights

- o Provide direct contents compensation system and lead new changes in contents management, distribution, and settlement centered on the creator through highly reliable copyright protection

<b>Transparent digital sound source distribution with high profitability and fast payment</b> (UK UjoMusic, '17)
<p>“The profit structure of the music industry that does not allow earning enough money with only music must be changed.”- Singer L</p> <p>△ Distribution of profits in the music market is centered on the production and distribution company, and the amount received by the <b>copyright holders</b> and <b>performers</b> (singer, performer) is low, and they are <b>settled and paid monthly</b></p> <p>☞ Through transparent music records management, it is possible to <b>double the profits of</b> music distributors, copyright holders, and performers, and <b>profits can be immediately shared</b> when a user purchases music</p>

④ **Public:** Securing the convenience and reliability of public services and increasing national participation

- o Reinvent the public sector by enhancing the reliability of public services, reducing unnecessary administrative expenses, expanding the direct participation of the private sector, etc. through blockchain

**Convenient and reliable online voting** (National Election Commission, developing in '18)

△ The National Election Commission receives applications of schools, apartment, etc. to provide smartphone and PC-based **online voting services** (K-Voting), but **due to concerns of hacking and fabrication** it is not used in **official elections**

\* The Election Committee online voting was used a total of 3,786 times (Apr. '18) / The US Virginia election commission **canceled online voting plans** ('15) due to concerns over hacking. In the British general elections, **it was decided not to accept online votes** ('17) in order to prevent hacking concerns in advance

☞ **Stakeholders** such as candidates, observers, etc. can directly **verify the vote counting process and results** by recording online voting information on blockchain, thus making reliable online voting possible

- By using the features of blockchain wherein hacking and fabrication are impossible, it can be used in **official elections**, etc. to contribute to **configuring direct democracy**

**5 Logistics/Distribution:** Innovation through real-time logistics tracking and management automation

o Secure real-time traceability and advance distribution such as inventory management optimization, authenticity verification, etc. using blockchain participated in by various stakeholders

**“Faster direct overseas purchase,” personal customs clearing that is fast and which can prevent false reports** (Korea Customs Service, developing in '18)

△ Customs clearing for electronic commerce is carried out in the order of shopping mall → express cargo company → customs, and for the **33 million** ('17) **imported items declaration** (express cargo company) and **verification** (Korea Customs Service) process, it takes about **12 hours per case**

☞ As information related to clearing customs is shared with the shopping mall, express cargo company, and customs service, **real-time import declaration** is possible and **under-value declaration can also be prevented**

**6 Energy:** Create new energy projects through transparent energy transactions, demand management optimization, etc.

o Through energy block chain, the construction of energy trading systems, expansion of trading of renewable energy, and acceleration of discovery of future energy industries are expected

**Real-time power trading between neighbors** (Cuevel Village, Netherlands, '17)

“The traditional power industry will be threatened by the implementation of blockchain” -Bloomberg

△ About **150 solar power panels** were installed on rooftops to produce 36,000kWh of power annually, and **residual power** is exchanged and used

together by the community

☞ Homes that have leftover and that do not have enough power are **connected in real-time** and the power trade details are recorded in blockchain making it possible to **realize an ideal microgrid** through effective power distribution

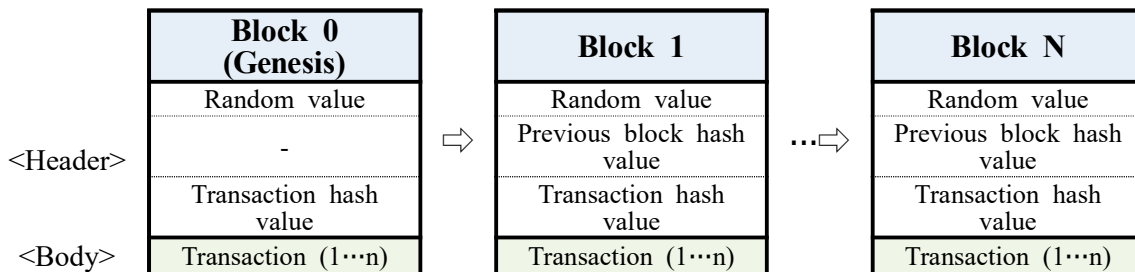
\*Coins called Jouliette are used for power trading, and this coin can be used to purchase food and beverages at cafes in the village

### III. Technological Features of Blockchain

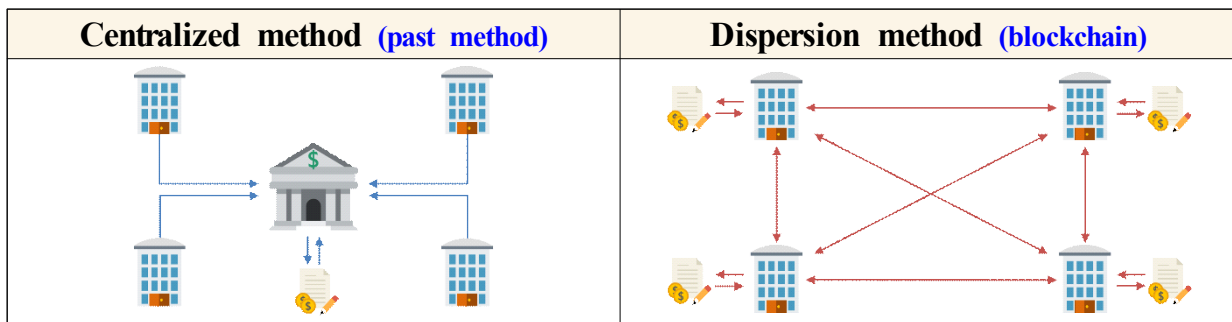
#### ◇ Concept of blockchain technologies

- **Blockchain is a foundational technology that secures the reliability of data**
- o Participants in the network jointly **record, verify, store, and execute the movement of information and values**, thereby **securing reliability** even without an intermediary
- After **generating blocks** containing data with a **constant period\***, previous blocks are **connected** like a chain; hence the name blockchain
- \* For example, blocks are newly generated through consensus processes (proof of work) every 10 minutes

<Composition of blockchain>



- Blockchain technology changes the past structure that managed data with a **centralized method** to a **decentralized/dispersed method** to make **work more efficient**, aiming at **social innovation** as well



- o The decentralized method/dispersion method has all participants (nodes) **each store all ledgers** that recorded transaction details to **perform** the work of reflecting/**updating** new transactions **jointly**
- Its advantages are that it can **reduce operating costs** for data management institutes (banks, public institutes, etc.), it is **safer** against hacking, and it has **malfunction resistance** wherein all functions operate even if there are partial errors
- Meanwhile, the fact that participants must reach a **consensus together** and manage **records each** are burdensome
- ☞ Establish conditions that can **highlight the advantages of blockchain technologies** by **developing P2P technologies** for fast transmission of messages, **improving computing technologies** needed for consensus, and **decreasing storage space costs** for saving records



- Blockchain can be divided into **public and private** blockchains depending on whether **prior approval** is needed to participate in the network

Category	Public blockchain	Private blockchain
Speed	Slow	Fast
Authority	All participants possess authority for reading, writing, and consensus	Authority can be designated according to members
Cases	Bitcoin (cryptocurrency), Ethereum (cryptocurrency/smart contract)	Corda (finance), Hyperledger (general use)

<Key features by blockchain type>

### ◇ Blockchain technology development forecast

- Blockchain technologies completed verification on simple payment method (1st generation) functions, and they were applied to various transactions and contracts (2nd generation); their range of utilization is being expanded
  - (1st generation: '09~'14) Since the appearance of Bitcoin, which is based on distributed ledger sharing, in '09, over 1,600 cryptocurrencies using blockchain technologies have appeared (as of Jun. '18)
  - (2nd generation: '15~present) Blockchain that added smart contracts (Ethereum) and private blockchain that can be utilized for specific work purposes of companies appeared
    - Using the smart contract functions wherein contracts are made automatically according to pre-determined conditions, it can be utilized in various services such as ordering items, real estate transactions, etc.
    - Application cases spread in various industrial sectors such as electronic document sharing, e-commerce, etc.
- In the future, blockchain technology is expected to become a **foundational technology that reinvents industry and society** by overcoming the current limitations (scalability, interoperability, etc.)
  - (3rd generation: Future) In addition to **improved performance** that exceeds the past centralized method, expected to create various innovation cases in fields requiring reliability such as public services, contracts, certifications, etc.

<Features and application cases per blockchain generation>


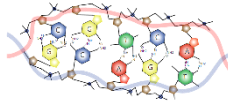

Category	1st generation (2009~2014)	2nd generation (2015~current)	3rd generation (future)
Main features	○ Cryptocurrency ○ Asset transaction	○ Smart contract (business automation) ○ Decentralized application	○ Scalability ○ Interoperability between blockchains

			○ IoT support
Key examples	○ Bitcoin	○ Ethereum ○ Hyperledger	○ Various blockchain platforms under development
Development status	■ Introduction period	■ Expansion period	■ Maturation period

## ◇ Importance of blockchain technology

- **Blockchain offers new growth potentials for our economy and society**
  - Blockchain serves as an **enabler that adds trust to the existing digital economy** and it has advantages in terms of security and transparency
    - \* Like the Internet in the past, blockchain is a foundational technology that has the possibility of laying a new foundation for economic and social systems (Jan. '17, HBR)
  - In order for blockchain technologies, which are in the early technological development stage, to become established as economic and social infrastructure, **technological and policy efforts are needed**
    - \* Technological development that can address issues with processing speed restrictions, excessive computer resources, etc. and systematic upgrades related to improving the roles and regulations of existing intermediary institutes are needed continuously
- **Blockchain supports the realization of the fourth industrial revolution** by ①reducing transaction costs, ②utilizing the safe and convenient use of data, and ③supporting autonomous collaboration between IoT devices
  - **(Reduced transaction costs)** With blockchain, **economic entities such as individuals and companies** can conduct transactions without expenses depending on reliable third parties such as the government, public institutes, etc.
  - **(Data utilization)** Blockchain, which makes fabricating data difficult, can safely store data and set access authority, enabling sharing data conveniently
  - **(Autonomous collaboration between IoT devices)** Supports real-time autonomous collaboration between IoT devices without human intervention based on smart contracts

**<Example of future blockchain-based services>**

Category	Service example		Description
<b>Reduced transaction cost</b>	Blockchain-based logistics service		Share all documents related to containers such as logistics contracts, shipping, transportation, etc. using blockchain technologies to reduce management costs
<b>Data utilization</b>	Distribution of genetic data based on blockchain		Safely share genetic data, which is sensitive information, with research institutes through blockchain
<b>Autonomous collaboration between IoT devices</b>	P2P power trading between neighbors		Automatic trading through real-time matching between prosumers and consumers through a blockchain-based power trading platform

## IV. Domestic and Foreign Blockchain Ecosystem Status and Diagnosis

### ◇ Acceleration of global competition to preoccupy the blockchain market

- Based on high interest in blockchain technologies, countries around the world are **developing technologies** and pursuing various **pilot projects** to promote the blockchain industry
- **(US)** Increasing interest in blockchain such as pursuing legal revisions\* of the federal and state governments to utilize blockchain in government services
  - \* Vermont (Jun. '16), Arizona (Mar. '17), and Nevada (Jun. '17) passed bills that recognize the legal effects of records and signatures on blockchain or exempt taxes for blockchain transactions, and Delaware (Jul. '17) allowed the use of blockchain for stock transaction lists
- **(UK)** Reviewing application in various government services to prevent forgery of government documents, prevent fraudulent reception, etc. to promote the utilization of blockchain centering on the Department of Science
  - ※ “Distributed Ledger Technology: beyond block chain, 2016” recommended to evaluate the effectiveness of blockchain technologies and pursue substantiation projects, including making improvements to regulations, securing technologies at levels that can be applied in reality, etc.
- **(China)** Selected blockchain as a focus fostering technology (Dec. '16), pursued the development of core technologies and pilot projects, establishing a blockchain industrial park in Huangzhou
- **(Estonia)** Introduced the blockchain-based digital citizenship (e-Residency) ('15) allowing anyone to use the various public services\* provided by Estonia
  - \* Opening bank accounts, online bank transfers, payment services within EU countries, possible to establish corporations in one day, etc.
- **(Honduras)** Honduras was under military dictatorship for a long period, and it pursued the implementation of blockchain for managing land registries to prevent fabrications by warlords and local powers ('16~)
- Global companies are developing blockchain platforms with improved performance for **use in company work** centering on various associations and specialized companies
- Various companies in IT, finance, etc. organized **associations** (consortiums)\* to lower risks and reduce investment costs by developing blockchain platforms together

\* Corda of R3 Consortium: Blockchain platform specializing in the finance sector /  
Hyperledger of the Linux Foundation: Blockchain platform that can be applied in various industries

o **Global companies** such as IBM and MS are providing support to help implement blockchain technologies without constructing separate hardware through **cloud-based blockchain services**\*

\* BaaS (Blockchain as a Service): Providing development environments using cloud services such as IBM Bluemix or MS Azure to support the configuration of blockchain-based services

◇ **Korea is making efforts in blockchain technology verification and substantiation cases**

□ As of 2017, there are about **30** blockchain companies in Korea, the market scale is less than 50 billion KRW, and there are an estimated **600 people** working in this field (Mar. '18)

※ Results from surveys on member companies of Blockchain Open Forum, more detailed status surveys are currently being pursued

□ **Specialized SMEs** and **SW/communication conglomerates** possess blockchain platform technologies, and they are making efforts to secure various service substantiation cases

o **Specialized SMEs** with blockchain platform configuration technologies are working with financial institutes and conglomerates in various **technological verification** cases and pursuing **pilot projects**

- There has recently been various blockchain **startups** appearing, and they are configuring new business models\*

\* Identity authentication, overseas remittance, insurance claims, electronic document management, sharing of medical information, real-time power trading, etc.

o SW/communication conglomerates (Samsung SDS, LG CNS, KT, SKT, etc.) are developing/applying **independent blockchain platforms** or focusing on improving blockchain technology competitiveness through **dedicated organizations**

o Internet companies (Naver, Kakao, etc.) are preparing to enter the blockchain business by establishing subsidiaries specializing in blockchain technologies or based on their messenger service

□ Compose a consortium wherein stakeholders in different fields work together on joint research, technological verification, etc. to promote efficiently the implementation of blockchain in Korea as well

o **(Finance)** Cooperate in pursuing joint projects by industry such as banks, financial investment, insurance, etc. ('16~)

<b>Korea Federation of Banks</b> and banks	<b>Korea Financial Investment Association</b>	<b>Korea Life Insurance Association</b> and life
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(16 companies)	and financial investment companies (11 companies)	insurance companies (20 companies)
Blockchain-based certification 'Bank Sign' testing (Apr. '18)	Blockchain-based certification 'Chain ID' implementation (Oct. '17)	Composition of consortium for pursuing joint blockchain projects ('17)

- o **(Marine Logistics)** Compose private-government joint marine logistics blockchain consortium for efficient maritime logistics procedures such as verification of import/export customs clearing service technology ('17~)
- ※ In May '17, 15 institutes such as Customs Service, Ministry of Oceans and Fisheries, shipping companies, transportation companies, banks participated → increased to 41 companies in Feb. '18

## ◇ Current tasks for promoting blockchain in Korea

### <Full-fledged application and commercialization of blockchain>

- Blockchain technologies are advantages when tangible or intangible **assets** are **traded** by multiple **participants**, and if those **records** must be shared together
- In particular, the economic effect of implementing blockchain is much higher when **newly constructing** instead of upgrading currently operating systems and when using in **multiple areas** rather than one

Asset	Stakeholder	Transaction	Record
Tangible and intangible assets such as finance, contents, goods, etc.	Owner, broker, manager, etc. of assets	Recording, moving, verification of asset information	Share transaction details about assets

- Meanwhile, when applying blockchain, the past centralized work processing method changes, so **prior consensus among multiple participants** is most important
- Nonetheless, most domestic blockchain projects are still at the level of PoC (Proof of Concept) that verifies technological possibility and **they have not led to full-fledged market expansion through social consensus** among multiple participants
- ※ The domestic market in 2017 was valued at less than 50 billion KRW, and investments are not commensurate with the social interest in this
- ☞ Through **pilot projects** that integrate blockchain technologies in various fields, promote discussions among participants and **standardize** work processing procedures for the implementation of blockchain in **each industry sector** and through this, **expand social awareness** and attract **more investments**

### <Technological competitiveness falling behind developed countries>

- The competitiveness of domestic blockchain technology is low compared to key developed countries
  - ※ Blockchain technology competitiveness ('17): US > Europe (96%) > Japan (84.8%) > China (78.9%) > Korea (76.4%)
- ☞ Blockchain technology is still in its development stage, and as domestic SMEs have sufficient **growth potential**, it is necessary to provide **assertive support for R&D**

### <Lack of experts for configuring blockchain technologies>

- There is a huge shortage of experts who can deal with blockchain

## technologies

※ As of 2017, there are an estimated 600 blockchain experts in Korea (Mar. '18, survey on industry circles)

☞ Pursue simultaneous fostering of on-site **working-level personnel** and **top-level personnel** needed by industries



# V. Vision and Promotion Strategy

## Vision

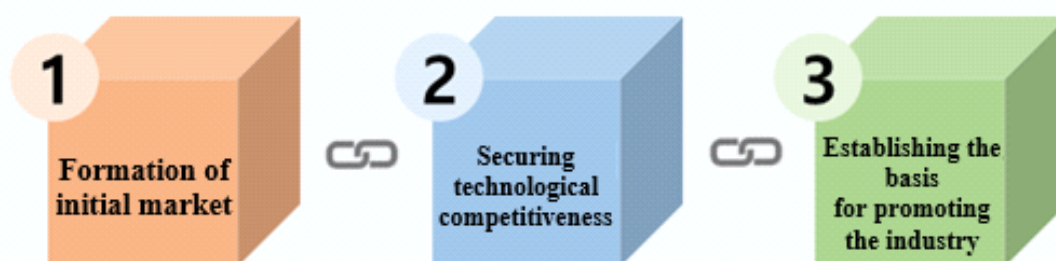
A country that **innovates** and **grows** with **blockchain**

## Basic directions

Utilize the strengths of blockchain technologies **for efficient work in the public & private sectors**

**Establish a blockchain industry development ecosystem**  
to preoccupy the global blockchain market, which is in its initial stages

## Promotion strategy



## Promotion tasks

### As-Is

- Level of technological possibility verification
- Not felt sufficiently by citizens

- Weak technological competitiveness
- Lack of performance evaluation system

- Insufficient personnel and companies with blockchain technologies
- Many obstacles to activating the market

### To-Be

#### Market formation

- Pursue preemptive projects led by the public sector
- Open innovation led by the private sector participated in and collaborated by umerous parties

#### Secure competitiveness

- Improve technological competitiveness by securing core blockchain technologies
- Blockchain technology support center for reliability evaluation
- Strengthen standardization activities to lead blockchain technologies

#### Establishing the basis

- Foster core personnel for blockchain
- Foster specialized blockchain companies with global competitiveness
- Make reforms to laws that are hindrances
- Activate by raising national awareness

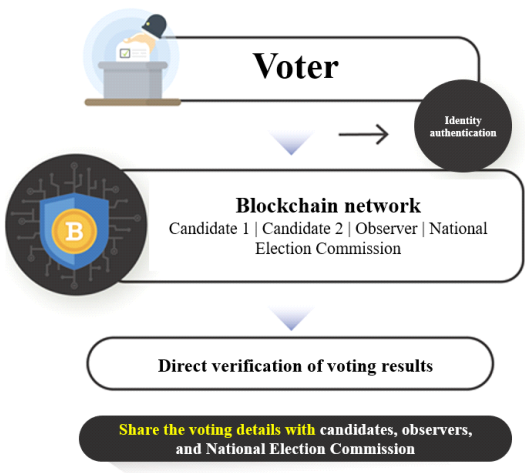
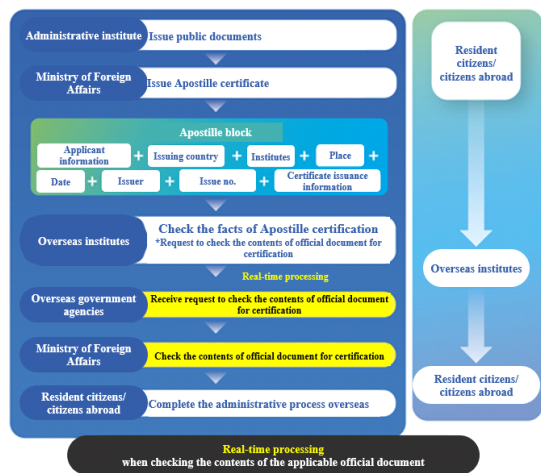
# VI. Major Promotion Tasks

## 1. Formation of early blockchain market

- ◆ **(Status)** Most domestic blockchain projects are still at the stage of verifying technological possibilities, and they have been unable to lead to market expansion
  - ※ The domestic blockchain market in 2017 was valued at less than 50 billion KRW, and investments are not commensurate with the social interest in this
- ◆ **(Strategy)** Apply **first** in the **public** sector to make public services more **efficient** and also attract expansion of private investments by playing the role of a **primer** to promote the domestic blockchain market

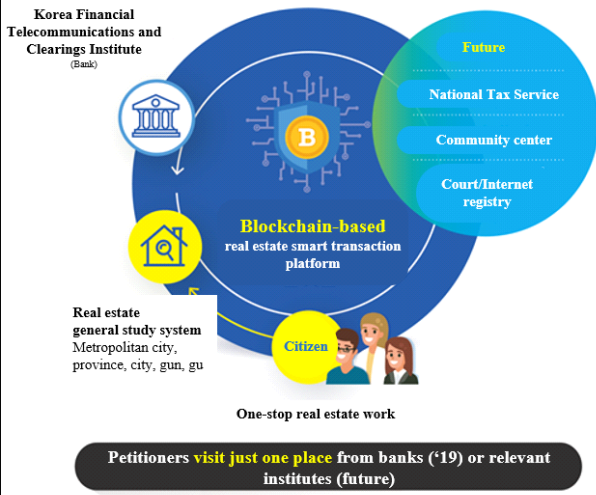
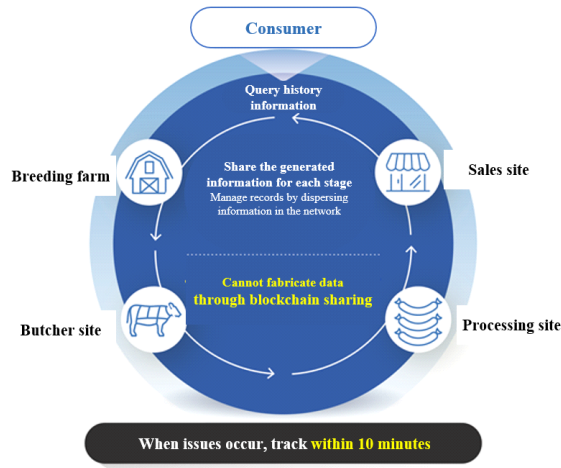
### 1 Efficient public work by promoting preemptive **public-led projects**

- o **(Public-led projects)** Pursue **pilot projects** for finding **exemplary cases** and for **efficient public services** through preemptive application in the public sector (6 projects in '18),
  - Select about **2** pilot project tasks with verified performance such as **simplification of work procedures, cost reduction, etc.** to spread to commercial services through multi-year support ('19~)

<p style="text-align: center;"><b>Online voting</b> [’18 National Election Commission collaboration]</p> <p>Reliable online voting possible through the direct verification of vote-counting process and results by stakeholders such as candidates and observers</p>	<p style="text-align: center;"><b>Inter-national distribution of electronic documents</b> [’18 Ministry of Foreign Affairs collaboration]</p> <p>Store official documents and certifications in blockchain to submit official documents conveniently using electronic documents to foreign agencies</p>
	
<p style="text-align: center;"><b>Livestock history management</b> [’18 Ministry of Agriculture, Food and Rural Affairs collaboration]</p> <p>Share information related to breeding, butchering, processing, and sales, and, in</p>	<p style="text-align: center;"><b>Simple real estate transaction</b> [’18 Ministry of Land and Infrastructure and Transportation collaboration]</p> <p>Land registries are shared transparently by the Ministry of Land and Infrastructure and</p>

case there are issues, the tracking period can be reduced from up to 6 days to less than 10 minutes

Transportation, local governments, and Korea Financial Telecommunications & Clearings Institute (KFTC) to be able to receive real estate collateral loans just by visiting the bank

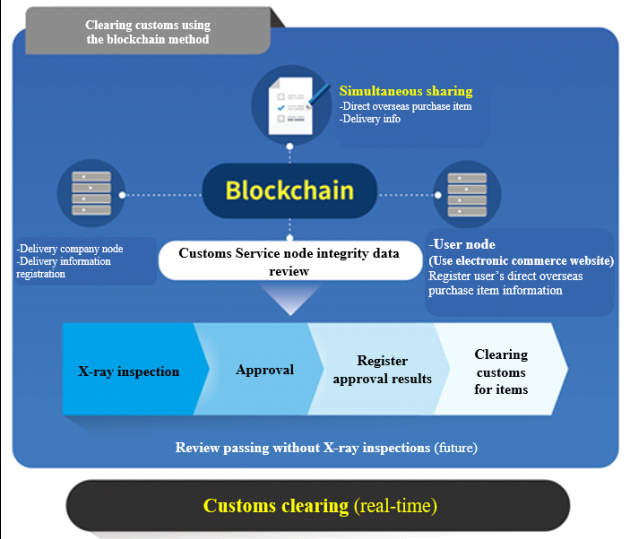
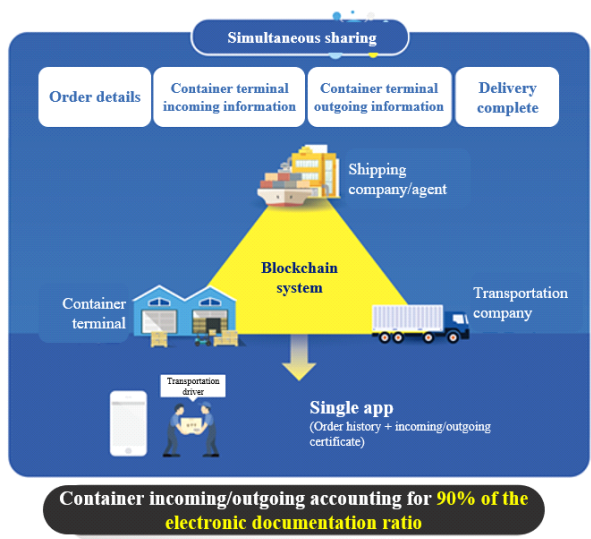


**Marine logistics**  
[’18 Ministry of Oceans and Fisheries collaboration]

**Person customs clearing**  
[’18 Korea Customs Service collaboration]

Share the numerous electronic ledgers issued during container movement with blockchain (shipper, terminal, transportation company), efficient transportation work

Information related to clearing customs is shared with the shopping mall, express cargo company, and customs service to allow real-time import declaration and prevent under-value declaration









2 Support open innovation led by the private sector with the participation of and in collaboration with numerous parties

o (National project) Carry out a national blockchain project led by the

**private sector** so that citizens can directly experience the effects of blockchain technologies (3 private sector matching every year, '19~)

- ※ Discover projects that can strengthen the blockchain utilization capacities of the private and public sectors and lead the demand for using blockchain throughout the industry and which can significantly reduce unnecessary social costs

<National blockchain project task (example)>

 <b>Common ID</b> Provide services to receive <b>easy self-identification services</b> form various public and private institutes with a <b>single ID</b>	 <b>Social sharing</b> Construct a platform for donating <b>various idle points</b> (communication, credit, air miles) with <b>neighbors in need</b> with one's approval	 <b>Used car history management</b> Manage regular <b>inspection results and maintenance history</b> , etc. to <b>relieve information asymmetry</b> between seller and buyer
 <b>Safe food</b> Manage the <b>food ingredient distribution history</b> for elementary, middle, and high schools with blockchain to provide <b>safe meals at school</b> for students	 <b>Transparent music distribution</b> Direct music distribution and transparent records management to <b>increase the profits of copyright holders and performers</b> and to realize <b>real-time profit sharing</b>	 <b>Trust-based used item transaction</b> Manage transaction history and payments with blockchain to <b>protect consumers from various types of petty fraud</b>

- o **(Link with projects leading innovative growth) Apply** blockchain technologies **first** in the 8 major projects leading innovative growth such as smart city, smart factory, etc. to support innovation led by the private sector

<Application tasks of the 8 major fields for leading innovative growth (example)>

<b>Ultra-connected smart</b>	<b>Smart factory</b>	<b>Smart farm</b>	<b>Fintech</b>
Use safe personal information combined with encryption technologies	Management of overseas purchase contracts based on smart contracts	Real-time agricultural and livestock distribution history management	Prompt overseas remittance with low fees
<b>New energy projects</b>	<b>Smart city</b>	<b>Drones</b>	<b>Future cars</b>
Renewable energy and carbon emissions trading	Transparent resident voting and convenient local currency	Mutual autonomous consensus between devices	Share safe self-driving information

## 2. Securing competitiveness in blockchain technology

- ◆ **(Status)** Blockchain technologies are in the **early development stages** and there is **competition in developing blockchain platforms** mainly among developer organizations (i.e.: Ethereum Foundation), specialized companies (i.e.: R3), and global companies (i.e.: IBM)

※ Korea is about 76.4% compared to the country with the world's highest technologies



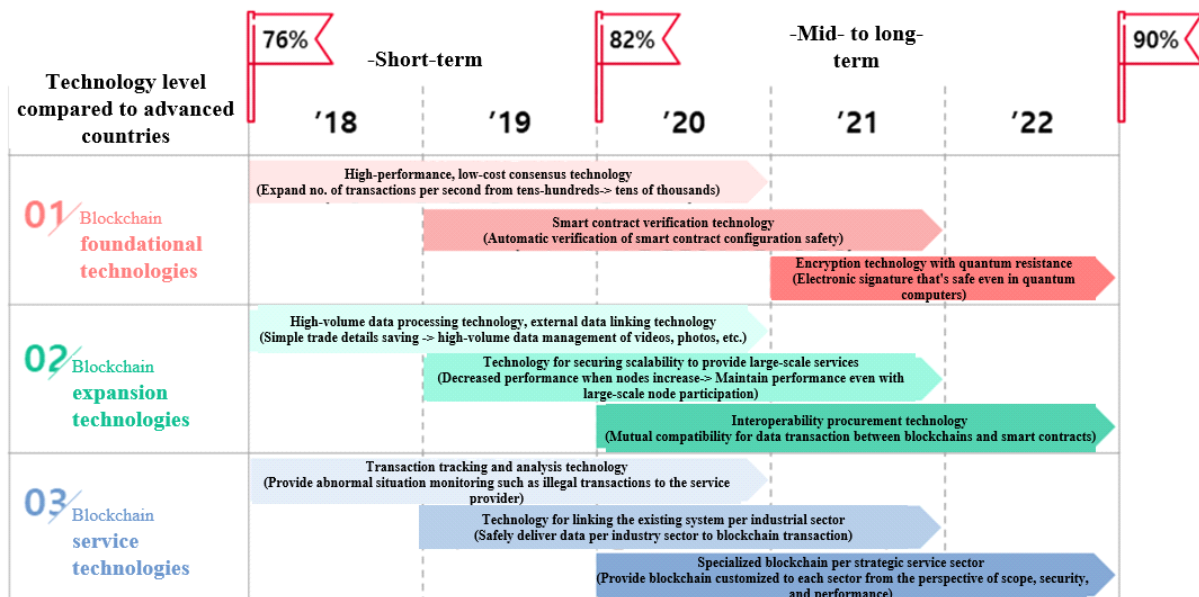
(US), and there is a technological gap of about 2.4 years (IITP)

- ◆ **(Strategy)** Support **development of core technologies** and **configure platforms** so that domestic companies can independently develop blockchain platforms and construct a **performance evaluation system**

**1 Enhance technological competitiveness by securing core blockchain technologies**

- o **(Secure core technologies)** Establish a blockchain technology development **road map** and update annually to conduct R&D with the **goal of achieving 90%** compared to the global technological leader
- For technologies requiring **early application** in the industry, pursue **short-term** ('18~'19) and large-scale **service expansion** technologies, pursue in the **mid- to long-term** ('20~) ※ '18 10 billion KRW→ '20 new early feasibility study, etc.

<Blockchain technology development road map (tentative)>



- o **(Specialized technology by industry)** Develop and support block chain platforms specialized (processing speed, data sharing level, etc.) by **industry sector** such as finance, logistics, medical, etc. with a **competing method**\*

- Pursue the development of the platform considering performance (processing speed), transparency (limitation of sharing level), openness (use of outside storage), etc.

\* Utilize core technology development results, and multiple executers compete until the second year to make the final decision for execution

**[Reference] Key tasks for blockchain technology development road map**

Category	Task name	Description
Foundational technology	○ <b>High-performance low-cost consensus technology</b>	- Next-generation consensus technology that simultaneously achieves high performance, decentralization, and low resource consumption by securing transaction integrity
	○ <b>Smart contract verification technology</b>	- Technology for judging the configuration vulnerabilities of smart contracts in advance and which uses formal verification technique*, etc. * Verification method applying the mathematical certification method that converts the functions of systems being analyzed with formal language like logical equations
	○ <b>Encryption technology with quantum resistance</b>	- Apply encryption technologies that are safe from quantum computing in encryption technologies ※ Quantum computing is a technology that can quickly calculate difficult mathematical problems (prime factorization problems, etc.) used in encryption technologies due to difficulties in solving with conventional computers
Expansion technology	○ <b>High volume data processing technology, external data linking technology</b>	- Technology for resolving block volume limits and interface technologies for linking blockchains with storage areas outside of the blockchain
	○ <b>Technology for securing scalability to provide large-scale services</b>	- Technology that maintains decentralization and security during the participation of multiple nodes while also maintaining blockchain network performance* * Network and transaction sharing technique, communication overhead minimization technique, etc.
	○ <b>Technology for securing interoperability</b>	- Technology for data trade compatibility between different blockchains, technology for compatibility between application programs and blockchain
Service technology	○ <b>Transaction tracking and analysis technology</b>	- Monitoring technology allowing the semi-real-time monitoring of transaction details distribution, integrity of transaction details saved in blocks, abnormal transactions, etc.
	○ <b>Technology for linking existing system per industrial sector</b>	- Technology for safely sending data in the existing system per industrial sector requiring linking with blockchain on the blockchain
	○ <b>Specialized blockchain per strategic service sector</b>	- Customized blockchain platform technology considering the different performances, security functions, and external compatibility required in the strategic service sector

**2 Construction of blockchain technology support center for reliability**

evaluation

◇ Construct blockchain **technology center** for enhancing the technological competitiveness of private companies to provide **reliability evaluation services and test beds**

o **(Reliability and performance evaluation)** Constructed and operated an **evaluation system** that can objectively verify **reliability and performance** of the blockchain's **core technology, platform, and service** (decentralization app) to allow comparative analysis between blockchain technologies ('19~)

- Deduce the main core properties of blockchain from a **reliability\* perspective** and establish evaluation standards and systems by identifying utilization areas and **properties suitable for evaluation**

\* Collection of properties guaranteeing that ICT products and services operate according to the objective and do not fail, and it includes security, privacy, safety, certainty, scalability, and malfunction resistance, etc.

<Main contents of blockchain reliability and performance evaluation>

<b>Elemental technology verification</b>	<ul style="list-style-type: none"> <li>o Perform <b>elemental technology verification</b> that is essential for configuring blockchain</li> <li>- (Consensus algorithm) Perform verification for <b>resistance against malicious nodes and performance</b> of consensus algorithms such as Proof of Work (PoW), Proof of Stake (PoS), etc.</li> <li>- (Encryption technology) Perform <b>configuration suitability verification on encryption technologies*</b> that apply blockchain</li> </ul> <p>* Applies the latest encryption technologies such as homomorphic encryption, multi-signature, secure multi-party computation, zero-knowledge proof, etc.</p>
<b>Blockchain platform evaluation</b>	<ul style="list-style-type: none"> <li>o When public institutes or private companies implement blockchain technologies, perform <b>blockchain platform reliability evaluations</b> to ensure safe use</li> <li>- <b>Reliability properties are applied selectively</b> according to the blockchain platform type and application domain, considering the relationships between properties</li> <li>※ China performed blockchain reliability pilot evaluations under the leadership of the China Academy of Information and Communications Technology (CAICT) (Jun. - Sep. '17)</li> </ul>
<b>Decentralization app test</b>	<ul style="list-style-type: none"> <li>o Test the <b>reliability and quality of the decentralized app</b> and perform <b>configuration vulnerability* verification</b> for smart contracts that applied the app</li> </ul> <p>* IBM announced that 94.6% (21,281/22,493) of Ethereum smart contracts have vulnerabilities (Feb. '18)</p>

o **(Provision of development test bed)** Considering the fact that it is difficult for a company to operate multiple blockchain servers (nodes) at all times, construct and provide a **large-scale testing environment** (i.e., 100 nodes) that can test blockchain platforms and services (decentralized app) under development ('19~)

**3 Strengthen **standardization** activities to lead blockchain technologies**

- o **(Advancement of standardization road map)** Advance the blockchain **standardization road map\*** and **link with R&D road map** to utilize as **mid- to long-term strategies** to gain global leadership

\* ICT standardization strategy map: Establish a response strategy direction for preoccupying standards by analyzing ICT policies, market, and technologies and the promotions of standardization organizations

**<Blockchain key standardization items of  
ICT standardization strategy map(ver.2019) (tentative)>**

Category	Standardization items	Contents
<b>Foundational technology</b> (‘17~‘20)	Blockchain terms	Definition of essential terms and concepts that allow consistent expressions
	Blockchain reference structure	Illustration of logical and physical structures and definition of relations between components
	Blockchain categorization system	Provide conceptual categorization, use case categorization, etc. of blockchain systems
<b>Platform and linked technologies</b> (‘17~‘21)	Internal/external interoperability of blockchain	Definition of API and interface for compatibility between blockchains or off-chain, etc.
	Cloud-based blockchain	Provision of requirements and reference structure for configuring blockchain in cloud
<b>Applied technologies</b> (‘19~‘21)	Reference structure, requirements of application fields	Provide reference structure and requirements such as contents copyrights, electronic records, etc.
<b>Managing technologies</b> (‘17~‘21)	Security threats and requirements	Identify blockchain security threats and vulnerabilities and define security requirements
	Blockchain ID management	Provide node identification, certification, ownership definition, and self-sovereignty ID management techniques

- o **(Support standardization expert activities)** **Expand support for experts** in official standardization, fact standardization, and consortium standardization activities

- **Official standardization organizations** such as ISO and ITU looking to reflect the national contributions of domestic experts, support participation in international meetings, expand the entry of editors and chair groups

\* Transferred the ISO blockchain standardization response work to the Ministry of Science and ICT through agreements with the Korea Agency for Technology and Standards (Mar. ‘17)

[Among domestic experts, 1 ISO/TC 307 editor, 1 ITU-T SG chair, 3 rapporteurs, and 6 editors are currently active]

- Strengthen standardization education for experts of private companies to support **fact/consortium standardization** (W3C, Hyperledger) activities and establish linking plans with official standardization activities



- o **(Pursue group standardization per industry field)** Pursue standardization for consensus among industries and to **secure compatibility** when applying blockchain in key industrial sectors such as logistics, distribution, medicine, etc.
- Organize the **Blockchain Standardization Association**\* per industrial sector, select **key standardization items** (reference structure, data model, smart contract templates, etc.), and pursue **group organization**
- \* (Finance sector) Organized the Financial Security Standardization Association, conducting blockchain standardization activities (Financial Security Institute, Sep. '17)
- Pursue the expansion of organization standards discovered in the industry sector as **international standards**

**[Note] Korea's Blockchain Standardization Progress**

**□ Status of blockchain standardization**

- o Blockchain standardization is in its initial stages globally and is being carried out mainly around ISO·ITU-T (official standardization) and W3C·IEEE (fact standardization)
- The target sectors are broad and inclusive of **blockchain-based sectors** such as terms and reference structures, security, smart contract, etc., and **application sectors** such as cloud and IoT linking, etc.
- o In order to respond to ISO·ITU-T, Korea is operating an expert committee and the Korea ITU Research Committee under the National Radio Research Agency ('17~), and efforts are being made to increase international influence by serving as the chair and editor
- ※ China launched a blockchain standardization technology committee under its Electronics Technology Standardization Research Institute (Mar. '18), and other countries are also increasing activities to preoccupy global standards

<International standardization trends related to blockchain>

Standardization organization	Official standardization organization		Fact standardization organization	
	ISO/TC307 (Newly established in Nov. '16)	ITU-T SG13/16/17/20 (Began discussions in Jan. '17)	W3C (Newly established in Mar. '16)	IEEE (Began discussions in Nov. '17)
<b>Main issues</b>	<ul style="list-style-type: none"> <li>·Definitions and reference structure</li> <li>·Security, identification, privacy</li> <li>·Smart contract</li> <li>·Interoperability</li> </ul>	<ul style="list-style-type: none"> <li>·Security threat, security service, guarantee</li> <li>·Link IoT and blockchain</li> <li>·Cloud-based BaaS requirements</li> </ul>	<ul style="list-style-type: none"> <li>·Web-based blockchain use case</li> <li>·Finance-related blockchain message format</li> </ul>	<ul style="list-style-type: none"> <li>·Framework for utilizing in IoT</li> </ul>
<b>Korean chair group</b>	<ul style="list-style-type: none"> <li>·Former SG4 chair (1 person)</li> <li>·Current WG1 editor (1 person)</li> </ul>	<ul style="list-style-type: none"> <li>·Current SG13 rapporteur (1 person), editor (3 persons)</li> <li>·Current SG17 chair (1 person), rapporteur (1 person), editor (7 persons)</li> </ul>	<ul style="list-style-type: none"> <li>·Current chair (1 person)</li> </ul>	-

**□ Future plans**

- o Pursue the restructuring of work group and research group with the expansion of standardization range and carry out new standardization such as "digital asset management security," "legal smart contract," etc. (ISO/TC307)
- o Conduct research on blockchain-related policies and regulation

frameworks by continuously pursuing the standardization items of each research group and through focus group activities (ITU-T)

### 3. Establishing the basis for energizing the blockchain industry

- ◆ **(Status)** There are only about 30 companies specializing in blockchain in Korea and there is insufficient manpower, making it **urgently necessary to establish** a blockchain ecosystem
- ◆ **(Strategy)** Respond to human resource demand by the industry by **fostering 10,000 human resources by '22** and incubate a blockchain ecosystem through **startup support, increased investments, system reforms, etc.**

#### 1 Foster core personnel for blockchain

- o **(Foster working-level human resources)** In order to have the social interest in blockchain technologies lead to securing working-level human resources, operate the tentatively named **blockchain playground\*** for **learning and experiencing the latest blockchain technologies and services** and hold **discussions** about it (Mapo Innovation Town, '19~)
- **(Operation of curriculum)** **Step-by-step curriculum development and operation** of beginner, developer, and expert courses depending on the purpose of the class and difficulty level by creating a blockchain curriculum

Education course per stage			
Stage	Beginner course	Development course	Expert course + corporate training
Target	Employees, prospective startup entrepreneurs, freelancers, etc.		
Main contents	<ul style="list-style-type: none"> <li>• Case of utilizing blockchain</li> <li>• Blockchain foundational technologies (Decentralization ledger, consensus algorithm, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• Smart contract utilization practice</li> <li>• Decentralized app (dApp) development practice</li> </ul>	<ul style="list-style-type: none"> <li>• Service modeling</li> <li>• Education focusing on practicing that reflects new blockchain technologies</li> </ul>
Education period	1 week (8 hours/day) X 24 times	2 weeks (8 hours/week) x 12 times	12 weeks (8 hours/day) + 12 weeks (training) X 12 times
People	30 people/times	20 people/times	10 people/times

**Educated about 1,000 people in '19, increase the no. of persons receiving education by acquiring additional budget & education space**

- **(Provision of experience environment)** Operate a **demo zone** that **introduces applications that have been commercialized or are under pilot operation\*** in order to enhance understanding of blockchain services

\* Use private sector commercial services and '17, '18 blockchain pilot project outcomes

- **(Promotion of exchange)** Promote communities related to blockchain through **blockchain seminars\*** and **expert mentoring\*\***, etc.

\* Establish laws, systems, technologies, labor affairs, and accounting plans needed for blockchain startups and introduce strategies, etc.

\*\* Provide diagnosis and guidance related to business, capacity development, and marketing needed for the operation of blockchain companies

o **(Strengthening of advanced and expert education)** Establish an expert fostering system that meets industrial demands

- **(Fostering expert personnel)** Designate and expand a **blockchain research center** to foster blockchain experts with master's or PhD's at domestic universities\* (Designate at least **2 new every year**)

\* Status of blockchain research centers: '17 (1 university)→'18 (3 universities), support 800 million KRW annually (max 6 years)

- **(Fostering young human resources)** Operate intensive curriculum for about 6 months consisting mainly of implementing projects with industry expert mentoring for students set to graduate from the university or those preparing for employment ('18~, 200 people/year)

o **(Expand pool)** Open college courses or provide online classes so that young adults/workers interested in blockchain technologies can easily access classes

- **(Open new college courses)** Offer special lectures or courses on blockchain at universities specializing in science and technology (KAIST, GIST, etc.) to enhance understanding of blockchain among college students

- **(Open online classes)** Offer open online classes\* so that anyone including students and workers can **conveniently** learn about blockchain technologies (2 classes in '18, to be expanded in the future)

\* Utilize platforms of colleges specializing in science and technology (STAR-MOOC) or the Ministry of Education (K-MOOC) (currently available only on foreign websites)

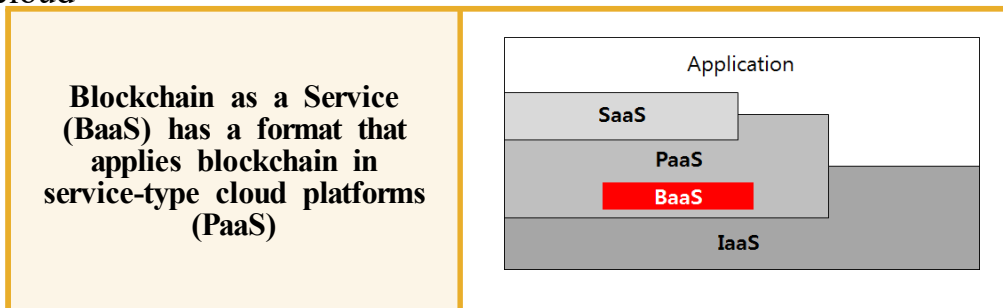
**2 Foster specialized blockchain companies with global competitiveness**  
(about 30 in '17 ⇨100 by '22)

- o **(Blockchain startup support) Foster blockchain-specializing accelerators** to find promising startups and support them through focused consulting, VC mentoring, entry into foreign markets, etc.
  - ※ Support office space at Mapo Youth Innovation Town, Pangyo Techno Valley 2, etc.
  - o **(Support for commercializing ideas)** Foster global prospective companies through support for blockchain business model concretization and commercialization of youths and companies with creative ideas
    - **(Concretization of ideas)** Provide the funds needed for concretizing ideas of **youths, future startup entrepreneurs, and startups** that are interested in blockchain through **contests**
    - **(Commercialization support)** Select blockchain business models with high social innovation ripple effects and blockchain business models with concrete ideas to support **funds for commercialization and testing**
  - o **(SME innovation support)** Support **cloud-based blockchain platform services (BaaS)**\* so that SMEs can quickly configure blockchain services
- \*BaaS (Blockchain as a Service): Service that offers a virtual decentralized network for cloud-based blockchain service development environment and testing; IBM and MS are currently providing BaaS services (domestic companies are also scheduled to launch)
- Support **vouchers** to SMEs (using companies) in cooperation with BaaS supplying companies (supplier) to spread blockchain and create a BaaS market ('19~)

**[Note] Overview of blockchain cloud service (BaaS)**

□ **Concept of BaaS (Blockchain as a Service)**

- o Environment that offers the components (decentralized network, communication protocol, etc.) and necessary functions (transaction information verification, discussion, node management function, etc.) of blockchain systems for developing and testing blockchain services based on cloud
- When developing blockchain services, possible to acquire interoperability and stability between services and development convenience by utilizing cloud



□ **Advantages of BaaS**

- o **(Flexible resource management)** Even without possessing hardware or software resources, offers a development and operating environment for easily creating blockchain
  - \* Assign, arrange, and distribute system resources according to user demands, can be prepared so that the system can be used immediately when needed
- o **(Elastic scalability)** Simplify adding and removing nodes from the blockchain network
- o **(Global availability)** Blockchain infrastructure and service composition possible anywhere in the world with cloud environments

□ **Characteristics and utilization cases per BaaS platform**

Entity/platform name	Characteristics	Utilization cases
Microsoft/EBaaS (Ethereum BaaS)	<ul style="list-style-type: none"> <li>- Utilize company's cloud system, Azure</li> <li>- Provide Ethereum blockchain development environment</li> </ul>	<ul style="list-style-type: none"> <li>- 11 financial companies in R3CEV consortium: Wiring/payment between financial companies</li> <li>- Webjet: Online travel payment service</li> </ul>
IBM/IBM Blockchain	<ul style="list-style-type: none"> <li>- Utilize company's cloud system, Bluemix</li> <li>- Provide Hyperledger blockchain development environment</li> </ul>	<ul style="list-style-type: none"> <li>- Walmart: Apply blockchain for tracking and transparency within the food supply chain</li> <li>- Northern Trust: Apply blockchain to secure clarity of private equity funds</li> </ul>
Amazon/Blockchain Template	<ul style="list-style-type: none"> <li>- Utilize Amazon's cloud system, AWS</li> <li>- Provide network construction through Ethereum and Hyperledger blockchain templates</li> </ul>	<ul style="list-style-type: none"> <li>- Support construction and management of blockchain-based decentralization app (DApps)</li> </ul>

### 3 Make reforms to laws that hinder the spread of blockchain technologies

- o **(Operate research group for making improvements to regulations)** Operate a "blockchain regulation improvement research group" to respond preemptively to regulations and systems that interfere with implementing blockchain technologies and services
- Regularly search for difficulties due to regulations and conduct research on improvement plans through on-site meetings with blockchain-related associations, organizations, and companies

<Review tasks for improving regulations related to blockchain (tentative)>

- **(Allow recording on blockchain instead of submitting documents)** When various laws require submission of documents, recording the contents in blockchain (decentralized ledger) also recognized as submitting documents
- **(Smart contracts and general contracts according to civil laws)** Review legal disputes (whether withdrawal from subscription is possible, real name and anonymity of transactions, inconsistency of proposals and codes, etc.) that occur due to differences in smart contracts and general contracts according to civil laws

- o **(Tax support)** In new growth R&D expense tax deduction\* technologies, add technologies related to blockchain\*\* to promote technological development by reducing the investment risks of companies

\* Deduction rate: (SMEs) Maximum 40%, (Large and medium companies) maximum 30%

\*\* The detailed target technology range confirmed when amending the Enforcement Decree of the Act on Restriction on Special Cases Concerning Taxation

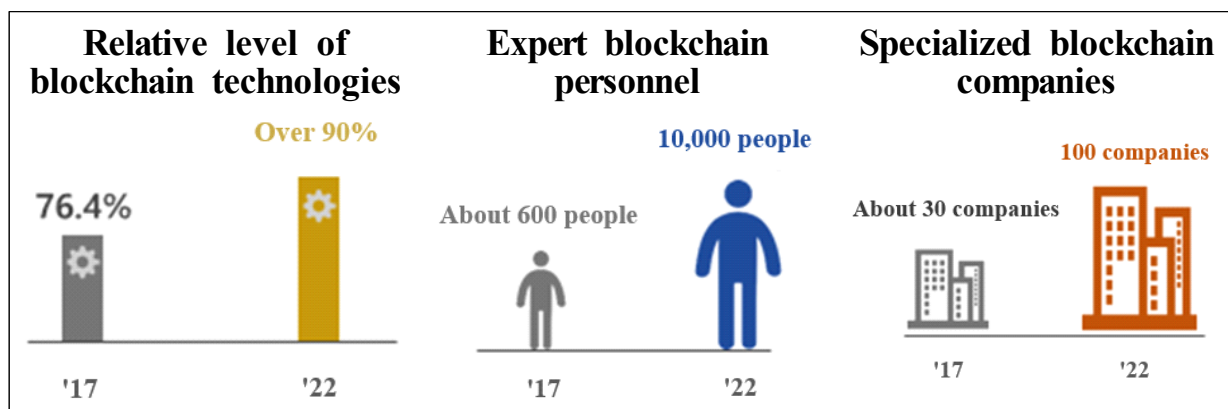
### 4 Activate by raising national awareness

- o **(Blockchain promotion week)** Hold annual blockchain promotion weeks that focus on hosting the relevant events with related companies, institutes, associations, organizations, etc.
- **(Global conference)** Examine the domestic and foreign trends and the direction of the blockchain industry through leaders such as domestic and foreign scholars, CEOs, etc. who lead global trends
- **(Share project achievements)** Exhibit and share the results of pilot projects, national projects, private sector achievements, technical verification cases of local hubs, hackathons, etc.
- **(Blockchain Challenge)** Hold challenges to encourage and motivate companies and individuals to develop the industry such as discovering and proliferating blockchain services
- o **(Industry fact-finding surveys)** Conduct regular **fact-finding surveys** for the domestic and foreign blockchain industry to identify the state of the blockchain market and use as basic data for pursuing policies



- **Find market statuses and forecasts, etc. through the analysis of industrial structures** such as systematic calculation of the domestic and foreign blockchain market scale, distribution of specialized companies per blockchain application field, etc.
- ※ Pursue the establishment of a standardized industrial categorization system focusing on Statistics Korea for the utilization of fact-finding surveys, comparison with the relevant statistics, enhancement of compatibility, etc.

## VII. Expected Effects




- Formation of early blockchain market**
  - o **Increase national experience** in blockchain through various projects led by the public and private sectors
  - o Assertively utilize the technical strengths of blockchain to **construct a social innovation platform**
    - ⇒ Pursue multiple projects directly connected to the everyday life of citizens such as common ID, social sharing, online voting, etc.
- Securing competitiveness in blockchain technology**
  - o **Overcome technological gaps with competing countries** through the development of core/application technologies
  - o **Establish conditions for strengthening competitiveness and becoming leaders** for companies
    - ⇒ Provide environment for strengthening competitiveness for systematic technological development, pursue standardization, etc. based on the road map
- Establishing the basis for energizing the blockchain industry**
  - o **Construct a blockchain growth basis** through technology experience, education per level, linkage with employment, and establishment of basis for startups
  - o **Safe landing of the blockchain industry ecosystem** by minimizing government intervention and through bold regulatory reforms
    - ⇒ Foster the blockchain industry by fostering personnel, fostering specialized companies, enhancing national awareness, etc.





**“Create new values and configure a digital reliable society through the development and application of technologies for promoting blockchain”**

## VIII. Promotion Schedule

Detailed promotion tasks	'18	'19	'20	'21	'22
<b>1. Formation of early blockchain market</b>					
① Pursue preemptive projects led by the public sector					
② Support open innovation led by the private sector					
<b>2. Securing competitiveness in blockchain technology</b>					
① Enhance technological competitiveness by securing core technologies					
② Construct blockchain technology support center					
③ Strengthen standardization activities					
<b>3. Establishing the basis for energizing the blockchain industry</b>					
① Foster core personnel					
② Foster specialized companies					
③ Make reforms to laws that are hindrances					
④ Enhance national awareness					

**Attachment 1 Key blockchain policy trends by nation**

Country	Policy trends
 US	<ul style="list-style-type: none"> <li>○ Trend of increasing policy interest in blockchain such as <b>system reforms, integration of blockchain technologies in public services</b>, etc. to use blockchain services</li> <li>※ Vermont, Arizona, and Nevada recognize the legal effects of blockchain-based electronic documents, with the Treasury Department, etc. performing concept</li> </ul>

	verification for implementing the technologies
 Canada	<ul style="list-style-type: none"> <li>○ The National Research Council (NRC) discloses government subsidy support information through blockchain and plans to find additional areas for trial application continuously</li> <li>※ The Bank of Capital is researching payment systems between financial institutes based on blockchain ('16)</li> </ul>
 UK	<ul style="list-style-type: none"> <li>○ Department for Science published the “Distributed Ledger Technology: beyond blockchain” report* (Jan. 16)</li> <li>* Recommended to evaluate the effectiveness of blockchain technologies and conduct test projects, make reforms to regulations, and pursue securing technologies at levels of actual application</li> <li>※ By applying blockchain technologies for managing welfare budgets, 2.5~5.4% savings are expected in welfare budgets that are lost due to unnecessary administrative procedures and document forging and fabrications</li> </ul>
 China	<ul style="list-style-type: none"> <li>○ In the 13th five-year national information scheme, <b>blockchain was selected as focus fostering technology</b> (Dec. '16) and fostering the industry by local governments was encouraged</li> <li>※ Huangzhou established the Blockchain Industrial Park (May '17)</li> <li>※ The Central Bank of China conducted pilot operation of blockchain-based promissory note trading platform</li> </ul>
 Japan	<ul style="list-style-type: none"> <li>○ Analyzed the effects of implementing blockchain technologies through the “domestic and foreign <b>trend study</b> of services using blockchain technology (Apr. '16)”</li> <li>※ Carried out the blockchain pilot project in the electronic sector system for urban/rural and forest land registry, government contract system, food safety, and procurement for central and local governments ('17~)</li> </ul>
 UAE(Dubai)	<ul style="list-style-type: none"> <li>○ Using the strategy for constructing a blockchain-based government system (Dubai Blockchain 2020 Strategy), <b>pursuing application in the public sector* in earnest</b> ('17~)</li> <li>* Expected to reduce CO2 emissions by 1.14 million tons through the digitalization of mandatory documents</li> <li>※ Hosted the Dubai Global Blockchain Challenge (21 startups from 15 countries joined, '17)</li> </ul>

## Attachment 2 Blockchain pilot project: 4 projects in 2017

Category		Main contents
Analysis of electric fire combustion	Overview	<ul style="list-style-type: none"> <li>○ For evidence related to electric fires, it is difficult to find the point of combustion because most are lost in fires, and legal disputes are frequent on responsibilities among the building owner, tenant, and insurance company</li> <li>-Information on spark (time, location) that accounts for 80% of electric fires can be stored in the blockchain joined by Korea</li> </ul>

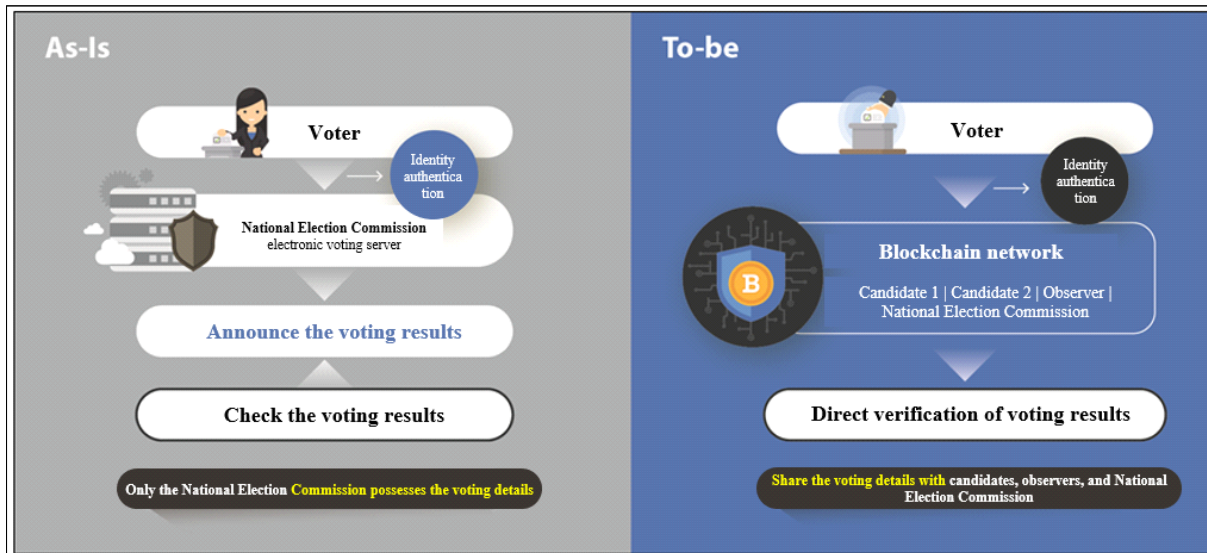
point (SKT)		Electrical Safety Corporation, National Fire Agency, insurance companies, etc.
	Status	<ul style="list-style-type: none"> <li>○ Currently under <b>test operation</b> in <b>10 places</b>* such as commercial buildings, residential buildings, traditional markets, Buddhist temples, livestock sheds, etc.</li> <li>* SKT company building, officetel in Bucheon, Namdaemun Market, Songgwangsa Temple in Jeonbuk, livestock shed in Geumseong-myeon of Jecheon, etc.</li> </ul>
	Future	<ul style="list-style-type: none"> <li>○ Developing and planning smart contract-based insurance service in cooperation with insurance companies</li> </ul>
Automatic indemnity insurance claims  (Kyobo Life Insurance)	Overview	<ul style="list-style-type: none"> <li>○ Currently, indemnity medical insurance requires the submission of medical record copies and insurance claims by the subscriber</li> <li>※ When the claim is small, many people give up claiming insurance due to the difficulties in preparing documents and its cumbersome procedures (survey results, 51.4% medical fees not claimed when less than 10,000 KRW)</li> <li>- Records the medical record sending and approval information of the insurance subscriber in blockchain, which is shared in real time by the hospital and insurance company; through this, copies of medical records are automatically sent</li> </ul>
	Status	<ul style="list-style-type: none"> <li>○ Insurance claims are being <b>test-operated</b> on 600 employees and planners at <b>3 hospitals</b> (Sanggye Baek Hospital, Samyuk Seoul Hospital, Suwon Saint Vincent Hospital)</li> </ul>
	Future	<ul style="list-style-type: none"> <li>○ Plans to expand to <b>10</b>* (including 3 existing hospitals) for all Kyobo Life customers in the first half of '18 and to an additional <b>10</b> secondary and tertiary hospitals in the second half</li> <li>* Seoul, Suwon, Incheon St. Mary's Hospital, Ajou University Hospital, Hanyang University Hospital, Seoul National University Medical Center, Korea University Anam Hospital</li> </ul>
Power trading between neighbors  (KEPCO)	Overview	<ul style="list-style-type: none"> <li>○ Match optimal prosumers and consumers in real time using a blockchain-based electric power trading platform for immediate transaction using energy points</li> </ul>
	Status	<ul style="list-style-type: none"> <li>○ Test operation of electric power trading of <b>2 KEPCO buildings</b> (Human Resources Development Center) and <b>EV charging</b> service</li> <li>※ Completed test operation of power trading among neighbors with 4 households 2 units in Hongeun Yuwon Apartment in Seodaemun-gu and 2 units in Namyangju Humansia Apartment (Jan. '18)</li> </ul>
	Future	<ul style="list-style-type: none"> <li>○ KEPCO reviewing plans for expanded application (i.e., Naju Smart City)</li> </ul>
U-Coin centered on university students  (Daily Intelligence)	Overview	<ul style="list-style-type: none"> <li>○ Easy payment and remittance system based on U-Coin (fixed value with KRW) that can be used at vending machines and participating nearby stores on the campuses of three universities in Korea (Sogang University, Korea University, POSTECH)</li> </ul>
	Status	<ul style="list-style-type: none"> <li>○ Currently, <b>vending machines</b> that allow purchases with U-Coin were installed and are being <b>operated</b> at <b>POSTECH and Sogang University</b>, and the products sold in vending machines are made up of items preferred by college students (earphones, snacks, tissue, etc.)</li> </ul>
	Future	<ul style="list-style-type: none"> <li>○ Reviews are underway to expand additional installation due to many inquiries by other universities and companies, and POSTECH is looking for ways to link with a variety of services at school aside from vending machines</li> </ul>

## Attachment 3

## Blockchain pilot project: 6 projects in 2018

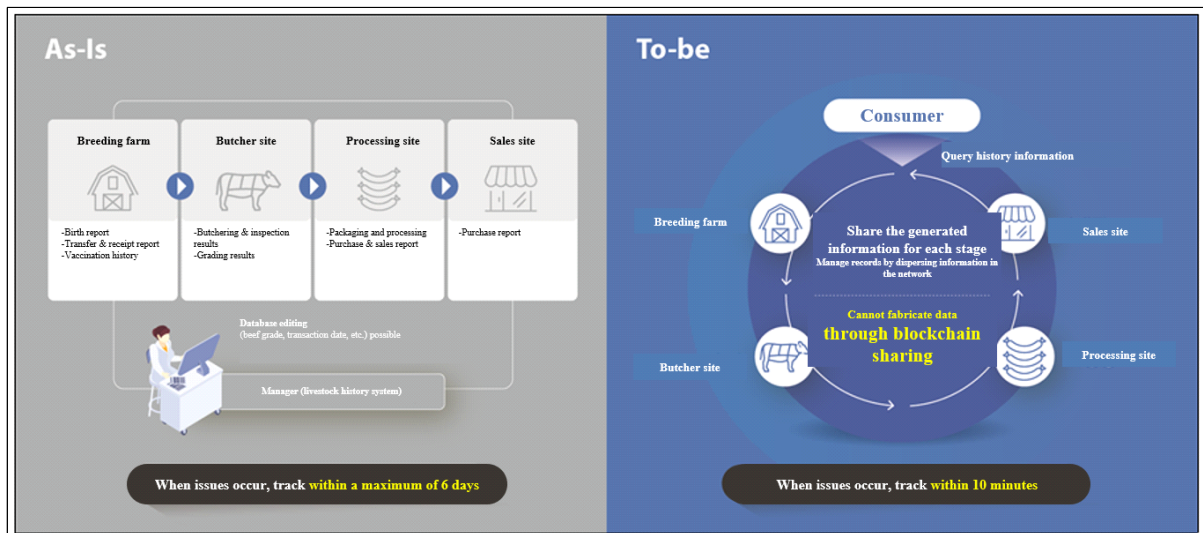
### Convenient and reliable online voting [National Election Commission]

- Online voting information recorded on blockchain so that stakeholders such as election candidates, observers, etc. can directly verify the vote counting process and results to improve reliability



### History management for beef that is safe to eat [Ministry of Agriculture, Food and Rural Affairs]

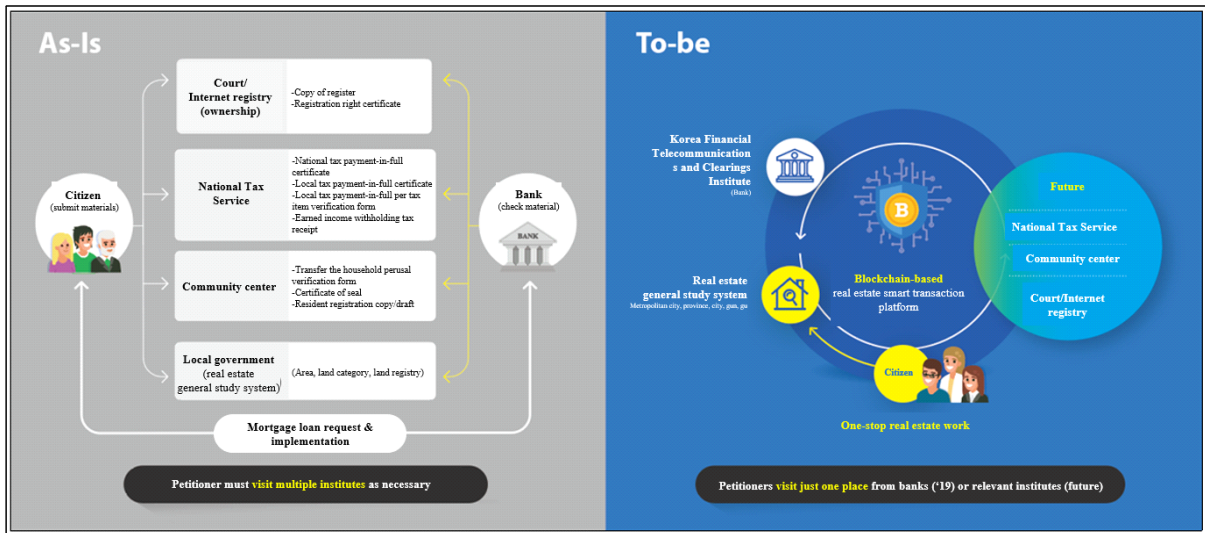
- Share information of all stages related to breeding, butchering, and sales with blockchain, and, if there are issues, the tracking period can be reduced from up to 6 days to less than 10 minutes



### Simple real estate trading [Ministry of Land and Infrastructure and Transportation]

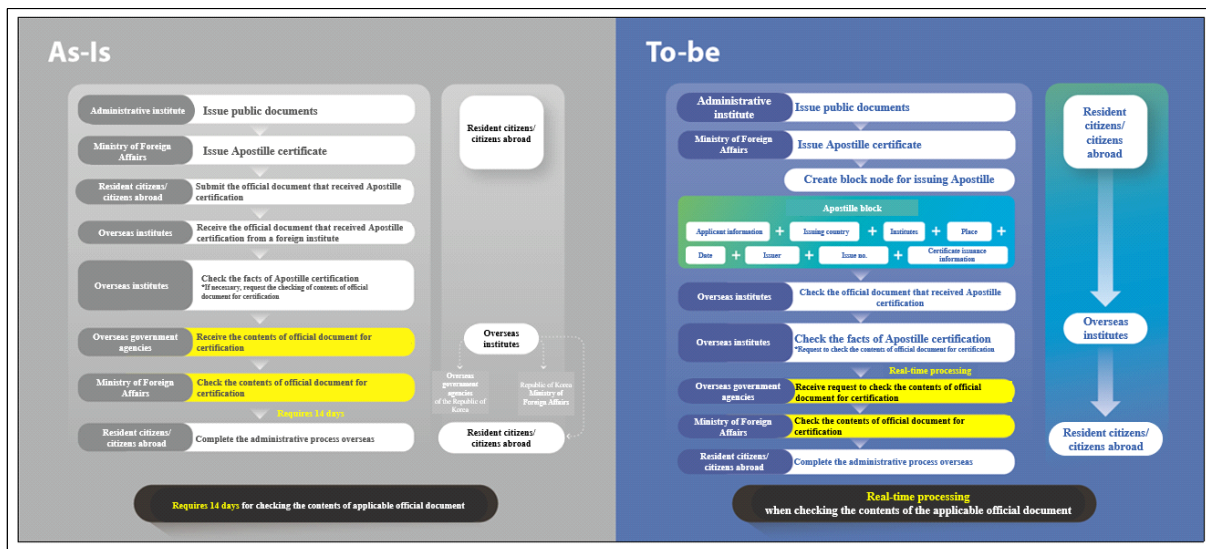
- The troubles of having to visit various institutes such as resident centers and National Tax Service to submit documents when requesting

mortgage loans are resolved through the blockchain-based real estate trading platform participated in by the relevant institutes



### Convenient submission of official documents to foreign institutes with electronic documents [Ministry of Foreign Affairs]

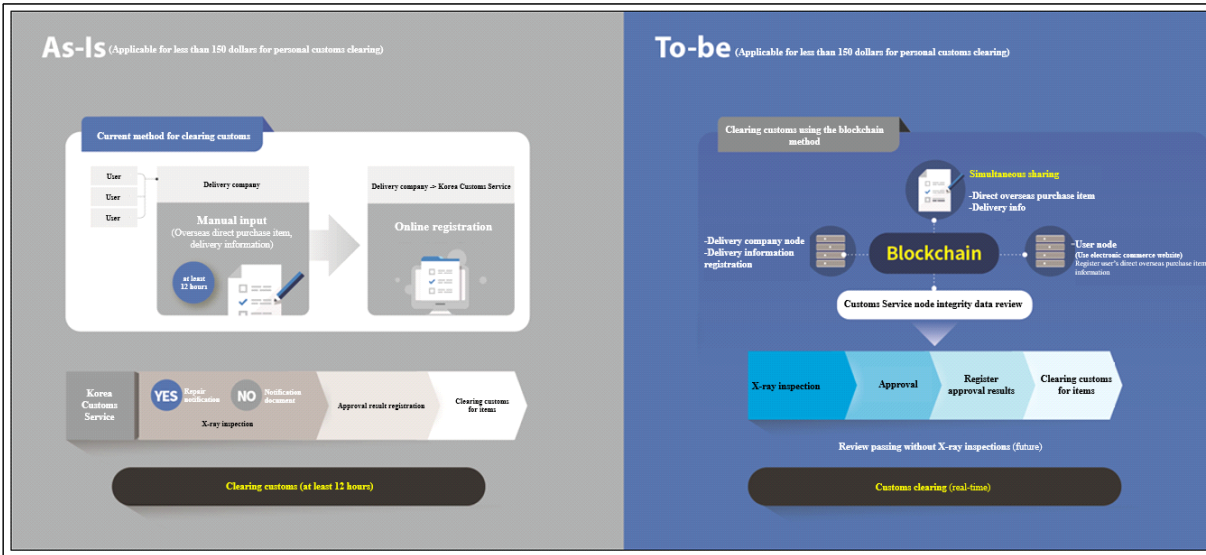
- o Save official documents and the Ministry of Foreign Affairs certifications with blockchain and share in electronic document format instead of paper documents with foreign institutes, able to check the contents of official documents in real time



### Personal customs clearing for fast processing and preventing false declarations [Korea Customs Service]

- o Record the entire process from orders, shipping, delivery, and clearing customs with blockchain to shorten the customs clearing time and reduce logistics costs through real-time import declarations, and also prevent undervalued declarations





**Efficient transportation of transshipment containers between terminals [Ministry of Oceans and Fisheries]**

o During container transshipment\*, share multiple incoming/outgoing certificates (documents) distributed between shipping companies, transportation companies, and terminals based on blockchain to improve the transportation process

\*Transshipment: Moving cargo loaded on a ship to another ship

