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"Study Group on the Creation of Next-Generation Financial Infrastructure"

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A Blueprint for Next-Generation Financial Infrastructure

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Part I: Perspectives Underpinning the Recommendations

This Study Group has been examining the future vision of next-generation financial infrastructure, premised on the provision of financial services leveraging digital technology from a long-term perspective. Based on the *"Guidelines for Considering the Creation of Next-Generation Financial Infrastructure"* published on July 5, 2024, this initiative was launched. Diverse viewpoints were shared during the discussions, leading to the conclusion that multiple pathways exist for realizing next-generation financial infrastructure. Nevertheless, we identified a set of shared concepts that formed a common understanding, and thus decided to compile them as an illustrative vision for the future.

The Study Group adopts a comprehensive view of “financial infrastructure” as the full range of financial services that underpin society. This includes both financial services—such as credit and settlement—and the narrower infrastructure that underpins them, which together constitute a layered structure. Here, we refer to the “narrow financial infrastructure” as the “foundational layer,” to ensure terminological clarity. Additionally, as discussed in subsequent sections, we refer to “modular financial services, formed by integrating financial and information-processing functions with related elements” as “modules.”

1. Historical Evolution and Present Recognition

From the past to the present, various financial services and their foundational layers have emerged as corporate entities and sectors aligned with the prevailing environment of each era, with corresponding regulatory frameworks subsequently established. Against the backdrop of the era-specific environment shaped by economy, technology, social governance including public trust, and cultural practices, financial services have been created under conditions shaped by inevitability or contingency, including economic rationality. These developments have led to the establishment of business models and corresponding underlying infrastructures. For instance, the decentralized and devolved financial system based on the three-currency system of the Edo period¹ was gradually centralized in the Meiji period.² This evolution continued with the establishment of the Bank of Japan and the shift to a two-tier deposit and settlement system by private banks, the digitalization of funds and securities settlement systems, the emergence of derivative financial products, the proliferation of electronic money and the diversification of debt-based money, and the resurgence of decentralized and devolved finance. These historical transitions have adapted to changes in the prevailing environment

¹ Translator's note: The Edo period (1603-1868) refers to a pre-modern era characterized by samurai governance in Japan, during which gold, silver, and copper coins were utilized as the basic currencies issued by the central government, but feudal domains (Han in Japanese) simultaneously circulated their own domain notes, and shrines as well as influential merchants issued independent forms of paper money, resulting in a decentralized monetary system.

² Translator's note: Meiji period (1868-1912) refers to a pivotal era marked by its centralization driven by the wave of modern nation-building.

of each era and are expected to continue evolving into the future.

A comprehensive review of these historical developments facilitates the identification of the origins and rationales behind the current financial system, underpins the examination of areas where adaptation to environmental changes has lagged behind, and provides clues for potential directions and approaches for improvement and transformation.³

From this perspective, when overviewing Japan's financial system with a focus on financial services, it can be said that large-scale reforms of the financial industry structure have not been carried out, as the necessity for such reforms has not been particularly high. Consequently, the dominant perspective has remained confined to traditional sectors such as banks, securities, and insurance, with regulations primarily grounded in industry-specific legislation. This mindset has remained entrenched in conventional approaches to financial service provision, thereby constraining the capacity to respond effectively to the emergence of new financial services and providers, as well as to the evolution of existing ones.

Similarly, the extensive foundational layers supporting financial services—such as settlement systems, market transaction infrastructure, information and communication infrastructure, and IT systems—have struggled to adapt to significant changes in industrial structure, even with the advent of the digital society. These foundational layers should also be considered, alongside financial services, when forming future visions in response to environmental changes.⁴

Conversely, the development of decentralized ledger technology creates opportunities to deploy new financial services on entirely different foundational layers, and these initiatives are actively underway on a global scale. Among these, areas such as stablecoins and security tokens are emerging, with both market scale and legal as well as systemic stability gradually improving. There are also increasing instances where financial institutions are developing foundational layers for the tokenization of financial and non-financial assets and deposits, and are envisioning the provision of

³ For example, refer to Shizume (August 2023), Soejima (March 2024), and Tatsuya Saito (March 2024) in SBI Research Review, and Takatsuki (July and August 2024), Matsuo (September 2024), and Mikazuki (July 2024) in the Report section on the website of this institute (all references are available only in Japanese).

Translator's note: The phrase "section on the website of this institute" was added in translation to clarify "Report," and the phrase "(all references are available only in Japanese)" was added in translation to assist English readers.

⁴ For example, in Western jurisdictions, the advancement of digital technology and accompanying changes in legal and other regulations have led to the emergence of Electronic Communication Networks (ECNs), Alternative Trading Systems (ATs), and Multilateral Trading Facilities (MTFs). These developments have driven substantial transformations in the industrial structure of equity and derivative trading markets, as well as the globalization of financial markets, including the ownership of foundational infrastructure. This in turn has prompted changes in the vertical silo structure of existing securities clearing organizations and Central Securities Depositories (CSDs). However, in Japan, the development of OTC markets for derivatives and other financial instruments, and the enhancement of trading systems at exchanges and clearing and settlement systems have not resulted in significant transformations of the industrial structure or in the emergence of new markets, including non-financial products. Additionally, governance through membership has, in part, functioned as a factor that may constrain structural transformation. As mentioned later, even in the foundational layers, which have been traditionally monolithic, unbundling and standardization are progressing, and it is necessary to respond to these developments.

financial and non-financial services built upon these layers.

2. Four Key Concepts

From the current understanding described above, four key concepts emerge as critical to envisioning the future of next-generation financial infrastructure.

The first key concept is the shift in perspective—from the economic entity-based approach to a financial function-based approach—which has led to a restructuring of financial services and their providers. After unbundling financial services into individual functions, they are recombined from a renewed, user-centric perspective, combining financial functions and broader information processing functions to create financial services that are demanded by individuals, businesses, and public sectors, or even those that have not yet been discovered. This integration of financial functions and information processing functions, through the realization of "neue Kombinationen (new combinations)," leads to the creation of modular financial services.

The second key concept is the need to rebuild the foundational layers that enable the restructuring of financial services as application layers, by conceptualizing the financial services industry as a layered structure.⁵

These foundational layers are also experiencing a wave of reconstruction, driven by technological innovation—including the decoupling of previously tightly integrated Core Banking System, the shift to cloud services, the publication of Application Programming Interfaces (APIs) for open banking, the transformation of communication infrastructure from dedicated lines to the internet-based networks, and the internal utilization of customer information ledgers for ecosystem-oriented business development. The emergence and spread of decentralized technologies have also led to cases of restructuring within foundational layers, accompanied by a reassessment of their relationship with the application layers of financial services.

As an illustration, a recent paper published by the IMF proposes the "ASAP model" as a framework to promote interoperability of digital financial asset platforms.⁶ In traditional financial systems, the ledgers of securities and deposits were inseparable from the financial assets, with the figures recorded in the ledgers representing the financial assets themselves. The development of tokenization technology has enabled the separation of the two, creating financial assets that can be circulated independently.⁷ The Monetary Authority of Singapore (MAS) has also presented the "Global Layer

⁵ The fact that the financial services industry is organized in a layered structure is illustrated by the process from market transactions to settlement shown in "Figure 1: Overview of FMI in Japan" in the Bank of Japan's *Payment and Settlement Systems Report (September 2024)*."

⁶ The ASAP model envisions a four-layer architecture consisting of applications, services, assets, and platforms.

⁷ In the tokenization of securities, a hybrid model is exemplified, in which basic ownership is managed by traditional systems, while certain rights and trading related functions are realized through tokenization. Tokens serve as direct

One (GL1)" as a new layered structure for financial services with a comparable objective. The concept involves establishing an open and interoperable foundational layer based on decentralized technology (GL1), and implementing financial assets and related services, and access methods to these services with additional internal layered structures in the application layers above it. These proposals suggest that in order to innovatively promote the modularization of financial services, the modularization⁸ and rebuilding of the foundational layers are likewise indispensable.

The third key concept is that the rebundling and rebuilding⁹ of financial services and the foundational layers to span both financial and non-financial sectors in a cross-domain expansion. The integration of financial and non-financial services is already advancing through the leveraging of economies of scope in information processing. Illustrative cases include business models in which FinTech companies access financial institutions' information systems via APIs to fulfill customer requests, and business models in which financial institutions, acting in a supporting capacity, provide financial services and the requisite foundational infrastructure to non-financial businesses as part of Embedded Finance.

Accordingly, integration may emerge from both the financial and non-financial sectors. The expansion into new business domains through the combination of functionally modular financial and non-financial services can be pursued by companies and economic entities—including those in the public sector—across either domain. To enable those with ideas to easily implement their business model, it is crucial that the modularization of financial services and the foundational layers that connect them be made accessible to the non-financial sector, provided at a low cost, in an operable form, and under clear regulatory frameworks,¹⁰ and that standardization to ensure interoperability be actively promoted.

The fourth key concept is to capture and visualize user needs through the utilization of data across both financial and non-financial sectors, thereby enhancing value creation through the automation and

digital embodiments of legally recognized rights. When traditional ledgers are completely replaced by decentralized ledgers, assets and ledger platforms once again become inseparable. In the case of tokenized deposits and stablecoins, the underlying assets are managed by traditional ledgers, while the newly issued tokens are managed by decentralized ledgers. This represents an alternative form of separation between deposit-based financial assets and their associated ledgers.

⁸ The three modules are organized as follows:

- (1) Data standardization, including standardization of asset definitions, their data formats, and access methods such as APIs;
- (2) Libraries of business logic functions—encompassing those related to business and contractual processes, such as the issuance and transfer of assets, as well as those managed and operated within entity-specific wallets, such as digital identities and financial assets; and
- (3) Blockchain infrastructure serving as the foundational layer.

⁹ Rebundling refers to reconstruction through integration, whereas rebuilding refers to reconstruction through redrafting of the underlying blueprint.

¹⁰ In legal regulatory frameworks, which are one of the foundational layers, it is also necessary to adapt to the modularization of financial services (modularization of regulations).

refinement of fragmented service production processes. This can be achieved either within the financial services domain itself or through collaboration with the non-financial domain.¹¹

In the discovery of user needs, the development of data infrastructure and the integration with IT systems are crucial. Well-known methods include initiatives in e-commerce to “1-Click makes it easy to buy” and “easy to sell,” and the utilization of search history information generated during the “buying” process in recommendation systems to stimulate additional demand. In the financial sector, revisions to business models are advancing, particularly in retail, and are beginning to extend to wholesale. In this process, the significance of establishing boundaries between financial services and non-financial services is progressively diminishing.

3. Factors Promoting Rebundling

In order to realize the "Blueprint of Next-Generation Financial Infrastructure," it is crucial to consider the driving forces that facilitate the modularizing and rebundling or rebuilding of financial services and foundational infrastructure. To envision a feasible future, it is essential to align the incentives of the various economic actors involved. The following seven driving forces represent potential sources of value creation through rebundling and rebuilding. The specific details are provided in the Annex at the end of the document. The seven driving forces are:

1. Advancing financial functionality through the unbundling and rebuilding of financial services
2. Pursuing efficiency through cost reduction and process acceleration enabled by new technologies
3. Pursuing economies of scale
4. Anticipating positive externalities
5. Managing the costs in system development, upgrades, and decommissioning while accelerating developments
6. Advancing services provision and fostering innovation through specialization in module development
7. Responding to structural changes in the business environment, including globalization

In order to leverage these driving forces effectively, it is necessary to ensure interoperability while promoting the modularization, cloud migration, and the opening up of foundational layers and

¹¹ Automation of services has advanced primarily in non-financial sectors, becoming a hallmark of the digital society. Various economic activities, social phenomena, and natural events are being recorded as digital information, and existing business processes are being redesigned to optimize the processing of this digital information. When reviewing business process algorithms, data science (e.g., AI, machine learning, causal inference) and new IT system development methods are utilized. This enables a rapid cycle of continuous improvement based on business implementation and feedback from operational results, driving the timely and efficient sophistication of services, and enabling the discovery of new ones. The ability to test at low cost and with speed is essential for discovering new services that require numerous trials. An example is the ongoing business implementation of generative AI.

financial services. Standardization and the development of data infrastructure constitute essential prerequisites.

Part II: A Blueprint for Next-Generation Financial Infrastructure

1. Approach of the Recommendations

As mentioned in Part I, it is expected that unbundling, rebundling, and rebuilding will progress due to various driving forces, while the precise form these transformations will take remain difficult to predict.¹²

"Next-Generation Financial Infrastructure" to be realized in the future will vary depending on the financial systems of each country, national characteristics, the anticipated timeline, and other relevant factors, and particularly the supervisory approaches by financial authorities. There are various possibilities, and no single, universally applicable vision can be prescribed. For instance, from the perspective of service providers, there are two cases: (1) financial intermediaries could play a core role in next-generation financial infrastructure, or (2) financial intermediary services could be fully automated through IT technology. The latter may be considered an edge case, but the realization of Straight-Through Processing (STP), which refers to the automation of operations from trading to settlement in the securities market, can be interpreted as its partial manifestation. Decentralized finance (DeFi) has already emerged as an integrated financial infrastructure that encompasses the full lifecycle from market transactions to ledger management, in the context of new financial assets leveraging distributed ledger technology. Regarding the former case (1), various forms of next-generation financial infrastructure can be envisioned. For example, one possible configuration is a two-layer structure, with distinct roles assigned to the central bank and private financial intermediaries. Alternatively, a single-layer structure operated jointly by the central bank and private sector participants may be considered. Other possibilities include a single-layer structure without the central bank participation, or a multi-layer structure¹³ composed solely of private financial institutions.

Accordingly, the Study Group aims to illustrate the "Blueprint of Next-Generation Financial Infrastructure" from a long-term perspective. First, we set out to demonstrate the structure of the foundational layers and the financial service modules positioned above them, as an illustration of the

¹² *"The future is already here—it's just not evenly distributed,"* is a well-known quote attributed to the science fiction writer William Gibson. In this context, it can be understood that various elemental technologies have already emerged, and that the future will be realized through their integration—hence, the future is already present. However, since the future will manifest in unexpected ways, it is preferable to avoid approaching it with rigid preconception. Instead, it is important to continue exploring with the open-mindedness of an entrepreneur.

¹³ For example, USD settlements in Tokyo are typically executed through a two-layer structure involving private banks, whereby domestic banks maintain USD deposit accounts at the three Japanese megabanks or the Tokyo branches of major U.S. financial institutions. Similarly, JPY settlements in London are facilitated either by major international banks or by the local branches of the three Japanese megabanks.

transformation resulting from the shift to a function-based approach.

Next, we will illustrate how users utilize modules on the foundational layers, based on the two cases of module providers outlined above: (1) a case where financial intermediaries play a core role, and (2) a case where settlement and information-sharing systems substitute for financial intermediation functions.

In response to the modularization of financial services, the foundational layers—including regulatory frameworks—must likewise be modularized and subsequently combined or embedded. In doing so, it is essential to consider externalities such as economies of scale and scope, as well as the stability of the financial system and the need for adaptation to globalization.

2. Future Vision of Next-Generation Financial Infrastructure and Key Points for its Realization

2.1 Shift to a Financial Function-Based Approach: Building Modules within a Layered Structure

As all business processes become digital and IT-supported, the characteristics of IT—namely modularization and layered structuring—have increasingly permeated business models. The financial services industry—often described in Japan as an “equipment industry,” reflecting its infrastructure-intensive and system-dependent nature—presents conditions highly conducive to modularization. In fact, in the financial sector, unbundling (disassembling financial services that were provided as a whole) and rebundling (combining disassembled services) are already actively underway. Furthermore, the layered structures—such as the relationship between financial infrastructure and the financial services, and the relationship between regulations and the financial services they govern—closely parallel the architectural layering observed in IT systems.

Given the characteristics discussed above, there has been a continued entry of non-financial sectors into the financial services industry, alongside the ongoing provision of financial services through the leveraging of data across financial and non-financial sectors. This has resulted in a shift in the composition of actors engaged in the provision of financial services. Indicative examples include the issuance of electronic money, the provision of financial services by e-commerce platforms, credit services in the form of deferred and advance payments, and the embedding of financial services into non-financial businesses—commonly referred to as Embedded Finance, which is in line with the broader trend of Banking as a Service (BaaS).

In response to the drastic changes in the financial environment, the constraints inherent in the historical development of Japan’s financial system have shaped both the provision of financial services and the corresponding supervision. As illustrated in Figure 1, industry coordination has traditionally been conducted based on a business-type framework—exemplified by the so-called “convoy system”—which categorizes financial institutions into banking, securities, insurance, and other

financial industries. This approach, grounded in a legal and regulatory framework centered on industry-specific laws, has increasingly constrained the ability to respond to the emergence of new financial services and the transformation of existing ones. Nevertheless, the principle of “same activity, same risk, same regulation” should, in principle, be applied, necessitating a shift from the economic entity-based approach to a financial function-based approach.

The following concept is proposed as a new perspective to understand the current state of the financial services industry and to envision its future trajectory:

2.1.1 Structure of Financial Services and Collaboration with and Integration into Non-Financial Sectors

As illustrated in Figure 2, there is a need to shift from the financial service provider-based approach to a financial function-based approach. Financial services should be broken down by function and reassembled into modular financial services by combining the necessary financial functions to meet specific user needs.

In line with the global trend toward open banking, it is increasingly important to promote collaboration and integration between financial and non-financial sectors, including the shared use of information and data obtained from both sectors. In such cases, it is crucial to act swiftly to establish appropriate frameworks—such as the legislation of user data rights, exemplified by Consumer Data Rights (CDR).

2.1.2 Design of Common Rules in the Foundational Layers

Specifically, as illustrated in Figure 3, a range of foundational layers should be established based on the premise of providing next-generation financial services leveraging digital technologies. These layers consist of cross-sectoral rules—encompassing non-financial sectors to the extent possible—and the IT systems that operate in accordance with these rules. These rules encompass regulations, tax regimes, accounting standards, certification schemes, governance mechanisms (such as Anti-Money Laundering (AML), Countering the Financing of Terrorism (CFT), and electronic Know Your Customer (eKYC)), information security, payment systems, international coordination rules, data-sharing protocols, and established practices. Each layer must, at a minimum, consist of rules that apply uniformly across the financial sector.

2.1.3 Alignment of Financial Functions, Services, and Regulations

Above these layered structures, modular financial services are designed and delivered by combining financial functions—classified from the perspectives outlined below—to meet user needs, without being constrained by the boundaries between financial and non-financial sectors, or by traditional financial industry classifications. This classification is intended to be illustrative in nature

and should be reviewed and revised as necessary in accordance with prevailing conditions when constructing next-generation financial infrastructure. Regulations should be designed with a focus on financial services, rather than being anchored in industry-specific laws. When providing modular financial services, corresponding modularized regulations should be applied to each financial service. Furthermore, regulations must take into account the need to maximize innovation in financial services (the creation of financial services). In cases where multiple modules (financial services) are provided simultaneously or in parallel, it is necessary not only to apply modularized regulations individually, but also to implement measures to prevent the emergence of any new issues.

Perspectives for unbundling financial services (See Figure 2):

- (a) Financial functions: exchange and settlement functions, value-preservation functions (including funding, credit, investment management, and maturity transformation functions), unit-of-account functions, insurance functions, information production functions, among others.
 - (b) Attributes of financial service users: amount of assets held and investment assets, eligibility as a professional investor, information gathering and analysis capabilities, among others.
 - (c) Risk characteristics: price fluctuation risk, liquidity risk, among others.
 - (d) Time horizon of financial services provided: short-term, long-term, among others.
 - (e) Market types: retail, wholesale, and cross-border markets, among others.
- Notably, (e) Market types are particularly closely linked to (b), (c), and (d).

2.1.4 Examples of Current Financial Services

The following outlines selected examples of current financial services and their corresponding financial functions required for their provision:

- (1) Small deposits: exchange and settlement functions, funding functions involving liquidity risk, generally not subject to price fluctuation risk, retail, short- and long-term, information production functions (deposit-related information)
- (2) Large deposits: exchange and settlement functions, funding functions involving liquidity risk, generally not subject to price fluctuation risk, wholesale, short- and long-term, information production functions (deposit-related information)
- (3) Loans: credit functions involving credit risk, asset management functions, maturity transformation functions, generally not subject to price fluctuation risk, retail/wholesale, short- and long-term, information production functions (loan-related information, including credit information of borrowers)
- (4) Housing loans: credit functions, asset management functions, maturity transformation functions, mainly for individuals, long-term, information production functions (loan-related information, including credit information of borrowers)

- (5) Life insurance sales and underwriting: funding functions, generally not subject to price fluctuation risk, mainly for individuals, primarily long-term, insurance functions, information production functions (insurance-related information)
- (6) Securities brokerage and underwriting: exchange and settlement functions, retail/wholesale, short-term, price discovery functions, information production functions (information about funding providers and investors, among others)
- (7) Securities investment: asset management functions, maturity transformation functions, retail/wholesale, short- and long-term, subject to price fluctuation risk, price discovery functions, information production functions (information about funding providers, among others)
- (8) Foreign exchange operations: exchange and settlement functions, retail/wholesale, short-term, price discovery functions, information production functions (foreign exchange-related information)
- (9) Exchange operations of cryptoassets and other digital financial products: exchange and settlement functions, funding functions, generally subject to price fluctuation risk, retail/wholesale, short- and long-term, unit-of-account functions, information production functions (information about investment demand, asset transactions including exchanges with fiat currency deposits, and remittances, among others)

2.1.5 Examples of New Financial Services, and Collaboration and Integration with Non-Financial Sectors

The following presents examples of new financial services that have emerged or transformed with the advancement of digital technology:

- (1) Electronic money: exchange and settlement functions, value preservation functions, generally not subject to price fluctuation risk, retail, short-term, information production functions (information about payment usage, remittances, and deposits, among others)
- (2) Security tokens: funding functions, asset management functions, maturity transformation functions, subject to price fluctuation risk, retail/wholesale, short- and long-term, fan marketing, information production functions (information about funding providers and investors, among others)
- (3) Stablecoins: exchange and settlement functions, value preservation functions similar to deposits and cash, information production functions
- (4) Zengin Electronic Data Interchange (ZEDI, operated by the Japanese Banks' Payment Clearing Network)¹⁴: exchange and settlement functions, information production functions (including non-financial sectors)

¹⁴ Services bundling wholesale payment services with information processing services (corporate accounting).

- (5) Super Apps¹⁵ like WeChat Pay: exchange and settlement functions, funding functions, subject to/not subject to price fluctuation risk, retail, short- and long-term, information production functions (information related to deposits, credit, insurance, and non-financial sectors)
- (6) Provision of financial services through the use of data in non-financial sectors¹⁶: exchange and settlement functions, funding functions, credit functions, investment management functions, maturity transformation functions, information production functions (information related to deposits, credit, insurance, and non-financial sectors)
- (7) Integration into platforms through point-based economies¹⁷: retail, short- and long-term, information production functions (including information from non-financial sectors)
- (8) Crowdfunding services¹⁸: funding functions, credit functions, investment management functions, maturity transformation functions, generally subject to price fluctuation risk, retail/wholesale
- (9) Tokenization of real-world assets (RWAs) and others¹⁹: exchange and settlement functions, value-preservation functions (funding functions, credit functions, investment management functions, maturity transformation functions), retail/wholesale, information production and processing functions
- (10) Integrated ledger approach²⁰: exchange and settlement functions, information production and processing functions

¹⁵ These services enhance remittance functionality by integrating financial services—such as deposits, investments, loans, and insurance—into settlement services (a form of comprehensive rebundling), and by linking with SNS services. Similarly, Social Finance (SoFi) has expanded from student loan refinancing into banking, investment, and insurance. Grab Financial, originating from ride-hailing services, and Apple Pay, embedded in communication devices, pursue comparable business models from the perspective of platform business integration.

¹⁶ The application of user behavioral data—such as accounting records, purchase histories, and production activity information—from non-financial sectors to the provision of financial services.

¹⁷ In platforms such as E-commerce and telecommunications carriers, the acquisition of individual users—primarily through digital ID capture—constitutes the basis of information production activities.

¹⁸ These services represent new methods of fundraising, as well as information provision methods by funding providers.

¹⁹ Tokenization enables the management of ownership information and the streamlining of ownership transfers; facilitates more efficient exchanges (including the improvement of market liquidity and cross-border transaction efficiency); supports the creation of credit channels; expands investment and funding opportunities; promotes integration with utility services; and allows for the provision of access (as means), services (as functions), assets (as financial products), and platforms (for funding, exchange, and information distribution) through new technologies.

²⁰ The connection of separately designed and developed ledger infrastructures for funds, securities, and physical assets has traditionally involved ad hoc coordination through bilateral reconciliation. A new approach has been proposed to overcome interoperability barriers by consolidating ledgers on a single platform. The BIS Innovation Hub's Project Agorá is currently conducting the proof of concept (POC) to advance this approach.

- (11) Purpose-Bound Money (PBM)²¹: exchange and settlement functions, information production and processing functions

2.2 Providers of Financial Intermediation: Case Studies

As mentioned in 2.1, even if modular financial services that combine multiple financial functions are provided, the entities performing financial intermediation functions can differ significantly. These range from multiple independent financial intermediaries, as in the current system, to IT systems such as payment and information systems that handle significant parts of the intermediation process, executed automatically via algorithms. Although the latter represents an extreme case, it is already partially realized through the utilization of blockchain technology for automated execution and the involvement of decentralized IT systems. This occurs in situations where an entity provides IT infrastructure, but no entity is responsible for delivering the service itself—in effect, the IT system itself constitutes the service provider. Examples include Decentralized Exchanges (DEX), crypto lending services, yield farming schemes (liquidity mining), stablecoin-based remittances, and DeFi insurance.

Accordingly, as mentioned above, we illustrate the entities responsible for financial intermediation functions by dividing them into two cases.

Case 1: Financial Intermediaries Play a Core Role (See Figure 4)

(A) Scheme Overview

The first case, where financial intermediaries play a core role, involves a scheme in which, as illustrated in Figure 4, cross-sectoral regulations and payment systems, spanning non-financial sectors to the greatest extent feasible, are established as foundational layers. Financial intermediaries then provide financial services by combining multiple financial functions built on these foundational layers.

²¹ Purpose-Bound Money (PBM) refers to money designed to embed programmable payment-related actions into digital assets. It is a concept presented within the ASAP model by the IMF and MAS, and it can be utilized as money restricted to specific payment purposes. The integrated ledger approach, as described in section (10), can be seen as a method for driving PBM on a single ledger infrastructure for wholesale payment use. More generally, money other than legal tender has been subject to some form of functional limitation, and easing such constraints to improve usability has constituted one dimension of payment innovation. This stems from the fact that most money—excluding commodity money such as gold coins—has been issued as debt-based money, and transfer of debt inherently entails complexity. To address the inefficiency of idle funds in traditional correspondent banking arrangements, where banks hold mutual deposit accounts, a two-tier money system was developed. This innovation represents one solution to the limitations of debt-based money. Notably, the upper tier does not necessarily have to be central bank money. Prior to the establishment of the central bank in the United States, a three-tier structure of private banks—Central reserve city banks, Reserve city banks, and Country banks—supported a nationwide payment settlement network.

The key point in this case is that financial intermediaries are expected to continue to play a central role. Nevertheless, as mentioned above, there is a shift from the traditional economic entity-based approach to a financial function-based approach, and each financial intermediary provides modular financial services by combining various financial functions. In addition, financial intermediaries select and combine modules according to their desired business models, without being constrained by industry boundaries. Furthermore, financial authorities supervise financial intermediaries as a set of modules provided across industry boundaries, based on regulatory instruments such as licenses, registrations, and notifications.

(B) Requirements for Foundational Layers and Considerations

Among the elements necessary for providing financial services utilizing digital technologies, the foundational layers should incorporate cross-sectoral rules spanning non-financial sectors as comprehensively as possible. Each layer must, at a minimum, consist of rules that apply uniformly across the financial sector.

The foundational layers may include regulations, tax regimes, accounting standards, certification schemes, governance including AML/CFT/KYC, information security, payment systems, international coordination rules, information-sharing rules, and other established practices. More broadly, it is also necessary to consider supervisory frameworks and IT systems that govern these layers.

(C) Requirements for Modules and Considerations

Financial intermediaries conduct their operations as a set of modules (financial services) selected in accordance with their business models. Accordingly, in compliance with regulations and rules, they must establish appropriate systems and organizations configured as a set of modules and secure necessary licenses, registrations, and notifications from financial authorities. In providing modules, financial intermediaries may, as in current deposit services, adopt either a two-tier structure with the central bank and financial institutions, or a one-tier structure, in which the central bank and private entities jointly manage the platform of deposit services. The latter approach is envisioned in integrated ledger projects, with either party acting as the issuer of deposit money. Additionally, while Central Securities Depositories (CSDs) often adopt a hierarchical structure of direct and indirect participation, the modules could also be centrally administered through IT infrastructure, such as a CSD or cryptoasset ledger.

Business models that combine multiple modules may have externalities that go beyond mere aggregation. For example, negative externalities may include systemic risk and information monopolies, while positive externalities may encompass enhanced efficiency of financial functions, improved financial inclusion, and positive spillovers to economic growth. For example, universal banking, as well as the integration of finance with platform business, can thus entail both positive and

negative externalities. Similarly, when modularizing the foundational layers, it is necessary to address the externalities associated with the modularization of financial services.

A typical example is deposit services, which have two functions: credit creation and funding. In particular, the former requires special consideration regarding the means of settlement, especially from the perspective of systemic risk prevention.

(D) Effects of a Scheme where Financial Intermediaries Play a Core Role

In this scheme, each financial intermediary selects modular financial services that align with its desired business models. Accordingly, as illustrated in Figure 5, some intermediaries may choose modules that span banking, securities, and insurance, thereby seeking economies of scope—for example, through universal banking models as observed in the EU. On the other hand, the advancement of IT has enabled efficient processing of large volumes of data, which may give rise to intermediaries specializing in small-scale deposits and loans for individuals within the banking sector (such as narrow banks or distribution-oriented financial institutions offering retail deposit and loan services). Conversely, certain intermediaries may focus exclusively on large-scale deposits and loans for corporations, pursuing a strategy of focused specialization. Additionally, there is the potential for intermediaries to offer a diverse range of financial services across deposits, insurance, securities, and cryptoassets and other digital products, targeting individual customers while simultaneously seeking the benefits of economies of scope.

Naturally, financial intermediaries may continue to offer financial services in the same manner as current intermediaries, organized along industry categories such as banking, securities, and insurance.

Furthermore, companies from non-financial sectors, which have accumulated extensive data, may enter the financial domain by leveraging these data assets to offer financial services.

In such cases, as mentioned above, the financial intermediaries must comply with regulations and rules as an entity offering a set of selected modules (financial services). It is particularly important to emphasize that, unlike current regulations and rules based on financial business types, the applicable regulations and rules apply only to the scope of the financial services provided. Moreover, when offering multiple modules, intermediaries must address issues such as externalities, as previously mentioned, and conflicts of interest. This implies that the scope of applicable regulations may extend beyond a mere aggregation of module-specific regulations and potentially evolve into a more comprehensive framework.

(E) Advantages and Disadvantages of a Scheme where Financial Intermediaries Play a Core Role

In this case, financial intermediaries bear full responsibility, including the management of arising issues, thereby clarifying accountability. Additionally, organizational measures such as firewalls and Chinese walls can be implemented to prevent conflicts of interest.

Furthermore, financial intermediaries can intentionally design and develop new modules—constituting novel financial services—through the combination of various financial functions. However, it is important to note that once such modules are created, they must comply with applicable regulations and rules. In some cases, these regulations and rules may require review and adjustment.

On the other hand, reliance on human intervention may lead to inefficiencies and may even cause potential troubles. Furthermore, financial authorities must continuously verify and supervise adherence to rules, particularly those aimed at preventing conflicts of interest.

Case 2: Settlement and Information-Sharing Systems Substitute for Financial Intermediation Functions (See Figure 6)

(A) Scheme Overview

In the second case, where settlement and information-sharing systems substitute for financial intermediation functions, as illustrated in Figure 6, it is necessary to establish multiple layers—including cross-sectoral regulations, certification frameworks, and settlement systems—as well as the IT systems that support these layers, including settlement and information-sharing platforms, in a manner consistent with Case 1.

The difference from Case 1 is that the settlement and information-sharing systems, constructed as a layer spanning both financial and non-financial sectors by digital technology, automatically execute the modular financial service embedded within these layers. Automation, achieved through the unbundling and subsequent rebundling of modular services, promotes "new combinations," potentially leading to not only increased efficiency but also the enhancement and creation of novel financial services. In this process, as the function of connecting modules shifts from integrative development to API-based development, standardization comes to play a critical role. In implementing automation, it is also necessary to develop digital identities for individuals, companies, devices, and system components.

(B) Requirements for Foundational Layers and Considerations

As in Case 1, rules that are applied cross-sectorally—spanning non-financial sectors to the greatest extent feasible—are required. These rules are among the essential elements for the delivery of financial services utilizing digital technology. Each layer must have rules that are, at minimum, commonly applicable across the entire financial sector.

The difference from Case 1 is that the settlement and information-sharing systems, which provide automated financial services as modules combining financial functions in accordance with predefined rules through digital technology, need to be constructed as layered structures. These systems could be centrally managed and operated by the government, the central bank, and private entities in

cooperation, or alternatively, by multiple private institutions in isolation from the government and the central bank. Moreover, it is necessary to establish execution rules that correspond to the automatically executed modules in advance and obtain the requisite licenses, registrations, and notifications from financial authorities.

(C) Requirements for Modules and Considerations

As in Case 1, modules are not constrained by industry classification. However, from the perspective of regulatory application, financial functions are combined and executed automatically according to predefined rules. This requires regulators to apply appropriate regulations and monitor compliance in response to environmental changes, such as the continuous emergence of new financial services.

Modular financial services are delivered automatically through settlement and information-sharing systems without the involvement of financial intermediaries. One example of the regulatory challenges presented by this is the need to establish an institution dedicated to addressing unforeseen contingencies in service provision, with a focus on safeguarding users. In addition, it is essential to minimize the likelihood of such contingencies and to ensure that the settlement and information-sharing systems are designed to automatically handle foreseeable issues in advance.

Especially when multiple modules are deployed concurrently or in parallel, various challenges such as conflicts of interest may arise, necessitating new regulatory measures. It is essential to take precautions to prevent such situations and to establish an institution responsible for monitoring conflicts of interest across modules.

When users from non-financial sector utilize financial services through the settlement and information-sharing systems, an institution that acts as a gateway providing contact points and consultation functions should be in place to ensure user protection. For example, in the EU, legislation governing the provision, registration, and operation of digital identities is centrally organized, and the institutional framework and design of such systems may serve as a valuable reference.

(D) Effects of a Scheme where Settlement and Information-Sharing Systems Substitute for Financial Intermediation Functions

In this scheme, pre-established settlement and information-sharing systems span across industry sectors, serving as financial intermediaries that automatically deliver financial services to users in accordance with their needs. These systems may take the form of a single common core platform or multiple coexisting systems.

For example, ecosystem services centered on electronic money—such as those developed by Alibaba and Tencent in China—have led to the emergence of super apps that provide financial services primarily to individuals, spanning banking, securities, insurance, and even extending into non-financial sectors. In the future, settlement and information-sharing systems customized for large enterprises could deliver financial services specifically tailored to the needs of these corporate users.

For instance, as the tokenization of financial and physical assets progresses, the trading of tokenized digital financial products may also be executed simultaneously and automatically, with the concurrent settlement of funds and corresponding digital assets facilitated by integrated settlement and information-sharing systems. Security tokens not only represent a new channel for fundraising and asset management, but also offer potential for integration with fan marketing, corporate activity monitoring, and accounting services.

(E) Advantages and Disadvantages of a Scheme where Settlement and Information-Sharing Systems Substitute for Financial Intermediation Functions

In this case, the provision of financial services is undertaken by the settlement and information-sharing systems, which combine modules according to standardized rules to deliver financial services. To mitigate conflicts of interest, these systems must be systematically structured to enable automatic implementation of measures similar to firewalls and Chinese walls between banking and securities divisions. Verification and supervision by financial authorities, including these preventive mechanisms, may be conducted prior to the provision of financial services and are generally considered sufficient, making this a highly efficient approach.

While the combination of modules must adhere to predefined rules—thereby minimizing the risk of regulatory deviation—this constraint may, as a trade-off, limit the spontaneous emergence of novel financial service concepts. Nevertheless, standardization and openness can exert positive effects on innovation, as evidenced by the widespread diffusion of PCs and the internet. There remains significant potential for new financial services to emerge through proposals from users or initiatives led by entities responsible for the governance and operation of the settlement and information-sharing systems, with a focus on enhancing user convenience. To promote such developments, mechanisms should be established to actively encourage such innovation. The general characteristics of service creation in a digital society, as discussed earlier, may offer valuable reference points in this regard.

3. Considerations for Next-Generation Financial Infrastructure

When developing next-generation financial infrastructure, it is necessary to standardize rules and institutional arrangements while taking into account international trends. To achieve this, the government, the central bank, and private-sector entities must closely cooperate to identify domains that require standardization and promote these efforts. Particularly in the case of digital finance, where cross-border barriers are minimal, international standards are expected to assume increasingly important. Accordingly, Japan should actively engage in international standard-setting initiatives and seek to take a leading role globally.

4. Requirements for Users and Considerations

Even users in non-financial sectors need to align with developments in the financial sector, such as the modularization of financial services based on a financial function-based approach. To enable interoperable utilization of data across both sectors, it is necessary to promote the automation of business processes and data sharing.

In order to utilize personal and corporate information while protecting the rights and interests of individuals and companies, reform is required not only among those exploring ways to utilize such information, but also among individuals and companies themselves, who must adapt to and evolve with new approaches. In many cases, the barriers to advancing paperless processes and AI adoption originate on the user side. For new financial services that seek to leverage the benefits of a digital society to gain societal acceptance, transformations on the user-side are likewise expected to be essential.

Part III: Relationship Between Future Development of Next-Generation Financial Infrastructure and the Second Recommendations: "A Blueprint"

The “Blueprint” compiled in this round presents two cases with a view toward the long-term future. However, even within the Study Group, the envisioned future of next-generation financial infrastructure varies considerably among members.

As the Study Group, we will continue to examine the future vision for next-generation financial infrastructure and the pathways toward its realization. In the meantime, based on the matters outlined in these recommendations, we have identified three specific themes for medium-term consideration. For each theme, we will establish subcommittees to conduct further examinations and sequentially compile recommendations.

Looking ahead, when next-generation financial infrastructure is developed on the premise of providing digital financial services, the blueprint presented in these recommendations by the Study Group is expected to serve as a strategic reference point, supporting the exploration of diverse forms and contributing to the realization of a more advanced financial system.

Annex: The Seven Factors Driving Rebundling

1. Advancing Financial Functionality through the Unbundling and Rebundling of Financial Services

Reverse mortgages secured by real estate typically require repayment through the sale of the property upon the borrower's death. However, if the borrower lives longer than expected, the lender bears the risk of a decline in property value. By combining the reverse mortgage with a collateral guarantee service designed to mitigate housing price fluctuation risks, it becomes possible not only to eliminate the burden of principal repayment but also to address the unpredictability of the timing of death—a risk faced by both borrowers and lenders. Similarly, credit derivatives and securitized products restructure credit risk associated with lending into distinct financial asset modules, namely instruments specialized in credit guarantees and securities with tranches. In the case of security token offerings (STOs) that incorporate fan marketing into fundraising, transferable utility tokens are issued as separate modules. This approach is also evident in instruments including warrant bonds, which combine corporate bonds with stock subscription rights, and in stablecoins, which combine token issuance and distribution infrastructure with value stabilization mechanisms. The concept of unbundling and recombining financial functions, as illustrated above, is not unique to the modern era. Deposits constitute a financial instrument that integrates credit creation and payment functions, but it is also possible to specialize solely in payment services, as seen in narrow banking. Electronic money—typically issued as a liability of the issuer—represents a payment-focused instrument, and Purpose-Bound Money (PBM), introduced in Part II, represents a form of money tailored to specific purposes. In this way, the unbundling and recombination of financial functions to enhance functionality and value-added services is a widely observed phenomenon in financial services. It enables the creation of financial services that can flexibly overcome constraints arising from temporal, spatial, technological, and regulatory limitations.

2. Pursuing Efficiency through Cost Reduction and Process Acceleration Enabled by New Technologies

Examples include the evolution from paper-based ledgers to digital ledgers; the shift to online banking; the automation of order placement in exchanges; the utilization of chatbots in call centers; the acceleration and cost reduction of settlement and remittance processes; the procurement and production management through Enterprise Resource Planning (ERP) systems; the rationalization of accounting operations; real-time processing of administrative workflows and enhanced monitoring and management facilitated by commercial Electronic Data Interchange (EDI); the automation of human decision-making through AI and machine learning; and the systematization of continuous improvement through causal inference methods, including A/B testing, as well as the implementation of Evidence-Based Policy Making (EBPM) through Development and Operations (DevOps)/Machine Learning Operations (MLOps).²² With the advancement of digital technologies, the development of IT systems has shifted from monolithic, tightly coupled architectures to loosely coupled modular structures, analogous to the assembly of Lego blocks. This transformation is also applicable to IT systems underpinning financial services and infrastructure. To fully

²² Development and Operations (DevOps) is a methodology that integrates development and operations to accelerate the development, testing, and release of applications. By establishing a Continuous Integration and Continuous Delivery (CI/CD) pipeline, it automates development, testing, and operational processes.

Machine Learning Operations (MLOps) incorporates machine learning (ML) into the DevOps lifecycle. It is a methodology for the continuous management of the development, implementation, operation, and refinement of machine learning models.

benefit from the efficiency gains afforded by these new technologies, the construction of services through the integration of modular components has become imperative.

3. Pursuing Economies of Scale

All industries are increasingly becoming software- and IT-driven. These industries are typically characterized by decreasing cost stemming from a combination of low marginal costs and high initial fixed costs—such as IT system development and implementation—which render them particularly conducive to economies of scale, making them a typical example of a decreasing cost industry. To contain initial costs and facilitate scalability, IT systems must be highly elastic and adaptable to business expansion. Cloud services that leverage modular combinations and virtualization technologies serve as effective mechanisms in this context. In the pursuit of economies of scale, it is also imperative to formulate business models that enable the rebundling of modules.

4. Anticipating Positive Externalities

Economies of scope refer to cost advantages that arise when distinct lines of business are undertaken simultaneously, rather than pursued in isolation. When engaging in multiple business domains, positive externalities may be expected not only within the firm itself but also in the form of enhanced value creation for goods and services. Examples include the following cases:

- i) A major global e-commerce company that repurposed its internally developed data centers, server infrastructure, and applications—originally built for its own operations—into general-purpose cloud services;
- ii) Customer data, originally generated as part of business services, was substantially monetized through its redeployment for alternative purposes, thereby enhancing personalization services such as demand forecasting, dynamic pricing, and recommendation systems, which in turn contributed to greater profitability;
- iii) A leading Chinese e-commerce firm initially provided payment and escrow services, in which a third party intervenes in commercial transactions to ensure secure settlement, and subsequently evolved into a data circulation-based business model and a data-driven system offering lifestyle support services through a super app.

Various cases of standardization also generate positive externalities with characteristics of public goods, including International Organization for Standardization (ISO) standards, Application Programming Interfaces (APIs), communication protocols, and internet protocols.

5. Managing the Costs in System Development, Upgrades, and Decommissioning while Accelerating Developments

In the rapid launch of new businesses and the continuous improvement enabled by iterative DevOps practices, it is essential to control costs associated with system construction, maintenance, reengineering, and system decommissioning and resource retirement upon business exit. For example, hardware migration from on-premises infrastructure to the cloud, containerization technologies, the utilization of modular managed services in cloud-based software development and operations, and interface deployment through web applications are among the contemporary approaches to system development and operation. These methods enable organizations to contain costs related to system construction, system decommissioning and resource retirement, while simultaneously facilitating accelerated business launches and continuous improvement. Service construction through modular selection allows organizations to build and dismantle

systems with agility by choosing only the necessary functions. Technologies that connect these modules have also been standardized, which contributes to enhanced interoperability. For instance, in cases where non-financial institutions incorporate financial services by utilizing Banking-as-a-Service (BaaS), such modular and packaged system architectures serve as optimal solutions.

6. Advancing Services Provision and Fostering Innovation through Specialization in Module Development

Rather than having each company develop all the modules necessary for service delivery, it is more effective to incorporate modules developed by specialized providers. This approach facilitates the advancement of service sophistication, accelerates development, ensures alignment with industry standards, and supports ongoing technological and security updates. Examples include services specialized in authentication and authorization, digital identity issuance and management, network and system load balancing and security, API integration, payment services, logistics for e-commerce, web data aggregation, subscription management, user behavior analytics, and data distribution. A similar trend is evident in the development of generative AI, where a clear division has emerged between a small number of companies investing heavily in the development of core large language models (LLMs), and others focusing on building services that incorporate those models. The utilization of modular services like these is expanding firms' strategic flexibility across various industries. One example is the unbundling of sales, logistics, payments, and marketing functions in e-commerce. Other examples include i) the separation of design, manufacturing and sales in the manufacturing sector (as seen in fabless semiconductor businesses); ii) the separation of demand detection, efficient dispatching, mobility services and payments in the services; and iii) the separation of issuance, acquiring, telecommunications services, credit assessment, fraud prevention, authentication-authorization, and Buy Now, Pay Later (BNPL) credit in retail digital payments. The delivery of rebundled, end-to-end services is enabled through the modular combination of sophisticated business logic and systems—each developed with a specialized focus—selected and orchestrated from an optimal modular perspective.

7. Responding to Structural Changes in the Business Environment, Including Globalization

When a business model is realized through the tight coupling of diverse operations, it tends to face difficulties in adapting to globalization-driven standardization and international regulations. In areas such as banking regulation, climate change response, and Anti-Money Laundering (AML)/electronic Know Your Customer (eKYC) compliance, a challenge lies in the collection, processing, and monitoring of information that is dispersed across multiple business lines and both domestic and international counterparties. In establishing a data infrastructure that supports information collection, processing, distribution, and access, it is essential to develop systems that can be flexibly reconfigured in response to the evolving business environment. Progress in establishing foundational layers will also facilitate the outsourcing of information processing. For example, in the context of climate change response and AML, if a cross-organizational shared database is developed as a foundational layer, system development that ensures interoperability with internal systems becomes increasingly critical. Similarly, in responding to international standards such as ISO 20022 for financial messaging and global standardization of digital authentication and identity management, loosely coupled business processes allow for easier adaptation through modular substitution of relevant components.