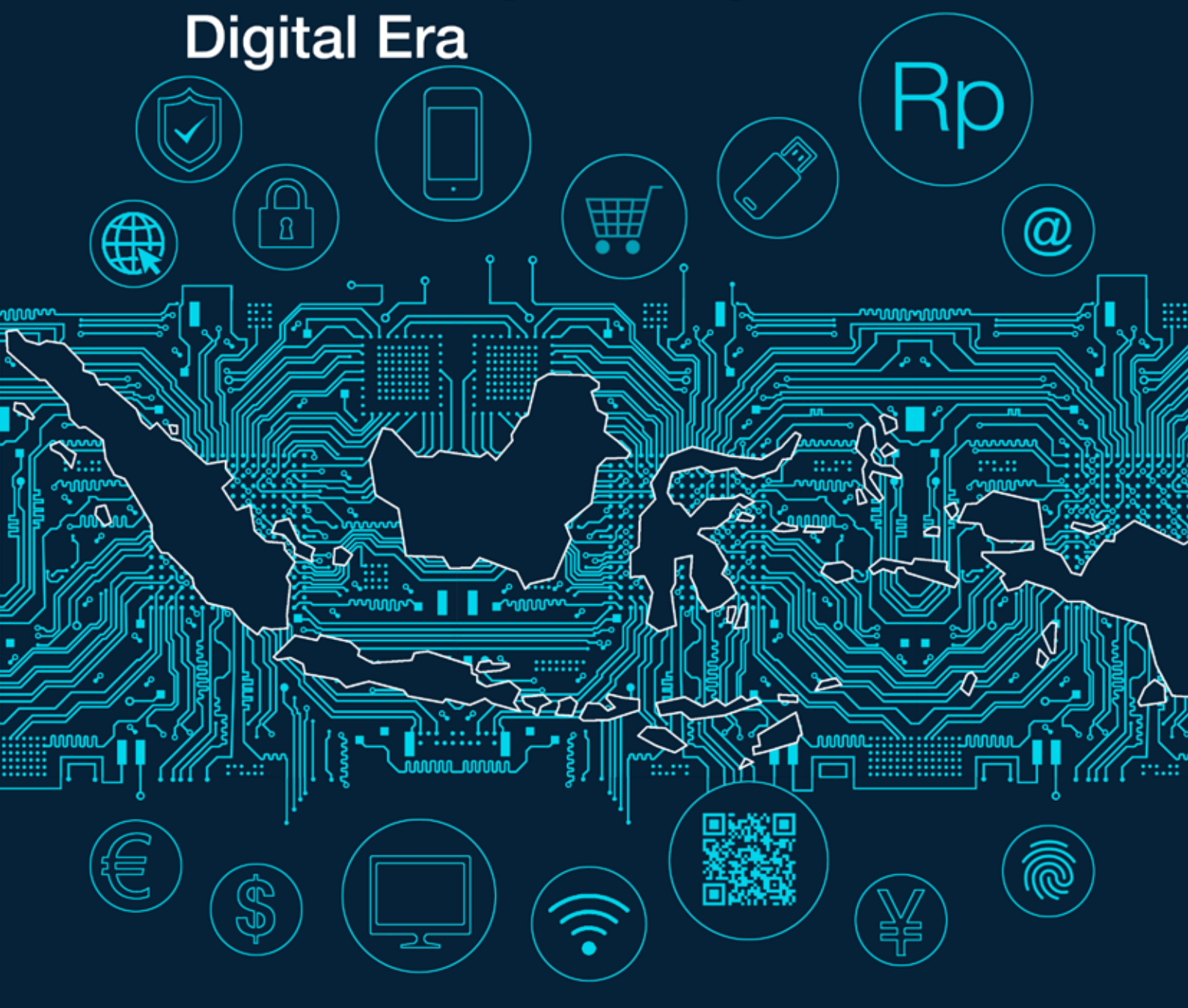


Indonesia Payment Systems Blueprint 2025

Bank Indonesia: Navigating the National Payment Systems in Digital Era



Indonesia Payment Systems Blueprint 2025
**Bank Indonesia: Navigating the National Payment
Systems in the Digital Era**

BANK INDONESIA
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Indonesia

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Jakarta, 28 November 2019

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Indonesia Payment Systems Blueprint 2025





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Abbreviations

APMU	Currency Based Payment
APMR	Deposit Account Based Payment
APMD	Non-Deposit Account Based Payment
API	Application Programming Interface
AML-CFT	Anti Money Laundering/Combating the Financing of Terrorism
ASPI	The Association of Indonesia Payment System
BI-ETP	Bank Indonesia Electronic Trading Platform
BIS	Bank for International Settlements
BI-RTGS	Bank Indonesia Real Time Gross Settlement
BI-SSSS	Bank Indonesia Scriptless Securities Settlement System
BUKU	Commercial Bank Classification
CASA	Current Account Saving Account
CCP	Central Counterparty
CPMI	Committee on Payment and Settlement Systems
CSD	Central Securities Depository
DLT	Distributed Ledger Technology
DVP	Delivery Versus Payments
EDC	Electronic Data Capture
ESMA	European Securities and Market Authority
FATF	Financial Action Task Force
FSB	Financial Stability Board
GPN	Gerbang Pembayaran Nasional (National Payment Gateway)
IMF	International Monetary Fund
IPS	Indonesia Payment Systems
IPSB	Indonesia's Payment System Blueprint
ISO	International Organization for Standardization
IT	Information Technology
KPEI	Kliring Penjaminan Efek Indonesia
KSEI	Indonesia Central Securities Depository
KYC	Know Your Customer
NIST	National Institute of Standards and Technology
NSICCS	The National Standard for Indonesia Chip Card Specification
OBIE	Open Banking Implementation Entity
OECD	The Organisation for Economic Co-operation and Development
OJK	Otoritas Jasa Keuangan (Financial Service Authority)
OTC	Over the Counter
PFMI	Principles for Financial Market Infrastructure
PP	Government Regulation
PSP	Payment System Provider
PSR	Payment System Regulator
PVP	Payments versus Payments
QRIS	Quick Response Code Indonesia Standard
RBI	Reserve Bank of India
RBNZ	Reserve Bank of New Zealand
SBN	Government of Indonesia Securities
SBI	Bank Indonesia's Securities
SKNBI	National Clearing System
SSK	Financial System Stability
UNCTAD	United Nations Conference on Trade and Development
VPA	Virtual Payment Address

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REMARKS

GOVERNOR OF BANK INDONESIA

Assalamualaikum warahmatullahi wabarakatuh



In the past decade, we have witnessed waves of digitalization and its diffusion into our lives. Nowadays, almost all devices are connected to the digital world. Unwittingly we have left digital traces of our daily activities and may be unaware that those traces have completely changed the economic and financial landscape.

The current digitalization in the economic and financial world changes the behavior of economic agents. Nowadays, people increasingly demand fast, affordable, and safe financial services. The interaction between economic agents, both as a consumers and factors of production, shows an unusual pattern. The world is heading towards a new normal that is no longer akin to what we have already perceived. Digitalization becomes a new genre that we need to discern and maximize its benefits without losing any vigilance.

Technological innovation is an agnostic solution that makes financial services in hand no longer as a mere jargon. Now everyone, male and female, young and old, rich and poor, with or without a bank account, has equal access to the financial world, only by resorting online application on their smartphone. Digitalization opens wide doors for economic and financial inclusion opportunities for all, including the unbanked and MSME segments. This is good news for Indonesia, where 51% of the adult population has not been exposed to banking services.

However, digitalization also changes the overall risk landscape at the same time. Cyberattack, big tech, cryptoasset and many other unfamiliar terms are now emerging as a new scourge for economic, monetary and financial system stability. The presence of risk in a new dimension calls for policy innovation from the authorities. The biggest demand is how to measure policies appropriately so that digitalization can provide optimal and sustainable benefits for economic and financial inclusion, while is still being able to mitigate various risks.

Bank Indonesia: Navigating the National Payment Systems in the Digital Era is the documentation of the Indonesia Payment Systems Blueprint 2025 as our new policy solutions to the new horizon of challenges in the digital era. The Blueprint comprises 5 Visions of the Indonesian Payment Systems 2025 which is further translated into 5 major initiatives and manifested into 23 key deliverables implemented in stages from 2019 to 2025.

With the Indonesia Payment Systems Blueprint 2025, we are confident that digital innovation will open up access for 91.3 million unbanked people and 62.9 million MSMEs in Indonesia to formal economics and finance in a sustainable manner. Thus, all efforts are directed towards a stronger and more evenly distributed Indonesia in the future.

Wassalamu 'alaikum Warahmatullahi Wabarakaatuh

PERRY WARJIYO

REMARKS

DEPUTY GOVERNOR OF BANK INDONESIA

Assalamualaikum warahmatullahi wabarakatuh



Al-hamdu lillahi rabbil 'alamin. Praise to Allah, the Almighty God for the publication of the Indonesia Payment System Blueprint 2025. This publication is the cornerstone of Bank Indonesia and the national payment system industry to step into the unprecedented digital era.

The digital era is a necessity and has colored the landscape of the payment system recently. Shorter technology cycles have become a challenge for regulators to keep abreast of developments amid variations, innovations, and the complexity of payment systems.

In response to these conditions, regulators need to be proactive in encouraging the development of innovation and technology that are considered capable of increasing productivity, efficiency, and inclusiveness.

On the other hand, regulators also need to be aware of innovation and technological development challenges and risks. For this reason, a balanced approach (striking the right balance) between encouraging innovation and mitigating risk needs to be done carefully and in the right amount.

The balanced approach is articulated by Bank Indonesia, as the regulator of the Indonesian payment system, in the form of the Vision of the Indonesian Payment System. Through this vision, Bank Indonesia continues to oversee the transition to the digital era through five initiatives. First, encouraging integration of digital economy and finance through digital banking transformation and interlink between banks and fintech using open API standards. Second, leading the orchestra to develop a national retail payment system to become the main infrastructure in the digital era, including the development of fast payments and the expansion of the Gerbang Pembayaran Nasional (National Payment Gateway). Third, modernizing the wholesale payment infrastructure in accordance with international best practices. Fourth, encouraging the development of public data infrastructure for the benefit of the national digital economy. Fifth, strengthening more adaptive and agile regulatory framework with the development of digitalization and reform of licensing and supervision to improve efficiency, market discipline, integrity, risk management, and consumer protection.

Indonesia's Payment System Blueprint 2025 will serve as a strong foundation in implementing Bank Indonesia's initiatives with the government, both the central and regional governments. These initiatives include a non-cash social assistance distribution program, electrification of local government transactions, and electrification of the transportation sector.

Regarding the dynamics of digital economy era, this publication is a living document that will be continuously updated as needed. This publication is expected to provide future directions for the development of the national payment system industry.

Finally, I would like to express my gratitude and give the greatest appreciation to the entire Indonesia's Payment System Blueprint 2025 team. With the support of all parties, both related ministries/institutions and the national payment system industry. May all aspirations and efforts benefit the Republic of Indonesia.

Wassalamu 'alaikum Warahmatullahi Wabarakaatuh

SUGENG

Digital Economy and Finance Ecosystem 2025

Opening up access for **83.1 million** unbanked people and **62.9 million** MSMEs to formal economics and finance in digital and sustainable manner through digitalization

Financial Sector

Real Sector

- OPEN API
- BI-FAST
- QRIS
- IPT
- BI-RTGS
- DATA HUB
- PAYMENT SANDBOX
- ID
- ELECTRONIFICATION



























































































































































































































































































































Executive Summary



The digital revolution in the past decade has drastically altered economic behavior. Consumption has shifted from offline to online shopping, increasing demand for faster, mobile, and more secure payment solutions. The pattern of industrial relations among agents has also become progressively modular and yielded new business models. Moreover, jurisdictional boundaries are fading in the presence of global digital platforms, impairing national economic sovereignty as well.

The trend of digitalization affects almost all economic aspects. It disrupts conventional functions including those in the financial sector. The demand for fast, efficient, and secure financial services becomes vigorous as consumers are indulged by seamless services and experiences. The new collaboration models among agents through sharing economy have eroded the role of formal financial institutions as middleman. The new business models have gone beyond the scope of the business activities definition as codified by existing regulations. In the financial world, non-banks that are less regulated have begun to infiltrate the financial sectors currently dominated by banks. The role of non-banks is becoming substantial, starting from local start-up companies to global and large-scale technology companies (big tech) as the entry barriers are loosened.

In the digital era, data becomes the most valuable resource (data is the new oil) as well as the key to competitiveness.

Today, almost all physical devices are digitally connected. The phenomenon of the Internet of Things (IoT) has created various

digital activities and produced digital footprints at their highest granularity. Granular data provides feedback to service providers to improve their service level to be more customer-centric in order to maintain their customer's loyalty. Granular data are also ruled as the key to competitiveness. Having the ability to possess and control granular data, some players can form an exclusive ecosystem by integrating digital services across platform in one value chain. With these strengths, a number of players evolved into big tech and started to dominate the market rapidly. The control on payment systems plays a key role in the process of integrating these ecosystems.¹

Digitalization has been growing rapidly in Indonesia recently and will be even more amplified in the future. With large population dominated by generations Y and Z, Indonesia becomes a prospective market. At the same time, large number of unbanked people opens up market opportunities even greater. Digitalization is a prevalent phenomenon in emerging countries as access to technology becomes more affordable and promotes the participation of the underserved. In contrast, the impact of digitalization in developed

¹BIS (2019) "Payments were the first financial service Big Techs offered, mainly to help overcome the lack of trust between buyers and sellers on e-commerce platforms."

countries are generally more modest due to its aging society couples with well-established financial institutions as well as low numbers of unbanked people.

If properly designed, digitalization will boost economic output. Digital innovation transforms social interaction toward economic democratization; promotes efficiency due to the rising ability of economic agents to access and utilize information; and enables a sound environment for new innovations and new business models, industries and new sources of economic growth to arrive. The interconnectivity among economic agents cuts off goods and services supply chain, encourages fair access and distribution of information more evenly, and promotes economic efficiency in general. The application of Cloud Computing and Big Data Analysis allows data utilization up to its granular level and extends products and services varieties which in turn broadens consumer's choices and simultaneously expands the market. These benefits are the key to unlock the opportunities for wider economic-financial inclusion for 51% unbanked and under-participated people. Hence, a clear understanding of the industrial revolution 4.0 which is totally different from the previous industrial revolution, will be the key success factor for the design of digital economy in Indonesia.

Digitalization also implies new dimension of risk. These risks include heightened shadow banking activities, soared imports especially consumer goods, exacerbated cyber risk, the emergence of new types of fraud, unfair business competition, and misuse of customer data. The impact of technology disruption on the labor market will also be very painful if not properly anticipated. In addition, the borderless character of the digital business model also raises the issue of economic sovereignty and thus complexity in maintaining national interests that guarantee the long-term sustainability of the economy. In this respect, the impact of those risk to the main objectives of Bank Indonesia i.e. monetary stability, financial system stability, and the smooth functioning of payment system could be potentially disruptive.

The large potential for market failure in an increasingly integrated payment system confirms the critical role of the central bank in the digital age. The payment system industry tends to be susceptible of concentration risk derived from the economies of scale and positive network effects. Meanwhile, not all fund settlements have been made through central bank money which possesses strong settlement finality element. This confirms the critical position of central bank as regulator, supervisor, as well as operator of payment system. Technological innovation and the shift of consumer behaviour urge the central bank to reform its policy paradigm. Central bank is also required to maintain public services quality at all times, following the shifting of public demands in the digital era.

Therefore, the policy challenge for economic and financial authorities in the digital era, especially for Bank Indonesia, is how to strike the balance between harnessing the digital opportunities while mitigating the risks.

Authorities need to identify integrated solutions to bring in 91.3 million unbanked people and 62.9 million Micro, Small and Medium Enterprises (MSMEs) into formal economics and finance by taking advantage of digitalization. The financial inclusion program needs to be expanded from being limited to ownership of payment instruments or bank accounts to sustainably accessing financial markets and the goods market as a whole. In this respect, Bank Indonesia will introduce a new concept of broader financial-economic inclusion. The door to inclusiveness is opened widely by agile digital solutions and the use of granular data and information as the main footprints of the Industry 4.0 era. The digital transformation program led by Bank Indonesia will be directed inclusively by involving small economic enterprises in the large stream of digitalization. Their digital financial activities will produce data which in turn create new business solutions that will bring them to a higher level of economic participation.

Digitalization should move in harmony with efforts to maintain monetary and financial system stability as well as efforts to maintain the smooth functioning of the payment

system. Banks need to develop an end-to-end digital transformation to maintain their competitiveness in the digital age. At the same time, interlinks between bank and fintech need to be promoted in a clear contractual standard. In addition, the regulatory framework, entry-policy as well as reporting and supervisory framework including risk management arrangements should also be adhered to the digital challenge. The control of granular data by few parties could raise monopolistic competition which need to be prevented. Hence, it is necessary to provide public infrastructure that guarantees data openness, transparency, and market discipline, equipped with strong data protection arrangements as well as fair consideration of national interest.

Bank Indonesia has formulated the Indonesia Payment System Blueprint 2025 which fully oriented towards efforts to build a healthy ecosystem for the development of digital economy and finance in Indonesia. The blueprint is built upon five visions and revealed as the articulation of Bank Indonesia's long-term policy direction end-states.

The implementation stage of the five visions of Indonesia Payment System Blueprint 2025 is cascaded into five initiatives. These

initiatives will be implemented by Bank Indonesia in accordance with its mandates and authorities, and through productive collaboration and coordination with relevant ministries/agencies as well as the industry. The five initiatives are further elaborated into Bank Indonesia's strategic programs which will be implemented gradually over a period of 2019 to 2025. The five initiatives are:

Initiative 1: Developing Open Banking. This initiative will be achieved through an open API standardization set up. The scope of standardization will include data, technical aspects of API, security, and governance including contractual standards. This step enables the disclosure of financial information and interlinks between banks and fintech.

Initiative 2: Strengthening the Configuration of Retail Payment Systems. This initiative will be achieved through the development of infrastructure that supports the availability of payment services in real time, seamless, 24 hours and 7 days (24/7) availability coupled with high level end-to-end security and efficiency. The provision of easy, comfortable, mobile, and affordable payment services for everyone becomes the final objectives of this step. Key deliverables for this initiative

INDONESIA PAYMENT SYSTEMS (IPS) VISION 2025

1

IPS 2025 reinforces **the integration of national digital economy and finance** in assuring the proper functioning of central bank mandate in money circulation, monetary policy, and financial system stability as well as financial inclusion

2

IPS 2025 fosters **digital transformation within the banking industry** to sustain banks role as a primer institution in the digital economy and finance through the implementation of open-banking standard as well the deployment of digital technology and data on their financial product and services

3

IPS 2025 assures **interlink between fintech and banks** to contain the escalation of shadow-banking risk through the regulation of the use of digital technology (e.g. API), business relation, and business ownership

4

IPS 2025 strikes **the balance among innovation, consumers protection, integrity, and stability as well as fair competition** through the implementation of digital KYC & AML-CFT, data/information/public business openness, and the deployment of Reg-tech & Sup-tech for reporting, regulatory and supervisory

5

IPS 2025 safeguards **national interest on cross-border use of digital economy and finance** through the obligation of domestic processing for all onshore transactions and domestic partnership for all foreign players under the consideration of reciprocity principle

*) IPS aspect comprise of instruments, mechanism, institutions, infrastructures, & cross-border, including synergy & coordination among institutions

include the development of BI-FAST, Integrated Payment Interface, GPN and QRIS.

Initiative 3: Strengthening Financial Market Infrastructures. This initiative will be achieved through modernizing the infrastructure and strengthening the regulatory framework for financial market infrastructure. Through this initiative, Indonesia's financial market infrastructure is expected to be able to operate according to standard best practices and provide support for optimal policy makings. Key deliverables for this initiative consist of modernization of BI-RTGS, BI-SSSS, and BI-ETP, as well as strengthening the regulatory framework of CCP and TR including its infrastructure developments.

Initiative 4: Developing Public Infrastructure for Data. This initiative will be implemented through the provision of public infrastructure for data management. Data openness, transparency, and market discipline, are expected to be accomplished through this initiative. Key deliverables in this initiative include the establishment of Data Hub, an integrated reporting system, and Payment ID.

Initiative 5: Strengthening the Regulatory, Licensing, and Supervisory. This initiative will be achieved through strengthening the framework of payment systems regulatory and supervisory framework as well as promoting an integrated licensing regime. Through this step, the rapid pace of digitalization could be

accommodated by regulation, entry-policy, and supervisory actions which also support the needs of the digital era, encourage innovations, and mitigate risks adequately. The key deliverables of this initiative include the new regulatory structure which covers a framework for personal data protection, cyber security, integrated entry policy and supervision including the use of regtech and suptech solutions.

The vision of the Indonesia Payment System 2025 will help navigate the process of Indonesia's economic transformation into the digital future. A well-functioning payment system, monetary system as well as financial system will act as a basis for economic growth, prosperity and financial system stability. The 2025 Indonesia Payment System Blueprint is the real contribution of Bank Indonesia in establishing a healthy and sound digital ecosystem while being able to guarantee the implementation of the tasks and authority of Bank Indonesia as a central bank in the Republic of Indonesia. Furthermore, the 2025 Indonesia Payment System Blueprint will knit structural reform of Indonesia's economy towards digital transformation in which the participation of all economic agents (large and small scale), at the center and the local regions, will be integrated into an inclusive digital ecosystem. Utilization of digital data will be the key to Indonesia's economic transformation, and it is necessary to bring it into the public spaces to warrant its usage for the greater good of common interest.



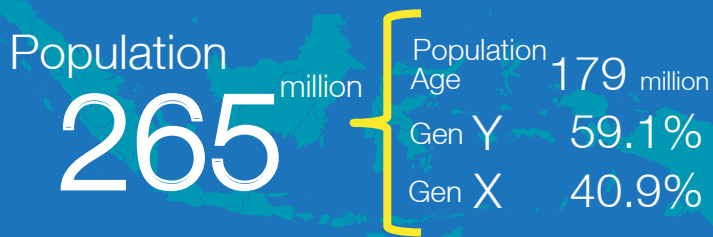
Indonesia

Digital Landscape

fostering inclusive growth while maintaining mitigation of risk

Opportunities

Demographic



Source: Statistics Indonesia

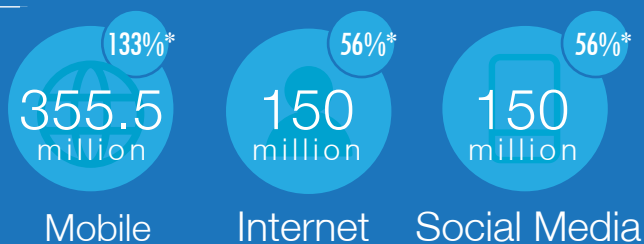
Digital Landscape

Large Market Opportunities

51%
unbanked people

Source: World Bank, 2017

Users



Players



*of population
Source: Wearesocial, AFTECH, BI, OJK

Challenges



Big tech

amazon

Alipay



Misuses of Data

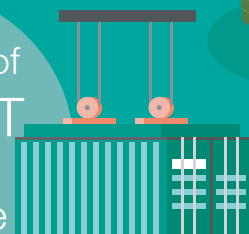


Cyber Attack

Highly Interconnected



Domination of
IMPORT
goods in
marketplace



Source: FGD Bank Indonesia, 2018



Money
Laundering

CHAPTER 1

STRATEGIC ENVIRONMENTAL BACKGROUNDS

"Innovation is the market introduction of a technical or organisational novelty, not just its invention."

(Joseph Schumpeter, 1942)

The trend of digitalization affects the joints of the economy. It changes the pattern of consumer's and corporate's transactions and disrupts conventional functions, including the financial sector. This trend creates opportunities as well as risks, providing new challenges for authorities. The main policy challenge is to find the right balance between efforts to optimize the opportunities brought by digital innovation and ability to mitigate the risks.



Digital technology is present in our daily life. Almost all individual activities have been exposed to digital innovation with rapid annexation rates in recent years. This phenomenon arises as a multiplier effect of fast computing capacity and rapid inclusion processes of digital technology innovations, such as the Internet of Things (IoT), Big Data Analytics, Artificial Intelligence (AI), Machine Learning, and Robotics.

The trend of digitalization affects the economy; it changes the pattern of public and corporate transactions and disrupts conventional functions, including the financial sector. The wave of digitalization along with the rise of sharing economy era and economy platform with increasingly modular business patterns, resolve cross-border jurisdictional problems

(borderless) and reduces the role of the middle man (Figure 1).



... with the fourth largest population in the world and a demographic structure dominated by Y and Z generations, Indonesia has the most prospective consumer segment to absorb the wave of digitalization.

Modular business patterns put data as an asset as well as a new competitiveness key in the digital era. The use of the Internet of Things (IoT) that connects various digital activities generates an increasingly granular explosion of information to the individual level. Hence, the detail and granular data able to provide benefits for service providers to improve their

Figure 1. The Digital Revolution



services quality in personalized their products and services (consumer-centric) and maintain consumer loyalty.

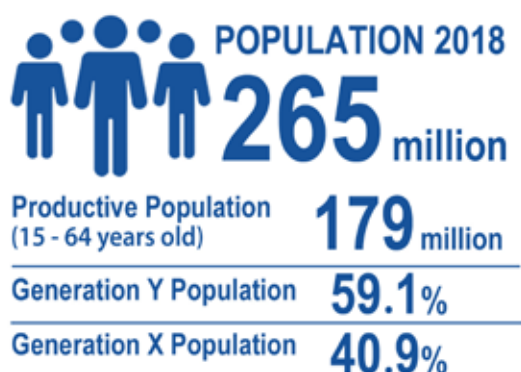
Indonesia's economy has a great potential to reap the benefits of digitalization. Being the fourth largest population in the world where the demographic is dominated by generations Y and Z, Indonesia became the most prospective consumer segment to absorb the wave of digitalization. Indonesia's population reached 265 million by 2018; more than 60 percent of them were aged between 15 and 64 years (Figure 2).

More comfortable and affordable access to digital infrastructure along with strong digital literacy tendencies in Indonesian society escalate the flow of digitalization. The ease of access is reflected by the affordable price of smartphones and the availability of high-speed internet that is increasingly widespread and equitable. Public interest continues to increase, along with the improving digital literacy

stimulated by the role of digital natives coming from generations Y and Z. In the payment system area, the magnitude of the interest is reflected in the growing popularity of online credit and debit transfer payment methods which are generally done using mobile devices (Graph 1). The trend is expected to become stronger in Asia-Pacific, including Indonesia.

Although the public interest is quite significant, the digital divide in Indonesia is still quite extensive, as well as the level of financial inclusion that is still lagging. Current data shows internet user penetration in Indonesia only reaches 56% of the total population, lower than the global average and ASEAN peer countries (Table 1). Besides, the number of unbanked people is still significant. Practically, only 49% of the total adult population (over the age of 15) has a bank account (Graph 2), far lower than the average of countries in the Asia Pacific region (71%). Access to finance to 62.9 million Micro, Small, and Medium Enterprises (MSMEs) is also still limited. However, the digital divide and

Figure 2. Demographic Potential



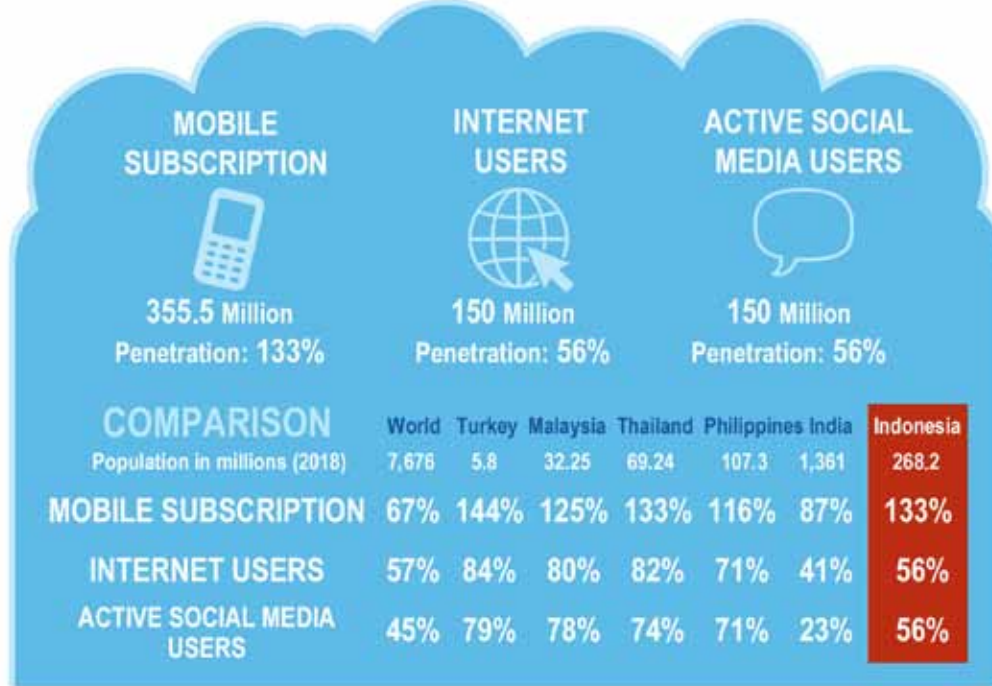
Source: Statistics Indonesia, 2019

Graph 1. Retail Payments Transaction Volume in Indonesia



Source: Bank Indonesia 2019

Table 1. Digital Penetration



Source: Wearesocial Jan-19, Jakpat

the low level of financial inclusion also reflect the wide-open opportunities for digital market penetration in Indonesia.

With these prospects, it is not surprising that online platform businesses, especially fintech and e-commerce, flourish in Indonesia. As of September 2019, there were 272 fintech players and 200 e-commerce players in Indonesia (Graph 3). Five of them hold unicorn status. Likewise, Indonesia also has a massive internet economy. By 2025, the size of Indonesia's internet market is projected to reach US \$ 100 billion, the highest in ASEAN (Graph 4). This opportunity has succeeded in drawing a large scale of capital inflows, both at domestic and foreign capital to numerous fintech and e-commerce start-up in Indonesia.

Graph 2. Share of Adult's Account Ownerships in Indonesia



Source: Global Financial Index, 2018

Fintech and e-commerce provide flexible and aggressive solutions to encourage financial inclusion. This expansion of inclusiveness noticeably in the network built by several fintech and e-commerce. In December 2018, the Gojek platform was reported to have employed around 1.7 people as online motorcycle taxi drivers and connected to more than 400,000 merchants who automatically opened an account at banks. In 2019, the Bukalapak platform has also been connected with more than 700,000 businesses and more than 500,000 stalls in Indonesia. Further, the Tokopedia network has established 5 million partnerships, including channeling capital assistance to MSMEs. Therefore, fintech and e-commerce can have the potential to open inclusiveness opportunities to 51% of the unbanked people and 62.9 million MSMEs.

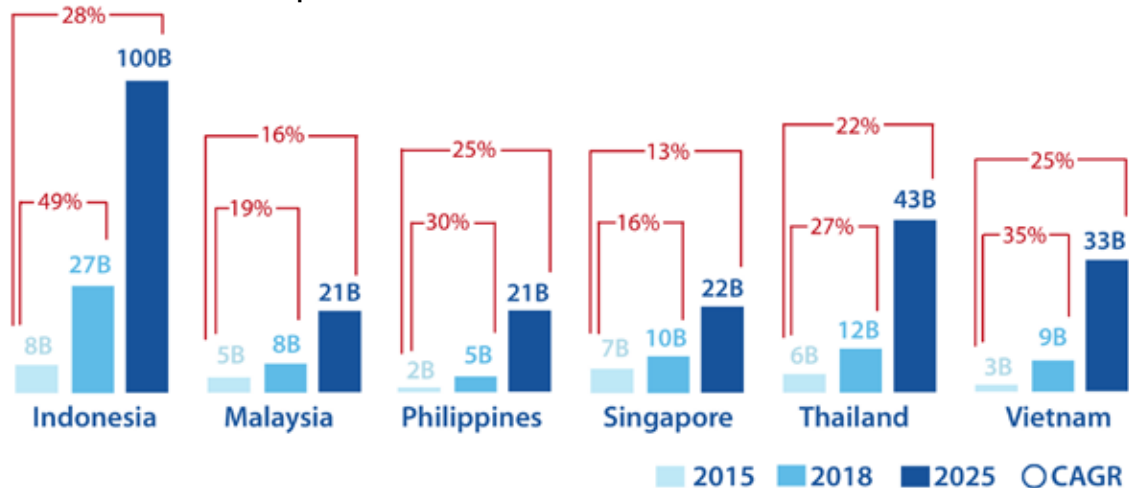
Graph 3. Fintech Development in Indonesia



Source: AFTECH, BI & OJK processed

² Fintech lending business model includes peer to peer lending, balance sheet lending, and online credit platform.

Graph 4. Size of the Internet Market in Southeast Asia



Source: Economy SEA 2019 (Google, Temasek, Bain & Company), AFTECH, BI, OJK

Public acceptance of fintech and e-commerce services is also strong. Both e-commerce transactions and fintech lending² grew exponentially. From 2017 to August 2019, e-commerce transactions grew significantly by 137.1% (CAGR) (Graph 5). Loans channeled through fintech lending reached Rp44.8 trillion in August 2019 (Graph 6). This trend is positively correlated with the increasing performance of fintech payment service providers, which are mostly electronic money issuers (Figure 7).

In the payment system, fintech transactions performance are approaching those of banks, especially driven by e-commerce transactions. The use of electronic money for e-commerce transaction, which is entirely provided by fintech continue to increase, reducing the usage share of digital banking services (credit and debit transfers) (Graph 8). People's preference for payment services offered by fintech in e-commerce transactions continues to strengthen, so does the merchant's acceptance (Figure 9). This development point

out the exponential increase in e-money floats, especially those managed by fintech. In August 2019, floating funds managed by non-bank issuers reached Rp2.9 trillion, faster than the accelerated increase in e-money floats managed by banks (Graph 10).

The strengthening of the non-bank's role in providing payment services, which was followed by a decline in banks role, displayed the effect of digital disruption in Indonesian financial industry. Now, the various financial service business models that banks typically provide can be imitated by fintech (shadow banking). In general, the payment system is an entry point for fintech in replicating the banking business model, as well as being the most vulnerable point in the disruption effect. Fintech has also disaggregated other banking services, such as lending, mutual funds, and remittances.

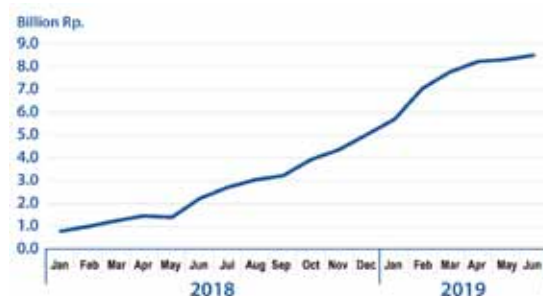
Players equipped with strong capital are by further able to conduct cross service

Graph 5. E-Commerce Transactions



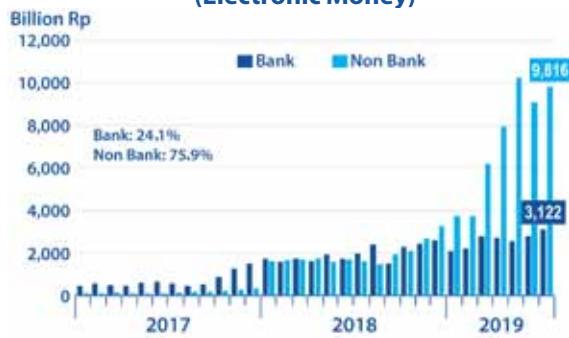
Source: Bank Indonesia

Graph 6. Loans via Fintech Lending



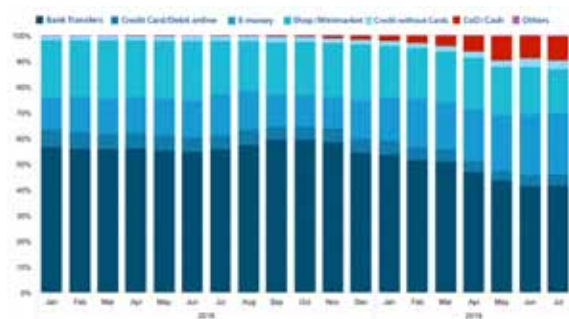
Source: Otoritas Jasa Keuangan

Graph 7. Fintech Payments Transactions (Electronic Money)



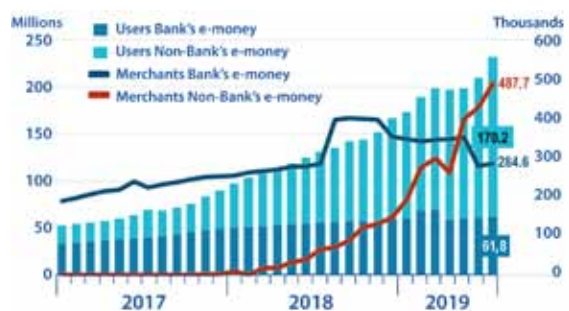
Source: Bank Indonesia

Graph 8. Share of E-commerce Payment Methods (By Volume)



Source: Bank Indonesia

Graph 9. Bank versus Non-Bank E-Money User and Merchant Acceptances



Source: Bank Indonesia

Graph 10. Bank vs Non-Bank E-Money Floats Funds



Source: Bank Indonesia

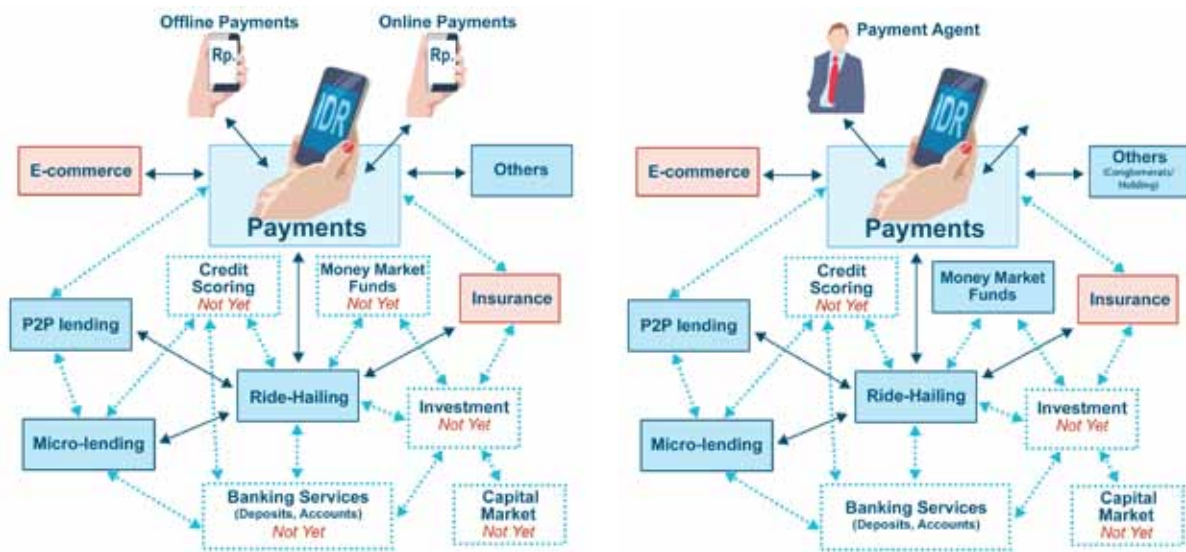
integration, both horizontal and vertical, into one value chain and forming big tech (Diagram 1). The ecosystem allows the players to control granular data massively and move towards market dominance. Substantial capital also emerged from the swift flow of foreign investment into fintech and e-commerce. Several domestic conglomerates have even begun to explore the fintech business model which integrated with other affiliated financial business activities.

The presence of big tech has increasingly escalated shadow banking activity. Like fintech, big tech generally begins to penetrate its financial services through payment system channels that are actively beginning to penetrate other financial service areas such as credit, insurance, even savings and investment products. BIS (2019) stated Indonesia has one company that has met the big tech criteria. Fintech and big tech generally conduct business collaboration with banks in providing financial services and mobile application interfaces for customer transactions, including facilitating the use of payment instruments issued by banks (credit cards or debit cards).

While digital transformation moves fast in the non-bank side, digital transformation in the banking industry, including in Indonesia, tends to lag behind fintech development. A survey conducted by Bank Indonesia (2018) of 30 banks in Indonesia showed that none of the banks surveyed were at the digital level 2.0 (quadrant III) (Appendix A). The majority of national banks are still at the IT development level (quadrant I). Several banks with large assets, especially BUKU 4 banks, have been able to reach the digital level 1.0 (quadrant II). Contrarily, banks with relatively small assets still left behind (Graph 11). Legacy systems are still the main obstacle for banks to transform. For relatively small asset banks, high investment costs are also an obstacle.

Other than that, the escalation of cyber incidents and operational related risks has given rise to a new dimension of financial system risk. Cyber risk has emerged as a top threat feared by business in the digital age as online transactions become massive. From 2006 to

Diagram 1. Omnichannel in Indonesia



Source: Bank Indonesia

2018, the number of global cyber attacks was reported to have increased significantly by 2500% (Graph 12). Losses due to the incident were estimated at US \$ 11.7 trillion in 2017. Payment system infrastructure operated by Bank Indonesia is also inevitable from this risk. In addition, the strengthening of the non-banks role and their interconnection with the financial system (including cloud services) makes the domino effect of operational incidents more complex. The increased dependence on IT also makes basic infrastructure disruptions which are electricity and internet networks, potentially systemic.

Data transformation not only turns into an important asset in the digital era, but also escalates the risk of personal data fraud by third parties (data managers). Leakage and sale of individual data became the main issues that can destroy consumer confidence. For example, 2,577 incidents of personal data fraud were reported to the ICO³ UK between Quarter IV-2018. The outbreak of the Facebook-Cambridge Analytica scandal in 2018 alarmed all elements to strengthen the framework of personal data protection.

The complexity of controlling money laundering and terrorist financing risks in the digital era is also increasing. One of the triggers is stemming from the development of virtual assets⁴ as a means of payment or known as virtual currencies⁵ (e.g. Stablecoin). FATF (2018) mentions that virtual asset ecosystems are generally anonymous or disguised (pseudonym) so that transactions are not transparent. This risk also found in Initial Coin Offering (ICO) and exchange trading (Exchange Coin Offering) activities. Based on the Cyphertrace report (2019)⁶, losses from money laundering and terrorist financing cases using virtual assets were estimated at US \$ 4.26 billion until Quarter II-2019.

The digital age has also made it even more challenging to safeguard national interests for sustainable economic growth in the long run. Risks arise from the large dependence of fintech and e-commerce on foreign investment. Foreign investment is needed to fill the gap in domestic funding sources. This phenomenon may widen current account deficit, especially if the domestic production sector is less productive than other countries.

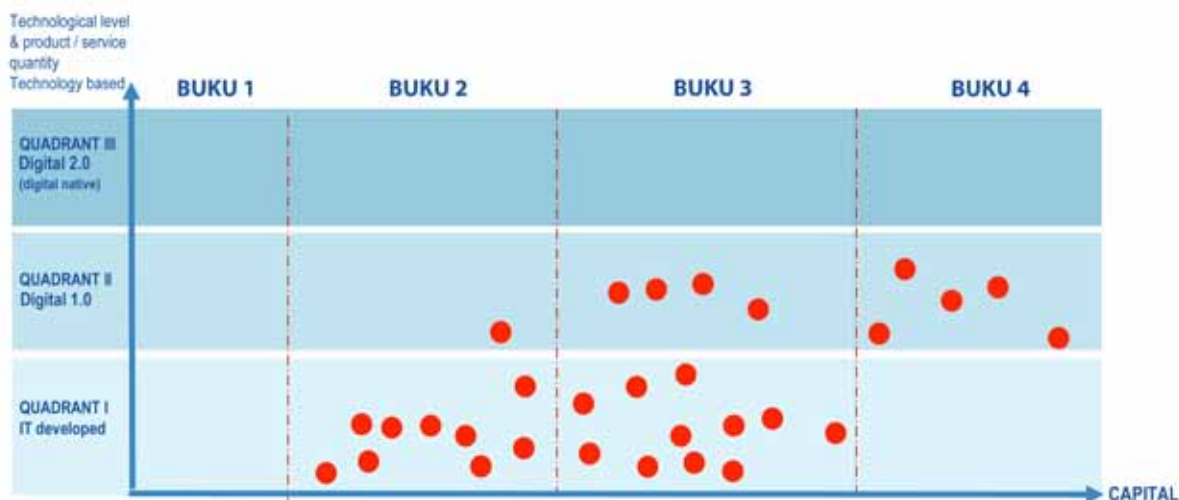
³ Information Commissioner's Office (2019) : Data Security Incident Trends.

⁴ FATF (2019) defines virtual assets as "A digital representation of value that can be digitally traded, or transferred, and can be used for payment or investment purposes". Meanwhile, the FSB (2018) defines cryptoasset as "a type of private asset that depends primarily on cryptography and distributed ledger or similar technology as part of their perceived or inherent value".

⁵ Virtual assets that use cryptographic technology and algorithms, especially in setting security standards, are often known as cryptoassets and / or cryptocurrency. In this paper, the terms virtual assets and virtual currency are used to describe a more general meaning, which is a form that resembles and represents the value of an asset or money.

⁶ CipherTrace Cryptocurrency Intelligence: Q2 Cryptocurrency Anti-Money Laundering Report.

Graph 11. Indonesian Digital Banking Classification



Source: Bank Indonesia Survey Result(2018)

The characteristics of imports dominated by consumer goods with limited added value exacerbated this situation. The surge in imports can also come from the demand for IT goods, which generally cannot be produced domestically. Bank Indonesia estimates the surge in IT imports, particularly from China and Japan, started since 2015 in line with the rapid flow of digitalization (Graph 13).

Digitalization will benefit macroeconomic stability and financial-economic inclusion in the long run, but the benefit will be limited if the digitalization flow is uncontrolled.

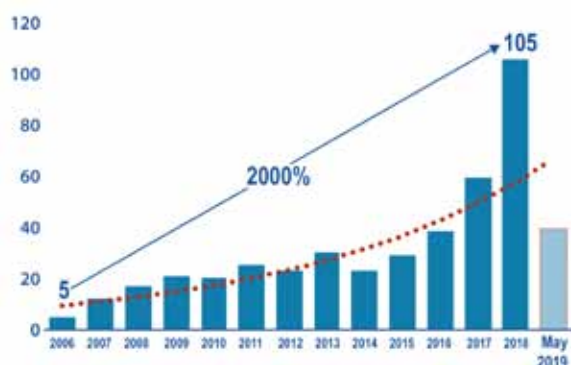
Public trust in the financial system will be eroded without adequate credibility and integrity. Bank Indonesia views misdirected digitalization flows will distort money circulation, as well as disrupt monetary stability

and financial system stability.

The policy challenge for economic and financial authorities in the digital age, especially for Bank Indonesia, is to striking the right balance the policy to nurture the digital innovation while preserving stability and integrity (Figure 4). Authorities need to identify solutions in utilizing digital innovation opportunities to bring 83.1 million unbanked people and 62.9 million MSMEs into formal economics and finance. Inclusion is more on access to financial and goods markets as a whole and sustainable not only limited to the ownership of means of payment or bank accounts.

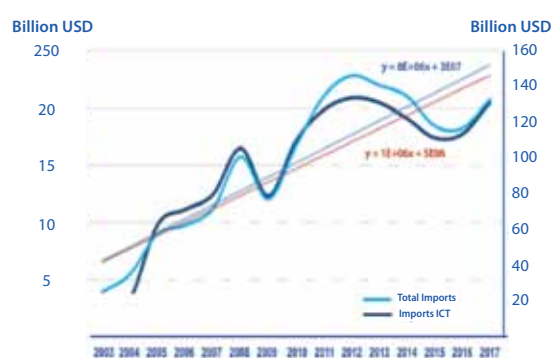
Authorities need to adequately improve the capabilities of policy responses. Digitalization should take place on the right corridor that ensures the effectiveness of central banks'

Graph 12. Significant Global Cyber Attack (Number of Incidents)



Source: Center for Strategic and International Studies, processed

Graph 13. Imports of ICT vs Total Imports (2 Digit HS)

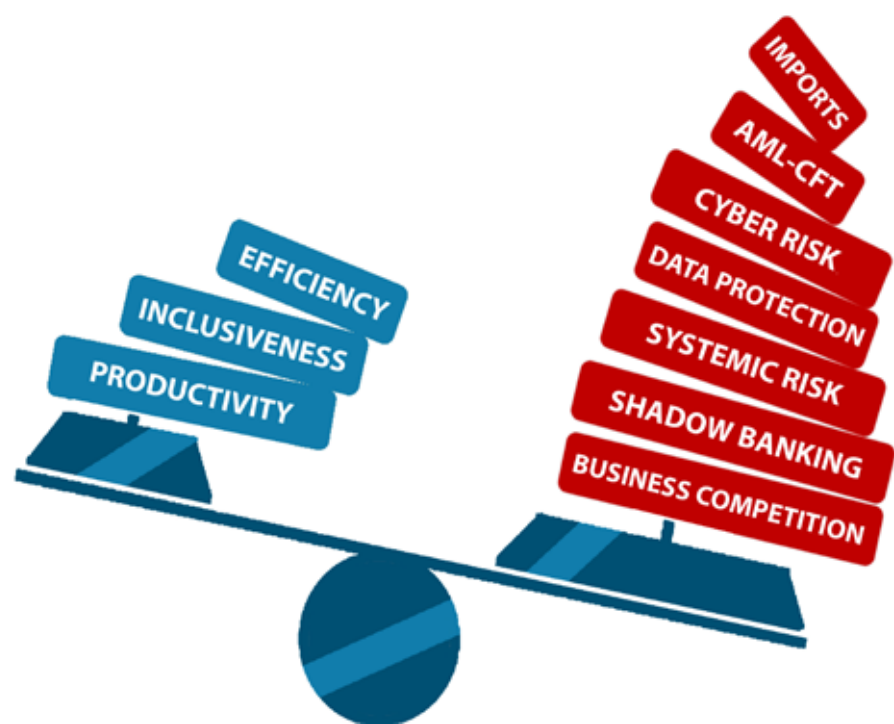


Source: Bank Indonesia

mandates. The banking industry needs to be encouraged to conduct end-to-end digital transformation. Interlinks between banks and fintech need to be strengthened. The regulatory, entry-policy, reporting, and

supervisory framework needs to be aligned with the demands of the digital era, including aspects of risk monitoring and control, as well as national interests. Digital acceptance of the society would also needs to be expanded.

Figure 3. Policy Challenges in the Digital Age



Source: Bank Indonesia

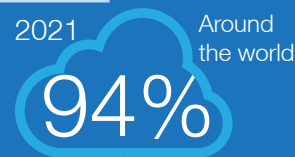
Data is the “New Oil”

Data: key to
competitiveness

Internet traffic/second



Cloud Computing Adoption



Social Media/Minute



Payment Transaction

2 thousands/second

Digital Banking



e-commerce



World



Indonesia

Source: UNCTAD, Cisco, Bank Indonesia, Lorilewis

CHAPTER 2

Indonesia Payment Systems Blueprint 2025

"I insist that neither monetary policy nor the financial system will be well served if a central bank loses interest in, or influence over, the financial system." (Paul Volcker, 1990)

Indonesia's Payment System Blueprint 2025 is present as a solution to meet challenges in the digital age. The end state of the Blueprint is represented by the Vision of Indonesia Payment System 2025, which is materialized through five initiatives, namely; Open Banking, Retail Payment Systems, Financial Market Infrastructure, Data, and Regulatory, Licensing, Supervisory.



Digital innovation has altered the behavior of economic agents. Demands for fast, affordable, and safe economic and financial services are increasingly strengthened in the digital age. This behavior shifting changes the pattern of interaction between economic agents, both as consumers as well as factors of production.

Digital innovation in the economic and financial fields opens up inclusiveness opportunities for unbanked people and strengthens stability, especially in emerging countries, such as Indonesia. Digital innovation will encourage business competition, increase the diversity of services and products that can increase society's economic participation. The financial system becomes decentralized so that it

becomes more stable. Systemic dependence on one or a few parties is diminishing. Thus, digital innovation becomes a concrete solution for equitable development while strengthening efficiency and productivity.

However, at the same time, the flow of digitalization that goes on without control will be counterproductive to macroeconomic stability and sustainable economic growth in the long run. Appropriate, fast, and forward-looking policy responses are needed to maximize the benefits of digital innovation. The payment system, in this case, exists as a determinant of the effectiveness of the policy response required to answer various policy challenges in the digital age.

2.1 Policy Context

The payment system is the pulse of the economy. The system determines the money supply process between economic agents. Any economic and financial transaction will not be complete without a reliable and robust payment system.⁷ The payment system determines the smooth flow of goods and services. A stable payment system and a well-functioning monetary system are the basis of economic growth, welfare, and financial system stability (Ingves, 2018).



...the provision of payment system infrastructure by the private sector tends to lead to natural monopolies due to high investment costs and positive network effects.

With this role, the payment system determines the effectiveness of monetary and financial system stability policy transmission. According to Manning and Russo (2007), monetary and financial system stability policies are rooted in the traditional duties of the central bank in the payment system. The central bank, as the issuer of final settlement assets, plays a vital role in ensuring the smoothness of the payment system (Tucker, 2019). The correlation between the three main tasks of the central bank becomes a supporting pillar for public confidence that determines the effectiveness of financial inclusion⁸. In this context, the central

bank's primary mandate is to maintain public confidence in the value of money and the financial system.⁹ Cartens (2019) asserts that only from the trust, the whole layer of society will get the optimal benefits from the financial system.

In the microeconomic dimension, the payment system meets the characteristics of public goods like electricity and transportation infrastructure. Ingves (2018) and Manning and Russo (2007) concluded that the provision of payment system infrastructure by the private sector tends to lead to natural monopolies due to high investment costs and positive network effects.¹⁰ This tendency limits competition, kills innovation, triggers economic inefficiency, and increases the concentration risk.¹¹ This was backed by Tobin (1987), who concluded that the provision of payment system service infrastructure tends to be challenging to be met efficiently by the private sector. This factor reiterates the position of the central bank as the authority of the payment system, both as regulator, supervisor, and system operator.

Bank Indonesia, as a central bank, is fully responsible for maintaining a sound economic and financial structure for sustainable economic development. The digital revolution in the Industry 4.0 era requires Bank Indonesia to understand the shifting demand of society, opportunities, and risk dimensions in maintaining the quality of its public services. This is important considering the current digitalization which may trigger the materialization of various conditions above.

⁷ Cartens (2019): "A modern economy cannot work without efficient, reliable and cost-effective payments".

⁸ Cartens (2019): "...But most of all, central banks promote trust. By reinforcing trust in the financial system and its institutions, central banks bring ordinary people into the mainstream and help them reap its benefits. In this way, the central bank can help to catalyse a more inclusive and vibrant economy".

⁹ Ingves (2018) concluded that the weak point of the payment system operated by private parties lies in the risk of counterparties which tends to increase with increasing interconnection between actors and the strengthening concentration of transactions on one or a few parties. Furthermore, Tucker (2019) and Ingves (2018) argue that the risk character does not apply to central banks. The central bank can always supply the liquidity needed to ensure a smooth settlement. Settlement of payments using central bank money has a high certainty element and contains an element of finality as a form of legal certainty regarding the completion of a transaction.

¹⁰ Katz and Shapiro (1985 dan 1994) in Beck (2006): "the source of positive consumption externalities as the "utility that a user derives from consumption of goods" which "Increases with the number of other agents consuming the (same) good" and "the value of (a) membership to one user (which) is positively affected when another user joins and enlarges the network".

¹¹ Manning and Russo (2007): "The provision of payment and settlement services is characterised by high fixed costs and low marginal costs – and hence increasing returns to scale – and network externalities..." which was emphasized by Ingves (2018): "The implementation of payments ..., there are economies of scale, which, in theory, leads to natural monopolies...if the market is left unregulated, the dominant company will have an incentive to supply too little of the product for too high a price. Monopolies can also create worsened conditions for innovation as these are often driven by competition. In addition, the system can be vulnerable when one company, and thus one technical platform, dominates..."

The digital revolution of the Industry 4.0 era is different from the digital revolution in the previous era. This revolution rests on three axis; technological innovation and business models, data, and network effects. Chip technology, smartphones, and high-speed internet combined with open and modular platform-based business model enable IoT to produce efficiently-managed big data through the Cloud. Big data is then analyzed using AI and Machine Learning and converted into information content capable of personalizing services (personalized user experience). This process will provide feedback to the IoT repeatedly (Diagram 2).

“*...digital revolution in the industry 4.0 era effects firstly on the wide open opportunity on the financial inclusion, secondly on the data and granular information becoming the key and thirdly on the stronger role of the non-banks.*”

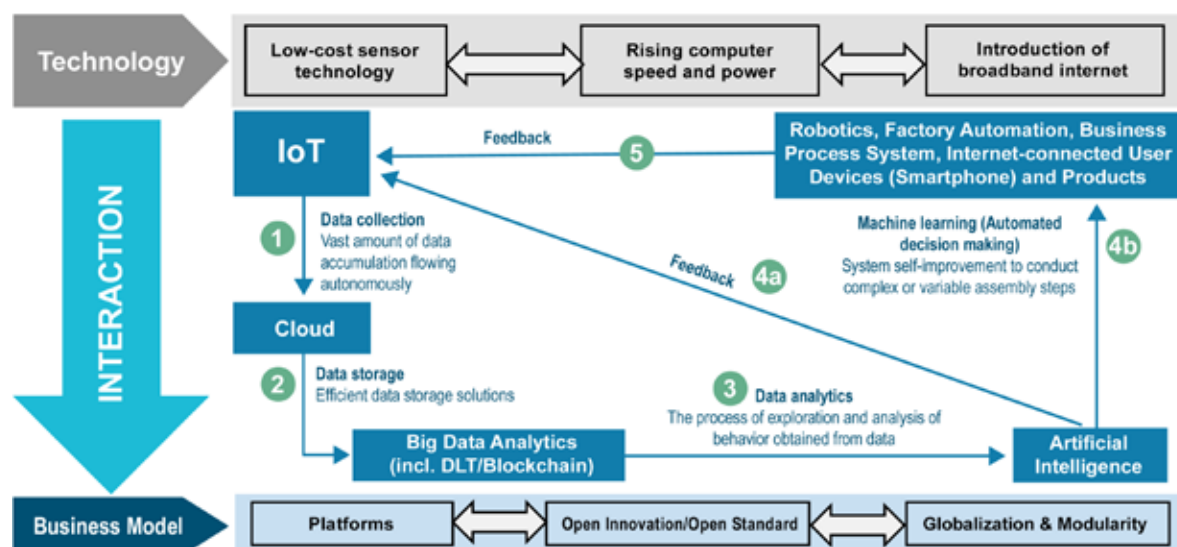
This iteration process will produce exponential growth and accumulation of granular data for each additional unit of the consumer added into the ecosystem (network effect). The network effect will only be achieved if

the scale of the economy is also fulfilled. The economic of scale can be fulfilled through the implementation of sharing economy, unbundling, and integration of cross-content (omnichannel), to predatory pricing¹² through promos and discounts on massive scale.

These developments have an impact on three aspects. Firstly, the digitalization of the economy and finance opens up opportunities for financial inclusion. Digital innovation offers convenient and affordable solution for anyone. These opportunities arise from the integration of technology and financial services (World Bank, 2017). Digital innovation also overcomes the classic constraints of financial inclusion, which, according to Cartens (2018), stem from the high cost of access, the lack of individual track records, and low trust.

Digitalization facilitates the process of opening an account, especially for the unbanked people. This breakthrough is an entry point for anyone to have digital track record. The availability of the track record will open wider access and enable financial service providers to be able to measure the creditworthiness of prospective customers while personalizing the financial services provided. Thus, the issue of trust is no longer an obstacle. The community will also have wider choices to get excellent service.

Diagram 2. Main Driver of Digitalization Trends in The Era of Industry 4.0



Source: Bank Indonesia, processed from various sources (2018)

¹² Viscusi et.al (2001) defined predatory pricing as “a pricing strategy designed to promote the exit of other firms”.

Underserved community segments, such as low-income households, micro-businesses, and rural communities, will benefit most from this breakthrough. The digital revolution needs to be transmitted into economic and financial inclusion revolution that can narrow the wealth gap. The efforts to reach Indonesia's population spread across 89,931 villages and 17,504 islands by 2018 (Statistics Indonesia, 2019) will be difficult without technological support.



Secondly, granular data and information are the primary keys to integrating digital economy and finance. The data and information revolution created by technological innovation opens new opportunities for economic and financial growth (Amamiya, 2018). The company's business model is increasingly oriented toward data as a determinant of competitiveness. With network effect, the company will be able to monetize or exploit the data to multiply profits. That put digital assets in a similar position with the intellectual property or business capital (India Ministry of Commerce and Industry, 2019). Granular data tends to grow massively in a country with a large consumer base like Indonesia. With the fourth biggest population in the world, Indonesia becomes a treasure and a major source of the commercialization of granular digital data.

Thirdly, the role of non-banks has strengthened while changing the structure and order of the financial sector. Service innovations have begun to emerge following changes in the modus operandi of financial services that utilize technology and granular data accumulation. Market aggregator is one of the business models that is snowballing. This business model connects consumers (end-users) to companies that have certain services, products, or services through the process of consolidation and standardization of products or services.



...the control of ownership and control of consumer data obtained from an extensive but exclusive digital network can trigger market concentration and domination by big tech.

Several actors are engaged in market consolidation to form an exclusive ecosystem. Some of them have even developed into big tech that can dominate the market by utilizing its advantages as pioneer (first mover's advantage) in data-driven ecosystems. In this context, the payment system becomes an entry point for big tech into the financial industry (BIS, 2019)¹³ and other digital financial services (Ingves, 2018).¹⁴ For emerging countries, the potential for consolidation is relatively high, reinforced by the findings of BIS (2019), which states that big tech in emerging countries generally develops proprietary payment services.¹⁵

The control of data strengthens the power of the big tech market (Cartens, 2019). Big tech has access to consumer data through various sources, making it easier to personalize financial services. Big tech has full claim on the consumer data. This perception arises because the referred data is by product of the services provided by big tech. Conversely, consumers

¹³ BIS (2019) : "Payments were the first financial service big techs offered, mainly to help overcome the lack of trust between buyers and sellers on e-commerce platforms".

¹⁴ Ingves (2018) : "New participants entered the market and many digital services linked to payments are presently offered, such as mobile solutions, electronic identification and so on".

¹⁵ BIS (2019) divides big tech into two categories. First, big tech as an overlay system provider, which relies on existing third-party infrastructure to process and complete payments (Apple Pay, Google Pay and Paypal). Second, big tech as a provider of proprietary systems, whose settlement process is carried out through infrastructure built by big tech (Alipay, M-Pesa, and WePay). This system generally develops in emerging countries, including Indonesia, along with the large unbanked population.

are often unaware or even did not know how the data is used by big tech. This has become a competitive advantage for big tech that can be exploited to strengthen the bargaining position and attract the maximum consumer surplus.

The ownership and control of consumer data obtained from extensive but exclusive digital network can trigger market concentration and domination by big tech. Big tech economic of scale turn to be a barrier of entry for other companies. This condition can change the total constellation of competition in the financial industry. If ignored, it can trigger market failure. Dominant market players can easily control product supply and raise tariffs to consumers. Besides, the potential for systemic risk will also increase due to the scalability of big tech in providing financial services.¹⁶ Big tech can become banks competitor because of its ability to unbundle financial services, which has been the domain of the banking business for ages.

This development has become a global concern. Various multilateral fora and standard-setting bodies are monitoring financial system stability risk originating from fintech and big tech. According to the results of the FSB assessment (2019), the entry of new entities into the financial services sector has the potential to change the market structure and existing financial service providers through changes in the level of concentration and contestability of financial services. This confirms that the benefits of digitalization will not just happen by relying on market forces and without the role of regulators (PSR, 2018).

There are lessons to be learned. Data and information management is the key to macroeconomic management in the digital age. The potential of granular data for economic and financial inclusion will be optimal if the concentration risk and silos of data can be mitigated. The risk mitigation can be done

through open access to data across providers with the right to access being fully determined by consumers (Mazer, 2018). Data openness will increase market competition along with the increasing number of parties who can use granular data to strengthen products or develop new products. It is also possible to widen the data utilization since data has a nonrivalry character.¹⁷ Increased product diversity and competition will, in turn, broaden choices and drive price and quality efficiency for consumers.

Another important lesson is the need to properly handle potential market failures so that digital technology innovation can contribute positively to economic development and stability. For this reason, it is necessary to strengthen the presence and role of authorities to ensure market discipline in maintaining and ensuring the continuity of digital innovation in a sound and stable ecosystem.

In this context, Bank Indonesia, as the payment system authority, plays a crucial role in managing the digital economic-financial ecosystem, which is principally formed by the payment system. Bank Indonesia will ensure that the payment system is able to integrate the economy and finance in the digital era, so that the money circulation, monetary policy, financial system stability, and financial inclusion



***...there are lessons to be learned...
Data and information management
is the key to macroeconomic
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contribute positively to economic
development and stability.***

¹⁶ The results of the FSB assessment (2019b) indicate that potential systemic risk can be sourced from big tech, while fintech tends to act as a partner in providing financial services (incumbents).

¹⁷ Carriere-Swallow *et.al* (2019) h. 13-14 "The digitization of data and the ability to transfer it across networks has made data increasingly nonrival..." Furthermore they also stated "An important implication of the nonrivalry of data is that, from a social perspective, it is desirable for data to be widely shared".

2.1 Indonesia Payment Systems Vision 2025

With this background, Bank Indonesia construct Indonesia Payment System Blueprint 2025. The Blueprint is formulated with full orientation towards building a sound digital economy and financial ecosystem. The Blueprint stands on the five foundations of Indonesia Payment System 2025 (IPS 2025) visions, which is also the end-state of Bank Indonesia's long-term policy direction.

Vision 1: IPS 2025 reinforces the integration of national digital economy and finance in assuring the proper functioning of central bank mandate in money circulation, monetary policy, and financial system stability as well as financial inclusion.

The first vision of IPS 2025 is directed towards the efforts of building a digital economy-financial configuration that supports the economic empowerment of the community and ensures open access to digital data in a framework of adequate protection and governance (Diagram 3). The management and utilization of digital payment data is key to the integration of the economy and digital finance in Indonesia.

This vision aims that the payment system will become an infrastructure that is in line with the demands of the digital era (fast, safe, and affordable). This vision also aims to ensure the flow of money and goods that are organized, standardized and integrated end-to-end. Public infrastructure for payments and data will be built to provide the connectivity of all economic agents, ranging from individual consumers, MSMEs, to large corporations, through digital platforms. Payment system infrastructure becomes the veins that integrates the digital economy and finance and ensures the smooth process of cash (APMU) and non-cash (APMR and APMD)¹⁸ circulation to the public inclusively

and equitably.

The first vision of IPS 2025 also leads to form a facilitative regulatory climate for economic growth and digital finance. These conditions are needed to encourage entrepreneurship empowerment, access to data, and connectivity between parties in a sound and productive digital ecosystem. Regulation must be a tool to ensure open and equal access for all economic actors (UNCTAD, 2019). A strong regulatory framework will facilitate the market entry process (Cartens, 2018) and strengthen the industrial structure.

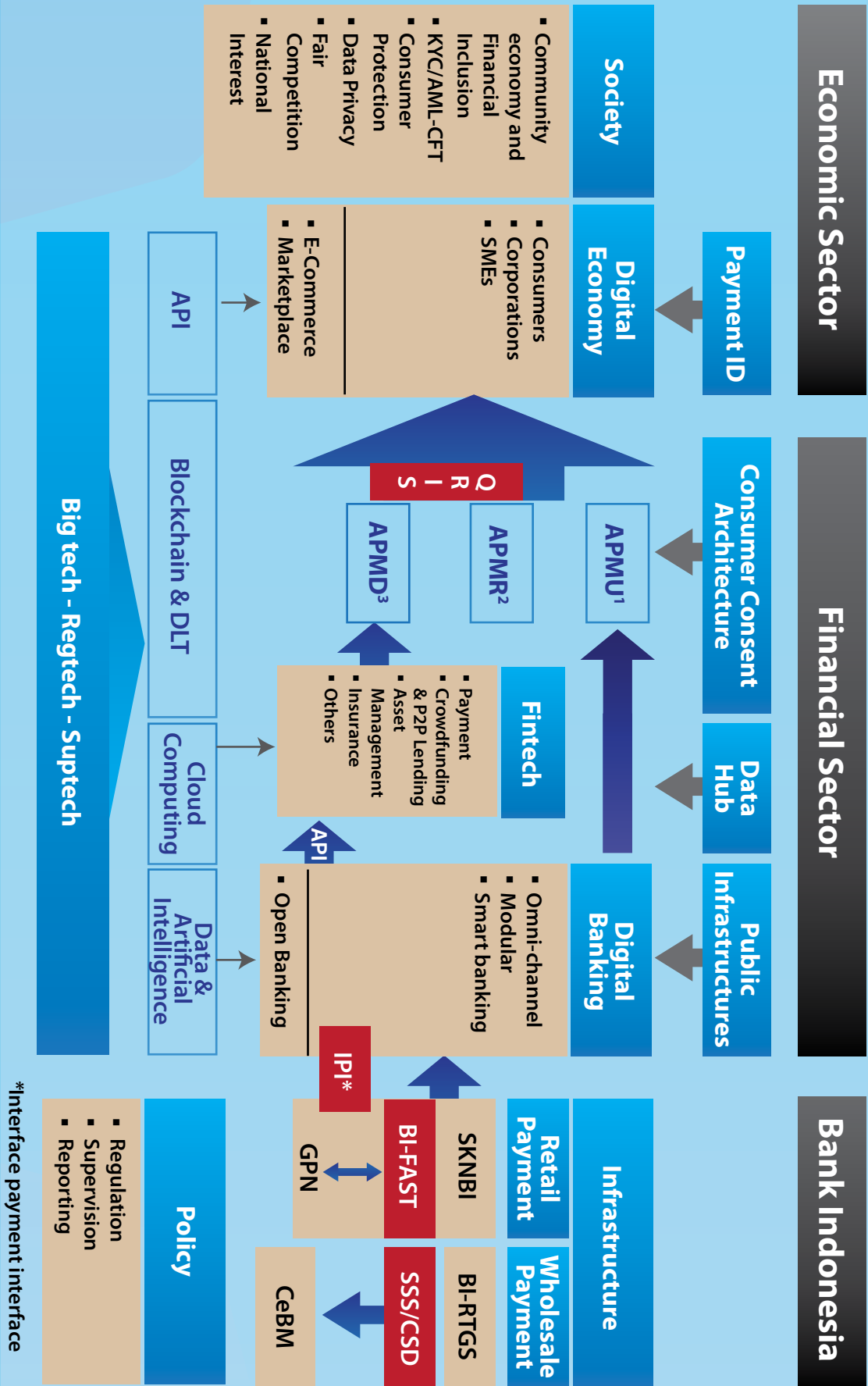
Bank Indonesia, as the payment system authority, has a role in ensuring the availability of infrastructure for the public and industries, both hard and soft, in line with the demands of the digital era. Hard infrastructure refers to the availability of financial system infrastructure, in particular, the payment system, which is capable of answering the needs of the public and industry.

In the retail payment system area, Bank Indonesia will build BI-FAST as a fast payment infrastructure that serves all types of payment transactions, including card-based transactions. BI-FAST will side with SKNBI and GPN as the retail infrastructure on the back-end side. BI-FAST is expected to be able to encourage industry competitiveness, provide more extensive payment options for the public, improve transaction efficiency, and strengthen the reliability of retail payment systems in Indonesia. Meanwhile, SKNBI will focus on clearing and checks settlement and demand deposits. On the middle-end, Bank Indonesia, together with industry, will develop an integrated payment interface to ensure interoperability from the transaction's starting point. This step is expected to be able to encourage innovation on the service provider side while reducing the barrier to entry.

¹⁸ APMU (*Alat Pembayaran Menggunakan Uang* - Currency Based Payments) are all payment instruments, created and circulated by the central bank, in this case, Bank Indonesia. Included in this group are banknotes and coins. APMR (*Alat Pembayaran Menggunakan Rekening* - Deposit Account Based Payments) is a payment instrument based on a banking account. Included in this group are credit cards issued by banks, debit cards, electronic money issued by banks, and all online and offline credit and debit transfers without a card. APMD (*Alat Pembayaran Menggunakan Digital* - Non-Deposit Account Based Payments) is the distribution (in a number of cases, including the creation, for example Bitcoin) conducted by non-bank players utilizing digital innovation. Included in this group are electronic money issued by non-banks, including fintech.

Diagram 3

Configuration of Indonesia Digital Economy and Finance 2025



To build a resilient financial market infrastructure, Bank Indonesia will modernize the financial market infrastructure organized by Bank Indonesia, namely BI-RTGS, BI-SSSS, and BI-ETP, as well as strengthening the regulatory and development framework of CCP and TR. The strategy is based on three main driving factors; first, the regulator / policy driver, namely the development needs of regulators especially the policies of the central bank and related authorities; second, the development based on international standard best practices, namely the development of international risk mitigation standards such as PFMI and other related standards; third, market development, namely financial market deepening efforts according to business needs.

Bank Indonesia will also build a Data Hub as a public infrastructure that enables data openness and its use in the public interest. The infrastructure will utilize granular data from payment transactions. For this reason, Payment ID, which allows granular data processing by the Data Hub, will also be designed to use data and information in payment transactions. Data and information generated will be open to the public based on consent of the data owner. This strategy is expected to be able to bridge MSME financing more effectively.

The scope of standardization of payment system instruments and services will be expanded. The implementation of the QR Indonesian Standard (QRIS) will continue to be strengthened to encourage interoperability and economic efficiency. Standardization under the GPN, the National Standard Indonesia Chip Card Specification (NSICCS), and Garuda card will continue to be pushed according to the set time target.¹⁹ Besides, domestic credit card

standards will be developed and expected to reduce the high interchange fees imposed by global credit card principal schemes.

Electronification programs will be strengthened through a more targeted engagement process. Education and expansion of digital payment acceptances (eg, QRIS), will focus on mass traditional economic functions (traditional markets). The full involvement of academic entities (universities) as the axis of development of technological innovation and financial business models will also be strengthened. This step is expected to accelerate economic and financial inclusion in Indonesia.

Vision 2: IPS 2025 fosters digital transformation within the banking industry to sustain banks role as a primary institution in the digital economy and finance through the implementation of Open Banking standard as well as the deployment of use of digital technology and data in the financial business.

The flow of economic and financial digitalization requires banks to transform to maintain their role and position as the central intermediary institutions in the financial system as well as the transmission of monetary policy. This demand arose as the strengthening of the role of non-banks in the financial sector. Banks are demanded to be able to change themselves through end-to-end digital transformation to maintain their competitiveness.

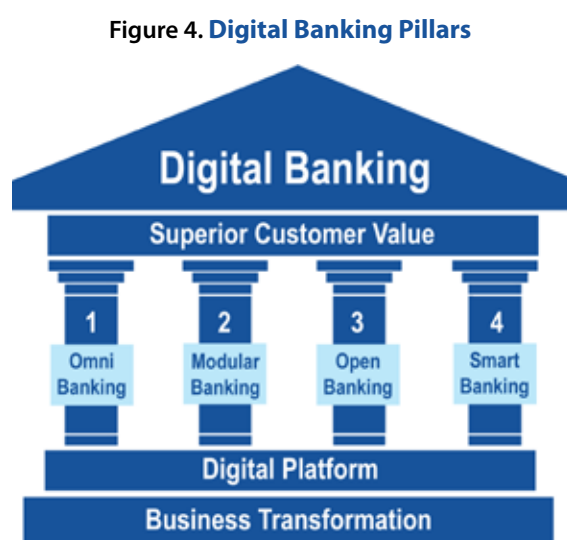
Digital transformation requires banks to be able to adjust business models, organizational structures, work culture, and infrastructure. This will determine how far the banking sector goes

¹⁹ Bank Indonesia Circular No. 17/52 / DKSP on 30 December 2015 set the NSICCS migration target of at least; 50% on January 1, 2020; 80% on January 1, 2021; and 100% on January 1, 2022, out of the total ATM Cards and / or Debit Cards issued using NSICCS and six-digit online PINs.

²⁰ Application of technology to ensure end-to-end transaction processing / banking operations initiated by clients that ensure maximum utility for clients regarding availability, usability, service improvement, and costs, and minimization of errors (Backbase, 2018). Meanwhile, OJK defines digital banking as "Electronic banking services developed by optimizing the use of customer data in the context of serving customers more quickly, easily and in accordance with needs and can be carried out entirely independently by customers by paying attention to security aspects".

digital (Bank Indonesia, 2018).²⁰ Backbase (2018) requires the fulfillment of the four pillars of digital banking (Figure 4), namely channels for consumers (omni banking²¹), agile architecture and infrastructure (modular banking²²), to open up to third parties (open banking²³), and efficient use of resources data based (smart banking²⁴). The four pillars are aimed at accelerating digital transformation within the banking body.

Indonesia Payment System Blueprint 2025 is directed at equal data and information openness between banks and fintech. For this reason, this Blueprint highlights the pillars of Open Banking explicitly. Open Banking



Source: Backbase.

is defined as an approach that allows banks to open their customers' financial data and information to third parties (fintech). However, the vision of Open Banking in Indonesia Payment System Blueprint 2025 also requires similar openness on the fintech side. This strategy is needed to maintain the level playing field between banks and fintech, prevent monopoly risk, and widen the opportunity for inclusiveness from the acquisition of more extensive granular data. Bank and fintech

interlink only occurs if each party is willing to open their customer data.

Open Banking can be realized through Open API standards which include technical standards, security standards, and governance standards. In particular, the focus of development will be directed at standardizing the opening of payment data for use cases of MSME loan disbursement based on customer approval. This strategy will optimize the granularity of data and information for economic and financial inclusion.

Open Banking has become a strategic solution to drive digital transformation in a more targeted manner. Banks become more able to take advantage of digital innovation opportunities. Banks will also be encouraged to provide more consumer-oriented services (consumer-centric), like the fintech business model. The policy direction is in line with developments in other countries that have adopted the concept of Open Banking. Standardization will cover aspects that are also taken by many best-practice countries to encourage a digital sound ecosystem (Table 2).

Indonesia Payment System Blueprint 2025 also directs national banks to be able to utilize digital technology innovations optimally. Besides the use of the Application Programming Interface (API), several types of innovations that are expected to be able to bring banks in the digital banking era are Distributed Ledger Technology (DLT), Cloud Computing, and AI / Machine Learning. In the future, banks that are loaded with technology use will be able to survive.

Currently, the banking sector in Indonesia has shown a serious development of digital transformation, although in a limited scope. The results of the Bank Indonesia assessment (2019a) show that several banks in Indonesia

²¹ The Bank has various streamlined service lines to consumers with a consistent level of customer satisfaction, anytime, anywhere, with various devices (Backbase, 2018).

²² Banks have a system architecture like lego with functionality that is easily changed and exchanged to anticipate changes in consumers quickly and easily (Backbase, 2018).

²³ Banks use APIs to connect applications with internal and external parties (Backbase, 2018).

²⁴ Banks use smart technology, such as AI and Machine Learning, in collecting, analyzing, and classifying data to encourage consumer personalization so as to boost sales while maintaining consumer loyalty (Backbase, 2018).

Table 2. Open API Implementation in Several Countries

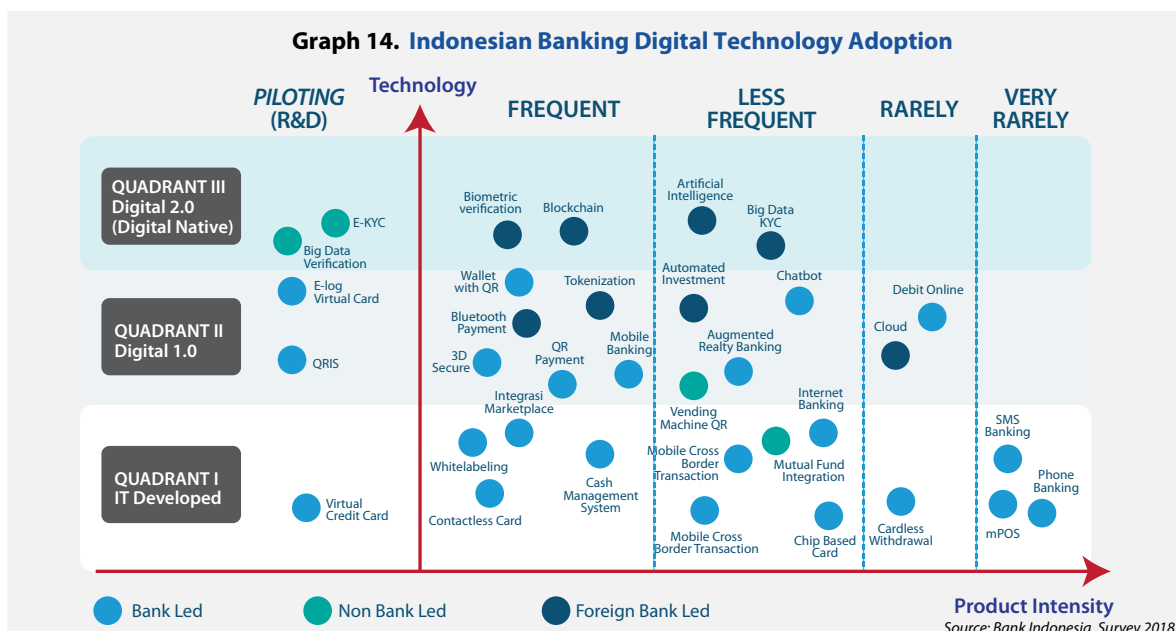
	Australia	Japan	Singapore	Hongkong	Europe	UK
Initiatives	Competition and Consumer Act (2010)	Amendment of Banking Act 2017	Finance as a Service: API Playbook (2016)	Open API Framework	Payment System Directive 2 (PSD2)	Open Banking Standard
Authority	ACCC supported by OAIC, ASIC, APRA & RBA	JFSA	MAS	HKMA	The European Commission	CMA & FCA
Scope of Policy	<ul style="list-style-type: none"> Customer-data Transaction Data Product information 	<ul style="list-style-type: none"> Payment status Transaction initiation Account information 	<ul style="list-style-type: none"> Payment status Transaction initiation Account information Product information 	<ul style="list-style-type: none"> Payment status Transaction initiation Account information Fraud detection 	<ul style="list-style-type: none"> Access to account Payment Initiation Account Information 	<ul style="list-style-type: none"> Transaction Data

Source: Processed from various sources, 2018

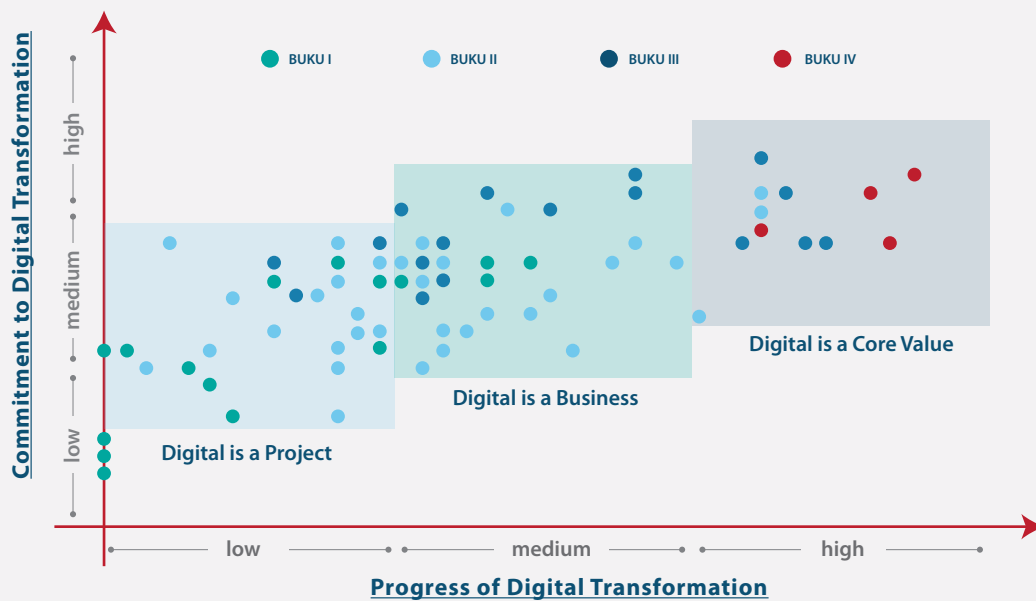
are starting to implement digital technology to strengthen their competitiveness and services to their customers (Graph 14). Foreign affiliated banks are generally more progressive in their transformation, on a par with non-bank players who are usually superior in adopting digital technology. Several large banks showed commitment and proper development of digital transformation (Graph 15). On the contrary, BUKU I banks tend to lag.

Several strategies were taken by banks to improve the quality and variety of financial services. Several banks take in-house approaches, which focuses on multichannel delivery (mainly internet and mobile banking).

In the digital payments area, several banks have started launching electronic payment features based on QR code. Banking has also begun to utilize new technologies such as AI, big data and machine learning, Open API, and biometrics. AI, big data, and machine learning are utilized to provide virtual assistant services to help the customer personalization process, fraud detection, and credit scoring processes. Some of them also use biometrics technology in the authentication process, thereby reducing transaction fraud. Open Banking has been implemented by banks in Indonesia, although it is still limited to several large banks (Bank Indonesia, 2018).



Graph 15. Progress on Business Digitalization in Indonesian Banking



Source: Bank Indonesia, Survey (2018)

Remarks:

Commitment to Digital Development, including aspects of: 1) Digital Strategy; 2) Digital Vision and Mission; 3) Digital Leadership

Progress of Digital Transformation, including aspects of: 1) Advancement; 2) Organization and Culture Transformation; 3) Investment in Digital Technology

BUKU: Commercial Bank Classification (ref: Regulation Otoritas Jasa Keuangan Nomor 6/POJK.03/2016)

Vision 3: IPS 2025 assures interlink between fintech and banks to contain the escalation of shadow-banking risk through the regulation of the use of digital technology (e.g., API), business relation, and business ownership.

The future of the financial industry is the convergence of financial service provision by banks and fintech (Citibank, 2018). Banks can utilize the presence of fintech to maintain their agility efficiently amid technological innovations that move in shorter cycles. Conversely, fintech can leverage bank customer data to strengthen the quality of its services to consumers. The interlink will only occur if each party is willing to open their customer data through the extensive use of API technology. In this context, interlink banks and fintech can mitigate shadow banking practices.

Data openness and information access in the digital era requires interoperability between actors, both banks and fintech. Open Banking is established as a guideline for all parties in accessing customer transaction data that ensures interoperability. Banks and licensed third parties, including fintech, are directed to open their financial services data in a contractual partnership. In this regard, to ensure equal access for all parties, standardization in Open Banking also includes the Open API cooperation contract format.

Banks and fintechs can differentiate the openness level of their API, depending on the Open Banking strategy adopted. In principle, each party retains control in determining the opening of API and third parties granted access. In this regard, there are four API collaboration models,²⁵ namely, partners, members, acquaintance, and the public, with

²⁵ EBA (2016) define each category of the Open API collaboration model as follows; (1) API partners: APIs that are only opened to certain partners based on bilateral agreements; (2) Member API: API that is open to anyone who is a member of a community; (3) Acquaintance API: API that is open to anyone who meets certain requirements; (4) Public API: API that is open to anyone and sufficient access is limited to registration for the identification and authentication process. EBA (2016) also defines the Private API included in the Closed-API 'group and can only be accessed exclusively within the organization within certain limits.

different levels of openness (Figure 5). The partner API is only open to certain parties based on bank preferences. Instead, the public API is open to anyone willing to fulfill the specified requirements. The open API Partner will give the bank full control over its API access. Instead, the public open API will provide a more optimal network effect. The open API contractual standard in IPSB 2025 will be built based on this model.

Figure 5. API Partnership Model



Source: EBA Working Group on Electronic Alternative Payments

Regarding the progress of the interlink between banks and fintech in Indonesia, a number of banks are also progressively collaborating with fintech. Large banks generally initiate collaboration between banks and fintech in Indonesia with varied patterns, including investment through the incubation program. For banks, the presence of fintech can be used to sharpen consumer-centric based services or as a third-party service provider to provide various services ranging from market support to supporting bank intermediation activities. Fintech is placed as a bank's learning partner in adopting technological innovation. Meanwhile, fintech needs banks to assist its operations; for example, fintech lending requires an escrow account and a virtual bank account²⁶ to process lending and borrowing funds according to regulations.

Forms of collaboration between banks and fintech are also carried out through financing patterns and bank coaching to fintech. Banking investments in fintech are generally carried out through bank subsidiaries (venture capital), to one or several fintechs. Besides, the bank also guides fintech through incubator programs, both directly and through its venture capital subsidiaries. The overall digital banking innovation and collaboration with fintech

will provide value-added for the customer experience that has the potential to broaden the base of CASA and bank credit, increase fee-based income, and strengthen risk management for both banks and fintech (Bank Indonesia, 2018).

Vision 4: IPS 2025 strikes the balance the balance among innovation, consumers protection, integrity, and stability as well as fair competition through the implementation of digital Know Your Customer (KYC) and Anti-Money Laundering and Combatting the Financing of Terrorism (AML/CFT), data/information/public business openness, and the deployment of RegTech and SupTech for reporting, regulatory and supervisory.

In addition to structuring hard infrastructure, Bank Indonesia will also arrange soft infrastructure through strengthening the regulatory framework, entry policy mechanism, and supervision. Regulatory regimes and entry policies are directed towards being simpler and adaptive in anticipation of fast-moving financial technology innovation. The regulatory structure will be arranged to reorganize the payment system ecosystem so that it becomes a solid foundation for licensing, monitoring, reporting, and implementation of payment system that supports economic and financial inclusion in the digital age.

The new structure of the national payment industry will be fully oriented towards efforts to encourage financial inclusion and innovation through ecosystems that promote healthy market competition. Bank Indonesia will carefully redefine the role and activities of payment system service providers. The role of market aggregators in the payment system will be arranged in a configuration that ensures equal access to the payment infrastructure. Incentive and disincentive mechanisms will be regulated to ensure openness and equality of data and information access and prevent market domination.

²⁶ OJK Regulation (POJK) No. 77/POJK.01/2016 about information technology-based loan services. Fintech Lending is required to provide a virtual account for each lender. In order to repay the loan, the loan recipient makes payments through a fintech lending escrow account to be forwarded to the lender's virtual account.

The financial market infrastructure policy framework will also be aligned with international standard best practices while fulfilling the G20 mandate. The policy strengthening will start with the regulatory framework governing the trading venue, both at the pre-trade and trade stages. In the clearing aspect, strengthening the regulatory framework will be aligned with the OTC derivatives reform agenda through the regulation of derivative transaction clearing and the development of CCP as a standardized clearing and guarantee institution that meets ESMA qualifications.

Open Banking will be equipped with risk control mechanisms related to data protection, security, system operation, and transaction integrity. Open access to data will be based on consumer approval mechanisms.²⁷ The consumer consent architecture that guarantees data ownership and control rights to individual data owners will be designed, as well as guiding principles regarding data placement at cloud service providers. Bank Indonesia will also develop a regulatory framework related to cyber resilience, specifically related to the operation of payment system infrastructure.

Transaction integrity will be strengthened through the fulfillment of KYC principles and AML/CFT commitments that are aligned with the dynamics of the digital era. It aims to maintain the integrity of financial transactions and not be counterproductive to the development of digital innovation itself. Transaction integrity in the money market and the foreign exchange market will also continue to be strengthened. Transparency of transactions will be enhanced to encourage the realization of a fair, orderly, liquid, and efficient money market and foreign exchange market with good governance.

The increasing complexity of risk in the digital age requires Bank Indonesia to innovate in the payment system licensing, reporting, and supervisory approach. Regtech and Suptech can be innovative solutions to increase the

effectiveness and efficiency of licensing, reporting, and supervision. Both regtech and suptech utilize digital data and computer networks to substitute old ways of working, organizational structures and information technology, and analytical tools to strengthen decision-making processes (Toronto Center, 2017). Furthermore, the solution can reduce compliance costs and enhance the effectiveness of risk management (Broeders *et al.*, 2018).

In this regard, Bank Indonesia will also revitalize the function of the sandbox to be able to explore opportunities for digital innovation, particularly for financial inclusion and strengthening regulations. Bank Indonesia will develop the Sandbox 2.0 concept, which also includes the functions of the innovation lab, developmental/industrial sandbox, and regulatory sandbox. The Innovation Lab will be a place for the exchange of knowledge, competition, and exploration of innovative technologies and business models. The developmental/industrial sandbox design will be integrated with an electrification program that is focused on traditional economic actors and academics to encourage the process of economic and financial inclusion. Furthermore, the regulatory sandbox is intended to test innovations that have an impact on potential changes in regulations.

Vision 5: IPS 2025 safeguards national interest on cross-border use of digital economy and finance through the obligation of domestic processing for all onshore transactions and domestic partnership for all foreign players under the consideration of reciprocity principle.

The principle of economic openness needs to be balanced with a spirit that continues to prioritize national interests, especially in the digital era, which is completely borderless. As a small open economy, Indonesia adheres to the principle of openness for the role of foreign business entities, as long as these foreign entities are able to meet the applicable regulations.

²⁷ The opening of customer data by the bank does not violate the confidentiality of customer data as long as it is initiated by the consent of the consumers who own the data and information. Article 40 paragraph 1 of Law No. 10 of 1998 concerning Banking states: "Every customer must be protected by the confidentiality of his data by the bank. Among other things, the interests of taxation, settlement of bank receivables, interests of criminal justice, and inter-bank civil cases".

The fifth IPS 2025 vision hopes that the transparency principals in the area of payment system could be implemented on the basis of reciprocity which guarantee the equal rights between countries in the context of bilateral relationship. This is particularly considering Indonesia's strategic position as a country with large consumer base. With reciprocity, Indonesia is not only destined as a market, but also have a similar opportunity to expand to overseas.

In the payment system area, this principle is realized through opportunities for cooperation between foreign business entities and domestic partners. This procedure is needed to ensure the effectiveness of monitoring and supervision conducted by Bank Indonesia. This step is also needed to ensure that all transactions that occur in the territory of the Republic of Indonesia are processed in the country using Rupiah in accordance with the mandate of the legislation.²⁸

This vision also opens wide opportunities for infrastructure interoperability and payment system instruments for cross-border transactions, both in terms of back-end and

front-end. The direction of developing ISO 20022 standards, both at BI-RTGS, BI-FAST, and BI-SSSS, as well as the development of multicurrency features at BI-RTGS, is an effort to streamline cross-border transactions as suggested by CPMI (2018).²⁹ This strategy is expected to be able to overcome the classic problem of cross-border transactions, which, according to CPMI (2018), tend to be slow, expensive, and not transparent.

In addition, various standardization efforts, such as QRIS and API, will certainly adopt best practices technical standards. International transaction cooperation and cross-border data exchange, upon inbound and outbound, will be based on the principle of reciprocity. This strategy was adopted to ensure that the flow of digitalization continues to be able to guarantee the long-term sustainability of domestic economic development.

These five visions of IPS 2025 will be further manifested into five initiatives. The next chapter will describe each initiative in detail, along with the key deliverables that are targeted at each initiative.



²⁸ Law No. 7 of 2011 concerning Currency and its implementing rules, namely Bank Indonesia Regulation No. 17/3 / PBI / 2015 dated 31 March 2015 concerning Obligations to Use Rupiah in the Territory of the Unitary Republic of Indonesia.

²⁹ CPMI (2018): "having more diversity of back-end clearing and settlement arrangements could result in cross-border retail payments that are quicker, cheaper and more transparent. Such diversity could include ... greater interoperability between domestic payment infrastructures and greater interoperability between closed-loop proprietary systems."

QUICK WINS

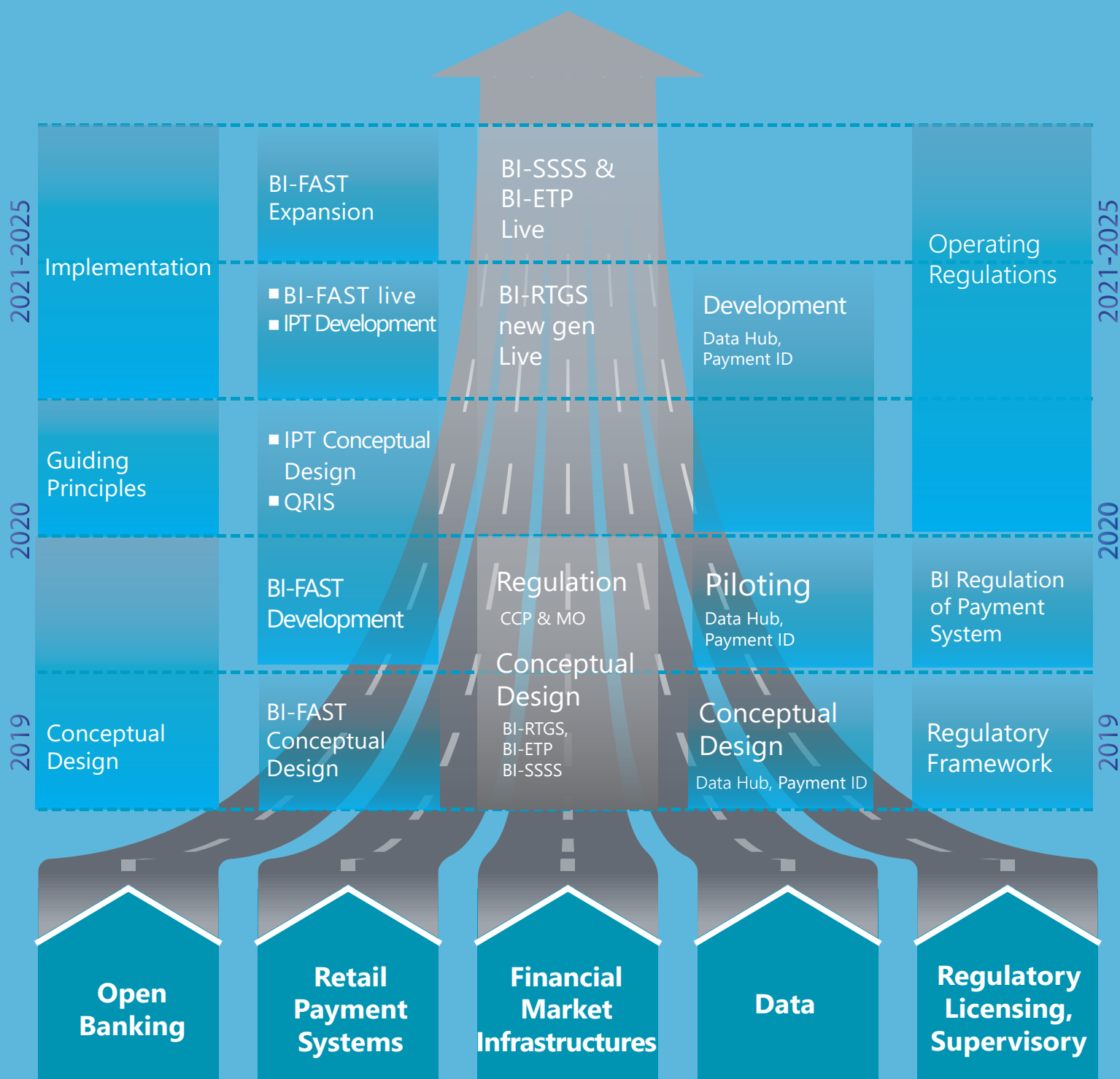
Open API
Standardization

BI-FAST
Development

Regulatory
Framework

INDONESIA PAYMENT SYSTEM 2025

91.3 million unbanked people and 62.9 million MSMEs are connected to formal economics and finance



CHAPTER 3

Roadmap

"Cinema is a matter of what's in the frame and what's out" (Martin Scorsese)

Indonesia Payment Systems Blueprint 2025 is cascaded into five initiatives, namely Open Banking, Retail Payment Systems, Financial Market Infrastructure, Data, and Regulatory, Licensing, and Supervisory. The five initiatives will be accomplished in stages by five Working Groups throughout 2019-2025. Synergy and collaborative approach with the relevant ministries and agencies, as well as industry, will be taken.



The IPS 2025 visions are outlined in 5 (five) initiatives that will be implemented in parallel by five Working Groups (WG). The WG's scope of work and deliverables will mutually reinforce.

3.1 Key Initiatives

The five initiatives of IPS 2025 visions are; Developing Open Banking, Strengthening the Configuration of Retail Payment Systems, Strengthening Financial Market Infrastructures, Developing Public Infrastructure for Data, and Strengthening the Regulatory, Licensing, and Supervisory. The initiatives are further cascaded into 23 key deliverables (Diagram 4), which will be carried out through three approaches, namely industrial, regulatory, and collaborative approach.



...all of key deliverables will be carried out through three approaches, namely industrial, regulatory, and collaborative approach.

3.1.1. Open Banking

As mentioned in Chapter 2, Open Banking in the IPS 2025 visions aims to promote digital transformation in the banking sector and build interlinks between banks and fintech. This vision was realized in the first initiative, Open Banking. It is also previously concluded that Open Banking implementation in Indonesia has not yet run in an ideal footing. In general, the application of Open APIs tends to vary and are not standardized, both in terms of contractual,

Diagram 4. Operational Framework of Indonesia Payment Systems Blueprint 2025



Source: Bank Indonesia

technical, and security-wise. It is also implemented in a limited scope with certain contract schemes, which are generally bilateral through the use of open partner API (Figure 6).

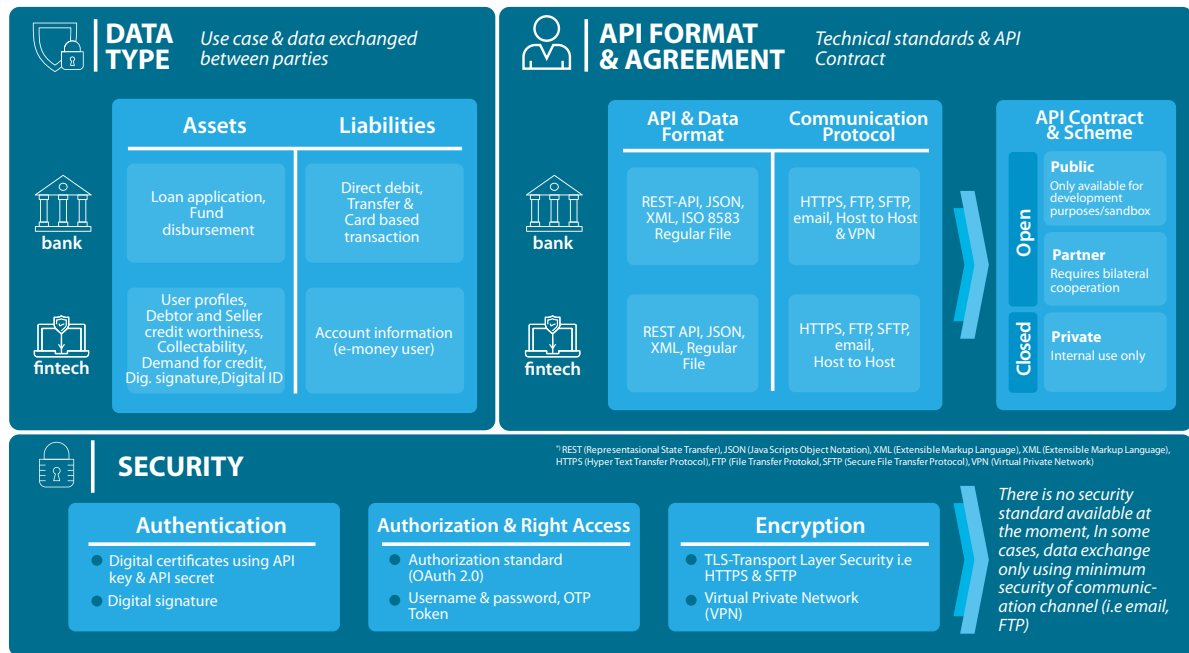
Several key elements in the contracts are not covered sufficiently, especially the clause of consumer data protection (e.g., customer consent), general consumer protection, and risk management (Table 3). Several internal and external factors also constraint the implementation of Open APIs. Internally, the application of Open API is constrained with high implementation costs, dependence on legacy systems, and limited talent. From the external side, constraint stems from limited regulatory support.

“

...the Open Banking initiative will commence through standardizing Open API which comprises data, technical, security, and governance standardizations.

Against this backdrop, the Open Banking initiative in IPS Blueprint 2025 will be constructed to answer these challenges. The initiative will be commenced through standardizing Open API, which comprises data, technical, security, and governance standardizations. To ensure equal access for all parties, standardization will also include the standard format for the business contract used (Diagram 5).

Figure 6. Summary of API Partnership between Banks & Fintech in Indonesia



Source: Bank Indonesia, based on a survey result of banks and fintech in 2019.

Table 3. Scope of API Partnership Contract between Banks-Fintech

SCOPE OF CONTRACT	Current Use Case											
	Top Up Channel	Merchant	Billor Aggregator/Biller	Corporate Banking	Cash Out Channel	Payment Gateway	Digital Acquisition Services	Loan Channeling	EDC /mPOS Provider	Reward Point	API TopUp e-money via NFC	Internet Acquiring
Consumer Consent	Not applicable											
Data Governance											●	
Task & Responsibility			●								●	
Data Access			●								●	
Consumer Protection	Not applicable											
Risk Management	Not applicable											
Dispute Resolution			●						●		●	
Reference Act			●						●		●	
Non Disclosure Agreement			●						●		●	

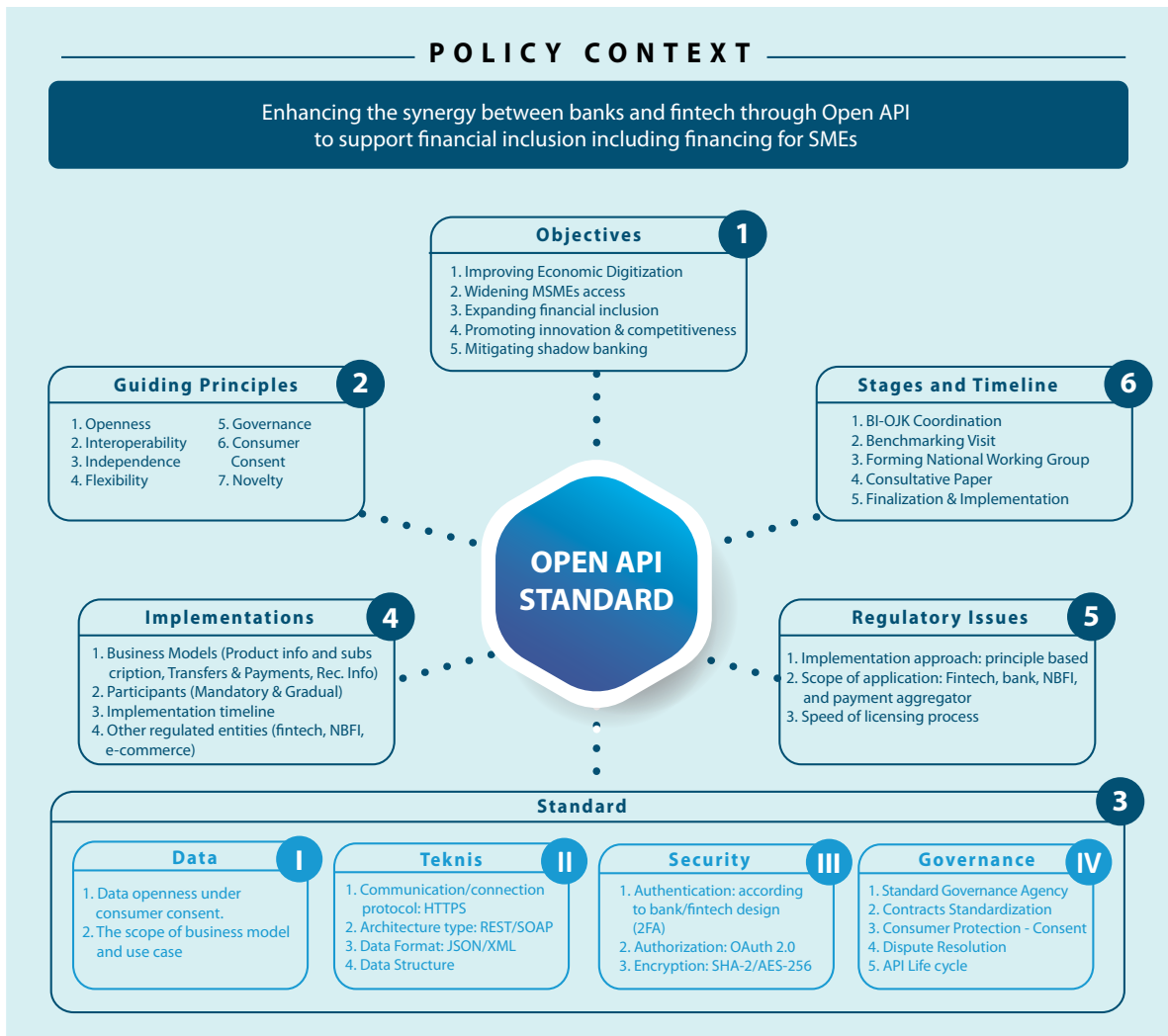
Source: Bank Indonesia, based on a survey result of banks and fintech in 2019.

Data standards will cover the scope and types of data that need to be opened by banks and fintech players. Technical standards will include, among others, reference for Open API specifications, including communication protocols, architecture types, data formats, and data structures. Security standards include minimum security compliance requirements that must be met by banks and fintech players,

including authentication, authorization, and encryption.

Governance standards include consumer consent, dispute resolution, API life cycle, and standard for the governing body. Besides, guiding principles for open API business contract standards between banks and third-party service providers, including fintech

Diagram 5. Open API Standard Policy Framework



Source: Bank Indonesia

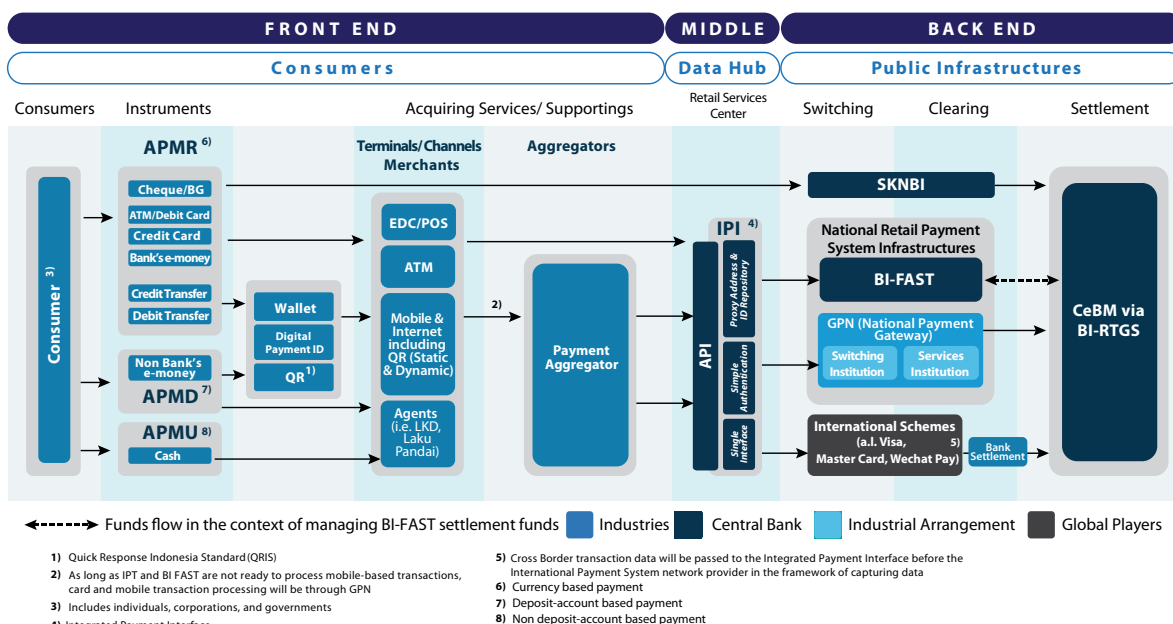
players, are set forth. The principles will include rules for granting consent for data disclosure, procedures for accessing and modifying data, and risk management.

3.1.2. Retail Payment Systems

The shift of the economic agent's transaction behavior towards online activities require sufficient support from infrastructure that can facilitate mobile, fast, safe, and affordable digital payment methods. This, in turn, soars the need for fast payment, which enables real-time, person-to-person, and available at all times payments.

The second initiative in IPS Blueprint 2025 aims at modernizing the retail payment systems toward more efficient and secure infrastructures by utilizing the latest innovations. In this fashion, the configuration of current national retail payment systems is still considered insufficient. GPN services are still limited to debit card transactions. SKNBI is not yet fully real-time and has not been operating 24 hours and 7 days (24/7). In addition, the application of proxy ID utilizes a mobile number or other types of identification, as the surrogate of the bank's account for payments has not been optimal. This initiative is expected to be able to respond to the rising public interest in efficient digital transactions.

Diagram 6. Indonesia Retail Payment System Configuration 2025



Source: Bank Indonesia

“
 ...the second initiative in IPSB 2025 aims at modernizing the retail payment systems toward more efficient and secure infrastructures by utilizing the latest innovations.

The new configuration of national retail payment systems will be ordained. The new configuration will constitute a healthier digital ecosystem (Diagram 6). The end state will be the presence of real-time, infrastructures that operate 24/7 efficiently inexpensive, safe, and able to serve various payment transactions between customers by utilizing Payment ID.

BI-FAST, GPN, and SKNBI will perform as the backbone for back-end retail payment infrastructures. BI-FAST will act as a fast payment infrastructure for card-based instruments, electronic money, and direct to account (credit and debit transfers) schemes. It will adopt a real-time gross settlement mechanism and operate 24/7.³⁰ ISO 20022 message format will also be used to ensure interoperability for both domestic and cross-border fund transfers. Moreover, it will also be

equipped with a proxy address³¹ to boost user experience. The two-tier participation model (direct and indirect participant) will be taken in the BI-FAST's membership arrangement and open for both bank and non-bank.

The GPN Services Agency will also be enhanced by enlarging the scope of its instrument's clearing and settlement capabilities (Diagram 6). The SKNBI is also strengthened by improving its service level agreement. The enhancement includes constituting an additional settlement period, reducing service fees to customers, as well as increasing the nominal cap of an individual funds transfer as well as regular/bulk credit payments (See Box 1).

On the middle-end, the integrated payment interface will become a single interface for mobile interoperability that connects all payment instruments and channels and routes transactions to back-end infrastructures. It will allow digital authentication using a proxy address. This interface and BI-FAST are also connected to the Data Hub for payments data collections (see Section 2.6).

³⁰ BI-FAST's settlement mechanism will eliminate credit risk. Acquirers (parties who deal directly with merchants) do not need to bail payments to merchants before the funds are effectively received by the acquirer from the issuer.

³¹ For example using a cellphone number, residence number, and email address for the transfer process.

BOX 1: THE ENHANCEMENT OF NATIONAL CLEARING SYSTEM (SKNBI)

SKNBI is an electronic fund transfer system that provides clearing services for debit and credit transfer with a centralized settlement for each transaction. Operated by Bank Indonesia since 2005, SKNBI has played a vital role as a Retail Value Payment System (RVPS).

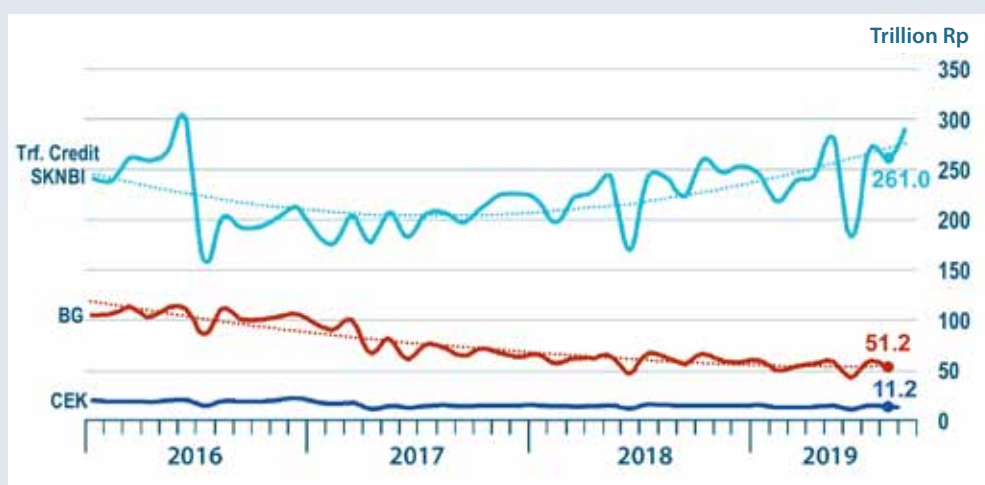
Credit transfer clearing via SKNBI has continued to increase since Generation II SKNBI launched in 2015. The widespread alternatives for payment channels, as well as the internet and mobile banking, have encouraged the use of SKNBI services. The relatively cheap transfer fee, among others, has also become the key attractiveness of SKNBI.

However, efforts to improve SKNBI service levels have to be continued amidst the new challenges posed by digitalization. Some enhancements must be taken to keep SKNBI competitiveness. Thereupon, in September 2019, Bank Indonesia has taken a number of steps. The discharge of full cost recovery of Generation II SKNBI granted spaces for Bank Indonesia to adjust transaction fees. The transfer fee charged by Bank Indonesia to banks has been reduced from Rp1,000 per transaction to Rp 600 per transaction. This allows the reduction of fee cap charged by banks to the public from maximum Rp 5,000 per transaction to a maximum of Rp 3,500 per transaction accordingly.

The limit for fund transfer has also been increased, from Rp 500 million to Rp 1 billion. This permits consumers, especially the corporate segment, to have flexibility to conduct their transactions using the SKNBI channel.

The SKNBI settlement mechanism has been improved. The timeframe for funds settlement has been shortened from initially 5 times with effective funds every two hours 5 times with effective funds every hour. This speeds up the fund collection process at the beneficiary side.

Those measures provide equitable benefits for SKNBI consumers in all segments. SKNBI becomes more efficient option for the individual consumer as well as corporates. The extensive SKNBI membership network also plays as a flexible option for users to manage their retail transactions from different banks, including collection management. Currently, SKNBI services now become a faster retail net settlement solution.



Source: Bank Indonesia

The integrated payment interface³², in principle, is a platform that integrates all payment channels³³ using API technology, which allows real-time fund transfer services among banks and non-banks. The interface connection with BI-FAST and GPN³⁴ will make various mobile-based services easier and cheaper. Bank Indonesia will regulate the use of this interface as part of the initiatives to realize digital transactions at affordable costs.

Integrated payment interface will allow everyone with a bank account(s) to create their proxy address using their mobile number, e-mail address, or other virtual payments address (VPA)³⁵. User could then directly transact using only their cell phone. Since VPA represents the customer's bank account as well as their Payment ID, it will increase transaction convenience and security. An integrated payment interface will also reduce the burden of card printing as anyone can use their cell phone(s) as a means of payment. The combination of cell phone and VPA appear to be the solution for universal, easy, and affordable payment acceptance tools.

The integrated payment interface has several key features. First, it acts as a single interface which consists of a set of API standards that enable the interconnection and interoperability of various payment instruments and channels, especially mobile, for all types of retail payment transactions.³⁶ The use of APIs will also grant easiness to application developers to provide a variety of front end service innovations without being affected by any structural adjustment on the back-end system. Second, it uses the proxy address as a unique identifier³⁷ that will console customers in making payments without exposing their sensitive credentials or account information. Third, it simplifies the authentication process through a one-click 2-factor-authentication approach to secure

their mobile transactions without the need for tokens or other security tools.

On the front end, all payment instruments are transacted through payment channels, both traditional channels such as ATMs and EDC/POS, as well as digital channels such as wallets and QR Codes. While cheque and Bilyet Giro (BG) are still processed through only SKNBI. In addition, cash instruments (banknotes and coins) are processed through agents. The scoop of standardization will be widened to promote interoperability, one of which is QRIS (QR Indonesia Standard).

QRIS is needed to expand acceptance of non-cash payments more efficiently. Through the use of a single QR Code standard, merchants do not need to acquire different types of QR Codes from the different issuer (Figure 8). The source of funds of QRIS transactions are bank deposits and/or payment instruments, e.g., debit cards, credit cards, and/or EU server-based. QRIS is developed based on the European Master Visa Co. (EMV Co) standard, which allows domestic and international interoperability.

At the initial stage, QRIS has developed under Merchant Presented Mode (MPM) method and assisted by the operator's specifications for interconnection. The next development stage of QRIS will be the adoption of the Customer Presented Mode (CPM) method. This, in turn, will impose flexibility for the industry. The obligation to use QRIS applies to all types of QR Code-based transactions, including payment transactions in Indonesia, which are facilitated by QR Codes using sources of funds from abroad (Box 2).



...QRIS is needed to expand acceptance of non-cash payments more efficiently.

³² The functional design in the integrated payment interface will integrate multiple bank accounts into a single mobile application, consolidate several financial services features, develop seamless fund routing, and integrate payments for a merchant

³³ Except for cheque/bilyet giro and cash transactions.

³⁴ Additional integrated payment interface layer integrated which is also connected to BI FAST and GPN.

³⁵ A user name accompanied by the bank's identity

³⁶ i.e., Person to Person, Person to Business, and Business to Person.

³⁷ i.e., mobile numbers, email addresses, and VPAs.

BOX 2: QUICK RESPONSE CODE INDONESIAN STANDARD (QRIS)

Innovations are imperative to achieved IPS 2025 visions and support the development of digital economic and finance. One of the fast-growing and widely acceptable innovations in the payment system is the Quick Response (QR) Code. Its popularity is derived from the more efficient cost of investment compared to other payment channels, such as EDC. With this competitiveness, the QR Code opens up wider opportunities for economic efficiency as well as economic and financial inclusion.

While it introduces many benefits, it also requires standardization to prevent fragmentation like any other payment instruments and/or channels. QR Code standard will reward merchants and consumers with efficiency as it prevents them from deploying diverse types of QR Codes from different providers. To this end, Bank Indonesia and the Indonesia Payment System Association (ASPI) has developed QRIS, launched on August 17, 2019 (soft launching).

QRIS is built under the EMV Co. standard. This allows interoperability between providers and instruments. This also allows for cross-border interoperability as EMV Co. Standard is also used in various countries. QRIS based transactions are linked to deposits and/or payment instruments i.e., debit cards, credit cards, and/or server-based electronic money as the funding sources.

QRIS uses UNGGUL as the idiom for its implementation. UNGGUL is an acronym of Universal, GampanG, Untung, and Langsung. Universal refers to the inclusiveness of QRIS for all levels of society and flexibility for local and abroad usages. GampanG refers to the transaction easiness use of gadgets as QRIS media. Untung refers to the efficiency gain for buyers and sellers from using QRIS as it only needs a single QR code for all payments. Langsung refers to an immediate feature of QRIS-based transactions as the transaction can be processed faster and instantaneous.

Currently, the QR Code is developed under two payment methods:

1. Merchant Presented Mode (MPM): The consumer only needs to scan his/her QR as the QR Code is shown at the merchant side. MPM can be static or dynamic. Static QR (generally in the form of stickers/acrylic) is fixed QR that does not change across its usage. Dynamic QR is QR that can change across its usage and is generally printed via EDC or shown by merchants through an electronic device interface.
2. Customer Presented Mode (CPM): The QR Code is generated at the consumer side, and the merchant will scan the QR. CPM only consists of dynamic type since a new QR code will be generated at the user side each time a transaction is made.

For the initial stage, QRIS uses the MPM method. The next stage deployment will also cover CPM.

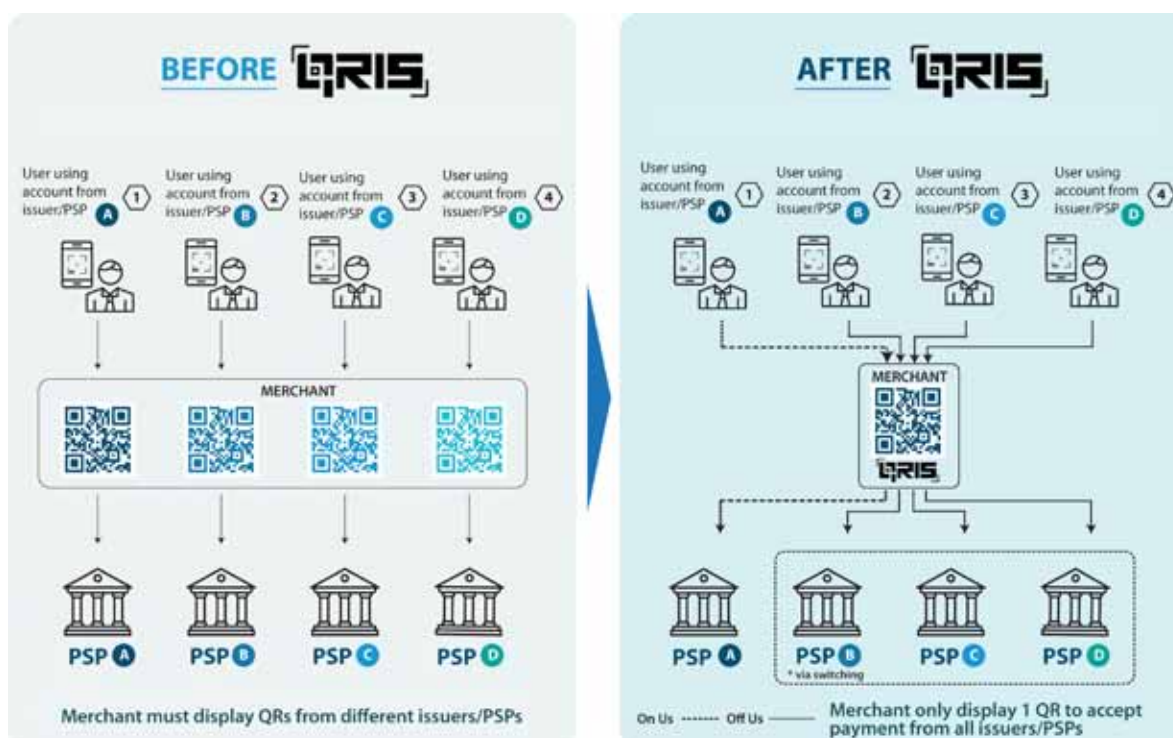
To support the implementation of QRIS, Bank Indonesia issued Board Member Regulation (PADG) No.21 / 18 / PADG / 2019 concerning the Implementation of the National Quick Response Code Standard for Payment dated August 16, 2019. The regulation, among others, regulates the scope of using the QR Code for payment, QRIS implementation as a national standard, as well as reporting obligation and supervision. QRIS nationwide implementation is set on January

1, 2020, to provide an adequate transition period for the industry. Parties who already used a proprietary QR code of payment before the QRIS declaration must adjust their QR code by QRIS regulation no later than 31 December 2019.

The mandatory use of QRIS applies to all payments made within Indonesia jurisdiction, including those facilitated by a source of funds administered and/or payment instruments issued outside the territory of Indonesia. The party who is administering the source of funds and/or issuing payment instruments issued outside the territory of the Republic of Indonesia must conduct business cooperation with BUKU 4 category bank(s).

Besides many benefits, QR-based payment services are not without risks. Therefore, the implementation of QRIS will be carried out in stages under prudential principles in its implementation.

Figure 7. **Payment Scheme Before and After QRIS**



Source: Bank Indonesia

3.1.3. Financial Market Infrastructures

The financial market plays a vital role as a source of economic funding and an intermediary for transmitting monetary, fiscal, and macroprudential policies. A deep and well-developed financial market will lead to a better allocation of resources and, thereby, economic growth. One characteristic of deep financial market is its ability to drive efficiency.

The space for strengthening Indonesia's financial market infrastructure (FMI) is still wide open. The quality, capacity, and reliability of BI-RTGS, BI-SSSS, and BI-ETP can still be boosted. Multi-currency³⁸ and PvP link in BI-RTGS can still be optimized to support the efficiency of domestic and cross-border transactions. Clearing, settlement, and custodial services for monetary operation (MO) and government bond (SBN) in BI-SSSS need to be strengthened³⁹ to improve certainty and

³⁸ Multi-currency is a feature that allows participants to have multiple accounts in currencies other than IDR.

³⁹ Indonesia Government Bond is still administered under a two-tier registry model where securities on the investor side are still settled at the sub-registry, and transaction data is reported at the end of the day.

Tabel 4. Commitment on OTC Derivative Market Reforms

Target	Commitment
All OTC derivative standard transactions	1. Must be transacted through exchanges or Electronic Trading Platforms (ETP) 2. Must be cleared through Central Counterparties (CCP)
All OTC derivative transactions	3. Must be reported to <i>Trade Repository</i>
Contracts that are not cleared through CCP	4. Higher capital requirement 5. Higher margin fee

Source: G20 Learder's Statement The Pittsburg Summit

capabilities of risk mitigation, i.e., settlement risk, operational risk, and cybersecurity risk.

The lack of presence of derivative clearing institutions that meet CCP standards according to ESMA⁴⁰ needs to be addressed. In addition, limited transparency and surveillance quality due to scattered financial transaction data among counterparties, prime brokers, trading venues, and custodians coupled with different data formats and fields need to be mended.



...the third initiative of BSPI 2025 anchors to the reconfiguration of national FMIs to be in line with the financial market deepening and standard international best practices.

With this background, IPS Blueprint 2025 formulates a third initiative, FMI, that anchors to the reconfiguration of national FMIs to be in line with the financial market deepening and standard international best practices adoption. This initiative is also in line with the contentment of the G20's mandates concerning Indonesia's position as a member of the G20. One of which is OTC Derivative Market Reforms⁴¹ (Table 4).

Accordingly, Bank Indonesia will develop a framework for FMI development to increase transparency, efficiency, and governance of transactions in financial markets, while concluding the G20 mandates as well as PFMI guidelines⁴² (Diagram 7). The infrastructures are the Systemically Important Payment System (SIPS), Central Counterparties (CCP), Securities Settlement System (SSS), Central Securities Depository (CSD), Trade Repository (TR), and Electronic Trading Platform (ETP).⁴³

BI-RTGS, BI-SSSS, and BI-ETP will be modernized by referring to 9 aspects, namely functionality, participation, technology, information management, message format, risk management, interconnection, surrounding environment, and price schemes. The technology and service level of BI-RTGS will be thoroughly modified and updated. The development of BI-RTGS will also be aimed at supporting the needs of the retail payments system as well as other financial markets development. Hence, the scope of the BI-RTGS access policy will be expanded through the adoption of a tiered participation arrangement to meet those needs.⁴⁴

The BI-RTGS functionality will be organized at

⁴⁰ The clearing and guarantee schemes for the stock, securities, and commodity markets have to meet ESMA qualifications to become a CCP. Moreover, the CCP function that covers OTC in the money and foreign exchange derivatives markets is still absent from Indonesia financial market. CCP plays its vital role in preventing market segmentation as CCP can minimize credit line and credit limit problems. CCP eliminates counterparty risk.

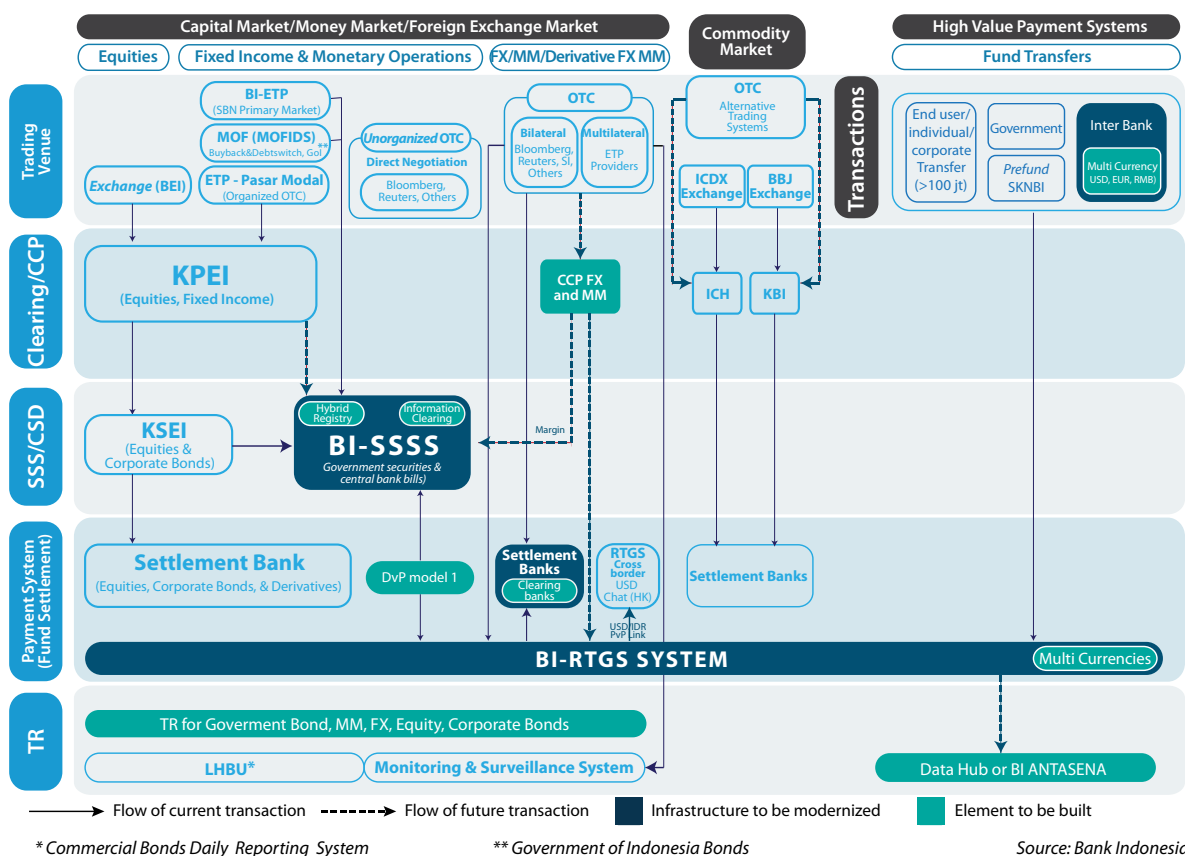
⁴¹ Leaders of the G20 countries agreed on OTC Derivative Market Reforms articulated in Pittsburg's G20 declaration, September 2009. The reform focus on standardizing OTC derivative market transaction by imposing mandatory transaction via ETP/exchange and also clearing at CCP to improve transparency and risk management. All standardized and non-standardized OTC derivative transactions must be reported to TR. As an incentive/disincentive, standardized OTC derivative transactions that are not cleared through CCP will incur higher capital charges and margins.

⁴² The PFMI guideline becomes an international standard which perform as the main reference in developing financial market infrastructure.

⁴³ CPSS-IOSCO (2012) PFMI categorizes FMI in PFMI as SIPS, CCP, SSS, CSD, and TR. These infrastructures carry out three main functions in post-trade activities in the financial markets, namely clearing (CCP), settlement (SSS for securities and SIPS for funds), safekeeping (CSD), and recording payments (TR). IPSB 2025 also covers ETP as an issuance/auction platform for securities and derivatives.

⁴⁴ Allows for indirect participants in the BI-RTGS membership structure.

Diagram 7. Indonesia Financial Market Infrastructures Configuration 2025



optimizing services, strengthening efficiency, and increasing risk mitigation capacity. BI-RTGS, as the inlet of financial market transactions, will be designed as an open infrastructure that allows interconnection with domestic and cross-border FMI. Thereupon, the multi-currency feature of BI-RTGS will be optimized to accommodate settlement in various currencies. It will also be equipped with a PvP link to mitigate principal risk. The ISO 2022 message format will be implemented in the new BI-RTGS. The step will also harmonize the standard message format use in the region, which will allow interconnections.

In addition, fraud prevention strategies, especially those of originating from endpoint security,⁴⁵ will also be developed, as well as compliance with the CeBM principles for systemic infrastructure/transactions.⁴⁶ From technology-wise, BI RTGS will leverage various breakthroughs and technologies to

support the implementation of other FMIs, including enhancing surveillance. To this extent, the adoption of ISO 2022 will increase transparency and traceability of financial transaction data as it opens the door of opportunities to increase the use of granular data.

BI-RTGS, BI-SSSS, and BI-ETP will be modernized by their functionality, membership arrangement, technology, information management, message format, risk management, interconnection, surrounding environment, and price schemes

BI-SSSS will be modernized in its function as SSS and CSD. SSS development will be focused on adding Delivery versus Payment 2 model (DvP 2) as DvP 1 option if participants need liquidity efficiency in the securities settlement process. The step will mitigate settlement risk and improve market efficiency. The clearing

⁴⁵ CPMI (2019) defined endpoint as "...a point in place and time at which payment instruction information is exchanged between two parties in the ecosystem, such as between a payment system and a messaging network, between a messaging network and a participant in the network, or between a payment system and a participant in the system."

⁴⁶ Currently, the systemic infrastructures whose settlement has employed CeBM are C-BEST owned by KSEI and BI-SSSS.

of information will also be added to mitigate the settlement risk rooted from inaccurate instructions. While CSD development will be focused on developing a hybrid registry, segregated administration at the level of investors (one-tier registry), and omnibus (two-tier registry), to improve settlement certainty and strengthen consumer monitoring and protection. Besides these two aspects, other aspects of the BI-SSSS will also be strengthened.⁴⁷

BI-ETP will be enhanced to sufficiently facilitate Money Operator (MO) transactions, both in Rupiah and foreign currency denominations, as well as Government Bond auctions on the primary market. This includes additional features for buyback and debt-switching programs on behalf of the Government. The cyber-resilience framework and fraud risk management features will also be upgraded. BI-ETP is also designed as an open infrastructure for domestic and international interconnection. Accordingly, the BI-ETP interface system with BI-SSSS and BI-RTGS will be strengthened. The Collateral Management System in the BI-SSSS will also be connected to the BI-ETP and transaction reporting system to improve efficiency. An automatic reporting mechanism to the Bank Indonesia reporting module will be built to buttress surveillance.

In order to encourage standardized OTC derivative transactions in accordance with G20 mandates, Bank Indonesia has taken a number of steps. Bank Indonesia has issued regulations governing the Market Operator⁴⁸ as the baby step to strengthen the money market and foreign exchange market transaction integrity. The objects of the regulations are money market and foreign exchange brokerage companies, systematic internalizers, ETP providers, and exchange. Implementation of the provisions is carried out in stages by considering the readiness of prospective market

operators and participants and the stages of instrument developments. Going forward, Bank Indonesia will arrange various types of standardized money market and foreign exchange market instruments and encourage their transactions to be carried out on the exchange or ETP.

Bank Indonesia has also issued a regulation that administers CCP institutions⁴⁹ to expedite the formation of CCP OTC derivatives in the money market and foreign exchange markets that satisfy PFMI. This is considered as the initial step toward the formation of CCPs in Indonesia. Nonetheless, several issues remain to be settled, e.g., close-out netting arrangements, types of transactions that are required to be cleared through CCP, and the imposition of margining-rule.

In addition, Bank Indonesia is also reviewing options for the establishment of TR as an outlet for OTC derivative transactions reporting as mandated in OTC Derivative Market Reforms. TR plays a vital role in improving transparency in financial markets transactions that are beneficial to authorities and the general public, thereby strengthening the SSK and reducing misuse of market data (market abuse). Among others, deep assessment is taken to explore the preconditions for TR establishment, respectively, data standardization, data quality consistency, and availability of transaction data. With TR, centralization of financial transactions data recording, especially OTC derivative transactions, will occur.

3.1.4. Data

The fast adoption rate of digital innovation and the massive growth of data in a consumer-based country like Indonesia demands the presence of adequate data policy. It has been argued in the previous chapter that concentration risk and monopolistic

⁴⁷ The improvements will also comprise BI-SSSS domestic and cross-border interconnection, tiered participation arrangement, ISO 20022 implementation, and risk management through audit trail, strengthening dashboard for monitoring, and cyber resilience.

⁴⁸ Bank Indonesia Regulation No. 21/5/PBI/2019 concerning Providers of Trading Platforms in the Money Market and Foreign Exchange Markets (Market Operators).

⁴⁹ Bank Indonesia Regulation No. 21/11/PBI/2019 concerning The Provisions of CCP for OTC Derivatives Transactions in Interest and Currency, September 9, 2019, effective on June 1, 2020.

competition in the digital era may root from extensive data acquisitions, which is augmented by data analytics capabilities. Since data is characterized as non-rival, competition should not originate from the acquisition and control of consumer data. Data acquisition function would be more advantageous to be put on the public domain, not to mention the need to ascertain the handling of data privacy externalities.

To this end, the attendance of public infrastructure for data is deemed necessary. Data infrastructure is an ecosystem that consists of technology, processes, and actors/institutions for the collection, storage, maintenance, distribution, and use of data by end-users.

Data management and infrastructure that arise from digital activities in Indonesia today remains problematic. Data silos are quite strong. Each player tends to develop their infrastructure in a closed ecosystem and tend to move onto market dominance. On the contrary, many players, especially in the payment system, still, limitedly take benefit from digital ID while the public is also lack of awareness on their personal data protection.



...the fourth initiative of BSPI 2025 leads to public infrastructure for payment data and information that guarantees open access and protection of consumers' personal data.

To that end, the fourth initiative of IPSB 2025 is aimed at provisioning public infrastructure for payment data that assures open access and protection of consumers' personal data. The infrastructure will be integrated with all payment transactions and organize payment data flow. The collected granular data from payment activities will be transformed into value-added content that enables industry, especially start-ups, to grow, advance innovations, and deepens economic and financial inclusion in a healthy competition environment. Open access that is equipped with data protection will sustain innovation and

widen the participation of economic agents as well as prevent market domination coming from control on data.

Digital ID is a key foundation in this strategy that opens the door to payment service access to all parties. Against this backdrop, Bank Indonesia will establish the Payment ID framework leverages granular data from payments. It will enable big data obtained from payments to be further processed into highly valuable content which will benefit economic and financial inclusion. Bank Indonesia will prioritize the availability of Payment ID that is reliable, easily verified, and can be used to facilitate access to digital financial services. Its attribute will be synchronized with various proxy IDs developed in retail payment system infrastructures (see Section 3.1.2).

Payment ID will also perform as a unique key/parameter that electronically links various distribution of subsidies and government transfers with the beneficiary's bank accounts. Subsidy beneficiaries will be identified and authenticated based on their Payment ID, including for the digital KYC process. This strategy will not only improve the accuracy of the Government subsidy distribution but also encourage broader economic and financial inclusion.

IPS Blueprint 2025 will also pioneer the establishment of public data infrastructure that operates as a payment data hub while simultaneously collecting granular payments data (Data Hub). The Data Hub will integrate the acquisition and traffic of granular data related to payments. An Open API platform will be built on it to connect it with a variety of front-end and back-end retail payment infrastructures to ensure interoperability. The standards used will be aligned with those developed in the Open Banking initiative.

Big Data Analytics capabilities will also complement the design of Data Hub. The presence of Payment ID, as explained previously, will enable the transformation process of granular payments data into valuable information content. Data Hub will also provide data as a service function. The output of Data

Hub will be shared with the related regulators and industry with due regard to the authority to access and protect personal data (Diagram 8).

Like Open Banking, guidelines will also be prepared. The guidelines will administer data collection and data structure, which will be routed to the Data Hub. Guiding principles will also be equipped with a data protection mechanism, including consumer consent. The guiding principle will include several elements, including notification, consent, integrity, and confidentiality, and requirements regarding how data is collected disclosed and processed.

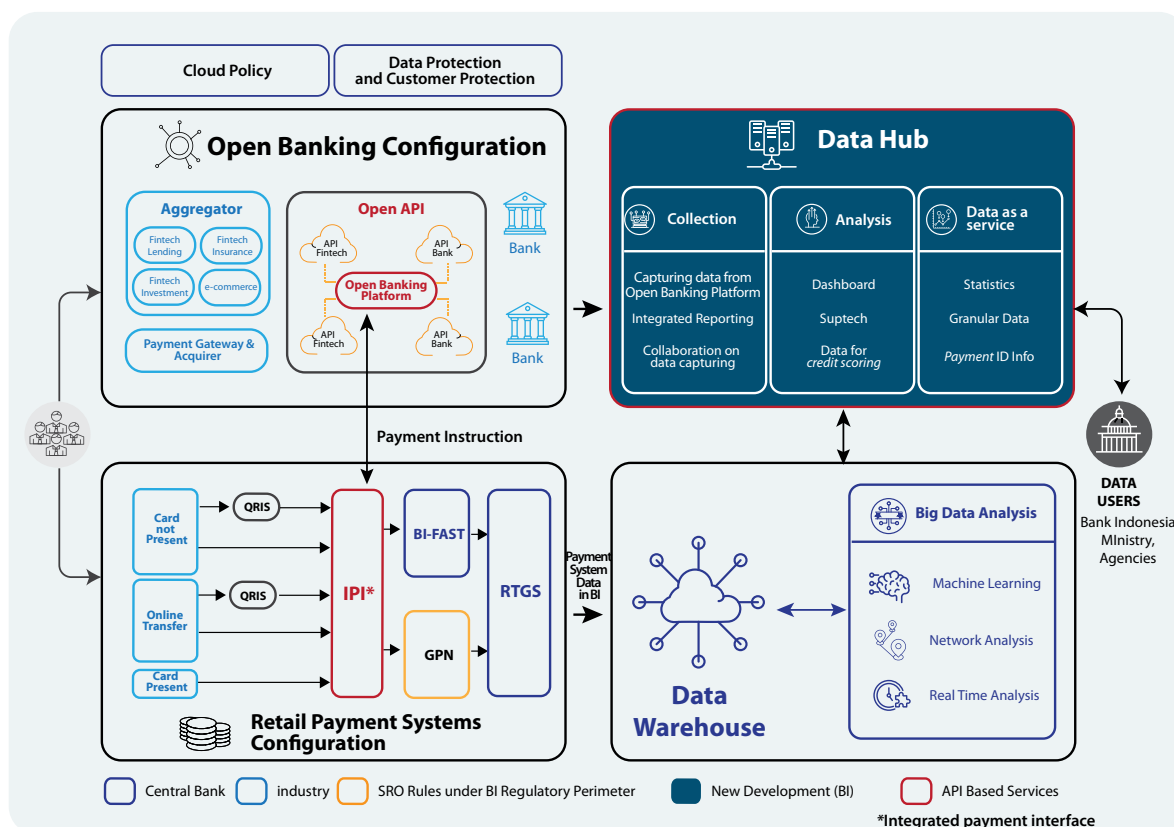
Bank Indonesia also continually enhances the reporting system. The integration of the reporting system through the BI-ANTASENA initiative would bring efficiency to the industry. Improvements will focus on expanding the scope of payment data. For this reason, BI ANTASENA will utilize the latest technology, including APIs that enable faster and efficient reporting.

3.1.5. Regulatory, Licensing, and Supervisory

The strategic shift in the economic environment due to digitalization, heightened the need to reformulate the payment system regulatory framework, as well as harmonize the existing regulatory structure. The new framework will contain a new regulatory structure and approach, which will act as the basis for the drafting and issuance of regulations in payment systems going forward. The payment system components approach will be used in the reformulation. The components consist of an instrument, institution, infrastructure, mechanism, and cross border.

There are a number of key elements to strengthen regulatory environments yield from reviews on the framework and scope of regulations adopted in several countries. First, a comprehensive definition and scope

Diagram 8. Data Hub Configuration



Source: Bank Indonesia

of payment instruments and channels are needed to accommodate the fast development of instruments and channels in the digital economic and financial ecosystem. Second, there is a growing need to reorganize payment system institutions. The activity-based approach, including criteria and mechanism for entry policy, will be taken according to the institutional type of the payments provider. Third, categorization of payment systems infrastructures based on the nature of risk embedded in the processed transaction and the beneficiary of payment system infrastructure services.



...the fifth initiative of IPS Blueprint 2025 is aimed at reformulating the payment system regulatory framework as well as harmonizing the existing regulatory structure.

Payment systems' regulatory structure will be reassembled and strengthened towards a more structured and consistent ecosystem. The design of new payment systems regulatory structure is also expected to warrant accessible acceptance by the industry to ensure smooth accommodation for future developments.

The new structure will act as the foundation for the formulation of payment systems regulations. Bank Indonesia Regulation (PBI) on Payment System will be issued based on the new structure and act as an umbrella regulation for all payment systems regulations (Diagram 9). The design of the PBI will ensure proper accommodation and coverage of all objectives encapsulated withing IPS Blueprint 2025⁵⁰. This will accelerate digital economic and financial development in accordance with IPS 2025 visions.

In this respect, the restructuring process will

be hinged on a number of objectives. First, rearranging the regulatory drafting and issuing toward a more structured, proportional, forward-looking, and agile process. Second, simplifying the existing regulatory structure. Third, optimizing the role of industry associations as a self-regulatory organization.⁵¹ Fourth, applying a principle-based approach to increase regulatory adaptability against industrial development. Fifth, promoting sound business practices to ensure safe, efficient, fast, and reliable payment systems, starts from the entry to exit point, including implementation and supervision.

The rising threat of cyber risk has to be responded accordingly with a strong regulatory framework. In this respect, IPS Blueprint 2025 also leads to the establishment of a cyber-security framework. The framework will be built in line with the National Strategy of cyber-security and resilience under the coordination of the State Cyber and Code Strategy (BSSN). The framework will also refer to international standard best practices⁵² that put a priority on Governance, Identification, Protection, Detection, Response, and Recovery. The cyber-security framework will apply for all PSPs under Bank Indonesia's supervision.

In terms of data protection arrangement, including consumer consent architecture and cloud policy, Bank Indonesia will establish a legal basis for managing payment transaction data in line with Government Regulation (PP) No. 71 of 2019 (PP PSTE).⁵³ Consumer data protection and consumer consent architecture will adhere to the PP PSTE, which requires the availability of a proper personal data protection mechanism by electronic service providers.⁵⁴ Meanwhile, cloud policy will be based on the allegiance of all PSPs to meet the principle of duty to inform supervisors.

⁵⁰ Includes Open Banking, interlinkage between banks and fintech providers, fast payments, integrated payment interface, use of CeBM, utilization of supotech and regtech, and data management such as aspects of personal data protection, Payment ID, and Data Hub.

⁵¹ Referring to Bank Indonesia Circular Letter Number 13/7/DASP concerning Self Regulatory Organization in the Payment System.

⁵² International best practices i.e., PFMI, ISO 27001, dan NIST platform sharing, and analysis center.

⁵³ Government Regulation No. 71 of 2019 concerning the Implementation of Electronic Systems and Transactions regulates the management of electronic data and information in Indonesia.

⁵⁴ Personal data protection mechanisms such as notification, consumer consent, security protection, and the limit on data processing limits according to the objective/purpose of its usage.



...going forward, payment system arrangements will include strengthening entry policies and simplifying licensing integration without reducing prudential aspects.

The new regulatory structure will be integrated with the entry policy, supervision, and reporting mechanism of PSPs in accordance with best practices and sound business practices principle. An integrated and simple licensing regime will be introduced without sacrificing prudential aspects. PSPs licensing will use an activity-based approach and be classified according to size, scale, and scope. Furthermore, entry requirements, including new product developments and business cooperation, will be applied and segregated based on its level of complexity or risk inherent in the type of activity to be carried out. In addition to the entry through licensing, Bank Indonesia will introduce the designation regime for payment system operators at entry.

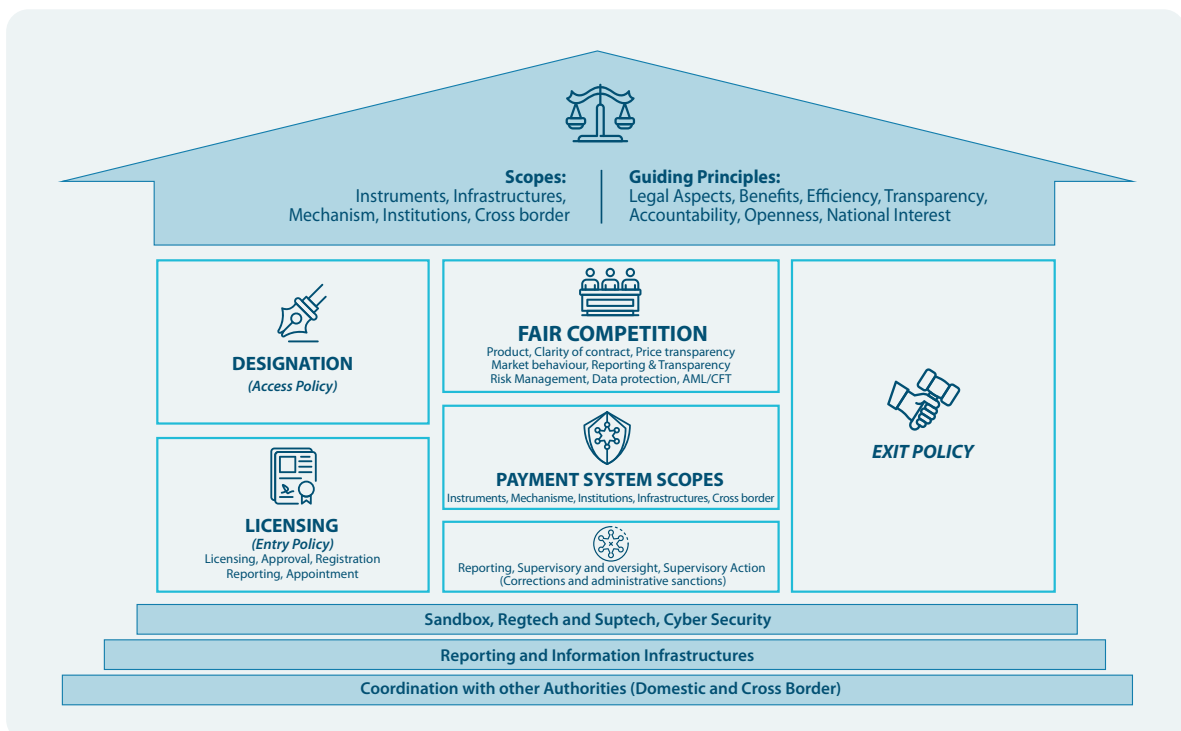
On the supervision side, the supervisory framework will be aligned with the direction of IPS Blueprint 2025 (Diagram 9). As a response

to the recent dynamic and challenges brought by digitalization, the supervisory approach will be fine-tuned toward the synergy between risk-based supervision and compliance-based supervision. The methodology will also be strengthened through the optimal use of granular data. In this regard, oversight and supervision will leverage opportunities brought by Data Hub and BI-ANTASENA (see Section 3.1.4).

The presence of regtech and suptech solutions would also open opportunities to strengthen licensing and supervision further. IPS Blueprint 2025 also aims at these solutions to respond to the need for efficiency in the licensing, supervisory, and surveillance processes as well as policy and decision making processes. The potential use of regtech and suptech can be done collaboratively with the industry and regulators, including through utilizing the sandbox function.

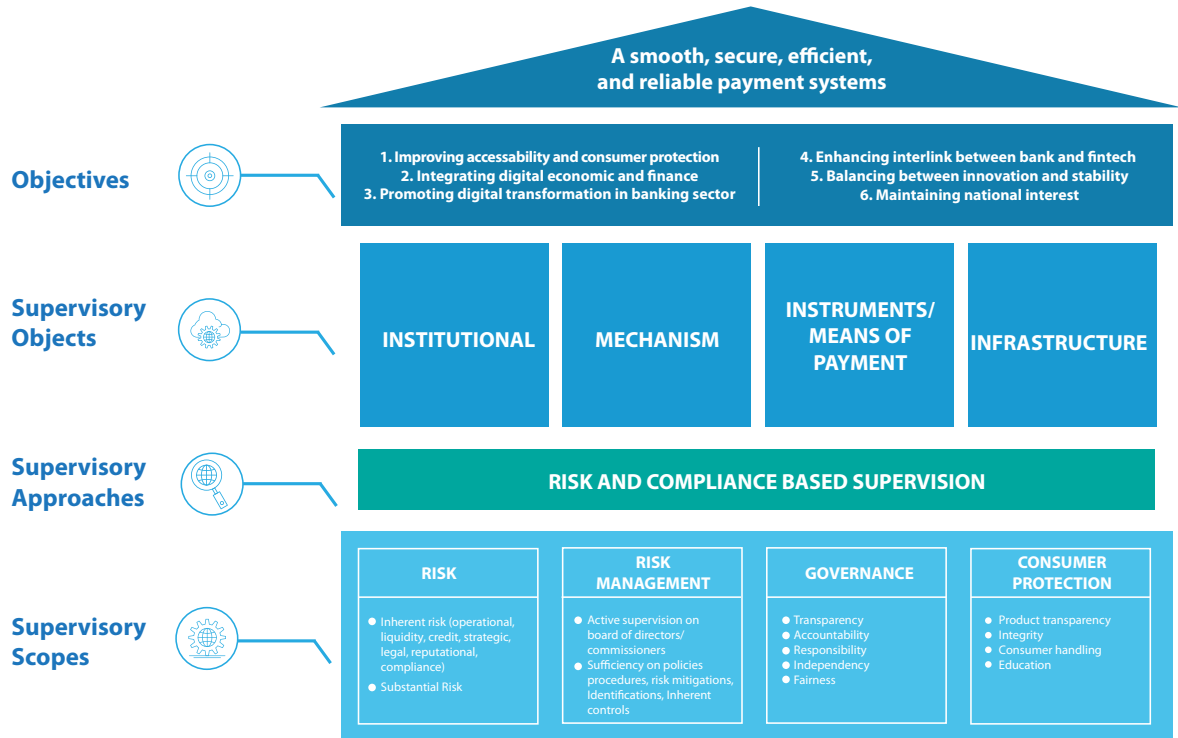
Against this backdrop, Bank Indonesia will revitalize the regulatory sandbox function toward Sandbox 2.0. In addition to the current regulatory function, the Sandbox 2.0 design will also be manifested into two new functions.

**Diagram 9. Integrated Payment Systems
Regulatory, Licensing and Supervisory Framework**



Source: Bank Indonesia

Diagram 10. Payment Systems Supervisory Framework

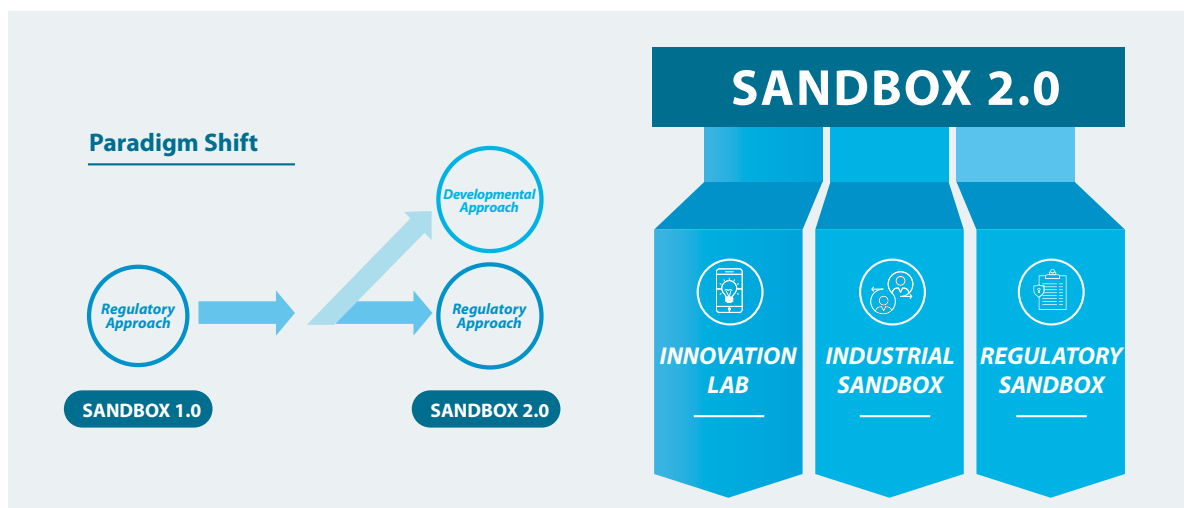


Source: Bank Indonesia

First, Innovation Lab as a means of exploring technology and innovative business models as well as detecting their opportunities and risks. Second, industrial / Developmental Sandbox as a means to synergize digital innovation with its actual needs in the real sector. These functions will also be synergized with the electrification program by strengthening the engagement of traditional economic actors and academics.

The journey toward sandbox 2.0 will take place in parallel and comprehensively without ignoring the risk mitigation aspects so that the balance between innovation and risk can be maintained. This strategy is considered to be more adaptable to the digitalization dynamic as the interval of digital innovations and its adaptation become shorter.

Figure 8. Sandbox 2.0 Framework



Source: Bank Indonesia

3.2 Roadmap

Five Working Groups (WGs) are deployed to advance the five Initiatives at their implementation stage. The initiatives have been articulated further into 23 key deliverables. The initiatives are elaborated into the Bank Indonesia strategic program, which will be implemented multi-years within the period of 2019 to 2025. Synergy and coordination with relevant Ministries and Government Agencies, as well as industries, will be taken accordingly to ensure the acceptability and smooth implementation of the IPS Blueprint 2025. The outline of the roadmap and milestones of the five WGs is summarized in Figure 9.



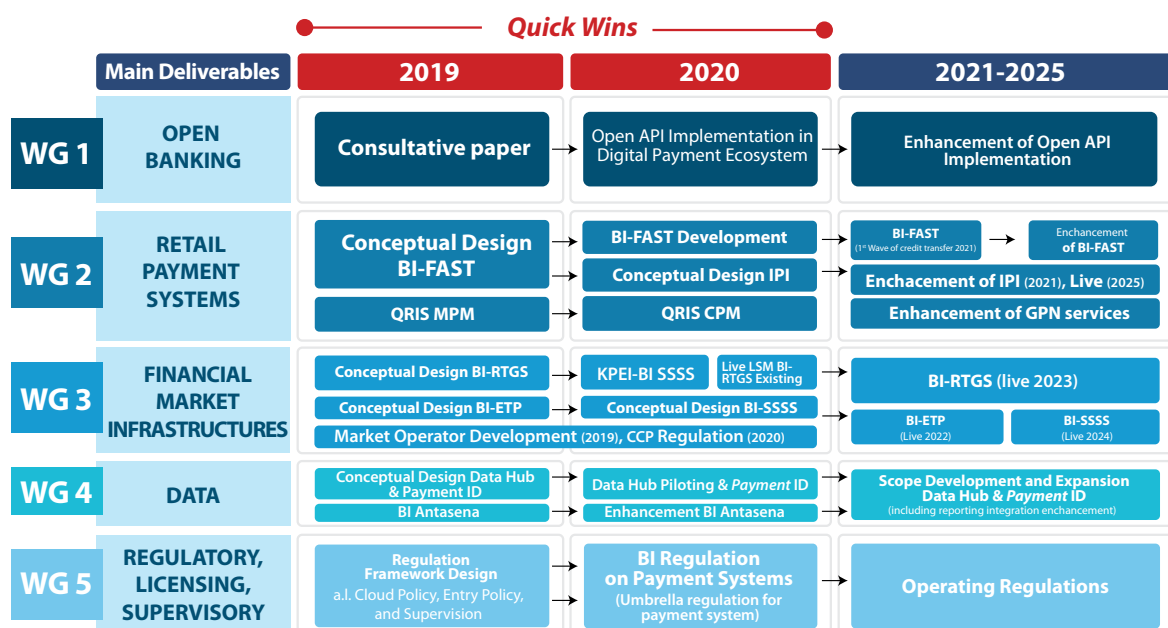
...Five Working Groups (WGs) were formed to implement the 5 initiatives and 23 key deliverables of IPS Blueprint 2025.

Working Group 1: Open Banking deliverables aimed at pushing forward a standard for Open API, which comprises standardizations on data, technical specifications, security specifications, and governance. The standard will be set forth in a guideline(s) to become the reference for banks and fintech providers in implementing Open Banking. The initial focus will be set on standardizing open payments

data for SMEs loans disbursement use cases. The standardization process will be carried out in stages. At the initial stage, the consultative paper will be issued to solicit inputs and feedbacks from stakeholders and act as the foundation to establish guideline(s) for Open API standard. The scope of standardization will also be applied in stages, starting with banks under the BUKU IV category. The implementation phase will be complemented by the fair transition period to provide sufficient space for banks and fintechs to prepare themselves according to each bank's business complexity and technology readiness. The standard is targeted to be finalized in 2020.

Working Group 2: The Retail Payment Systems deliverables aimed at the establishment of BI-FAST and integrated payment interface infrastructure, the extension of GPN services, and the development of QRIS. The construction of BI-FAST will begin in 2019, starting with the finalization of its conceptual design, which will become the foundation for further construction process starting in 2020. By 2021, the first wave of BI-FAST, namely credit transfers, is targeted to be completed and act as a stepping stone for the next wave, which will be completed in 2025. BI-FAST will also act as the basis for the integrated payment interface establishment, whose conceptual design will be finalized

Figure 9. IPS Blueprint 2025 Roadmap and Timetable



Source: Bank Indonesia

in 2020. The construction process will begin in 2021 and will be rolled out in stages until reaching its full implementation by 2025. The interface will be connected with both BI-FAST and GPN. The extension of GPN services will be focused on widening the scope of card-based payment service standards (in addition to debit cards) with development stages that will be set upon agreement with the industry. Meanwhile, QRIS will be expanded following the MPM roll-out started in January 2020. QRIS will also be expanded to adopt CPM. The development will begin in 2020.

Working Group 3: Financial Market

Infrastructure deliverables aimed at modernizing BI-RTGS, BI-SSSS, and BI-ETP as well as the strengthening regulatory framework for OTC derivatives in money and foreign exchange markets as well as paving the way for the establishment of CCP and TR infrastructures on this area. Conceptual designs of new BI-RTGS and BI-ETP will be finalized in 2019, followed by BI-SSSS in 2020. The new BI-ETP, BI-SSSS, and BI-RTGS are targeted to be rolled out in 2022, 2023, and 2024 consecutively. The new BI-RTGS will also be aligned with the BI-FAST to ensure the integration of both systems. The currency coverage that will be accommodated in BI-RTGS multi-currency will be applied in stages that begin with USD, followed by other currencies, such as EUR and RMB. Regarding the financial market infrastructure regulatory framework, the scope of Market Operator regulation will be expanded to accommodate the standardization of money and foreign exchange market instruments and transactions on the exchange/ETP. Likewise, the enhancement of regulatory framework for CCP OTC derivatives in money and foreign exchange markets to also cover legal basis for close-out netting, mandatory clearing, and margining-rules. In this front, intensive coordination with relevant authorities and industry will be taken.

Working Group 4: Data deliverables will be aimed at establishing Payment ID, Data Hub, and integrated reporting system (BI-ANTASENA). These deliverables will be carried out in stages. The formulation of Payment ID's and Data Hub will begin in 2019. The conceptual designs will act as the basis

for piloting, which will be carried out in 2020. The construction of Data Hub will leverage existing Bank Indonesia's IT infrastructure. Meanwhile, the initial stage of the Payment ID establishment will leverage electronic money transaction data, which will allow the piloting process to be started in 2020. The development of Payment ID, Data Hub, and BI-ANTASENA will be done as an integral part of the development of Open API standards constructed by WG on Open Banking as well as aligned with proxy ID developed in BI-FAST as well as the integrated payment interface. This strategy will ensure interconnection and interoperability across systems.

Working Group 5: Regulatory, Licensing, and Supervisory deliverables will be aimed at restructuring the payment system regulatory framework as the basis for further enhancement of the licensing and supervisory frameworks. The new regulatory structure is targeted to be finalized in 2019. The provision of the new structure will pave the way for the drafting of the umbrella regulation in the payment system articulated in the Bank Indonesia Regulation (PBI) on Payment Systems. The PBI is targeted to be finalized in 2020. The PBI will become the basis for reconstruction for further operating regulations, which will be issued between the period 2020 to 2025. The new regulatory structure will also accommodate the cybersecurity framework and the concept of licensing integration and the supervisory framework, which will also be finalized from 2019 to 2020. Also, the regulatory sandbox revitalization into Sandbox 2.0 will begin in 2019 and be rolled out in stages starting from 2020.

The implementation of IPS Blueprint 2025 culminates with three milestones, which will also become Bank Indonesia's flagship programs. Those are the Open Banking consultative paper, the BI-FAST conceptual design, and the new regulatory structure. These three milestones will guide and act as a stepping stone for the implementation of further deliverables in IPS Blueprint 2025.

IPS Blueprint 2025 will navigate Indonesia's digital economic transformation. A

well-functioning payment systems, a monetary systems, as well as the financial systems, will yield economic growth sustainability, prosperity, and financial system stability. Likewise, IPS Blueprint 2025 will bridge structural reforms agenda with digital transformation, in which the participation of all economic agents will be integrated into an inclusive digital ecosystem. In this context, the efficacy of IPS Blueprint 2025 deployment will resemble in two main outcomes (Graph, 16).

First, effective digital transformation in the banking sector induced by interlink between bank and fintech, proxied by Banking Digitalization Ratio (see annex B). IPS Blueprint 2025 aims at achieving an exponential increase in this ratio from 6.0x in 2019 to 13.3x in 2025.⁵⁵

Second, a significant increase in the level of the adult participation rate in the financial sector, proxied by the acceleration of all digital payment transactions, ratios against the total adult population and GDP. IPS Blueprint 2025 aims at the expansion of this ratio from 1.23x of GDP in 2019 to 1.64x of GDP in 2025⁵⁶ as well

as 32.3x of the total adult population in 2019 to 55x of the total adult population in 2025⁵⁷.

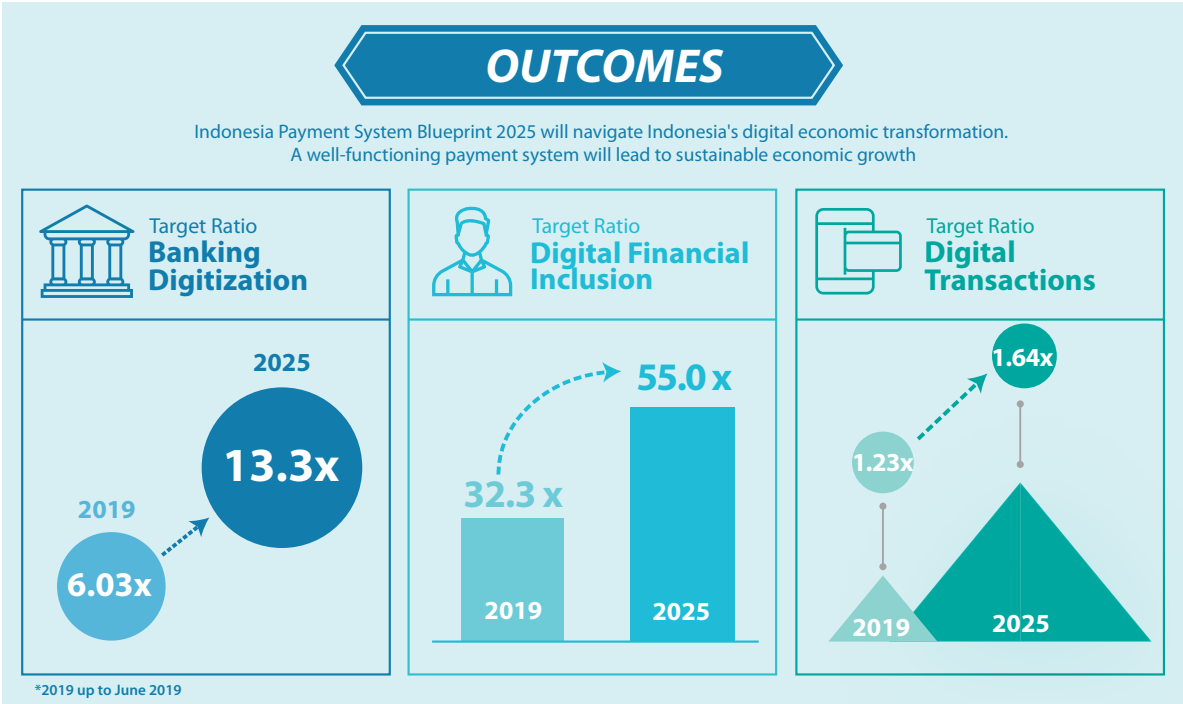
IPS Blueprint 2025 will act as a manifestation of Bank Indonesia’s real contribution in establishing a healthy digital ecosystem while at the same time guaranteeing the implementation of Bank Indonesia’s legal mandate as a central bank.

IPS Blueprint 2025 will verify that the current digitalization in Indonesia will be able to provide optimal, equitable, and sustainable benefits for Indonesian society as a whole through better and broader economic and financial inclusion.

3.3 Conclusion

The digital revolution in the past decade has drastically changed the behavior of economic agent, affected the economy in all of its aspects, and disrupted conventional functions including in the financial sector. One thing that distinguishes the current digital revolution compared to the previous era is the

Graph 16. Target Outcomes of IPS Blueprint 2025



⁵⁵ See Appendix B for the methodology.

⁵⁶ Long-term GDP forecast numbers refer to Bank Indonesia projections c.q Economic and Monetary Policy Department calculated in June 2019.

⁵⁷ The projection of the adult population refers to the 2010-2035 Statistic Indonesia Agency’s projection on population-based age groups (Men+Women).

greater opportunity for financial inclusion. In this context, Indonesia can be considered as an economy with great potential to absorb digitalisation. Large population couples with young demographic structure, but still populated by unbanked people becomes the source of this enormous potential.

In the digital age, data is the new oil as well as the key to competitiveness. If it is not properly and carefully addressed, business competition based on consumer data hoarding practices collected from a closed ecosystem can lead to concentration risks as well as monopolistic competition which in return wipes out innovations while threatening financial system stability and monetary stability. In such a situation, digitalization promises of the efficiency gain and financial inclusiveness will turn into inefficiency and polarization of economics that claims high social costs.

Hence, digitalization will only increase economic output if it's properly designed. Digital innovation transforms social interaction into economic democratization, improves efficiency from higher economic agent's capability to access and utilize information, and stimulates further innovations, new business models, as well as new sources of growth. All of these benefits are key to opening up opportunities for Indonesia's economic-financial inclusion. An understanding of the industrial revolution 4.0 which is different from the previous industrial revolution will be the key success factor in designing the digital economy for Indonesia. In this context, the Indonesia Payment System Blueprint 2025 which equipped with its five visions stands as a solution for Indonesia in looking at the future towards a perceptible and lucrative digital transformation for sustainable economic development.



The IPS Blueprint 2025 will be a manifestation of Bank Indonesia's contribution in establishing a healthy digital ecosystem while at the same time guaranteeing the mandates as a central bank in the Republic of Indonesia.



“

Accessible and affordable digital
payment services for all.... ”



BANK INDONESIA
BANK SENTRAL REPUBLIK INDONESIA

Glossary

2-factor-authentication	Two-Step Verification (something you know and something you have)	Google
Application Program-ming Interface	A set of routines, protocols, and tools for building software applications. An API specifies how software components should interact.	OBIE
Acquirer	Banks or Non-Bank Institutions that collaborate with merchants so that merchants are able to process transactions from the issued instruments by parties other than the Acquirer and responsible for the settlement of payments to merchants.	BI
Artificial Intelligence	Advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions.	Gartner
Big Data	Large volumes, high frequency, and unstructured data generated using digital technology and information systems	BI
Big Data Analytics	The use of advanced analytic techniques against very large, diverse data sets that include structured, semi-structured and unstructured data, from different sources, and in different sizes from terabytes to zettabytes.	IBM
Bigtech	Large technology companies that expand into the direct provision of financial services or of products very similar to financial products.	FSB
Central Counterparty	An entity that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer and thereby ensuring the performance of open contracts.	FSB
Consumer Consent	Any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her	GDPR
Cloud Computing	A model for enabling ubiquitous, convenient, on-demand network access to a shared	US NIST
Central Securities Depository	An entity that provides securities accounts, central safekeeping services and asset services, which may include the administration of corporate actions and redemptions, and plays an important role in helping to ensure the integrity of securities issues.	BIS
Delivery versus Payment	A securities settlement mechanism that links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs.	BIS
<i>Dana Float</i> (UE)	All e-money value held at the issuer for the results of electronic money issuance and/or top up e-money balance which is still the obligation of the issuer to the users and providers of goods and/or services.	BI
Digital Banking	Electronic banking services developed by optimizing the use of customer data in order to give faster, easier services to the customers and is customized to the customer needs and can be carried out completely independently by prudent customers	OJK
Digital Divide	The very large difference in opportunity between people who can easily access computers and the Internet and people who cannot	Oxford
Digital ID	A set of electronically captured and stored attributes and credentials that can uniquely identify a person	World Bank

Digital Literacy	The ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy	UNESCO
Digital Native	A person who was born or has grown up since the use of digital technology became common and so is familiar and comfortable with computers and the Internet	Oxford
Distributed Ledger Technology	A novel and fast-evolving approach to recording and sharing data across multiple data stores (or ledgers). This technology allows for transactions and data to be recorded, shared, and synchronized across a distributed network of different network participants.	World Bank
Escrow Account	Current account held at bank under the name of the service provider which is deposited and used for a specific purpose, namely the receipt and disbursement of funds from and to users of the loan service provider based on information technology.	OJK
Financial Market Infrastructures	A multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling or recording payments, securities, derivatives or other financial transactions.	BIS
Fintech	Technology-enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services	FSB
FMI Link	A set of contractual and operational arrangements between two or more FMIs that connect the FMIs directly or through an intermediary.	BIS
Generasi Y	Those born between 1984 and 1996	HBR
Generasi Z	Those born after 1996	HBR
Granular	The level of detail of your data within the data structure	Dwhwiki
Gross Settlement System	A transfer system in which the settlement of payments, transfer instructions, or other obligations occurs individually on a transaction-by-transaction basis for full value.	BIS
Indirect Participant	An entity that does not have direct access to the FMI's services, and is typically not directly bound by the rules of the FMI, but whose transactions are cleared, settled, or recorded by the FMI through a direct participant. An indirect participant has a bilateral agreement with a direct participant.	BIS
Internet of Things	Digitization of the physical world	McKinsey
Machine Learning	A form of AI that enables a system to learn from data rather than through explicit programming	IBM
Modular (design)	A design approach that subdivides a system into smaller parts called modules that can be independently created and then used in different system	TCBAF
<i>Monetisasi Data</i>	Using data for quantifiable economic benefit	<i>Gartner</i>
Multicurrency RTGS	RTGS that can function as fund transfer and/or settlement intermediaries in several currencies.	BI
Horizontal integration	The combination of two or more companies in the same business, carrying out the same process or production, usually to reduce competition and gain economies of scale	Oxford

Omnibus	An account structure where securities or collateral belonging to some or all customers of a particular participant is commingled and held in a single account segregated from that of the participant.	BIS
Proxy Address	Surrogate identity/address of the original identity/address	BI
Omnichannel	A seamless and consistent interaction between customers and their financial institutions across multiple channels	IBM
QR Code	A technological feature that allows payment transactions to be carried out only by scanning certain codes through a mobile application at the merchant	BI
Regtech	The use of technologies to solve regulatory and compliance requirements more effectively and efficiently	BIS
Securities Settlement System	An entity that enables securities to be transferred and settled by book entry according to a set of predetermined multilateral rules. Such systems allow transfers of securities either free of payment or against payment.	BIS
Segregation	A method of protecting customer collateral and contractual positions by hold-ing or accounting for them separately from those of the direct participant (such as a carrying firm or broker).	BIS
Settlement Agent	An entity that manages the settlement process for transfer systems or other arrangements that require settlement. Settlement agent sometimes differs from the owner or settlement institution of the system	BIS
Shadow Banking	Credit intermediation involving entities and activities (fully or partially) outside the regular banking system	FSB
Sharing Economy	An economic system in which people can share possessions, services, etc., usual-ly by means of the Internet	Oxford
Systemically Important Payment System	A payment system which has the potential to trigger or transmit systemic dis-ruptions; this includes, among other things, systems that are the sole payment system in a jurisdiction or the principal system in terms of the aggregate value of payments, and systems that mainly handle time-critical, high-value payments or settle payments used to effect settlement in other FMIs.	BIS
Straight Through Processing (STP)	The automated end-to-end processing of trades and/or payment transfers, including the automated completion of confirmation, matching, generation, clearing and settlement of instructions, without the need for re-keying or refor-mating data.	BIS
Suptech	The use of innovative technology by supervisory agencies to support supervi-sion	BIS
Tiered Participation Arrangement	Arrangements that occur when some indirect participants rely on the services provided by direct participants to use the FMI's central payment, clearing, set-tlement, or recording facilities	BIS
Unbundling	A process by which a company with several different lines of business retains core businesses and sells off assets, product lines, divisions or subsidiaries.	<i>Investo-pedia</i>
Unicorn	A new company valued at more than a billion dollars, typically in the software or technology sector	Oxford
Unique Identifier	A numeric or alphanumeric string that is associated with a single entity within a given system	TechTar-get
Venture Capital	A form of private equity and a type of financing that investors provide to startup companies and small businesses that are believed to have long-term growth potential	<i>Investo-pedia</i>

Vertical Integration	A strategy whereby a company owns or controls its suppliers, distributors, or retail locations to control its value or supply chain	Investopedia
Virtual Account	Banking services that are included in or part of an Escrow Account, in the form of an identification number of the end user and can be made by the operator or bank, aims to identify the receipt and disbursement of funds from and/or to an account.	OJK
Virtual Payment Address	An identifier that can be uniquely mapped to an individual account	ETCIO

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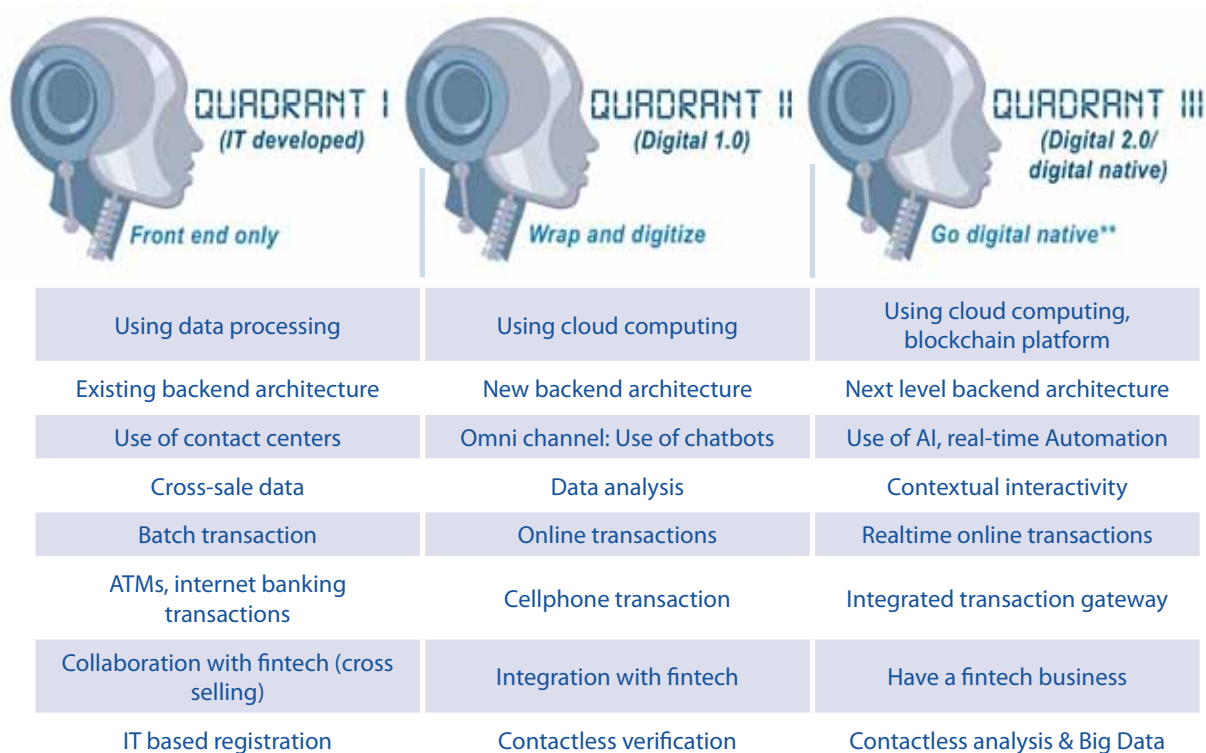
ANNEX A

METHODOLOGY FOR MAPPING OF DIGITAL BANKING ADOPTION IN INDONESIA'S BANKING SECTOR⁵⁹

The rate of digital banking adoption in Indonesia's banking sector is mapped through the classification of banks based on their digital transformation level. The classification methodology is established by leveraging the methodologies developed by Marous (2016), Barquin et al. (2018), PwC (2017), and Desmangles et al. (2018).

In general, the stages of digital banking transformation will be divided into three quadrants, namely quadrant I (IT developed / bank with advanced IT), quadrant II (digital banking stage 1.0) and quadrant III (digital banking 2.0). The classification is arranged based on the parameters as follows:

1. The level of technology utilization in product/service development
2. The level of customer interaction with bank's staffs
3. Channels that are used dominantly
4. Transaction processing speed.



**From various sources: The Financial Brand (2017), PwC Insight, McKinsey Review, BCG Insight (2018), processed*

Key elements are assumed as the basis for the mapping process. They are the level of IT adaptation in the innovation and development of products and services, organizational responsiveness, and business processes/procedures that are carried out. These elements determine the degree to which a bank has been "go digital."

⁵⁹ Summarized from survey conducted by Department of Financial Sector Surveillance Bank Indonesia as outlined in Memorandum No.21/5/DSSK/M.02/B regarding "Analisis Mengenai Perkembangan Digital Banking pada Perbankan Indonesia dari Perspektif Pengawasan Sistem Pembayaran", dated January 16, 2019.

The Basis of Digital Banking Mapping



Innovation and development of banking products supported by adaptive information technology, responsive organization, and business processes / procedures that are carried out determine the classification of how far banking goes digital

The mapping process is taken against Top 30 largest (by assets) national and foreign affiliated banks. Several steps are taken in the process. First, classifying and identifying payment services provided by banks. Second, mapping banking products. Third, mapping each bank position based on their product characteristics, especially related to their product reliability, IT systems, organizational structure, management and human resources as well as business processes they use.

Two main findings arise. First, most payment products developed by national banks are in quadrant I (IT developed) and begin towards quadrant II (digital banking 1.0). Second, most banks in Indonesia are still in quadrant I. It is also found that the BUKU 4 banks and few other big banks are in quadrant II. Not a single national bank has succeeded in entering quadrant III (digital banking 2.0).

It can be broadly concluded that the digital banking adoption rate by national banks is still relatively slow. This condition was triggered by infrastructure and domestic payment system regulations that were not yet sufficiently adaptive, the passive response of the banking sector as a result of the relatively tight regulations, and high investment costs.

ANNEX B

Methodology for the Formulation of Digital Banking and Economic-Financial Inclusions Ratios

The effectiveness of IPS Blueprint 2025 executions will be echoed in two outcomes. First, the success of digital banking transformation, which among others was born from the interlink between bank and fintech. Second, a significant increase in the participation rate of adult population in the financial sector.

Bank Indonesia develops quantitative tools to appraise the progress of both outcomes. The tools are utilized to determine quantitative targets which will anchor the IPS Blueprint 2025 end-state, and measure the prognosis of annual performance while identifying potential gaps from the targets set. These tools also act as proxies of the ratio of account ownership by adult⁶⁰ as well as non-cash composition that still suffers from lagged-availability of data and other statistical issues⁶¹.

The first indicator is the banking digitalization ratio, which is used to measure the speed of digital banking transformation. This ratio is formulated as follows:

$$\text{Banking Digitalization Ratio} = \frac{(VB_{ib} + VB_{mb})_t}{(APMU + APMR + APMD)_t}$$

Where:

- VB_{ib} : Internet banking transaction volume
- VB_{mb} : Internet banking transaction volume
- APMU : Currency Outside Bank
- APMR : (third party fund outstanding + bank's electronic money floats outstanding + the balance of credit card ceiling limit) – (time deposits outstanding + non bank's electronic money floats outstanding)
- APMD : Non bank electronic money floats outstanding
- t : Time parameter

The faster and more effective the banking digital transformation, the more economic (e.g. purchase of goods) and financial transactions (e.g. account opening and/or loan disbursements) facilitated by bank's digital platform. The total APMU, APMR, and APMD reflect total cash and non-cash transactions⁶³.

To measure the impact of digital innovation on economic and financial inclusion, two ratios are developed, namely the digital transaction ratio and the digital inclusiveness ratio. The first ratio is formulated as follows:

$$\text{Digital Transaction Ratio} = \frac{(NF_{sb} + NB_{ib} + NB_{mb})_t}{PDB_t} - \Delta TS_t$$

Where:

- NF_{sb} : Non bank's electronic money transaction value
- NB_{ib} : Internet banking transaction value
- NB_{mb} : Mobile banking transaction value

⁶⁰ The ratio of account ownership by adult refers to World Bank's Global Financial Index which is last published in 2017

⁶¹ The calculation of cash and non-cash ratio is not straightforward due to different level of data. Cash transactions is characterized as stock data character, while non cash is flows data.

⁶² Credit card ceiling balances are proxied from the volume of credit card transactions discounted by the composition of credit card limits set by issuers.

⁶³ Comparisons among APMU, APMR, and APMD reflect individual/corporate preference to payment methods. APMR and APMD are proxies to the share of individual/corporate income allocation to bank (deposit) account and e-money account, both issued by banks and non-banks. The share resembles preference. The higher the share of APMR and APMD, the bigger the non-cash preference.

PDB : Gross domestic product (nominal)
TS : Bank's and non bank's electronic money ticket size
 Δ : Growth

While, the digital inclusiveness ratio is measured by:

$$\text{Inclusive Digital Ratio} = \frac{(VF_{sb} + VB_{ib} + VB_{mb})_t}{(PD)_t}$$

Where:

VF_{sb} : Non bank's electronic money transaction volume
PD : Adults population (≥ 15 years)

The greater the digital acceptance, the greater the use of digital channels both provided by banks and non-banks, the higher the ratio of digital transactions. The ratio is normalized by the growth of electronic money ticket sizes to minimize bias⁶⁴. Meanwhile, the digital inclusiveness ratio will affirm the degree of inclusion content within the digital transactions ratio dynamics. The conditions under which digital-based economic and financial inclusion takes place will be reflected in the simultaneous increase in both ratios. Hence, the acceleration gap between the two ratios also reflects the acceptance gap between segments (lower income vs high income)⁶⁵.

⁶⁴ The rise in the ratio which is generated more by the increase in transaction value per unit does not reflect the expansion of acceptances. Hence, normalization procedure using ticket size growth will discount the impact of each unit rise in transaction value.

⁶⁵ For example, the higher the rise of digital transaction ratio compare to those of digital inclusiveness ratio, the higher the probability that the rise on digital transaction ratio is generated more by middle to higher income segments which does not imply inclusion.

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