

Summary of Workshop Entitled "Digitalization and the Future of Japan's Financial Services"

April, 2025

The Center for Advanced Financial Technology, Bank of Japan

(English translation based on the Japanese original)

The Center for Advanced Financial Technology of the Bank of Japan's Financial Systems and Bank Examination Department hosted a workshop entitled "Digitalization and the Future of Japan's Financial Services" on January 31, 2025, at the Bank's Head Office (which was also simultaneously available via web streaming). The following summary has been prepared by the secretariat of the workshop. (All titles of the speakers and presenters are as of the time of the workshop.)

【1st Session: Implications of Digitalization for Japan's Financial Services and Economic Activities】

Keynote Speech "How Will Digitalization Change Japan's Financial Services and Economy?"

Speaker: Hirohide Kouguchi, Executive Director, Bank of Japan

(Why Should We Discuss Digitalization and the Future of Japan's Financial Services Now?)

There are three reasons why we chose this theme. First, recent innovation

in digital technologies, including developments in generative artificial intelligence (AI), cyber security management, cloud services, tokenization, and post-quantum cryptography, is bringing about discontinuous changes to financial services and the financial industry globally. Second, increasing labor productivity through the use of digital technologies has become an urgent agenda for Japanese firms, including financial institutions, as labor shortages due to population decline have become pronounced in recent years. Third is a phenomenon particular to Japan's economy: changes in price developments. Rising inflation and interest rates rising at a moderate pace have increased demand for new financial services. New technologies will enable firms in the financial industry to come up with management resources to meet such demand and offer services that provide higher customer satisfaction.

(Opportunities and Risks of Digitalization for the Functioning of Financial Services)

How will digitalization change Japan's financial services? Finance is an information industry, whose core operations involve a huge amount of information processing, which is where the benefits of digitalization should be most evident. In this regard, I think there are three distinctive features of recent digitalization. The first is the rapid increase in digital data, including unstructured data. The second is the substantial improvement in data processing capacity, which can lead to further efficiency improvements and higher value-added financial services. The third is the growing risks associated with progress in digitalization – cyber risk in particular is the most important risk in terms of financial stability.

Given these features, the outcomes of recent digitalization are no longer limited to improvements to the efficiency of existing operations and the enhancement of online payment and settlement services, but could significantly transform financial services and the financial industry as a whole. In this process, an appropriate framework needs to be established to maximize the benefits of digitalization while controlling the associated risks. Using digitalization to change the way financial institutions in Japan do business will become an even more important issue for their management.

(Will Digitalization Improve Productivity?)

Some studies on the use of generative AI suggest that the extent to which human beings can master the use of generative AI will make a big difference to the size of productivity increases. Other studies suggest that, generally speaking, when a new technology emerges, the extent to which it leads to productivity growth in the overall economy depends on the extent to which firms and society are successful in creating an ecosystem that can make best use of new technologies; that is, an overall framework consisting of computer systems, human resources, expertise in using new technologies, governance and risk control structures, communications infrastructure, regulations, and central and local governments. If we assume that not only new technologies but also the creation of such an ecosystem itself is an innovation, I think we can expect Japanese firms and financial institutions to find excellent use cases for digital technologies such as generative AI, given the expertise they have in process management and systems design.

(What Is Crucial to Enhance Digitalization of Financial Services in an Effective

Manner?)

There are five points that I think are crucial to actually enhancing digitalization of financial services. The first is the commitment of top management. The second is restructuring of business operations to realize improved efficiency and high value added. The third is risk control. In terms of financial stability, priority should be given to responses to cyber risk, third-party risk, and concentration risk. The fourth is capacity building for digitalization. The last is cooperation among relevant parties. Since digitalization has network externalities, it is important that not only financial institutions but also corporates and central and local governments further enhance digitalization and standardization of their businesses.

Digitalization of financial services is considered to enhance productivity through firms' capital accumulation. With improved productivity, the economy is expected to show higher growth, which will increase the profits of firms and financial institutions, fostering a virtuous cycle.

【2nd Session: Digitalization for Promoting Advanced and Efficient Financial Services】

(1) Presentation

Presentation 1 "Utilizing Digital Technology to Enhance the Sophistication and Efficiency of Financial Services at MUFG"

Presenter: Tadashi Yamamoto, Managing Corporate Executive, Mitsubishi UFJ Financial Group, Inc.

(Overall Picture of the Digital Strategy)

MUFG is promoting digitalization in three areas: first, in-house digital transformation, which aims to enhance the sophistication and efficiency of MUFG's own operations through the use of digital technology; second, customer digital transformation, which aims to provide new services to customers through digital technology; and third, the Center of Excellence (CoE), which explores new technologies as well as fosters collaboration through investments in startups, as a foundation for achieving the two goals of in-house and customer digital transformation.

MUFG previously had separate departments for the tasks of firm-wide digital transformation and data strategy, but merged the two functions in fiscal 2024 into a single Digital Strategy Division. This division is pursuing three initiatives: (1) data aggregation and infrastructure development on OCEAN, MUFG's big data platform; (2) utilization and penetration of cross-firm solutions such as AI and data visualization tools; and 3) the use of digital technologies in automating business processes. To support these activities, we are also focusing on hiring and training highly skilled specialists and personnel who can drive our digital strategies. In tandem with these measures, we have been pursuing business development, including collaboration with FinTech firms, to introduce new technologies.

(Initiatives to Enhance the Sophistication and Efficiency of Financial Services)

MUFG has reviewed its branch network and enhanced digitalization to evolve the customer experience at branches. For corporate and back-office operations that are difficult to digitalize, we are undertaking a fundamental

review by consolidating these operations into centralized processes or by utilizing the web. Regarding evolving the customer experience through digital technology, in Phase 1 scheduled for this spring, we will completely renew our Internet banking service Mitsubishi UFJ Direct and integrate it with the applications and services of our group firms. In Phase 2, we will implement Money Advisory Platform (MAP), offering comprehensive proposals tailored to the asset composition and life stage of customers. In the area of housing loan screening and contracting, we are boosting operational efficiency by means of digital technology and AI.

MUFG Bank has engaged in BaaS (Banking as a Service) since 2022, and is planning to release &BANK, a BaaS application that provides general-purpose financial functions such as deposits, money order transactions, and various loans. We have also begun offering MoneyCanvas, an asset formation support application. Aiming to expand our customer base in the mass retail business, in addition to branches, Internet banking, job-based networks (employees of client firms), and other channels, we intend to grow the BaaS business so that it becomes the next pillar of our business.

(Utilization of Digital Technology)

MUFG has established an AI Intelligence Team within the Digital Strategy Division to keep track of the latest trends in AI. This team not only gathers information but also provides consulting support for AI implementation across business units and administrative departments. Strengthening the intelligence function is key to supporting the consulting role. Regarding generative AI, MUFG Bank released an intra-bank application, AI-bow, in May 2023. Already,

one out of every two head office employee is using AI-bow in their work. Going forward, we plan to make more effective use of generative AI by capitalizing on AI agents and building our own large language model (LLM) based on in-house data.

Regarding the implementation of AI use cases, we focus on three areas: (1) data-driven sales, (2) business model reform, and (3) employee working style reform. We have been releasing a series of related applications since the second half of fiscal 2024. In terms of data-driven sales, we aim to enable AI to efficiently provide high-value proposals and create materials tailored to the needs of individual customers. In terms of business model reform, we are working on transforming our call centers, which are currently operated manually, by implementing AI solutions. The ultimate goal is to use AI agents that automatically respond to inquiries and AI concierges that offer consultation on inheritance matters via chat rooms. In terms of employee working style reform, we aim to create an environment where employees can focus on more strategic tasks by replacing simple clerical work and complex, time-consuming tasks with AI. Specifically, we plan to implement a framework where AI is involved in part of the system development process starting in fiscal 2024.

Presentation 2 "New Business Creation through the Use of Digital Technologies by SMBC Group"

Presenter: Naoki Shiraishi, Executive Officer, Sumitomo Mitsui Financial Group, Inc.

(Creation of Diverse Digital Services)

Our bank started creating external digital services about 10 years ago, at a time when "digitalization" was a buzzword and the touchpoints between financial institutions and their customers were beginning to change with the widespread use of smartphones and other devices. When launching the services, we were aware of the critical need to digitalize our core business. As platform providers like GAFA and other fintech companies had been entering the financial sector, we felt a strong sense of urgency to accelerate the digitalization of our core financial services. At the same time, a proactive awareness drove us to venture into non-financial fields leveraging digital technologies. These served as the foundation for our comprehensive digital initiatives.

Our Olive service is a comprehensive financial service for individuals that seamlessly integrates bank account, card payment, finance, online securities, and online insurance functions within a mobile application. The securities and insurance services of Olive are provided by firms that are not necessarily part of our group. We have also launched Jenius Bank, a state-of-the-art, fully digital bank for U.S. retail customers, which is steadily growing its deposit and loan balance. We look for such changes in customer touchpoints to take place in our corporate services as well. Currently, corporate services provided by financial institutions are mainly based on physical touchpoints, but we will actively deliver our service content to customers through email distribution, owned media, and other venues to generate demand, and then use phone calls and other inside sales activities to meet such demand, ultimately leading to business transactions.

As for non-financial services, we operate PlariTown, a digital platform

company for corporate clients. We established PlariTown in May 2020 as a SaaS (Software as a Service) service intermediary subsidiary to help small and medium-sized firms pursue their own digitalization. The company consults with about 3,000 customers annually and provides services to a part of them. Many small and medium-sized firms face issues such as being unable to determine where to begin when it comes to digitalization or being unable to roll out services due to a lack of human resources. In August 2024, PlariTown and Freee jointly established a new SaaS implementation support company, Incloop, to address these issues.

(Entering the Human Capital Business)

SMBC Wevox, established in October 2023, provides a monthly survey that takes only a few minutes to complete. It allows customers to visualize the state of their organizations in real-time and offers solutions to various management issues. One of its strengths lies in its ability to leverage AI that analyzes and learns from engagement data accumulated through usage by many customers, including SMBC, as well as internal feedback. The AI serves as a chat-based advisor for improvement measures, offering concrete support for building better organizations. While SaaS solutions are often abandoned and canceled after implementation due to lack of use, creating daily touchpoints through AI in this way is expected to be a key source of competitiveness for future B2B services.

One of our initiatives aimed at addressing the labor shortages, which have become a serious social issue in Japan, is an avatar-based business. Here, we are collaborating with AVITA, a company specializing in AI and avatar

technology. In addition to providing work opportunities for women raising children and people with disabilities, we are taking on the challenge of putting AI behind avatars to make firms' operations more efficient.

(Transforming the Culture)

We hold monthly CDIO Meetings, also attended by our president, as a venue for making decisions about ways of supporting the commercialization of businesses from the idea stage. Persons in charge of potential projects can make presentations at these meetings, and we have secured an independent budget so that the meetings can serve to uncover buried ideas. The CDIO meeting also manages an "AI-CEO budget"—since AI investments are hard to evaluate in terms of cost versus return from an ROI standpoint, this type of meeting is used to bring projects to light that have been overlooked.

Since we cannot create new businesses simply by extending the existing banking culture, we are also working on transforming the culture. Specifically, we have established an innovation hub to network with outside experts, facilitate discussions on internal social networking services, and communicate through owned media. In this era of rapid change, we cannot respond to digitalization unless we ourselves change. Our desire is to create new business through digital technology while continuing to pursue these efforts to transform the culture.

Presentation 3 “Digital Transformation Strategies for Corporate Innovation in FFG”

Presenter: Masahiro Fujii, Executive Officer, Fukuoka Financial Group, Inc.

(Digital Transformation Strategies in FFG)

In 2016, our bank established iBank, a neo-banking service provider. This was the start of our digital transformation (DX) efforts, and led to the establishment of the digital bank, Minna Bank. We have been attempting to pursue such new areas away from the main body of the Bank of Fukuoka, like a kind of island body away from the mainland. As for transforming existing areas within the bank, we established a Digital Strategy Division in 2017 and began hiring engineers to tackle Agile development, which at the time was relatively rare for a bank in Japan. In this way, we have been pursuing a two-way approach, launching new business projects like the establishment of the digital bank while simultaneously upgrading the existing businesses of the bank.

When we established the Digital Strategy Division in 2017, there was a sense within the bank that all digitalization fell within the purview of the new division, despite the fact that digital reform needed to be pursued on a bank-wide basis. Therefore, we established the DX Promotion Headquarters in 2022, which was tasked with three parallel key initiatives in which all employees should necessarily be involved: (1) the renewal of digital channels, (2) the introduction of a framework to pursue overall optimization by enabling headquarters to grasp all system projects from the conceptual stage, and (3) reform of the culture to allow these initiatives to move forward.

(Business Transformation Starting with Digital Channels)

We developed a new personal banking application in 2023. Although we had already started Internet banking, years had passed since we launched

the platform and its usability and UI had grown outdated. With the introduction of the new app, branch staff were able to transition customers from existing channels by recommending use of the app, which in turn freed up time for staff to focus on building deeper customer relationships. As for a digital channel for corporate clients, we established a new business portal, BIZSHIP. BIZSHIP is not only used by our business partners themselves, but also for helping us improve the quality of communication with such partners, such as when sales representatives visit the partners and discuss issues while viewing the screen together. In conjunction with the renewal of these wholesale and retail digital channels, we have also renewed our sales force automation (SFA) platform, enabling us to offer more sophisticated and uniform proposals to customers by integrating information, knowledge, and other sources into a single system. By developing these three products simultaneously, we have created an environment in which all employees take a personal stake in our digital transformation.

(Framework for Pursuing Optimization as a Whole)

The bank has reviewed its process for exploring digital systemization to pursue overall optimization. We changed the framework so that all systemization projects are centralized at the secretariat from the planning and conceptualization stages and the secretariat assesses the impact of implementation. After trials are conducted, when necessary, by the divisions in charge, decisions are made. In addition, we have established an Architecture CoE to reflect considerations from a systems perspective from the initial planning and conceptualization stages of systemization projects, thus avoiding duplication in development and speeding up the development

process.

(Culture: Seeking the Participation of All Members)

I would also like to showcase our efforts in terms of a corporate culture that emphasizes the participation of all members. The floor of the DX Promotion Headquarters is called KATARI-BA, a space for co-creation, and the floorplan is laid out in a way that allows open discussion. The word *katari* means both "to discuss" and "to participate" in the dialect of Hakata (a district in Fukuoka City). This floor gathers together engineers and data scientists from the DX Promotion Headquarters, members of project teams and architects for each product development project, and experts from our partners outside the bank. In addition, we have set up a "branch supporter system," whereby headquarters staff visit branches to explain the necessity of digital utilization, while offering lectures on the use of digital tools. At the same time, these staff members gather user feedback from the field, which is used in system development.

(AI Utilization)

Our bank has been pursuing business transformation and operational reforms grounded in the use of digital channels, and we believe the adoption of generative AI and other new digital technologies will accelerate these moves. In April 2024, we established an AI Strategy Group within the DX Promotion Headquarters. In adopting AI, our focus in the short term is on achieving small wins, while in the longer term we aim to overhaul all of our operational and business processes from an AI perspective. Examples of small wins include the development of a function to automatically generate

draft documents for loan approvals and a function to automatically create transaction records and logbooks from voice recordings.

(In-House Development at FFG)

Until now, we have outsourced the majority of our development to outside partners, which resulted in some issues regarding costs and pace. With the progress of the digital society, however, we believe that bringing some development processes in-house will be key in terms of setting the bank apart. Although bringing all development processes in-house is unrealistic, we would like to maintain tight control over the business side and the core of the development process, with the aim of providing valuable products quickly and inexpensively. While we maintain Agile practices in the business, when it comes to the bringing development processes in-house, our choice of digital development method, whether Agile or Waterfall, will depend on which is better suited to the objective of providing valuable products quickly and inexpensively.

Finally, I would like to explain the future vision FFG's digital transformation efforts are striving for. As a regional financial institution, we believe how we can contribute to the development of the region is paramount. We would like to use digital technology to deepen our connections not only with our direct business partners, but also with local governments, local public bodies, and all other stakeholders in the region, creating a system that enables us to offer valuable services.

Presentation 4 "Shinkin Bank Industry Data Utilization for Business Advancement: Shinkin DB, the Industry's Big Data Utilization Platform"

Presenter: Yoshinori Jinno, Managing Director, Shinkin Central Bank

(Issues and Directions towards Solutions for Data Utilization in the Shinkin Banking Industry)

We aim to move forward in two directions with regard to the relationship between digital technology and shinkin banks (a type of community-focused financial institution in Japan). The first is the creation of new value through the fusion of in-person and digital-based services. As community-focused financial institutions, shinkin banks have an advantage in building face-to-face relationships with their customers. By capitalizing on this strength and combining it with cutting-edge digital technology, and then by creating new value, we aim to make shinkin banks the financial institutions of choice for their customers. The second direction is to boost productivity by improving the efficiency of local economic activities. By incorporating digital technology into the business processes of shinkin banks, we hope to further improve the efficiency and productivity of operations and, by promoting digital transformation among customers, hope to contribute to greater efficiency and productivity across the entire region.

(Overview of Shinkin DB and its Implementation)

There were two challenges to the use of big data by the shinkin banks. One was the cost issue, as handling big data requires significant system investment. The other was the issue of human resources and expertise. It is not easy for individual shinkin banks to secure data scientists or obtain sufficient data to train AI. To address these issues, Shinkin DB, a data utilization platform for shinkin banks, was established in fiscal 2023. This

database has made it possible for individual shinkin banks to lower costs and for us to train and utilize Shinkin Central Bank employees as data scientists. By collecting data from across the shinkin bank industry, the issue of limited data volume was also resolved. Shinkin DB stores transaction data, financial data, customer attributes, and other data held by shinkin banks nationwide in a single database, processes and analyzes the data, and yields output that can be used by each shinkin bank.

(EBM Solution)

The first analytical service provided by Shinkin DB was an event-based marketing (EBM) solution. The output here consists of (1) scores that show the probability of successfully closing a financial contract, calculated by analyzing the transaction status of customers, and (2) events that have occurred with customers, detected from analysis of their data. When the solution detects such events, it also recommends actions to shinkin bank staff, giving them hints about what they should propose to customers. When shinkin bank staff gain a deeper understanding of a customer's situation by utilizing information yielded by data analysis, in addition to information obtained from face-to-face interactions, they are able to make optimal proposals that better meet the customers' needs, and the resulting increase in customer satisfaction supports a stronger relationship between the customer and the shinkin bank. Staff at user shinkin banks have commented that the EMB solution enables them to make proposals even to customers with whom they have had little day-to-day contact and about whom they lack information. In addition, while it takes a certain level of experience for staff to identify customer needs from conversations, the EBM solution allows even less-

experienced staff to repeat the cycle of narrowing down potential customers, formulating their own proposals, and actually reaching out to the customers.

(Credit Scoring AI)

The second service was credit scoring AI. Having learned the characteristics of deposit and withdrawal data of past borrowing counterparties who defaulted, this AI uses a counterparty's deposit account data to evaluate the likelihood of default. Financial statements and other financial information are not required—only deposit account data is used to assess creditworthiness. In this case, more timely assessment of the counterparty is possible, able to be carried out on a monthly basis, as opposed to assessments based on financial information that is only updated annually. While financial institutions typically use debtor classifications and ratings constructed based on financial analysis to evaluate firms' creditworthiness, it is difficult to detect small signs of deterioration in business conditions in a timely manner. Even when banks communicate frequently with business partners to understand their business conditions, there are limits to what one person can oversee. When the creditworthiness assessment of business partners is updated frequently based on the credit scoring AI, in addition to information obtained from financial analysis and communication, early signs of deteriorating business conditions can be quickly identified. This allows the bank to initiate appropriate support at an early stage, helping to prevent further deterioration. In addition, because the credit scoring AI does not use financial information, but instead assesses creditworthiness from a different perspective, it provides a more detailed understanding of the degree of credit risk of the counterparties.

(Future Prospects)

We hope to pursue three initiatives going forward. The first is to enhance the existing services. Because we have developed the data analysis functions of Shinkin DB ourselves, flexible improvements to these functions are possible, and because Shinkin Central Bank's analysts regularly exchange opinions with shinkin bank employees, it is easy to reflect users' needs in improvements to the functions. The second is the development of new data analysis services. Since shinkin banks are facing a wide range of management issues, we would like to help them reinforce their management capabilities by, for example, providing data-based analysis services for branch strategies. The third is to collaborate with other firms outside the shinkin bank industry. Capitalizing fully on our database and analytical expertise requires us to be flexible in our thinking. We would like to consider taking new approaches through collaboration with other firms, rather than confining our efforts only to Shinkin Central Bank and the shinkin bank sector. Specifically, we are considering the possibility of contributing to the revitalization of regional economies and societies by offering Shinkin DB-driven solutions to firms and organizations other than shinkin banks.

Presentation 5 "Digital Transformation Initiatives at Nomura Group: The Challenge of New Financial Services Using Digital Technology"

Presenter: Hajime Ikeda, Senior Managing Director, Nomura Holdings, Inc.

(About Nomura Group and Nomura Securities)

Nomura Group was established in 1925 and will celebrate its 100th anniversary in December 2025. Today, it employs approximately 27,000

people, with executives and staff from about 90 countries. The Group has three divisions: Wealth Management, Wholesale, and Investment Management. It also has Content Company, which creates and manages global research, economic data, and other content, as well as Digital Company. These two entities are interconnected with the main divisions. The Digital Company, which was started in 2019 as the Future Innovation Company to develop digital services together with customers, was reorganized into its current structure in 2022 to promote Nomura's digital transformation.

(Changes Brought about by Digital Technology)

The environment surrounding our customers is currently undergoing several key changes: (1) accelerating digitalization (fueled by the spread of smartphones and expansion in the scope of their use), (2) customers' access to a broader range of financial services via digital means, along with continued use of in-person consultations depending on the situation, (3) the rise of decentralized finance through blockchain technology, along with new products such as security tokens and crypto assets, which provide customers with more choices, and (4) the shift from savings to investment, with the spread of investment options like Nippon Individual Savings Accounts (NISA). Furthermore, the emergence of generative AI has led to growing expectations that, over the next five years or so, our customer services and workflows will undergo dramatic changes, in addition to improving our own productivity. Overseas, the use of generative AI is expanding in front-line (customer touchpoint) services. While there are regulatory differences between Japan and other countries, we aim to develop our own services with reference to

cutting-edge examples from abroad.

(Digital Strategy in Nomura Holdings)

There were discussions, in which some suggested that sophisticated proposals to customers regarding asset management and administration could not be fully provided in digital form, and that it would be difficult to offer such services without actual employees. If we can make use of digital technology, however, (1) all customers can receive the same services that wealthy customers have been receiving until now, even as our customer base currently expands, and (2) data on customer behavior, which digital technology is adept at handling, can be obtained. In addition, in many cases the breakdown is along the lines of "in-person services for the wealthy and digital services for the general public." On this score, we would like for all customers, whether they are wealthy or in the asset-building phase, to initially come into contact with our digital services. We want to be able to offer digital communication in the first stage, contact with the contact center in the second stage, and actual face-to-face services in the third stage. We believe that the quality of this first stage of digital services will help set financial institutions apart.

Meanwhile, new products are now being developed that will usher in a new financial capital market, one that bridges the gap between traditional finance and decentralized finance. Security tokens have been issued in Japan over the past three years, mainly in the form of real estate security tokens, with a total issuance of 150 billion yen. Blockchain technology has enabled timely updates to the data of investors and transactions, making it possible to issue

security tokens in the form of public offerings and in small lots. Real estate tokenization has allowed investors to make small investments in a range of real estate properties, including high-rise condominiums, hotels, commercial properties, and rental housing. As for crypto assets, our firm has launched Laser Digital Holding AG, which engages in trading, venture capital, and lending. With the rapid increase in the number of overseas transactions involving crypto-asset ETFs, discussions are ongoing about how to regulate this market in Japan as well.

(Utilization of Generative AI and Strategies)

As for the group's use of generative AI, we have been laying a foundation to support front-line operations in contributing to revenue growth and to enhance operational efficiency in a way that leads to cost reductions. Going forward, we envision services that reach customers directly, but believe that the hurdles to achieving this are still somewhat high. In 2024, we established Japan AI CoE to create and instill an environment for the use of generative AI. Since regulations differ across regions, we started with Japan, and as the project is now getting off the ground, we want to extend it to other countries next fiscal year. We currently use generative AI to support ad screening and summarize internal reports. While this year is touted as the "first year of AI agents," our further steps will involve aiming to build AI agents that can link multiple AIs autonomously and respond to more sophisticated instructions. We also hope to incorporate generative AI into both in-person and digital services.

Presentation 6 "From Generative AI to the Era of AI Agents"

Presenter: Akira Kaneko, Senior Director, Microsoft Japan Co., Ltd.

(Trends and Challenges in the Use of Generative AI in Enterprises)

Many people may have the impression that generative AI is a general-purpose application used primarily for chatting, due to the popularity of ChatGPT developed by OpenAI. However, as generative AI technology rapidly advances, it is coming to be embedded in a wide variety of applications, including specialized AI (for example, as a substitute for specific tasks like call centers and system development, or as an element integrated into new products and services, such as autonomous driving). It is also notable that one issue in terms of using generative AI has been that the extent to which the potential of general-purpose generative AI can be exploited depends on the capabilities and interaction skills of individual users. To address this, prompt engineering to design and optimize prompts and commands for generative AI and other techniques have been developed, and I believe the AI agents with embedded prompts that have emerged will overcome the issue of dependence on user skill levels.

(The Difference between What a Human Being, an IT System, and a Large Language Model Can Do)

Analyzing how human beings work, when given a task, the first step is for the person to think about how to break down or schedule the task. The next step is to do research using the company's internal systems or the Internet. When required to move forward with a process, the person files an application or places an order. The final step is a process involving people communicating with one another. IT systems, on the other hand, can execute predefined

processes and search for and retrieve desired information ("research"), but cannot think or communicate. Large-scale language models (LLMs) can now "think" about what steps to take in response to instructions given by human beings, and can "communicate" through multimodal capabilities.

(Background of the Emergence of AI Agents and Advances in AI)

The background to how it became possible to implement AI Agents with large language models (LLMs) is that AI with extremely advanced capabilities is now able to think. The "o1" model, developed by OpenAI and provided through Azure OpenAI Service, is highly capable in terms of solving complex problems, especially those involving inferences. This model has an IQ of 120, making it equivalent to the top 10 percent of the human population. Furthermore, the upcoming "o3" model is said to have even greater capabilities than "o1," and when it is released in the future, it will be possible for people to use an AI model with Nobel Prize-level capabilities as an assistant. In addition, while existing generative AI faces the issue of so-called "hallucinations," in which it provides false or fabricated answers that are factually inaccurate, the "o1" model has been equipped with a self-reflection mechanism to avoid hallucinations. As AI becomes more sophisticated, AI agents will gain the ability to think, research, execute, and communicate, enabling them to work on behalf of human beings. In the near future, AI human resource strategies -- namely how AI agents are deployed within an organization -- could become a key trend.

(Examples of AI Agents Being Used by Japanese Firms)

SoftBank Corp. is working to automate its call center operations through the

use of AI agents. West Japan Railway Company is also utilizing AI agents to support station staff, as it has become increasingly difficult for staff to respond to customer inquiries due to the growing complexity of routes and operational rules. Powertrain Company, a business unit of Toyota Motor Corporation, has also developed several AI agents that have acquired the knowledge of engineers and knowledge about local regulations. The company uses these agents to support automobile development by allowing employees to ask questions to an "orchestrator" that brings these AI agents together.

(Outlook)

Going forward, AI agents will be embedded in a variety of situations. For example, there will be stand-alone agents that check contract documents and multi-agent systems that bring together and coordinate multiple agents. This vision was described last November (2024) by our CEO, Satya Nadella, as "the dawn of the Agentic World." We will have built-in agents embedded in our own products, third-party agents that cooperate with the services of other firms, and customized agents that can be easily created using tools such as no-code/low-code platforms and can offer more sophisticated solutions. These agents will be utilized according to the specific needs of each business.

(2) Panel Discussion

【Q1: How to create added value amid digitalization?】

– How will financial services and financial institution management change over the next five years as digitalization progresses?

(Tadashi Yamamoto, Managing Corporate Executive, Mitsubishi UFJ

Financial Group, Inc.)

As financial services become increasingly digitalized, constraints associated with time and place in providing these services will disappear. Additionally, as AI utilization and big data analysis advance, the quality of proposals to customers and convenience for customers will improve as they are driven by a deeper understanding of customer needs. This will lead to a world where financial services can be proposed and contracted anytime, anywhere, and where financial institutions will be able to provide individualized advice to a larger number of customers, both in terms of assets and liabilities.

The growing sophistication of financial services is not only analogous to the historic shift from fixed-line phones to flip phones, but also implies the creation of new service concepts on the level of the advent of smartphones. To foster such new ideas, agile organizational management and high-speed plan, do, check, and act (PDCA) cycles are essential.

As digital technologies advance, especially in AI, the processes underlying them may become somewhat of a "black box," i.e., invisible to the user. It will thus be critical to manage the risks involved through a "human-in-the-loop" (HITL) approach, incorporating human judgment and expertise into complex systems. Furthermore, even as the volume of digital consultations increases, many customers may still prefer to speak with a human being at the end of the process. These challenges will persist regardless of how much we pursue digitalization.

(Naoki Shiraishi, Executive Officer, Sumitomo Mitsui Financial Group, Inc.)

The essence of digitalization is not simply to shift from an analog to a digital

environment, but rather to change the very nature of the business. In particular, it is vital to dramatically change the way we engage with customers. In the corporate world, due to human limitations, the structure of organizations within financial institutions is currently divided between transactions and finance. As AI agents develop, however, these two areas could potentially be integrated. If this happens, it may turn out that providing value to corporate clients by means of accounting software that integrates both transactions and finance will offer them greater convenience. If financial services are provided through various media in this way, my concern would be that other industries might encroach upon the business of financial institutions unless financial institutions themselves expand into adjacent business areas – although, here, they are constrained by regulations and business laws.

(Masahiro Fujii, Executive Officer, Fukuoka Financial Group, Inc.)

One of the major roles of regional financial institutions in Japan is to help create a sustainable society amid a declining population and stagnant productivity. To achieve this in regional areas, these institutions need to go beyond simply supplying risk capital, working closely to help corporate clients innovate their businesses and industries and creating new customer experiences and business value. Regional financial institutions must become platform providers of both financial and non-financial services, capitalizing on their high trust and their share of the regional markets. Digitalization will be essential to strengthening collaboration between regional financial institutions and their business partners. Here, new financial services, such as BaaS (Banking as a Service), where payment settlement and financing functions are embedded at the point of sale, are likely to continue to evolve.

(Yoshinori Jinno, Managing Director, Shinkin Central Bank)

As digitalization progresses, personalization itself may become commoditized and lose value. If this happens, the spotlight may shift to values that differ from the digital realm. For example, the value of face-to-face connection and the warmth of human interaction. The value of trust between a financial institution and its customers may increase more than ever. The key will be who you buy from rather than what you buy. In addition to using digital technologies to add value, it will become important to ensure that financial institutions can be "chosen" by their local communities.

(Hajime Ikeda, Senior Managing Director, Nomura Holdings, Inc.)

It will be key for financial institutions to pursue digitalization and become a communication partner with customers and an integral part of the customer journey. It will also be crucial to enhance customer performance through digitalization. Critical steps for the institutions in achieving this are (1) providing personalized services to customers by leveraging the customer data they have obtained, (2) combining qualitative and quantitative data, and (3) offering never-before-commercialized services by harnessing new technologies.

(Akira Kaneko, Senior Director, Microsoft Japan Co., Ltd.)

Ongoing digitalization and the emergence of generative AI are akin to the Industrial Revolution. Generative AI, like the advent of automobiles and computers, extends human capabilities. The real challenge for human beings now is how they themselves add value and work effectively with generative AI. In the past, for example, the amount of data that financial institution staff

could explore and the creation of proposals based on that data were limited by time constraints. By replacing such work with generative AI, human beings can now focus on preparing ways of explaining to customers the AI-generated proposals. The value added by digitalization is that human beings can now decide for themselves how to work effectively and happily with the technology.

【Q2: What digital technologies most interest you right now?】

- Which digital technologies do you think will most significantly change financial intermediation activities and the management of financial institutions over the next five years?

(Hajime Ikeda, Senior Managing Director, Nomura Holdings, Inc.)

I would like to mention blockchain technology, though I am also paying attention to generative AI. Traditional finance is a business that locates financial institutions and markets at the center, and trust and confidence in the institutions and markets form a crucial foundation. By contrast, the concept of decentralized finance is not based on countries or financial institutions, but presents a different worldview. By utilizing blockchain technology, which embodies a distinct worldview, mindset, and values, it becomes possible to create products and services that conventional thinking cannot achieve, thereby expanding options for customers. Furthermore, blockchain technology has the potential not only to generate new products and services but also to improve workflow efficiency.

(Yoshinori Jinno, Managing Director, Shinkin Central Bank)

It is truly fortunate for Japan at this juncture that the evolution of generative

AI and AI agents is happening on a scale similar to the Industrial Revolution. Generative AI and AI agents will address issues arising from our country's declining population. Even now, AI is beginning to take over some of the document preparation, compliance, and clerical work at financial institutions. We can also expect AI to take on marketing, promotion, and sales tasks, which require more sophisticated decision-making. On the other hand, assuming that a technological singularity will eventually be realized, it is necessary to ensure that AI technology is controllable in terms of security and ethics, so that human beings will not be exploited by it.

(Akira Kaneko, Senior Director, Microsoft Japan Co., Ltd.)

It is highly significant that we are entering a phase in which generative AI is being implemented in society at a critical juncture, when the working population of Japan is declining. The significance of generative AI for financial institutions is, first, that it can generate hyper-personalized content at customer touchpoints, and second, by replacing various processes and procedures, it can boost efficiency and save labor in tasks such as procedural and confirmation work, freeing up employees to focus on areas where human beings can deliver the most value.

Also, when large language models perform an action, they do so through an API (Application Programming Interface: an interface connecting software, programs, and web services). So, it will likely prove highly effective that financial institutions already have APIs in place.

【Q3: What aspects of the digitalization of the real economy interest you most?】

– Digitalization is moving forward not only among financial institutions but also across society in general. What are some trends you are paying attention to in relation to financial services?

(Tadashi Yamamoto, Managing Corporate Executive, Mitsubishi UFJ Financial Group, Inc.)

The positive side of digitalization is that it will lead to greater personalization and real-time access to services, as customer activity data will be accumulated and access to services will be facilitated through digital channels. The downside is that cyberattacks and digital fraud will become significant issues as digitalization progresses.

Another area of broader concern is the digital divide. Depending on how easily digital services can be accessed and how well they can be implemented, significant economic, informational, and social disparities could emerge, among both individuals and firms. In fact, even though the digital services of financial institutions, whether Internet banking services or apps, are becoming easier to use in terms of both user interface and user experience (UI/UX), there are still some customers who prefer not to use them.

(Naoki Shiraishi, Executive Officer, Sumitomo Mitsui Financial Group, Inc.)

I believe the use of data is what is impacting the real economy. Regarding the use of data, one concern in Japan is that digital IDs have not developed in a way that allows all data on a person to be collated by name. It would be desirable to develop such IDs through co-creation, rather than competition, across firms and industries.

【Q4: What technological innovations over the past 20 years have you paid attention to?】

- What technological innovations over the past 20 years have had the greatest impact on financial services?

(Masahiro Fujii, Executive Officer, Fukuoka Financial Group, Inc.)

Although the time frame may be longer than 20 years, the spread of the Internet seems to have been very significant. The Internet's spread shifted customer touchpoints from brick-and-mortar locations to computers, cell phones, and smartphones, which greatly enhanced convenience. The diffusion of smartphones in particular has accelerated the change in these touchpoints and had a significant impact on society in general. Consumers can now access the information they want at any time, and perform any procedure they want at their fingertips. As a result, financial institutions have had to redefine what the convenience of financial services means.

Another key development is API technology. The development of this technology has allowed financial systems, which were previously closed to the outside world, to be connected with external systems, enabling non-financial entities to access financial data and provide highly convenient services with reference to the data.

The lessons that can be learned in this context are the need to quickly identify and respond to changes in customer needs, as well as the importance of standardizing technology. The latter is particularly crucial because, as with API technology, if all firms pursue their own technology, they will run up against differences in decryption work and security levels, which will hinder

the widespread adoption of the technology.

【3rd Session: Digitalization for Ensuring Stable Financial Services】

(1) Presentation

Presentation 1 "Transformation of the Use of Cryptography in Financial Systems and Responses to Ensure Security"

Presenter: Shin'ichiro Matsuo, Research Professor, Georgetown University

(Interbank Systems and the Internet)

I would like to discuss the transformation of cryptography in financial systems and responses to ensure security. Before the advent of the Internet, security risks to interbank systems were manageable. With the introduction of the Internet into the interbank systems, an attack surface was created at the point of contact with users. User authentication and encryption of communication channels were put in place around 2000. Later, ID and authentication systems became linked to enable the coordinated use of various disparate services. Nevertheless, the backbone of the financial systems remained separate from Internet-based threats and risks until the advent of Bitcoin.

(Secure Operation of Blockchain Technology)

In this era of decentralized and permissionless financial systems like Bitcoin, such systems have been built by grassroots cryptographers and engineers rather than by Japan's Financial Services Agency (FSA) and financial

institutions.

In this context, the governance structure of the systems has been changing in line with the increasing involvement of open-source engineers as stakeholders in the blockchains, who have been creating the distributed technology, in addition to traditional regulators. Sufficient communication channels between the two parties have been lacking, making it difficult for regulators to determine whether or not the technologies need to be regulated. In this context, even today, the infrastructure and preparations needed for stable operations are not in place, which implies that, as shown in past incidents like those involving Mt. Gox and DMM Bitcoin, the technology is still not safely used widely.

A paper by Satoshi Nakamoto, the presumed creator of Bitcoin, claims that Bitcoin can prevent duplicate payments even without a trusted third-party organization, and describes Bitcoin as secure as a payment system. When it comes to attacks on settlements and application components beyond that, however, the assistance of a trusted third-party organization is required. To operate blockchain technology securely in practice, not only cryptographic algorithms but also other factors are needed, including foundational protocols such as consensus mechanisms, application protocols such as privacy protection, business logic such as settlements and contracts, implementation measures such as those that ensure that there are no backdoors, and operational elements such as key management. All of these elements must be in place together, and even a single point of vulnerability can be a target of attack. This point is generally understood in, for example, the ISO standards, but has not been widely recognized within the blockchain industry. Naturally,

it is difficult for startups to address these issues on their own.

(Need for Human Resource Development)

In addition to the theory and technology required to balance security and scalability, technology concerning system security and its operation, and collaboration between the realms of social engineering and economics and computer science, what is particularly needed in Japan is technology related to regulation (RegTech/SupTech). The human resource development required for this needs to be addressed by creating a skill map, but this is still insufficient. In September 2015, Bitcoin engineers launched the Scaling Bitcoin conference to discuss how to solve the scalability problem, but there were no Japanese participants present other than myself. The same conference was held in Japan in 2018, but there were no proposals from the Japan side, indicating a lack of depth in human resources. Other global cryptography-related international conferences have also seen very limited Japanese participation. In the U.S., the broad vulnerability of log4j (an API frequently used in Java-based applications) has triggered the start of open-source supply chain security initiatives. Japan also needs to develop standards and train human resources through a process of standardization. A conference by top researchers in the area of cryptography will be held on Miyakojima island in April 2025. I hope financial institutions in Japan will not consider this conference to be irrelevant, but will instead consider coming to Miyakojima to get a feel for what is happening.

Presentation 2 “Post-Quantum Cryptography and the Response of Financial Institutions”

Presenter: Osamu Terai, Group Executive Officer, Mizuho Financial Group, Inc.

(The Need to Transition to Post-Quantum Cryptography)

I would like to discuss post-quantum cryptography (PQC) and how financial institutions should address it. The main applications of cryptography include encryption, digital signatures, and authentication, and the type of keys used in these applications include symmetric key cryptography and public key cryptography (for example, ciphertext is created using a public key and decrypted into plaintext using a private key). The cryptographic algorithms and key lengths currently permitted for use are regarded as secure because the private key cannot be derived from the public key in a realistically feasible amount of time. However, there is a threat that some of the existing ciphers may be broken in the future, once cryptographically relevant quantum computers (CRQCs) with a certain level of capability become practically usable. Therefore, the transition to PQC, which is resistant to CRQCs, has become an important topic internationally for governments and private firms.

The National Institute of Standards and Technology (NIST) has been soliciting and validating PQC since 2016. Since the NIST announced three algorithms as standard PQC algorithms in August 2024, various standardization bodies and industry associations have been actively studying the standardization of implementation methods and transition guidelines. There are various opinions as to when CRQCs will come into practical use, and at this point it remains unclear.

(Response of Government Agencies in Various Countries to the PQC

Transition)

In this context, government agencies in various countries have taken different responses to the PQC transition. The U.S. government, the most proactive government in the world on this issue, has announced a policy to reduce the risk to as close as possible to zero by 2035 for systems related to the national security of federal agencies (2022). In Europe, the European Commission has issued a recommendation to encourage member countries to consider transitioning to PQC (2024). Regarding financial authorities, the G7 Cyber Expert Group has issued a recommendation to start employing risk mitigation measures against HNDL attacks (see below) and CRQCs (2024). Additionally, Japan's Financial Services Agency has held a Study Group on Deposit-Taking Institutions' Response to Post-Quantum Cryptography (2024).

(CRQC Risks)

There are various risks associated with the misuse of CRQCs. First, there is the risk of a loss of confidentiality, which could occur as the result of unauthorized payments that mimic legitimate transactions, as well as unauthorized access to sensitive financial data, customer information, and transaction records from multiple banks. Second, there is a risk of integrity degradation, such as the compromise of block integrity by altering the contents of the initial block, impersonation of legitimate software through signature tampering, and manipulation of digitally signed financial transaction records. In addition, there is an attack tactic referred to as "harvest now, decrypt later" (HNDL), which involves collecting encrypted data now and decrypting and exploiting it once CRQCs are fully deployed. This risk also

needs to be prioritized from the perspective of protecting data that financial institutions have to preserve over the long term.

(PQC Migration Response)

Given that the response to PQC entails a lengthy transition period and involves high degree of uncertainty, it is critical to set priorities, create a crypto inventory, apply an agile architecture, and develop and execute a transition plan. Regarding the deadline for the PQC transition, it is recommended that financial institutions complete the PQC transition of high-priority systems by the mid-2030s, since governments in various countries and regions have been promoting explicit timelines for the PQC transition, and international settlement services to which Japanese financial institutions have been connected may follow these timelines. My request to the management of financial institutions is to decide on a transition policy, allocate management resources, and establish a transition framework.

Presentation 3 "Challenges and Risks for Implementing Generative AI"

Presenter: Takashi Hosotani, Senior Vice President, NTT DATA JAPAN CORPORATION

(Challenges in Implementing Generative AI)

I would like to discuss some challenges and risks associated with the introduction of generative AI. According to a survey on generative AI, currently, while expectations for this technology are high, a high percentage of respondents show concerns about potential security risks or indicate that government regulations on AI are unclear, which stifles innovation and hinders

investment in the technology. As the scope of AI and data utilization expands into areas that require highly reliable outcomes, criteria for evaluating AI models have been shifting, from a simple measure of accuracy to areas that reflect social considerations like transparency and fairness as well as ethical considerations. In fact, examples of risks associated with the introduction of AI include privacy breaches and erroneous chatbot responses. Moreover, the content generated by generative AI has raised issues such as unintended bias, fake information, and the leakage of information by way of prompts.

(Risks Associated with the Implementation of Generative AI)

While conventional AI automates actions that are specified in advance, such as particular tasks, generative AI is characterized by the creation of content and deliverables based on instructions. The implementation of generative AI may introduce new risks or amplify existing risks, which suggests that conventional risk management practices will be inadequate here. Examples of risks associated with generative AI include rights infringement, product liability, data breaches, misuse or abuse by outside parties, privacy violations, and "hallucinations" (i.e., the generation of false or misleading information). While generative AI has a broad range of diverse applications and is expected to have a wide range of impacts, its associated risks are also growing.

(Major Legal Frameworks Related to AI)

Shifting the focus, I would like to overview the major legal frameworks related to AI. In Japan, although there is currently no dedicated law governing AI, the AI System Study Group within the Cabinet Office is discussing the

issue of AI with a focus on the balance between innovation and risk management, international cooperation, and other related topics. The use of AI requires compliance with existing laws, such as those governing copyright, the protection of personal information, and product liability. Amid international discussions of AI governance, including AI regulations in Europe and the G7's Hiroshima AI Process, relevant ministries and agencies in Japan are taking a more active approach to rule-making. The European Union's AI Act adopts a risk-based approach, categorizing AI by degree of risk and applying regulations accordingly.

(AI Governance by Financial Institutions)

From the perspective of financial institutions' implementation of AI governance, various measures must be taken in the use of AI in anticipation of issues specific to financial operations. In terms of operational guidelines, institutions will need to share AI use cases that are effective for operations at branches and administrative centers and formulate AI usage guidelines. In terms of utilization, they will need to broadly instill measures to protect copyrights in advertisements for financial products, and to safeguard the personal information of customers and employees and trade secrets. Major overseas banks have invested considerable resources (manpower, funds, and time) into AI governance, putting them ahead of financial institutions in Japan. Here, major financial institutions are taking the lead in formulating guidelines that take into account the risks of generative AI and working to implement the guidelines while building governance frameworks. According to the Financial Data Utilizing Association (FDUA) benchmark, most institutions in Japan currently fall between Level 1 and Level 2 (i.e., internal use of

generative AI), while some are making headway toward Level 3 (i.e., use of generative AI for customer service in keeping with technological advancements).

Although generative AI has great potential for use in serving customers, issues specific to financial institutions also need to be addressed. Specific challenges that have to be overcome include ensuring data quality (i.e., that data is accurate, up-to-date, and representative of financial data), maintaining security and privacy, countering the risk of erroneous results and decisions (such as the potential for generative AI to offer erroneous financial advice or decision-making), and ensuring regulatory compliance and internal controls (i.e., compliance with financial and legal regulations). Additionally, a strategic framework for consolidating internal resources and knowledge is needed to steadily increase the value of generative AI and enable its safe use. It is vital to build IT systems based on an established vision and roadmap (strategy), promote the generation of use cases as a business process, and establish an organizational framework (governance) to monitor and control the use of generative AI, while also pursuing human resource development.

Presentation 4 "Balancing Financial Innovation and Stability: AWS's Efforts to Support, Protect, and Strengthen Japan's Financial System"

Presenter: Norihisa Tsuruta, Director, Amazon Web Services Japan G.K.

(About Amazon Web Services [AWS])

I would like to discuss the balance between financial innovation and stability, focusing on AWS's initiatives. We launched global operations in 2006 as an independent systems division of Amazon. In Japan, we started up operations

in 2011 and have since lowered prices a total of 151 times while offering more than 240 services and workloads that allow customers to build systems as if they are putting together Lego blocks. This approach allows customers to significantly boost productivity, quickly carry out development, and start small compared to on-premise solutions, with the added flexibility of exiting easily. Additionally, since scale is automatically adjusted, there is no need to have servers in place from the outset with the processing capacity of peak periods. This model is not only a good fit for the financial sector, but also for customers in industries such as gaming and ticket sales.

(Recent AWS Results)

We launched some major projects last year. One was the migration of SBI Securities' entire equity trading system to AWS, which was completed in April and has been running very stably, with more than 13 million accounts. In addition, AWS has been hosting the system for Sumitomo Life Insurance's Vitality program, a product that provides information regarding disease prevention and other health advice when health information is entered into a smartphone app. Also last year, Fukushima Bank started to use a fully cloud-based banking system. This year, several banks, including Shimane Bank, are scheduled to begin running on AWS, and there are signs of a full-scale shift to cloud-based banking systems.

(AWS's Future Investment Policy)

In relation to the topic of this session, stable financial services, our aim is to deliver a stable social infrastructure in Japan by 2030. Over my 40 years of working with customers in finance, I have dealt primarily with on-premise

server systems. Roughly 80 percent of Japanese financial institutions' investment is in this area, while only 20 percent is allocated to customer contact and strategic initiatives. Unless this environment changes, Japanese financial institutions will struggle to become more competitive. We believe cloud computing can help address this challenge, and are eager to contribute, collaborating with financial institutions in human resource development and other areas to ultimately ensure a high level of global competitiveness.

Specifically, we plan to invest 2.26 trillion yen in Japan over the five years from 2023 to 2027. Part of this investment will be used to build and renovate data centers. We are also working to provide a reference architecture to support the security and resilience required by financial institutions and to strengthen our support services so that even critical business systems can use AWS with confidence.

(Efforts to Introduce Generative AI)

Finally, I would like to mention our initiatives in generative AI. We announced the launch of a new generative AI infrastructure model (NOVA). We developed our own chips for the base model, and prepared the Amazon Bedrock service, a platform for various large language models (LLMs). Additionally, we are assisting with the ad screening process mentioned earlier by Nomura Holdings. Furthermore, Nissay Asset Management is using our generative AI service to analyze its corporate synthesis reports, and both SBI Life Insurance and Saison Technology are incorporating our generative AI service into their call center operations. These firms are expanding the use of generative AI not only for internal purposes but also to support customer

service.

Presentation 5 "Tips for Stabilization from a FinTech Perspective"

Presenter: Toshio Taki, Executive Officer, Money Forward, Inc.

(What Has FinTech Brought?)

FinTech is no different from conventional finance in terms of functionality. Finance consists of various functions, and changes in technology and economic and social systems have altered the combination of various elements and tools, giving rise to new areas of finance, payments, and other fields.

One specific characteristic separating the financial industry from other industries is the area of authentication. For example, information contained in a bank transfer instruction becomes valuable only when authenticated. An interesting aspect of the financial industry lies in combining various technologies to achieve more sophisticated authentication. Blockchain is also considered to be a very significant technology if it can transform the discussion on authentication.

(Trends and Risks of Payment)

One trend in payment is the shift from payment by traditional credit card or check (although checks are rare in Japan) to payment by means of real-time bank transfers via API payment systems. There is also a trend away from traditional face-to-face transactions toward transactions via e-commerce services, with payment functions also being incorporated into these services (embedded finance). Amid these trends, actions are needed to mitigate the

risks of fraud and misdirected transfers.

Japan has account transfer services that entrust the amount of withdrawal to the counterparty, based on a high level of mutual trust. A challenge is how to handle this using APIs. In response to the view that this can be dealt with via credit cards, my question is whether that is a good idea, given that it comes at such a high cost to society as a whole.

On the one hand, since users choose payment services based on their advantages and convenience, efforts to increase the reliability of payment transactions may fail if not handled carefully. On the other hand, since high convenience makes human beings less attentive, it is also true that we cannot safeguard people unless we build a framework that take risks into account, even if we may have to resist calls for greater convenience. In this regard, there are many lessons to be learned from the incidents of unauthorized withdrawals through account transfers that occurred in 2020.

(The Future of Finance)

I would like to discuss how I see the future of finance in three scenarios.

The first scenario is a world where the banking experience becomes API-based and financial functions are embedded in the user interfaces of applications. In such a world, information is concentrated in the layer that is driving the transaction. As progress is made in offsetting credits and debts, the degree to which people use existing financial institutions will decline. In such a case, financial institutions will probably try to survive as know your business (KYB) and know your customer (KYC) aggregators, capitalizing on their strengths in authentication. At this point, I believe a key will be the

development of legal entity identifiers (LEIs), which are used to identify entities involved in financial transactions.

The second scenario is a world where the "four horsemen of the banking apocalypse" -- (1) e-KYC, (2) open banking, (3) instant account opening, and (4) read and write APIs -- are aligned and smoothly integrated, causing the assumptions that underlie indirect finance and asset-liability management (i.e., the belief that there will always be a certain amount of unused money) to collapse. From a customer's perspective, this may seem like a good thing, given the greater convenience it would bring, but it is possible that the preconditions for maintaining financial order may cease to hold.

The third scenario involves a future in which all types of discretionary contracts are managed by AI, which could lead to unforeseen risks. For example, a simultaneous transfer of funds in the same direction could create issues. The way for financial institutions to counter such an event would be to leverage their trustworthiness, differentiating themselves by taking custody of vital data and other non-financial data, which would allow them to offer advice based on a deep individual understanding of their clients.

Presentation 6 "Security Trends in the Financial Sector"

Presenter: Atsuto Suzuki, Associate Director-General, Head of Center for Information Technology Studies, Bank of Japan

(Cybersecurity Threats Changing Both Qualitatively and Quantitatively)

Cybersecurity threats are changing in both quantitative and qualitative terms.

First, in terms of quantitative changes, cyberattacks are proliferating at an unprecedented rate worldwide. By sector, education and government have seen the highest rates of increase, but financial services have also experienced a significant rise. Regarding qualitative changes, while most attacks that search for vulnerabilities still originate from overseas, unauthorized access (i.e., theft or exposure of confidential information) has been increasing in terms of the types of attacks.

I believe the backdrop of these quantitative and qualitative changes includes both (1) geopolitical factors and (2) the spread of generative AI.

(Heightened Geopolitical Risks)

With regard to geopolitical risks, cyberattacks by states for the purpose of espionage, disruption, political messaging, and economic gain are on the rise.

Espionage is a common type of state-sponsored cyberattack aimed at stealing military intelligence, intellectual property, or other sensitive information. Disruption with the goal of destroying infrastructure is increasing. Political messaging is also seen in attacks where hacktivists hijack the web pages of private firms to make political statements. Economic gain has been seen in attacks that are aimed at stealing crypto assets.

(Spread of Generative AI)

Generative AI is likely to be exploited in ransomware, targeted attacks, and business email fraud, which are high on the list of the 10 Major Security Threats published by Japan's Information-Technology Promotion Agency (IPA).

Three keywords that indicate the relationship between generative AI and malware used in cyberattacks are simplification, advancement, and efficiency. In terms of simplification, malware can now be created by conversational generative AI without specialized knowledge, and some arrests in this regard have been made in Japan. In terms of advancement, a British firm was defrauded of 200 million Hong Kong dollars (approximately 3.7 billion yen) after being tricked into sending money by a deepfake audio and video replicating the firm's CFO. In terms of efficiency, the time required to create phishing emails has been greatly reduced, which gives attackers a significant advantage.

(Technical Countermeasures)

Let me touch on the latest research trends regarding technical countermeasures.

First, in terms of phishing attacks, which are characterized by their ability to exploit the vulnerabilities of individual customers, research on cognitive security, which incorporates psychological elements, is ongoing. Research on countermeasures against false and misleading information is also progressing. In this area, nudges (to influence behavior), educational interventions (to influence competence), and rebuttal strategies (to influence beliefs) are considered to be effective.

Regarding deepfakes, research has already shown that it is difficult to construct a general-purpose detection model that can address all of the deepfakes constructed by different generation methods. It is thus necessary to combine multiple detection models. Another challenge is the lack of a

framework for evaluating detection methods side-by-side. Furthermore, e-KYC authentication involves challenges such as low accuracy in determining the authenticity of video and the difficulty of detecting cut-and-paste edits of authentic video, indicating that human inspections remain important.

(Institutional Countermeasures of Financial Institutions in Japan, Conclusion)

The Financial Services Agency (FSA) Guidelines for Cybersecurity in the Financial Sector, released in October 2024, lay out in an easy-to-understand manner the actions required of management, boards of directors, and others in terms of cybersecurity. The FSA and the BOJ have also conducted a survey on cybersecurity. The results show that regional financial institutions have made headway in their cybersecurity efforts, but that challenges related to human resources and third-party management remain.

Cybersecurity is changing in both quality and quantity as a result of geopolitical risks and generative AI. The keys to countering this involve initiatives by financial institutions themselves, mutual aid, and public assistance. From an academic perspective, while privacy concerns must be taken into consideration, carrying research forward calls for building a well-developed dataset on cybersecurity through cooperation across financial institutions.

(2) Panel Discussion

【Q1: Comparison of Risks under Digitalization】

– In the next five years, what are the most significant risks that could become more serious as digitalization progresses?

(Shin'ichiro Matsuo, Research Professor, Georgetown University)

I consider it a major risk that the demarcation of responsibilities in the event of broken cryptography is ambiguous, and that the responsibilities and the burden of damages are not clearly written into contracts. This situation has remained unchanged for about 20 years since the previous transition to public key cryptography. Cryptography is inherently something that can be broken, but people continue to believe that that can't happen.

The current situation has become complicated, as software is deployed in a state where technology and the use of cryptography have both become more complex. Potential risks must be addressed by working backward from the demarcation of responsibilities. If we don't start thinking now about how to deal with these challenges, we will suffer somewhere down the road.

(Osamu Terai, Group Executive Officer, Mizuho Financial Group, Inc.)

Until around 2005, the banking system in place in Japan consisted of a limited number of stakeholders and was simple to understand. Now, the expansion of stakeholders makes it difficult to grasp the full extent of risks posed by the supply chain. Furthermore, exposure to risk is growing because an attack on one part of the supply chain may halt an entire business and result in information leaks. It is also difficult to align risk management levels when financial and non-financial institutions are connected but have different supervisory authorities. The same holds true for post-quantum cryptography (PQC), where there are challenges in understanding the location of risks and coordinating with relevant parties. Risk management for new technologies is becoming increasingly difficult.

(Takashi Hosotani, Senior Vice President, NTT DATA JAPAN CORPORATION)

We can point to new vulnerabilities arising from the use of AI and the increasing sophistication of attacks by means of AI. We might address individual risks by taking our own countermeasures or, in difficult cases, through mutual assistance. In responding to the sophistication of attacks, it is fundamental to share information and take countermeasures in a timely manner, as attack methods continuously evolve. It is also crucial to introduce control mechanisms, such as "human-in-the-loop" (HITL) checks on AI processing.

(Norihiro Tsuruta, Director, Amazon Web Services Japan G.K.)

The expansion of supply chain risk is also felt from the standpoint of cloud service providers. In this regard, our aim is to enhance the resiliency of cloud services and widely share best use practices with stakeholders. Another challenge is that about 80 percent of IT investment in Japan goes to legacy systems, which pose the greatest risk. The key to utilizing new technologies lies in developing and securing human resources, and I believe this will become increasingly critical in the areas where financial institutions compete.

(Toshio Taki, Executive Officer, Money Forward, Inc.)

Many scams involve the theft of cash held at home or the use of ATMs with four-digit PIN numbers obtained by fraud; the common denominator is that these all involve human beings. Actions done by hand and manual entry are the root of the risk, so reducing such actions is vital. I believe reducing actions done by hand and manual entry is a key task for FinTech. Also, in Japan, there

is too much stress on perfectionism and a low tolerance for failure, which fails to prevent over-investment in some cases and impedes investment that is at an appropriate level overall. This in itself poses a considerable risk.

(Atsuto Suzuki, Associate Director-General, Head of Center for Information Technology Studies, Bank of Japan)

Fundamentally, I believe the greatest risk is people. For example, in the case of the theft of high-value crypto assets, it was not due to vulnerabilities in the system, but rather because of malware downloaded from an external email. In this way, people who can't keep up with technological advances may fall into a security gap. On the other hand, people's cognitive abilities themselves are advanced and effective at defending against fakes. As a response to risk, the Financial ISAC, a platform for mutual aid among financial institutions, is effective and active in sharing information and hosting working groups.

【Q2: What digital technologies most interest you right now?】

- Which digital technologies do you think will most significantly change financial intermediation activities and the management of financial institutions over the next five years?

(Toshio Taki, Executive Officer, Money Forward, Inc.)

If I had to pick only one, I would choose the in-house use of generative AI. It was formerly said that customer support was the largest use case for this technology, but generative AI can also be used to perform functions that until now were handled by middle management, such as matching personnel,

identifying candidates for training and conducting one-on-one interviews, and so on. The labor-saving impact of generative AI should be more pronounced in industries with a high overhead ratio. Financial institutions will see significant benefits because of their large middle manager headcount.

(Noriyoshi Tsuruta, Director, Amazon Web Services Japan G.K.)

New technologies such as quantum computing, AI, and robotics are emerging and will have a significant impact over the next five years. Going forward, though, it's hard to predict what other technologies will emerge. Paradoxically, as our founder Jeff Bezos often points out, it's a good idea for us to relentlessly pursue user needs that are likely to remain constant even down the road, such as low cost, a wide range of choices, and fast delivery to consumers. By addressing these needs and combining the best technologies available at the time, we can create new services.

(Takashi Hosotani, Senior Vice President, NTT DATA JAPAN CORPORATION)

I believe the impact of the evolution and application of generative AI will be significant over the next five years. Generative AI is repeating the "short cycle," in which new technologies emerge to make up for obsolescence before the old technologies enter the disillusionment phase of the Hype Cycle (a taxonomy consisting of five phases of expectations for a particular technology, including the technology trigger and the trough of disillusionment). I believe various financial operations will be able to accomplish numerous tasks at a speed beyond the scope of common sense today, thanks to generative AI. For example, I believe it will be possible to develop advanced credit scoring,

robotic advisors and advanced market forecasting in asset management, as well as enhanced fraud detection to ensure the security of payments.

(Osamu Terai, Group Executive Officer, Mizuho Financial Group, Inc.)

Although this may not be a direct answer, I believe that, to incorporate digital technology in the future, Japan's financial institutions and others need to get used to and better tolerate situations where the future is uncertain.

In this context, I believe generative AI should be promoted for efficiency purposes, as it generates visible results. On the other hand, in areas like product development where it takes time to see results, it may be harder to implement generative AI. Although finance has a culture that does not tolerate ambiguity, I believe it is important to shift this mindset to take advantage of technologies like generative AI and quantum computing, which deal with things that cannot be quantified in black-and-white terms.

(Shin'ichiro Matsuo, Research Professor, Georgetown University)

Because authentication and encryption, as mentioned, are becoming more complex, it is important to develop technologies and frameworks for utilizing them safely. I believe various security incidents have occurred because these areas are inadequately developed. Although such areas are difficult to monetize, the more widespread use of appealing technologies and services is not possible unless robust security measures are in place.

【Q3: What aspects of the digitalization of the real economy interest you most?】

– Digitalization is moving forward not only among financial institutions but also

across society in general. What are some trends you are paying attention to in relation to financial services?

(Takashi Hosotani, Senior Vice President, NTT DATA JAPAN CORPORATION)

I'm paying attention to the way that digitalization firmly connects commercial and financial flows, in the sense that, from a macroeconomic perspective, this will improve the social costs and speed that have been impeded until now by the fact that the two flows were separate. Additionally, from the perspective of non-financial firms providing financial services, I think it is crucial to expand financial service design from the customer's point of view, and I expect this trend to spread.

(Toshio Taki, Executive Officer, Money Forward, Inc.)

The expansion of the e-commerce economy is making headway in Japan as well, significantly contributing to growth in the proportion of cashless payments. Moreover, as seen in the case of overseas restaurants and some fast food restaurants in Japan where customers use apps to make purchases, apps are making inroads even into physical locations, and I consider the shift from the brick-and-mortar store experience to e-commerce to be an important trend.

I predict that discretionary investment management services in the areas of consumption (discretionary consumption management services) will emerge going forward. This may sound unrealistic, but similar services already exist, such as in cruise ship packages and home nursing care services that predict what consumers will want and provide services accordingly. However, the

more such services increase, the greater the risk that consumers may act carelessly. Technologies that safeguard such consumers, including the area of financial services, will be important.

【Q4: What technological innovations over the past 20 years have you paid attention to?】

– What technological innovations over the past 20 years have had the greatest impact on financial services?

(Shin'ichiro Matsuo, Research Professor, Georgetown University)

Cryptography, which started out as a weapon, first became available in 2000 when technical restrictions were lifted in the U.S. Since then, public key cryptography has become widely available, with secure communication technologies such as SSL and TLS now being utilized. Such secure communication has made it possible to safely use banks' services online. Another significant advance is that cryptography has further evolved into modern cryptography that has used theorems to prove the security of the mathematical components of ciphers. Such progress has pared down the issues involved with encryption key security to the question of encryption key management. Even though this is where the risks are now concentrated, however, it is also of note that many people have forgotten the importance of key management. When something becomes more convenient, risks often shift to specific areas, so I think it is important to identify where most of the risks are.

(Atsuto Suzuki, Associate Director-General, Head of Center for Information Technology Studies, Bank of Japan)

Smartphones have continued to improve in terms of convenience, and even now I consider them to be a remarkable technological innovation. At the same time, attacks targeting smartphones have been proliferating and becoming more sophisticated. For this reason, authentication and the construction of secure protocols are becoming increasingly critical, although this is a long-standing and recurring topic. For example, people commonly use two-factor authentication and tend to think that is adequate. Even with two-factor authentication, however, a "man-in-the-middle" (MITM) attack can still extract information between the bank and the server. Smartphones are currently what are provoking this renewed debate.

【4th Session: Concluding Remarks】

Speaker: Noriyuki Yanagawa, Professor, University of Tokyo

In a word, this has been a truly wonderful and fulfilling symposium. Although there's little more that I can add, I'd like to share my summary and impressions.

(What Are Advanced Financial Services?)

Given the theme of this workshop, I started thinking about the basics. In the midst of changes in the environment, what exactly are financial services? The sphere of financial services has begun to extend beyond what so-called financial institutions have traditionally done. I would like to make a few comments about which aspects of "advanced financial services" are actually becoming more advanced, and what kinds of changes make financial services more advanced.

First, there was a comment in the workshop that a higher level of trust might make financial services advanced in a sense. I think this is one important point. Not only digital technologies but also analog human relationships help to establish trust. Financial institutions have cultivated such relationships, which might be one of their competitive strengths. I think a key point is how to leverage this strength in their business, as generative AI and other technologies develop.

Second, although I agree that fulfilling some types of customer needs may make for "advanced" financial services, I don't yet feel that we've seen enough of which needs should be or can be fulfilled. From a different perspective, it is still unclear to me where the significant business opportunities for financial institutions lie. There was a comment that financial institutions are stepping into the non-financial sphere and providing various types of non-financial advice to customers, which raises the fundamental question of what financial services actually are. In relation to this topic, other comments mentioned that data could play a meaningful role in understanding customer needs and offering the right services to meet those needs. While I agree with those comments, I also have some concerns. One is the issue of privacy. The big question may be whether financial institutions can use personal data to provide services that are so convenient that retail customers feel they cannot help but hand over their data. Another concern is whether analyzing personal data truly leads to more convenient services. Many people may believe that it does, with the aid of generative AI. I think that simply collecting data may not be enough, however, and see significant challenges ahead.

Third, I would like to discuss the aspect of enhancing convenience. Greater

convenience is desirable for financial services, regardless of whether or not data is utilized. For example, there was a comment that it would be highly convenient for customers if financial institutions could provide virtually all services online (accessible via smartphone) without requiring them to visit a branch. Regarding generative AI, rather than simply using AI to obtain information, I think a key feature of the technology is that it can better understand information users provide and respond accordingly. Even if a user asks a question in an ambiguous or analog way, AI can grasp what the user intends and respond appropriately. Personally, I think this feature of generative AI holds great potential for improving customer convenience.

(Efficient Business Operation by Utilizing Digital Technology)

When it comes to convenience for the financial institutions utilizing digital technology, there were comments suggesting that operational efficiency could be significantly improved, particularly by leveraging generative AI. While I agree with those comments, I believe we need to keep several points in mind. First, a prerequisite is that the digitalization of information moves forward. Second, digital transformation in a broad sense cannot be effectively achieved unless the purpose of it is clear, including what needs to be achieved and how to achieve it. Third, to achieve the purpose, it is necessary to review and reorganize the entire business process. Fourth, the commitment of top management is clearly essential in successfully carrying out these changes.

(Security Issues)

Although I'm not an expert in the security issues discussed in the latter half of the workshop, I was convinced that we need to take these issues seriously

to firmly support advances in financial services and the enhanced convenience mentioned earlier. Many aspects of the security challenges are related to cryptography, quantum computing, AI-generated fakes, cognitive issues, and risks to the stability of certain systems. Each challenge requires its own response, which makes the task even more daunting. This was a key takeaway for me in the second half of the workshop. There were comments about the necessity of clarifying who is responsible and how that responsibility should be allocated in society, as well as the need to recognize that these issues are not just for engineers but for the social system as a whole. I found these comments very important. I was keenly aware that addressing security issues means creating an appropriate system for society as a whole by adjusting laws, regulations, institutions, and business processes.