

Investigating the design of the retail payment system: Focusing on the retail payment sector in Japan

by

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ABSTRACT

Globally, a variety of innovative technologies are emerging and traditional economic activities are gradually shifting to the digital economy. Among these, in the retail payment sector, which deals with customer contact and payment information, a trend to review interbank retail payment systems is occurring in many countries. The UK initiative has led the way, and similar efforts to instantiate and remake retail payment systems into new systems have been underway in various countries. One of the reasons of the reviews is the fact that, from the user's point of view, there are many aspects of payment services provided by companies that are not user-friendly. In the Japanese retail payments sector, there are various issues such as lack of interoperability, and the government and the banking industry are working to improve these issues.

This paper focuses on providing recommendations for the Japanese case. It examines the state of the retail payment systems, considering the payment systems as a quasi-public social infrastructure that can affect all industries, rather than simply a system in the financial sector. More specifically, this paper focuses on the interbank retail fast payment systems and mobile payments based on it, while taking a broad view of the retail payment system, including its regulatory framework. There are various stakeholders with different perspectives in the retail payment system, and the central bank has a neutral perspective and can be the best entity that could provide the system. In reviewing the retail payment system, it is desirable for stakeholders to compare multiple design options and make decisions after clarifying the performance and functions they need. In the Japanese case, the best design option in the short term would be to utilize the banking industry's CoTra system while applying regulations to ensure interoperability, and in the long term, the central bank could provide the system, including the issuance of Central Bank Digital Currency (CBDC). This paper aims to provide a new perspective to stakeholders of the Japanese retail payment system and contribute to the discussion on the future review of it.

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This thesis is dedicated to you, one of the stakeholders of the retail payment system. With you, the future of the system looks brighter than the past.

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Table of Contents

| | | |
|----------|---|-----|
| 1 | Introduction | 10 |
| 1.1 | Short Overview of Thesis Objectives, Structure, Methodology, and Findings Summary | 10 |
| 1.2 | Research Motivation | 13 |
| 1.3 | Research Objective | 16 |
| 1.4 | Research Questions | 17 |
| 1.5 | Methodological Approach | 18 |
| 1.6 | Definitions and Scope | 19 |
| 1.6.1 | Definitions of Payment and Settlement | 19 |
| 1.6.2 | Definition of Retail Payment System | 21 |
| 1.6.3 | Research Scope in the Field of Payment | 21 |
| 2 | Overview and Analysis of the Japanese Payment System | 23 |
| 2.1 | Overview | 23 |
| 2.2 | Regulatory Framework | 24 |
| 2.3 | Functions of the Retail Payment System | 29 |
| 2.4 | Performances of the Retail Payment System | 33 |
| 2.5 | Recent Policy Changes in Japan | 37 |
| 2.6 | Trends in the Banking Industry in Japan | 40 |
| 2.6.1 | Commercial Banks | 41 |
| 2.6.2 | Central Bank | 43 |
| 2.7 | Stakeholders | 45 |
| 2.7.1. | Classification of Stakeholders in the Retail Payment System | 47 |
| 2.7.2. | Comparison of Viewpoints on Stakeholders | 54 |
| 2.7.3. | Stakeholder Needs | 65 |
| 3 | Reference Cases of Overseas Payment Systems | 69 |
| 3.1 | Reference Cases | 69 |
| 3.2 | Trends in the Reference Cases | 70 |
| 3.3 | Characteristics | 77 |
| 4 | Architectural Design Options and Analysis | 88 |
| 4.1 | Desired Performances and Functions | 89 |
| 4.2 | Architectural Options | 98 |
| 4.3 | Design Options | 104 |
| 4.4 | Evaluation of Design Options | 119 |
| 5 | Conclusion | 125 |
| 5.1 | Recommendations for Japan | 126 |
| 5.2 | Future Work | 133 |

Table of Figures

| | |
|---|-----|
| Figure 1 Legal framework and main function for typical services and systems in the Japanese retail payments sector (not comprehensive)..... | 31 |
| Figure 2 Stakeholder prioritization example for the hybrid car (Edward Crawley et al. 2016) | 55 |
| Figure 3 Zengin-Net’s viewpoint on stakeholder prioritization | 58 |
| Figure 4 Bank of Japan’s viewpoint on stakeholder prioritization..... | 61 |
| Figure 5 PSPs’ viewpoint on stakeholder prioritization..... | 64 |
| Figure 6 Comparison of viewpoints on stakeholder prioritization | 65 |
| Figure 7 Focuses of possible design options for the Japanese payment system..... | 107 |
| Figure 8 Zengin EDI (ZEDI) system (Japanese Banks’ Payment Clearing Network, 2010) | 108 |
| Figure 9 Programmability in CBDC (Bank of Japan, 2022)..... | 134 |

Table of Tables

| | |
|--|-----|
| Table 1 Main problems in the Japanese retail payment system | 34 |
| Table 2 Recommendations on the Japanese retail payment system made by the Japan Fair Trade Commission (Japan Fair Trade Commission, 2020a, 2020b)..... | 38 |
| Table 3 Action plan of the Growth Strategy and reported actions (Cabinet Secretariat, 2020, 2021) | 39 |
| Table 4 Categories of stakeholders (not inclusive) | 48 |
| Table 5 System owner needs (not inclusive)..... | 66 |
| Table 6 Stakeholder needs | 66 |
| Table 7 Retail fast payment systems in reference countries..... | 71 |
| Table 8 Faster Payments Effectiveness Criteria (Faster Payments Task Force, 2016) | 83 |
| Table 9 Desired performances perspectives | 90 |
| Table 10 Relationship between the problems in Japan and the desirable performances | 93 |
| Table 11 Main architectural options to define design options..... | 99 |
| Table 12 Architectural options..... | 106 |
| Table 13 Evaluation on design options | 120 |

1 Introduction

1.1 Short Overview of Thesis Objectives, Structure, Methodology, and Findings Summary

The purpose of this paper is to provide a new perspective to stakeholders in the retail payment system and contribute to the discussion of future retail payment system reviews. Globally, a variety of innovative technologies are emerging and traditional economic activities are gradually shifting to the digital economy. Among these, the retail payment sector, which deals with customer contact and payment information, is an area that will benefit greatly from the transition to the digital economy. It has been noted that the retail payment system has become more public than a single service, as a platform offering various business opportunities. Against this backdrop, a trend to review interbank payment systems is occurring in many countries, including Japan. Various countries have been reviewing their retail payment and settlement systems, and Japan has just started the review and is in the phase of considering specific designs.

Therefore, this paper examines the retail payment systems by considering them as a quasi-public social infrastructure that can affect all industries, rather than simply a system in the financial sector. The paper discusses cases from various countries, while proposing possible system design options for the Japanese case. The issues in this area are difficult to deal with from a policy perspective because there are many stakeholders, status quo bias is likely to be at work, and the area requires extensive industry knowledge. Therefore, this paper aims to contribute to future discussions by organizing the complex issues and presenting possible options for solving the current problems.

Chapter 1 describes the objectives of the study, the definition of retail payment system, and the scope of the study, focusing on the retail fast payment systems and mobile payments based on it, but also including other payment instruments and regulatory frameworks to provide a bird's eye view of retail payment system.

Chapter 2 presents the current state of the retail payment system in Japan, including their functionality and performance, the regulatory framework and recent initiatives by the government and industry, and analyzes stakeholder needs. Various challenges exist in the Japanese retail payment sector, including a lack of interoperability, and efforts are underway by the government and the banking industry to improve the situation. Various stakeholders exist, but their perspectives differ, with the central bank having the most neutral perspective.

Chapter 3 presents five country case studies that can be used as references for the design of retail payment systems, covering the cases of the UK, Australia, the US, Sweden, and Singapore, introducing the flow of study for each country and then presenting a wider range of case studies for each notable feature of retail payments. The UK initiative has been preceded by similar efforts in various countries to instantiate and transform retail payment systems into new systems, but the details of these efforts vary from country to country.

Chapter 4 analyzes possible designs for the retail payment system in Japan, based on the Japanese environment. For each retail payment system provider, which is central bank, commercial banks, or a dominant payment service provider (PSP), we present and evaluate

possible desirable retail payment system design options. In the short term, the banking industry's Cotra system could be a good option for ensuring interoperability and regulation, while in the long term, the central bank could be a good option for providing the system, including issuing Central Bank Digital Currency (CBDC).

Chapter 5 makes several recommendations regarding the review of Japan's retail payment system. The paper views the retail payment system in a broad sense, including related legislation, and discusses several possible options and expected actions to materialize them in order to resolve problems with the current system.

Summary of Findings: The paper suggests that, in the long term, the most desirable option is for the Bank of Japan (BOJ) to provide a retail payment system with a neutral perspective, and in the short term, the most desirable option is for the government to be involved in increasing the number of banks participating in Cotra, which is currently under development. The report outlines some expectations of key stakeholders for its concretization. The Bank should consider retail payment systems from a broad perspective that is not limited to CBDC, and CBDC should be discussed carefully to ensure that it is as acceptable as cash, and still proceed to materialize each point of discussion. The government should keep a close eye on developments in the retail payment sector and consider how government intervention and regulation should be implemented, such as ensuring interoperability, reducing fees for retail payments, making open APIs (Application Programming Interfaces) mandatory for fund transfer operators to make an effort, and continuously examining interbank fees. Cotra should be involved in the future Cotra should promote the design of a system that does not provide incentives to reduce the frequency

of remittance of mandate management functions and functions that enable the exchange of settlement-related information when building the system. Zengin-Net, the system owner of the interbank payment system called Zengin-system, should consider plans for a major renewal of its system in the future in an open manner. In addition, this chapter also presents a wide range of other perspectives on future work that could not be addressed in this study.

1.2 Research Motivation

Globally, traditional economic activities are gradually shifting to the digital economy. The emergence of a variety of innovative technologies and the establishment of the necessary foundations for the digital economy, such as mobile devices, the Internet, and the cloud, have led to the creation of innovative products, services, and new business models in a variety of fields in recent years. Since these innovations have the potential to enrich people's lives, they must be well controlled and widely utilized by humans to enjoy the benefits of affluence.

In the field of retail payments, too, an environment has been created in which innovative products and services can emerge. The widespread use of smartphones has created an environment in which digital payments are more easily accessible, as people carry high-function devices with constant access to the Internet. The advance of digital payments also opens up the possibility of utilizing payment-related information. Data is very important in today's economic activities, and payment information is particularly important for marketing, as it often reveals a person's behavior, value judgments, relationships with other companies, and connections.

In addition to the technological environment, retail payments have advantageous features that further increase the benefits derived from the transition to a digital economy. That is, the payments sector is characterized by the ease with which it can connect with its customers. In the payments sector, anti-money laundering regulations require that the identity of customers be verified before they can use payment services that allow cash withdrawals. As a result, they have strong points of contact with their customers, which is important in the digital economy.

Moreover, retail payment systems with such characteristics are likely to become more public with the transition to the digital economy. With much greater opportunities to provide other services based on customer contacts and account-related information built up in the retail payment sector, the retail payment system will become more public as a platform that provides a variety of business opportunities rather than a single service. For example, in the UK, the retail payment systems were even considered an "essential facility" from a competition policy perspective. Thus, the retail payments sector has a great deal of potential to gain from the transition from traditional economic activities to the digital economy.

On the other hand, even if such new products and services are technologically feasible for practical use, they often fail to become widespread due to various other complex obstacles to their widespread penetration in society. Even in the field of retail payments, diverse stakeholders have acted on their different interest structures, resulting in services that are not necessarily desirable from the end-user's perspective being insufficiently provided. In addition, cases have arisen where it has been pointed out that, as a background to this, competition among firms is not adequately ensured. In Japan, there has been a situation in which various payment services have

become disorganized and user costs have not been sufficiently reduced despite technological innovation, and the service environment is not ideal for users. In Japan, the competition authorities have even issued recommendations to improve the current situation in the retail payment sector.

Against this backdrop, there is a trend to review interbank payment and settlement systems in many countries, including Japan. Discussions on CBDC and the establishment of CBDC are also becoming more active in many countries (Bank for International Settlements, 2020). Such movements can be seen as a move to change the undesirable status quo by reforming the underlying system, or as a move to change what has become possible through technological innovation by making it practical and changing it into a desirable society.

Therefore, this paper examines the state of the retail payment systems, considering them as a quasi-public social infrastructure that can affect all industries, rather than a simply system in the financial sector. From a broader perspective, the paper will examine how payment systems can contribute to the promotion of innovation and industrial development by removing various complex obstacles that prevent new products and services from being put to practical use and widely penetrating society.

Issues in this area are difficult to handle from a policy perspective because the stakeholders are complex, the status quo bias is likely to be activated, and the field requires technical expertise and extensive industry knowledge. Therefore, this paper aims to contribute to future discussions

by laying out the complexities of the issue and presenting options for resolving the current challenges.

1.3 Research Objective

The purpose of this paper is to provide a new perspective to stakeholders in the retail payment system and contribute to the discussion of future retail payment system reviews.

As its stakeholders, this paper has in mind, first and foremost, the stakeholders of the Japanese retail payment system. It presents a more specific argument for Japanese stakeholders by proposing a design for the system that fits the Japanese environment, based on cases from other countries. As the second stakeholder, this paper has in mind the stakeholders involved in retail payment systems in countries that may be reviewing their retail payment systems in the future, especially policy makers at regulatory authorities. The process of how the review was conducted in a particular country environment, based on overseas case studies, will be a useful reference for policymaking in countries other than Japan.

The new perspective presented by this paper is a bird's eye view of the retail payment system and material for discussion of a review of the retail payment system. First, each of the seemingly disparate developments, such as the provision of payment services by PSPs, the discussion of the review of interbank payment systems, and the central bank's consideration of retail CBDC, are related to each other in terms of the functions provided by retail payment systems from the user's

perspective. By considering these various related factors and organizing the relationships, the intent is to provide a higher-level view of the retail settlement system. It is also intended to provide material for discussion of the retail payment review by presenting and evaluating several possible design options through analysis of the system design.

1.4 Research Questions

Given the aforementioned objectives, the most important question this study analyzes is "What design of retail payment system should be established in Japan?" In order to analyze the answer to this question, it is necessary to answer multiple questions. These questions and the chapters and sections that answer them are as follows:

Main Question:

- What is the desired design of the retail payment system in Japan?

Sub Questions:

- What are the needs of stakeholders?
- What functions are required of the system?
- How to evaluate the performance of the system?
- What options are available for system design?
- What are the results of the evaluation of each design option?

Supportive Questions:

- What is the current state of the retail payment system in Japan?
- What examples of payment systems are there in the world?
- What are the architectural options for designing the system?

1.5 Methodological Approach

This study analyzes the desirable system design of Japan's retail payment system by combining system design analysis methods and case studies from various countries.

First, the analysis process in this study is designed with the system architecture analysis methodology in mind. However, this study does not apply the proposed methods and notations as they are, but rather incorporates and utilizes the essence of the ideas that may be useful in the analysis of the topic taken up. The basic concepts of system architecture analysis methods are extremely versatile. However, they often focus on a specific project of one company for analysis. The scope of this paper takes a broad view of systems, including legal frameworks, rather than just specific systems, and since multiple projects and services are the subject of analysis, the emphasis is on a bird's-eye view rather than designing detailed IT systems. As a result, the emphasis has changed with respect to general system architecture analysis methods. Because of such a broad perspective, the target system provider itself is one of the system design options in this paper, and the comparative evaluation of these options is carefully conducted. In addition, since the readers of this paper are assumed to be those who are unfamiliar with system

architecture analysis methods, the paper is presented in a plain manner, avoiding expressions unique to system architecture such as Object Process Methodology (OPM), which are considered to have a large cognitive load for them.

Also, in constructing the system architecture options that shape the system design options, this study aimed to increase the feasibility of the options by combining case studies from different countries. Unlike a single company creating a new product that does not exist in the world, the theme of this paper is one for which there are examples of initiatives already underway in other countries, even if the situation in each country is different. Therefore, there are already some solutions being implemented or planned in different countries and regions. By incorporating such things into the options, we aim to constitute an option that has a certain degree of feasibility.

1.6 Definitions and Scope

1.6.1 Definitions of Payment and Settlement

In preparation for defining the scope of this paper, this section provides definitions of basic terms. First, for the purposes of this paper, the definition of settlement, as explained by the Bank of Japan (BOJ), refers to "the delivery of money in order to complete a promise to exchange something of equal value with another person." On the other hand, more strictly, payment is defined by the Bank for International Settlements (BIS) as "the transfer of a monetary claim by the payer to a party acceptable to the payee." This is the definition of payment because a

transaction creates a claim or obligation and a settlement resolves a claim or obligation, but a definition that includes a "transaction," a promise to exchange something of equal value with another person, would be easier to understand by stakeholders unfamiliar with the financial sector.

To add to the discussion of the purpose of settlement, it is interpreted that the purpose of people settling is to reduce the "credit risk" or "liquidity risk" they assume. The risk that you will not receive money from the person who was supposed to pay you and you will lose money is called "credit risk." The risk that the money you are supposed to receive from someone will not be paid by the time you use it and you will not be able to make your payment is called "liquidity risk." Therefore, it should be noted that in a credit-based society and economy, the need for payment may diminish when such risk is small.

Next, this paper uses the BOJ's explanation of the definition of retail payments, which refers to "payments among users of payment services, such as individuals and firms." In the payments sector, there are three tiers: (1) end-users of payment services such as individuals and firms, (2) banks, and (3) central banks. Payments among end-users are called "retail payments," and payments among banks are called "wholesale payments." By contrast, "Retail payment" is sometimes referred to as "small payment," while "wholesale payment" is sometimes referred to as "large payment. However, this paper will not use the definition because very small settlements are also made between banks, and firms may make large settlements with bank deposits.

1.6.2 Definition of Retail Payment System

For the purpose of this paper's analysis from a broader perspective, the definition of payment system refers to a country's entire payment system, which includes not only the network facilities, rules, and other organizational mechanisms for making payments, but also the related laws and regulations. According to the BOJ, "In some cases, the payment system includes relevant laws and regulations, and the term is used to refer to the entire national payment system." On the other hand, according to the the Bank for International Settlements (BIS), a payment system is "A set of instruments, procedures, and rules for the transfer of funds between or among participants; the system includes the participants and the entity operating the arrangement." This is treated as a narrow definition of a payment system.

For the purposes of this paper, a retail fast payment system is defined as a system that is available almost 24/7 to process retail payments and make funds immediately available to recipients.

1.6.3 Research Scope in the Field of Payment

First, the services and systems of particular interest in this paper are retail fast payment systems, which are primarily operated by the banking industry and on which mobile payments are provided. Existing payment methods such as card payments will be included in the analysis from the perspective of understanding current issues, but the focus will not be on the systems that

support them. In addition, as mentioned above, the payment system is considered in a broad sense, and the analysis will cover not only systems such as network facilities, but also regulations related to the payment sector. Wholesale payments, on the other hand, will not be included in the focus.

1.7 Brief overview of International Trends in Redesigning Retail Payment Systems

This study considers a comparative analysis of five countries to draw lessons for Japan. In the U.K., from the perspective of competition policy in the financial sector, the government has taken the lead in envisioning the future of the retail payment system under the leadership of various stakeholders and has promoted system development, serving as a role model for other countries. Taking the example of the UK as a reference, other countries have also made progress in reforming their retail payment systems. In Australia, regulators have been proactively gathering input from various stakeholders as they implement reforms; in the United States, central banks are working to improve the lack of interoperability; in Singapore, regulators are flexibly adopting effective measures from other countries, while also developing their own policy measure on interoperability; and in Sweden, private banks have been cooperating to revamp the retail payment systems to meet the needs of users.

The individual retail payment systems in the review process have been characterized by different options from various perspectives. These include system ownership, non-bank participation,

publication of effectiveness criteria, system structure, and regulations of interoperability, open APIs, and payment fees.

2 Overview and Analysis of the Japanese Payment System

2.1 Overview

From the end-user's perspective, the Japanese retail payment system provides the ability to take custody of the end-user's funds and pay those funds to others. There are different regulatory frameworks depending on the risk of the payment service.

The functions provided by the Japanese retail payment system are not uniformly provided from the end-user's perspective. It may be easy for payment service providers to concentrate on areas that are attractive to them. There are many areas that could be improved, including interoperability, data openness, end-user fees, merchant fees, clearing of merchant revenues, stakeholder coverage, none-bank participation, safety and security.

In terms of policy trends, in 2020, the JFTC released a report on its investigation of cashless payment practices, which recommended a review of interbank commission practices, strengthening the governance structure of the Zengin-Net, and opening up access to the Zengin-system for non-banks. The government's overall policy is to support the recommendations of JFTC, while considering the "construction of a new settlement system focusing on frequent,

small amount payments." The policy also indicated that a demonstration of CBDC would be conducted.

The banking industry has been working on a task force on next-generation fund settlement systems, preparations for non-banks (fund transfer companies) to join the Zengin-system, launching a group to improve the convenience of high-frequency small-lot payments, changing the way the Zengin-Net Expert Committee operates, and open APIs. Although the BOJ has no plans to issue CBDC, it is providing a forum for discussion among various stakeholders and is conducting a CBDC demonstration experiment.

2.2 Regulatory Framework

This section introduces the main legal frameworks that should be taken into account when considering the design of Japan's retail payment system.

From the end-user's perspective, the function of a payment service is A) to receive funds and B) to pay others with the deposited funds. Depending on the risk of these functions, there are different regulatory frameworks under the Banking Act and the Payment Services Act, and for services that allow cash conversion, the Act on Prevention of Transfer of Criminal Proceeds requires authentication when using such services.

From the end-user's perspective, the functions of a payment service are A) to receive funds on deposit and B) to pay others with the deposited funds. The function of having funds deposited can be broadly classified into three categories: A1) "deposits" under the Act Regulating the Receipt of Contributions, Receipt of Deposits and Interest Rates Article 2.2, A2) funds for settlement deposited with a fund transfer agent under the Payment Services Act Article 51, and A3) unused balances deposited with a provider of prepaid means of payment under the Payment Services Act Article 3.2. Depending on which of the A1-A3 measures is chosen, the risk from the end-user's point of view varies. Roughly speaking, A1, A2, and A3 are considered to be less risky in that order.

For A1, the bank lends to others, but the settlement obligation is fully protected. Banks are subject to regulations prohibiting other businesses and capital adequacy ratios to ensure the soundness of their operations, and in preparation for the event of a possible bank failure, they are covered by the deposit insurance system under the Deposit Insurance Act Article 69-2.

With regard to A2, although funds transfer operators are supposed to protect an amount equal to or greater than the funds deposited by users under the Payment Services Act Article 43, it has been pointed out that, in the event of a failure of a funds transfer operator, it would take longer in practice to make refunds than in the case of a bank. Specifically, in the case of a bank, the bank is supposed to take actions to make refunds available as soon as they are ready; "for example, if a bank fails on a Friday, [they] will make every effort to make refunds available starting the following Monday." (Financial Services Agency and Deposit Insurance Corporation, 2010). On the other hand, in the case of fund transfer agencies, it is estimated that it will take about six

months to refund the deposit due to the necessary procedures (Ministry of Health, Labour and Welfare, 2022). Nonbank mobile payment services like “PayPay,” whose use has grown rapidly in recent years, fall into this category (Financial Services Agency, 2022a).

As for A3, an amount equivalent to at least one-half of the unused balance of the prepaid means of payment is to be preserved under the Payment Services Act Article 14, which does not necessarily mean that the full amount will be preserved in case the provider of the prepaid means of payment goes bankrupt. Also, unlike A1 and A2, end-users of A3 are not free to withdraw the unused balance as cash at any time under the Payment Services Act Article 20.5. Deposit card payment methods for settlement like “Suica” provided by East Japan Railway Company, known as a service of "electronic money" in Japan, fall under this category (Financial Services Agency, 2022b).

In addition, one of the most important flows of funds from end-users is the deposit of payroll. A1 is the only means that is allowed for this purpose. This is because the Labor Standards Act Article 24 allows only bank accounts and securities accounts as the only payroll deposit destinations other than hand cash delivery. Since the securities account is rarely used as a payroll transfer destination, salaries are basically transferred to bank accounts. Although there is a policy to allow accounts of fund transfer agencies to be permitted under certain requirements for this regulation, coordination has been difficult from the viewpoint of worker protection. According to the Japanese government policy, the government will "seek to institutionalize the system as early as possible in fiscal year 2021” (Cabinet Secretariat, 2020). However, as of April 2022, the system has not yet been institutionalized.

As for A2, the 2020 amendment to the Funds Settlement Law revised the classification of funds transfer business, which had previously been defined as the business of exchange transactions of 1 million yen or less by persons other than banks. Currently, Type 1 Funds Transfer Businesses are defined as those that engage in exchange transactions exceeding 1 million yen; Type 2 Funds Transfer Businesses are defined as those that engage in exchange transactions of 1 million yen or less; and Type 3 Funds Transfer Businesses are defined as those that engage in exchange transactions of the company that is responsible for remittances of 50,000 yen or less. However, as of March 31, 2022, as a matter of record, all money transmitters are Type 2 Funds Transfer Businesses (Financial Services Agency, 2022a).

For A1, A2, crypto assets and credit card payment services, the Act on Prevention of Transfer of Criminal Proceeds imposes on banks, fund transfer agencies, credit card issuers, and crypto asset exchangers the obligation to verify the identity of end-users from the perspective of preventing money laundering. In addition to face-to-face methods of identification, online methods of identification that can be completed online are also permitted (Financial Services Agency, 2021b). Individual end-users may respond to identity verification with an identification card or electronic certificate.

Next, as for B) the function of paying funds to others, it is assumed that end-users may use this function for settlements at stores and for P2P money transfers. B can be broadly divided into B1) payment services provided by banks, B2) payment services provided by fund transfer providers, and B3) card payment services.

For B1, funds from A1 bank account deposits are used for online storefront payments and P2P remittances, but rarely for physical storefront payments.

For B2, funds for settlement in A2 or unpaid balance for settlement in A3 provided by a fund transfer company are used. For A2, mobile money transfer services, which have expanded rapidly in recent years, are representative services and can be used for online store settlements, physical store settlements, and P2P remittances. A3, card-based e-money is used only for payments at physical stores. For online-type services, some also support P2P money transfers, but it should be noted that the transferred balance cannot be freely withdrawn as cash under the Payment Services Act Article 20.5.

B3 is different from other types of settlements because it is a post-payment settlement, such as credit purchase brokerage, although the settlement is made based on the deposit in A1 in many cases. Under the Installment Sales Act, regulations to ensure fairness of transactions and protection of purchasers are imposed on issuers of cards and acquirers who manage merchants, while B1 and B2 are legally defined as “exchange transactions as a business” under the Payment Services Act Article 2.1 and 2.2, and B3 is a deferred payment settlement, which is different in nature from them.

In addition, with regard to crypto assets, according to the Payment Services Act, a crypto asset exchange business must be conducted only by those who have been registered by the Prime Minister. Although initially regulated as virtual currency, they were reorganized as crypto assets rather than means of payment. This is because it became clear that crypto assets are not widely

used as a means of payment for now (Financial Services Agency, 2021a). Stable tokens utilizing blockchain technology will be offered as a form of B2 service as a means of funds transfer.

In addition, although there is no contact with the end-users mentioned above, the settlements system provided by the BOJ is indispensable to complete the settlement process. One of the Bank's objectives, in accordance with the Bank of Japan Act, is to “ensure the smooth settlement of funds among banks and other financial institutions, thereby contributing to the maintenance of credit order.” To this end, the Bank may conduct operations that are deemed to contribute to the facilitation of fund settlement among financial institutions, subject to "authorization by the Prime Minister and the Minister of Finance" under the Bank of Japan Act Article 39.

As mentioned above, from the end-user's perspective, there are different regulatory frameworks depending on the different functions of payment services and their risks, which are designed to protect end-users and ensure smooth fund settlement. Payment service providers, including banks, design their services based on these frameworks.

2.3 Functions of the Retail Payment System

This section summarizes the functionality of Japan's retail payment system in terms of the main services and in which cases the systems are being utilized.

As for the functions offered by the Japanese retail payment system, they are not uniformly offered from the end-user's point of view. It may be easy for payment service providers to concentrate on areas that are attractive to them.

Figure 1 summarizes the main use cases and legal frameworks for typical services and systems in the retail payment sector in Japan. This figure is based on our research and organized from a perspective that fits the scope of this study, and is not intended to cover the entire retail payment sector. The structure is such that each of the various payment services exists, and each payment is supported by the Zengin-system and the BOJ-net.

There is another system, the Zengin EDI system (ZEDI), which is different from the Zengin-system, but is not widely used at present. While the Zengin-system handles clearing transactions between individual banks, ZEDI "enables transaction details and other information on the commercial transaction to be attached to B2B transfer messages" (Japanese Banks' Payment Clearing Network, 2010). Although there are more diverse payment services and systems that support each payment service, such as CAFIS for card payments, this section is organized to be as simple as possible.

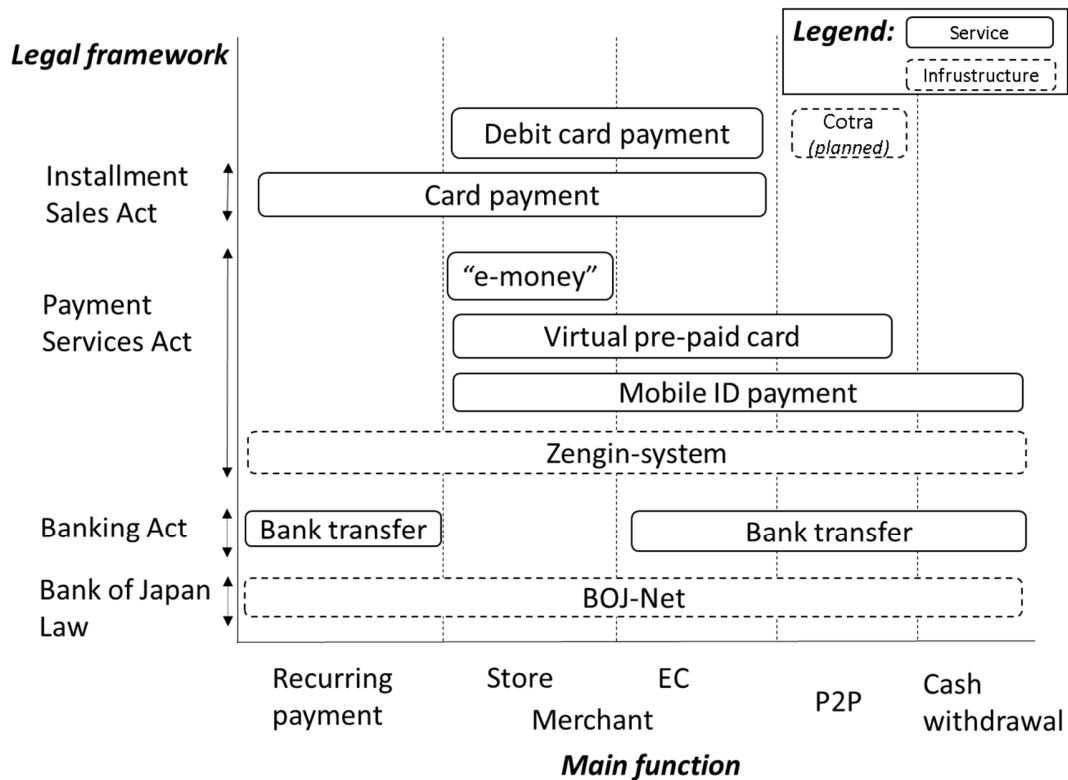


Figure 1 Legal framework and main function for typical services and systems in the Japanese retail payments sector (not comprehensive)

Figure 1 shows some characteristics of the Japanese retail payments sector. First, while the functions from the end-user's perspective include recurring payments, payments to merchants, P2P transfers, and cash withdrawals, there is no single service that satisfies all of these functions. Users use multiple services to meet their needs.

Second, the Japanese retail payment sector is characterized by the concentration of private-sector service offerings in in-store payment methods. One possible explanation for this is the relatively high merchant fees for payment services in Japan. In one survey of stores in Japan, more than 20% of stores reported credit card merchant fees of 4% or more, and more than 70% of stores

reported fees of 3% or more. In addition, the model case used in discussions at government meetings is 3.25%. Fees for credit card-related services operating in various countries are also noted to have relatively high commission rates in Japan (Ministry of Economy, Trade and Industry, 2022). Therefore, offering services related to in-store payment is often attractive for PSPs as a business.

Third, in contrast to the second point, services that can cover P2P remittances are scarce: the network externality of P2P remittances has made it difficult for a single company to provide a convenient P2P service without gaining overwhelming market share. The recent expansion of mobile payment services has improved the user experience, as services that can both use cash and easily perform P2P remittances have emerged, but the companies are not mutually compatible. The Cotra P2P service that is about to be offered, discussed below, is another move to compensate for the lack of interoperability in this area.

With regard to the functions provided by the Japanese retail payment system, there is a tendency to concentrate on in-store payments. On the other hand, the functionality of P2P remittance, in particular, has not been adequately provided.

2.4 Performances of the Retail Payment System

This section summarizes the performance of Japan's retail payment system. From the perspective of improving performance based on the current situation, this section does not exhaustively summarize the current performance, but rather focuses on issues of poor performance.

When looking at the Japanese retail payment system mainly from the user's point of view, the following factors are considered: interoperability, data openness, end-user fee, merchant fee, clearing of merchant revenue, stakeholder, there are areas that could be improved in terms of stakeholder coverage, none-bank participation, safety and security, and other issues.

Table 1 summarizes performance in Japan's retail payment system that is considered to be underperforming relative to other issues.

Table 1 Main problems in the Japanese retail payment system

| <i>Problems in Japan</i> | |
|-------------------------------------|---|
| Interoperability | There is incompatibility between different payment services. |
| Data Openness | Banks' updating APIs are relatively late in being released. Similar APIs are not provided by non-bank payment services. |
| End-user Fee | Bank transfer fees have been reduced but remain high. |
| Merchant Fee | There is a structure where merchant fee is easy to get high. |
| Security | There are payment service providers with low levels of security. |
| Clearing of merchant revenue | Non-bank payment services like mobile payments take longer to deposit sales. |
| Stakeholder Coverage | Banks lead the payment system, and it is challenging to reflect end-users' needs. |
| None-bank participation | Non-banks cannot participate in the Zengin-system. |

Interoperability

Payment services such as “e-money,” virtual pre-paid cards, and mobile ID payments have been pointed out that they may be “under no interoperability, and both banks and non-bank payment providers are caught in a competitive trap (Bank of Japan, 2020b).” Therefore, end-users are forced to use a combination of services to make payments. For end-users, it is difficult to collect payment information when using different services, and they are unable to send money to others who use different services than they do.

Data Openness

There are limitations in terms of transfer of end-user payment-related information and delegation of end-user mandates. While banks have made progress in their efforts to release open APIs, their efforts to release update-based APIs tend to lag behind those of reference-based APIs. In addition, non-banks are not obligated to make efforts to release open APIs, making it difficult for information from non-bank settlement services to be used by other companies' services.

End-user Fee

Many payment services do not charge fees paid by end-users, but bank transfers cost several hundred yen, which is relatively high. Although banks have been reviewing their fees through the review of inter-bank charges, it is difficult to freely send money to others like text messages or cash because of the certain cost.

Merchant Fee

The cost for stores to accept payments is high compared to the cost in other countries. The average merchant fee for credit card payments is about 3%, which is so high that some companies are losing profits due to this fee. Mobile payments, which have been expanding in recent years, are often cheaper than credit card payments, with some charging as little as 1%. This is thought to be a competitive pressure, but they tend to be higher than card payments in other countries (Ministry of Economy, Trade, and Industry, 2022).

Clearing of merchant revenue

Card and mobile payment services require a certain period of time from the time sales are recorded to the time the sales are credited to the bank account, which has had a negative impact on cash flow for end-users of companies.

Stakeholder Coverage

Widely used payment services and payment systems are basically provided by private companies based on their own interests or those of their industry, and the incentive structure is such that users' needs are not necessarily satisfied if the services are not in their interests.

None-bank participation

The Zengin-system does not allow non-banks to participate. This point is under review by the banking industry.

Safety & Security

Some payment service providers have experienced system failures and fraudulent use of their systems. There have been cases of system failures by banks that have resulted in the unavailability of some services, and cases of payment service balances being reduced due to unauthorized use of payment services. One example of insufficient security measures at a fund transfer service provider is the case of unauthorized access to some accounts of "7pay," a barcode payment service operated by Seven Pay Co. As a result, Seven Pay Co., Ltd. decided to discontinue the 7pay service (SEVEN-ELEVEN JAPAN CO., 2019). As for banking matters, a system failure occurred at Mizuho Bank, affecting ATM and Internet banking transactions (Mizuho Financial Group, 2021b), and the Financial Services Agency and the Ministry of Finance took administrative action against the bank (Mizuho Financial Group, 2021a).

As noted above, there are many aspects of Japan's retail payment system that can still improve performance from the user's perspective.

2.5 Recent Policy Changes in Japan

This section discusses changes in the retail payment system environment in Japan due to government intervention. The main focus is on the survey of the Japan Fair Trade Commission (JFTC) on cashless payments and the overall government policy decided on the basis of the survey.

In 2020, the JFTC released a report on its investigation of cashless payments, which made recommendations on issues such as reviewing transaction practices related to interbank fees, strengthening the governance structure of the Zengin-Net, and opening up access to the funds transfer system to funds clearing and settlement companies. The overall government policy was to support these issues. The government also indicated that it would consider the construction of a new settlement system focusing on frequent, small amount payments, and that the BOJ would conduct a demonstration test of CBDC.

On April 21, 2020, the JFTC issued a press release titled "Competition Policy Issues for Improving Financial Services Utilizing Fintech," in which it released two fact-finding reports on "household account bookkeeping services" and "cashless payment using QR codes." Table 2 shows the recommendations included in them as topics relevant to the theme of this paper.

Table 2 Recommendations on the Japanese retail payment system made by the Japan Fair Trade Commission (Japan Fair Trade Commission, 2020a, 2020b)

| <i>Topics</i> | <i>Recommendations</i> |
|--|--|
| Updating APIs | "Each bank should consider creating an environment that allows easy access to updating system APIs in order to increase competitive pressure on its payment infrastructure." |
| Impact of paying wages to non-bank code settlement providers' accounts on equal footing of competitive conditions | "If the ban on the payment of wages to the accounts of money transmitters were lifted, it would have a favorable impact on ensuring equal footing of competitive conditions in code settlement between banks and non-bank code settlement operators." |
| Revision of business practices related to interbank commissions | "Each bank should work toward correcting the current situation in which interbank fees are maintained at a level significantly higher than administrative costs by conducting a review that includes the necessity of interbank fees and by fulfilling its accountability regarding the level of fees and the basis for setting them." |
| Strengthening the governance structure of Zengin-Net and ensuring transparency of transactions | "Zengin-Net should strengthen its governance structure to reflect the needs of end-users." "Zengin-Net should ensure transparency of transaction costs using the Zengin-system." |
| Consideration for opening access of funds transfer agents to the funds clearing and settlement system | "Zengin-Net should organize the conditions required for connection to the Zengin-system and consider opening access to those funds transfer operators that meet the conditions." |

These findings and recommendations have influenced banking industry initiatives and government-wide policies.

Table 3 summarizes the policies on retail payment and settlement systems determined in the "Action Plan of the Growth Strategy" approved by the Cabinet on July 17, 2020, and the conducted initiatives reported as a result.

Table 3 Action plan of the Growth Strategy and reported actions (Cabinet Secretariat, 2020, 2021)

| <i>Perspectives</i> | <i>Policies</i> | <i>Reported actions</i> |
|---|---|---|
| Review of Bank Transfer Fees | “Inter-bank fees, which account for a considerable portion of the costs behind bank transfer fees and having not changed for more than 40 years, should be reviewed. For the review, from the perspective of securing stable and efficient operation of nationwide payment network infrastructure, inter-bank fees should be integrated to the system mandated by the Japanese Banks' Payment Clearing Network (Zengin-Net), and should be lowered to a reasonable level that properly reflect costs, while visualizing cost structures.” | "The Domestic Exchange System Operating Fee (in principle 62 yen per transaction) was established as a mechanism to be determined by Zengin-Net in place of the inter-bank fee that had been determined through consultation among individual banks. The government plans to follow up on trends in transfer fees set by financial institutions." |
| Improve Convenience of Frequent, Small Amount Payments | “To improve convenience for users make remittances more frequently and in smaller amounts, promote the diversification of the fee system that is now mechanically charging fees per remittance regardless of the total amount of remittance, such as introducing a new fee system charging fixed fee regardless of frequency of remittances.” “In addition, construction of a new settlement system focusing on frequent, small amount payments will be discussed.” | "In discussions with the banking community, we encouraged the diversification of fee structures from the perspective of improving user convenience. The government plans to follow up on trends in transfer fees set by each financial institution." |
| Participation of Non-Banks | “The qualifying mark of the Zengin-system will be reconsidered to allow the participation of non-banks so that they can reduce remittance costs on their own efforts.” | "The Task Force on Next Generation Funds Settlement Systems (Secretariat: National Banking Funds Settlement Network (Zengin-Net)) studied the issue and compiled a report in January 2021. The plan is to position the small-lot settlement infrastructure concept as a short-term realistic solution, aiming for operation in early FY2022, and to continue to study it from a medium- to long-term perspective. In order to materialize this direction, the parties concerned will continue their discussions." |

It was also decided in 2020 as a government policy that “the Bank of Japan will explore Central Bank Digital Currency (CBDC) by, for example, conducting experiments on technical aspects while coordinating with other countries” (Cabinet Secretariat, 2020).

As noted above, the business environment in the retail payments sector has begun to change dramatically with the release of the Japan Fair Trade Commission's investigative report in 2020 and a number of government policies.

2.6 Trends in the Banking Industry in Japan

This section presents recent developments in the banking industry and the Japanese central bank in the area of retail payments. Both have been increasingly active in initiatives related to the retail payments sector since around 2020, and this section provides an overview of the details of their initiatives.

Government policies such as the revision of the Banking Law and the release of the JFTC's investigation report have prompted the banking industry to pursue initiatives related to the retail payment system. These include the study by the Task Force on Next Generation Funds Settlement Systems, preparations for non-banks (funds transfer operators) to join the Zengin-system, the launch of Cotra to improve the convenience of high-frequency small-lot payments, changes in the way the Zengin-Net Expert Committee operates, and open APIs.

Although the BOJ has no plans to issue CBDC, the bank is simultaneously promoting the provision of a forum for discussion from a wide range of perspectives with a variety of stakeholders, as well as a demonstration experiment of CBDC.

2.6.1 Commercial Banks

In May 2020, Zengin-Net took the opportunity of the release of the Fair Trade Commission's investigation report to establish the Task Force on the Next Generation Funds Settlement System in order to promote the study of what the Zengin-system should aim for in the future, without being bound by the traditional framework of banks. In fiscal year 2020, the task force mainly studied the participation of non-banks (fund transfer companies) in the Zengin-system and the improvement of convenience for high-frequency small-lot payments, and compiled a summary (Japanese Banks' Payment Clearing Network, 2020). In fiscal year 2021, working groups on institutional and systemic aspects were established to study the specific issues identified in the report (Japanese Banks' Payment Clearing Network, 2022a).

As for Cotra, on July 20, 2021, a new payment infrastructure planning and management company for high-frequency small-lot payments was established by Mizuho Bank, Mitsubishi UFJ Bank, Sumitomo Mitsui Banking Corporation, Resona Bank, and Saitama Resona Bank (Sumitomo Mitsui Banking Corporation, 2020). They plan to start handling person-to-person money transfers in the first half of fiscal year 2022. Cotra is a payment infrastructure designed for small amount transfers between individuals, and the fees paid by end-users of such transfers seem to be considered "determined by the connecting entity" (NTT DATA Corporation, 2021). Cotra will also open access to fund transfer operators and will work with them to build an "all-Japan fund settlement infrastructure" (Japanese Banks' Payment Clearing Network, 2022b).

Regarding the governance of the Zengin-Net, the method of operation of the Zengin-Net Expert Council has been changed. Interviews at the study group meetings will be conducted multiple times, the number of experts will be increased, and additional members from the public and private sectors will be added. The summaries of the proceedings, which were previously undisclosed, are now open to the public. These operational changes are aimed at establishing a continuous effort (PDCA cycle) using the Expert Committee (Japanese Banks' Payment Clearing Network, 2017).

An Application Programming Interface (API) generally refers to “a connection specification for calling and using the functions, managed data of an application from other applications.” The banking industry is also moving forward with open API initiatives.

Of these, “APIs that can be accessed by third parties” are called “open APIs” (Report of the Study Group on Open API, 2017). In 2017, a revised Banking Law was passed, obliging banks to make an effort to open their APIs to the public under the Banking Act Article 11. The government's Growth Strategy 2017 set a goal of introducing open APIs to more than 80 banks by June 2020 (Cabinet Secretariat, 2017). The introduction of Open APIs has proceeded at a pace exceeding that target, and as of the end of March 2020, 129 banks were supporting Open APIs, with 114 banks having already developed reference APIs and 67 banks having already developed update APIs (Financial Services Agency, 2020). While the number of banks supporting open APIs has been increasing since then, the speed at which update APIs are being released tends to be slower than reference APIs. The additional cost of system development is required for an update API, and concerns about profitability have been pointed out as a possible

reason why regional banks have not yet developed an API connection infrastructure for update systems (Japan Fair Trade Commission, 2020a).

Government policies such as the revision of the Banking Law and the release of the JFTC's investigation report have prompted the banking industry to pursue various initiatives related to the retail payment system.

2.6.2 Central Bank

The Bank of Japan (BOJ) announced that it will host the "Future of Payments Forum: The Future of Central Bank Digital Currency and Payment Systems" on February 3, 2020 (Bank of Japan, 2020a). The theme of the forum is how to improve the problems of current payment services, both retail and wholesale, as well as the benefits and risks of issuing a CBDC. As participants, the forum has provided a forum for discussion from a wide range of perspectives with a variety of stakeholders involved in payments, including financial institutions, corporations, and universities.

On October 9, 2020, the Bank also released the Bank's Policy on Central Bank Digital Currency Initiatives. The Bank has “no plans to issue CBDC at this time,” but it has indicated that it is committed to “general-use CBDC,” including future demonstration tests, for use by a wide range of entities, including individuals and businesses, in order to “prepare for future changes in the

environment to ensure the stability and efficiency of the entire payment and settlement system” (Bank of Japan, 2020c).

First, the report lists three expected functions and roles of CBDC when it is introduced: “(1) introduction of a means of payment alongside cash, (2) support for private-sector payment services, [and] (3) construction of a payment system appropriate for a digital society.” In particular, the Bank emphasizes that when introducing general-use CBDC, it is appropriate to maintain the “two-tier structure of the payment system between the central bank and the private sector” (indirect form of issuance). The report also lists five basic characteristics that CBDC should possess: (1) universal access, (2) security, (3) robustness, (4) immediate settlement, and (5) interoperability. The points to consider are “(1) relationship with price stability and financial system stability, (2) promotion of innovation, (3) ensuring privacy and handling of user information, [and] (4) relationship with cross-border settlement.” These show the need of BOJ well.

As for the Bank’s demonstration experiment, the Bank will proceed with the experiment in a phased and systematic manner in order to verify the technical feasibility regarding CBDC. After the proof-of-concept phases 1 and 2, the Bank plans to “consider conducting pilot experiments involving private-sector businesses and consumers on a hands-on basis, if deemed necessary”. In Phase 1, a systematic experimental environment was established and verification of the basic functions of CBDC (issuance, distribution, and refund) was conducted, which was completed in March 2020. In April of the same year, Phase 2 of the proof-of-concept experiment began. In

Phase 2, the plan is to “verify the feasibility of adding CBDC peripheral functions” to the environment established in Phase 1 (Bank of Japan, 2022).

As mentioned above, the BOJ does not currently have any plans to issue CBDC, but in preparation for future changes in the environment, the Bank is conducting discussions with various stakeholders through the Future of Settlement Forum and conducting a demonstration test of CBDC.

2.7 Stakeholders

Stakeholder analysis is very important when considering the design of the payment system. The purpose of a detailed stakeholder needs analysis is “to build the relevant knowledge to write representative and complete goals” (Edward Crawley, Cameron Bruce and Selva Daniel, 2016). The payment system is built to meet the needs of stakeholders. Therefore, it is important to understand what the priorities and critical needs of stakeholders are in order to design a valuable system. Those needs are the basis for considering the goals, functions, and performance of the desired payment system. It is also important to carefully analyze stakeholders and their needs, even more so in a state where payment systems are becoming increasingly public. This thesis consists of a stakeholder analysis of three possible owners of Japanese retail payment infrastructure—commercial banks, central bank, and a dominant payment service provider (PSP).

The stakeholder analysis included three parts. The first step in the stakeholder analysis was to categorize the stakeholders by their roles. This is because even if different stakeholders have the same position, their interests are often similar and overly complex analysis can be avoided. Although there are many stakeholders in the payment system, it was found that they can be mainly divided into End-users, Participants, Operator, Regulators, Other Industry Segments, and Investors. In addition, the analysis checked what kind of differences in needs existed for different entities within the same category so that a more detailed analysis could be conducted if necessary.

Second, the priorities of the stakeholders were examined. It is necessary to determine which needs of which stakeholders are important in order to properly identify the necessary requirements for the design of the system. In this prioritization process, we analyzed and compared how the system looks from the perspective of three different entities: commercial banks, dominant PSP, and central bank. Their perspectives are particularly important because they are the main providers of value to the payment system and can take concrete actions. This analysis showed that central banks are the most neutral. Although commercial banks tend to neglect the perspective of end-users, they are trying to be closer to neutral through policy guidance in recent years.

Third, for each of the stakeholders that need attention, specific needs were identified. This is because even similar needs may have different nuances for each stakeholder, and by identifying the needs for each stakeholder, the needs can be identified more carefully.

Through this analysis, we have identified a structure where business activities for profit do not necessarily provide ideal services for users.

2.7.1. Classification of Stakeholders in the Retail Payment System

In this section, stakeholders were categorized by their roles. Even though there are different stakeholders, stakeholders with similar roles often have similar needs; therefore, grouping them together avoids overly complex analysis. After categorizing the stakeholders to capture the overall trend, we also checked how the needs of different entities within the same category differed to make it possible to conduct more detailed analyses if necessary.

Table 4 shows the classification of the stakeholders in the Japanese retail payment system. There are many stakeholders in the payment system, but they can be mainly divided into End-users, Participants, Owners/Operators, Regulators, Other Industry Segments, and Investors.

Table 4 Categories of stakeholders (not inclusive)

| <i>Main Categories</i> | <i>Sub Categories</i> |
|-----------------------------------|--|
| A) End-Users | A1) Consumers |
| | A2) Business and Government |
| | A3) Retail Business |
| B) Participants | B1) Banks |
| | B2) Payment service providers (PSPs) |
| C) Operators | C1) System owners |
| | C2) Systems integrators |
| D) Regulators | D1) Bank of Japan (BOJ) |
| | D2) Financial Services Agency (FSA) |
| | D3) Japan Fair Trade Commission (JFTC) |
| | D4) Cabinet Secretariat |
| | D5) Ministry of Economy, Trade and Industry (METI) |
| E) Other Industry Segments | E1) B2C (*) business companies |
| | E2) B2B (**) business companies |
| F) Investors | F1) Direct investors |
| | F2) Potential investors |

**Business to consumer*

** *Business to business*

The details of each of these stakeholders are as follows.

A1) Consumers

Consumers are those who use payment services in their daily lives. They mainly use payment services to send money to corporations and individuals when they make payments in exchange for something of value, such as some kind of product or service. Among consumers, their needs are likely to differ depending on the frequency of use of the Internet and smartphones. In recent years, Internet and smartphone use has expanded across a wide range of age groups; for example,

a survey shows that as of 2020, over 70% of Japanese people in their 70s own a smartphone (Digital Agency, 2021). It should be noted that among the elderly, the number of consumers who do not use the Internet or smartphones is decreasing every year.

A2) Business & Government

Business and government end-users use payment services to make the payments required for business activities and government service delivery. They select a payment service that can send money to them depending on the type of account that individuals they are sending money to use to receive funds.

A3) Retail Business

Retail business end-users use payment services to receive payment for something of value, such as a product or service, they provide. They decide for themselves which payment services to offer to the entity making the payment.

B1) Banks

Financial institutions connected to the Zengin-system are 1) banks under the Banking Act, 2) credit unions, which are “Shinkin banks” under the Shinkin Bank Act and “Cooperatives” under the Small and Medium-Sized Enterprise Cooperatives Act and Act on Financial Businesses by Cooperatives, 3) labor banks under the Labor Bank Act, and 4) agricultural cooperatives under the Agricultural Cooperatives Act. They are entities that participate in the payment system in order to provide their customers with deposit accounts and the payment services associated with

those accounts. In accordance with the Banking Act, banks lend out the deposits they receive and are subject to strict regulations, while being able to obtain deposit insurance.

B2) Payment Service Provider (PSP)

The PSP is non-bank entity that does not offer deposit accounts, but only provides payment services to their customers. Although they do not currently have access to the Zengin-system, it is planned that they will be granted access to the Zengin-system in the future if they meet the necessary requirements and are potential participants in the payment system.

C1) Japanese Bank's Payment Clearing Network (Zengin-Net)

The Japanese Bank's Payment Clearing Network (Zengin-Net) is an organization that began operations in October 2010, taking over from the Domestic Exchange Management Organization (established in 1973), which had been operated by the Tokyo Bankers Association (Japanese Banks' Payment Clearing Network, 2010). They operate the Zengin-system which supports the small and large amount of transactions between banks.

C2) Bank of Japan (BOJ)

BOJ operates the Bank of Japan financial network system (BOJ-Net) for settlement. BOJ-Net is "the backbone infrastructure of Japan's settlement system that handles the settlement of funds and government bonds between the Bank of Japan and financial institutions" (Bank of Japan, 2015). Although there are no plans to issue CBDC at this time, the BOJ will be the owner of the system to provide CBDC, if it were to do so in the future.

C3) Payment Service Provider (PSP)

The PSP can also act as a system owner retail payment system in terms of the function of the retail payment infrastructure. If the market share of an individual payment service increases to a significant degree, in effect, the service itself will be responsible for clearing a large number of payments as it is widely used.

C4) Systems Integrator

Systems Integrator receives requests from the system owner to develop and provide their systems. The Zengin-system uses the system developed and provided by NTT Data Corporation (Japanese Banks' Payment Clearing Network, 2019).

D1) Bank of Japan (BOJ)

The purpose of the BOJ, in accordance with Article 1 of the Bank of Japan Act, is "to ensure the smooth settlement of funds among banks and other financial institutions, thereby contributing to the maintenance of credit order." From the perspective of ensuring the safety and efficiency of the settlement system as a whole, the BOJ, like the central banks of major countries, conducts oversight for private settlement systems. Oversight refers to "the central bank's activities to monitor the institutional design, risk management systems, and operational status of various private-sector payment and settlement systems, to evaluate their safety and efficiency, and to encourage them to make improvements as necessary" (Bank of Japan, 2013).

With regard to the relationship between the Bank and the government, Article 5 of the Bank of Japan Act states that "the autonomy of the Bank in its business operations shall be given due consideration," and Article 4 of the Bank of Japan Act states that "the Bank shall always keep in

close contact with the government and maintain adequate communication with it." The Bank's conduct of policy is left to the neutral and professional judgment of the Bank, with a certain degree of independence from the government.

D2) Financial Services Agency (FSA)

The Financial Services Agency (FSA) aims to “contribute to the improvement of the safety, efficiency, and convenience of the fund settlement system to ensure the proper implementation of services related to fund settlement, protect its users, and promote the provision of such services” under the Payment Services Act. The FSA has jurisdiction over many payment-related businesses under the Payment Services Act and the Banking Act.

D3) Japan Fair Trade Commission (JFTC)

In accordance with the Act on Prohibition of Private Monopolization and Maintenance of Fair Trade, JFTC prohibits private monopolization, unreasonable restraint of trade, and unfair trade practices. JFTC aims to “promote fair and free competition, encourage business operators to exercise their creativity, promote business activities, raise the level of employment and national income, thereby securing the interests of general consumers, and promoting the democratic and sound development of the national economy” under the Act.

D4) Cabinet Secretariat

In accordance with the Act on Special Measures for Productivity Enhancement, the Cabinet Secretariat is required to prepare an action plan and evaluate the progress of business activities that belong to business fields in which Japan should urgently strengthen its international

competitiveness and that are conducted using innovative technologies or methods in those business fields.

D5) Ministry of Economy, Trade and Industry (METI)

The Ministry of Economy, Trade and Industry (METI) is responsible for “the development of the economy and industry with a focus on improving the economic vitality of the private sector and the smooth development of external economic relations” under the Act for Establishment of the Ministry of Economy, Trade and Industry. Based on the Installment Sales Law, METI is responsible for the sound development of credit card transactions, the protection of the interests of purchasers, and the facilitation of the distribution of goods and the provision of services.

E1) B2C business companies

Business to consumer companies include companies in all sectors where electronic payments are possible. Since the PSP is dealt with above in C3, this section does not deal with companies that provide payment services. B2C business companies include traditional financial sectors like companies in the insurance, securities, and money lending business sectors. There are also firms that provide FinTech services, such as household account management services. In addition, manufacturers of consumer products are also included, but not limited to the financial sector.

E2) B2B business companies

Business to business companies include companies from all sectors. System integrators that provide payment services are included in C4, so they are excluded here. Businesses that provide

tools to support back-office operations and businesses that provide financing to companies are included. Also included are businesses that provide B2B2C platform services.

F) Investors

As Investors, we assume that investors invest in the companies of each stakeholder.

2.7.2. Comparison of Viewpoints on Stakeholders

From a broader perspective, the owner of the retail payment system could include banks, the central bank, and a dominant PSP since the functions required by a retail payment system can be covered in a variety of ways.

One of the methods of stakeholder analysis is to analyze the stakeholders as shown in Figure 2. It has been proposed to identify those classified as “stakeholders who must be considered and satisfied,” “stakeholders who must be considered and should be satisfied,” “stakeholders who must be considered and might be satisfied,” or other stakeholders (Edward Crawley et al. 2016).

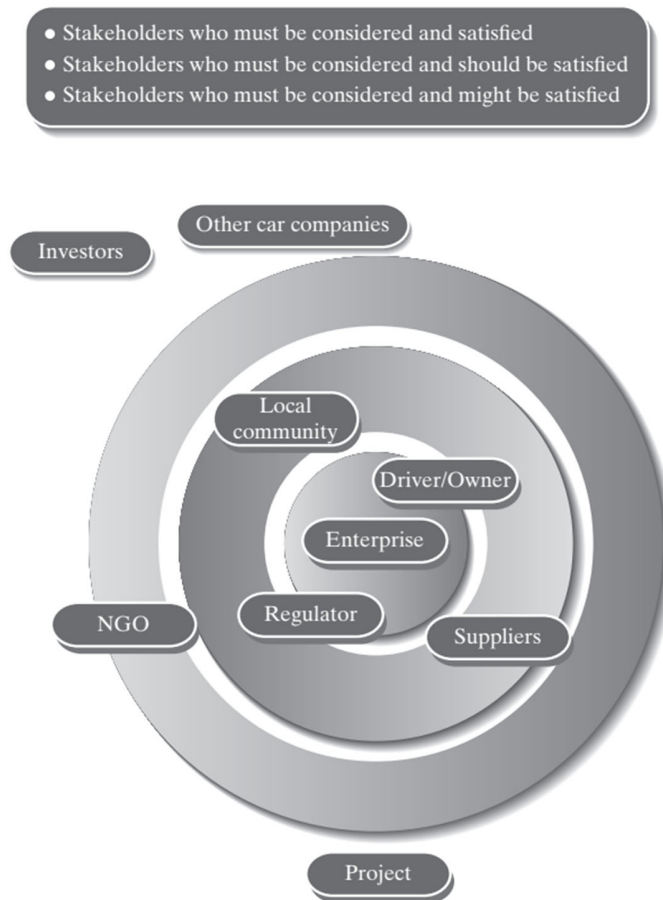


Figure 2 Stakeholder prioritization example for the hybrid car (Edward Crawley et al. 2016)

The analysis here was based on the method of stakeholder prioritization. In addition, although it is ordinary to organize each stakeholder into one of the three categories, some stakeholders were organized as belonging to more than one category if the stakeholders have multiple needs and the priorities considered differ among them.

Possible owners of the retail payment system determine how the system is constructed and operated. By analyzing which stakeholders are considered important from their point of views, we can roughly predict trends in their behavior. For this reason, the analysis here covers the

importance of stakeholders from the perspective of the owners of the infrastructure. Since there are several possible entities operating the retail payment infrastructure, priorities were organized according to their perspectives so that they can be compared. Specifically, the analysis focused on the perspectives of the Zengin-Network, the BOJ, and a dominant PSP.

As a result, the analysis showed that the central bank is the most desirable to meet the needs of diverse stakeholders because of their neutral perspective, followed by banks and a PSP in that order.

2.7.2.1. Zengin-Net's Viewpoint

The most typical retail settlement system is the interbank settlement system. Japan's interbank settlement system is called the Zengin-system. The system is operated by the Japanese Banks' Payment Clearing Network (Zengin-Net).

Figure 3 shows the order of priority of stakeholders from Zengin-Net's perspective. First, since Zengin-Net is an organization established by banks, it considers banks as one of the stakeholders who must be considered and satisfied. Also, since Zengin-Net is the only payment clearing agency as defined in the Payment Services Act. Regulators, especially the Financial Services Agency (FSA), are one of the stakeholders who must be considered and satisfied.

Next, Zengin-Net is considered to view end-user as both one of the “stakeholders who must be considered and satisfied” and one of the “stakeholders who must be considered and should be

satisfied.” End-users' needs are to be able to transfer money between different bank accounts and to ensure security is considered as “must be satisfied.” On the other hand, end-users’ needs for inexpensive money transfer and excellent UI are considered “should be satisfied” and not prioritized if they overlap with the needs of banks to secure their profits. However, with the recent review of governance, there is a move to position end-users as one of the “stakeholders who must be considered and satisfied.”

Zengin-Net is one of the customers for the system integrator and it is considered that Zengin-Net views the systems integrator as one of the “stakeholders who must be considered and should be satisfied.” Zengin-Net also describes its system as "an economic infrastructure", so it would be assumed that they also view other industry segments as one of the “stakeholders who must be considered and should be satisfied.”

Zengin-Net has not viewed PSPs as one of the “stakeholders who must be considered” as PSPs compete as payment service providers. However, given the public nature of the retail payment system and the government policy to allow access to PSPs, they have changed their policy to allow non-bank access to the Zengin-system and are currently working on a detailed design. Thus, they are undergoing a change to rethink PSPs as one of the “stakeholders who must be considered and should be satisfied.”

Zengin-Net is a general incorporated association and has no direct shareholders. In addition, when investors are taken in a broader sense, it is not considered to go so far as to say that stakeholders who must be considered.

As a result, Zengin-Net tends to focus on the needs of banks as their direct users, which led to the government’s policies to modify their governance and design of the system.

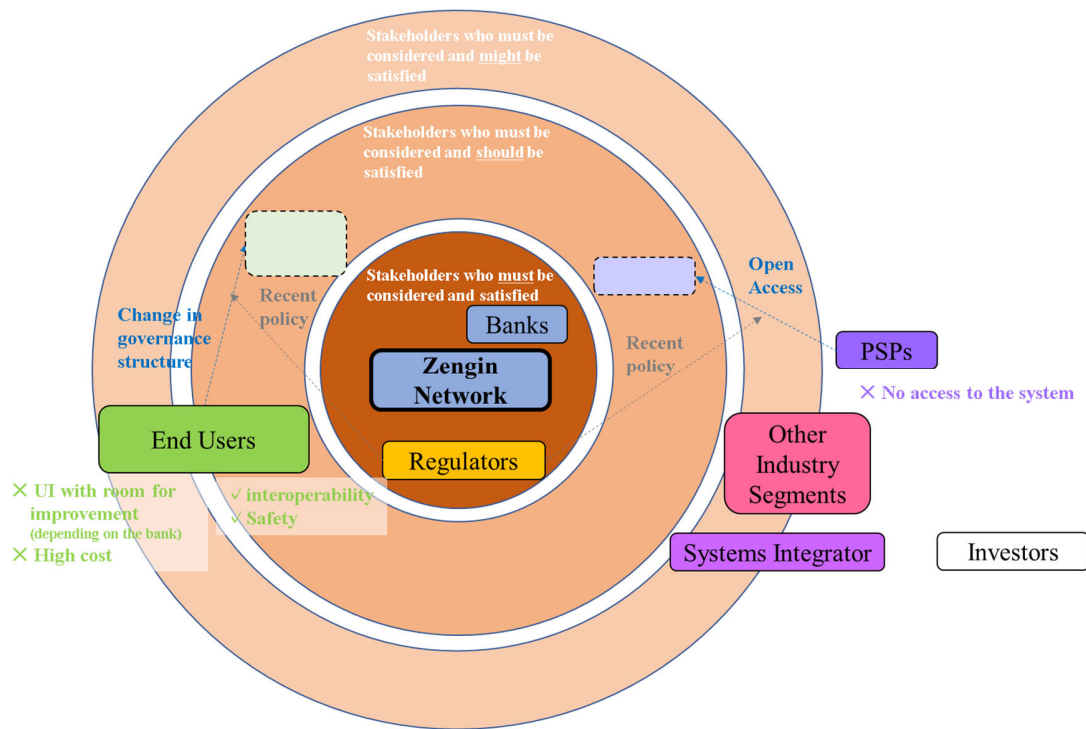


Figure 3 Zengin-Net's viewpoint on stakeholder prioritization

2.7.2.2. Bank of Japan (BOJ)'s viewpoint

The BOJ could also be an entity in the retail payment system. As in the U.S. case, the central bank could provide the retail payment system, or the central bank could issue retail CBDC.

Figure 4 shows the order of priority of stakeholders from BOJ's viewpoint. One of the Bank's objectives under the Bank of Japan Act is to "ensure the smooth settlement of funds, thereby contributing to the maintenance of credit order." Since the Bank has the perspective of making the system desirable not only from the perspective of the system's participants, but also from the perspective of end-users and, ultimately, the economy as a whole, Banks, PSPs, end-users, and other industry segments are all "stakeholders who must be considered and should be satisfied."

BOJ is also looking to promote innovation. In their Forum on Future Currencies, they are discussing topics that could affect a wide variety of industries, such as programmability of digital currencies and overlay services for the retail payment system.

From BOJ's perspective, regulators are considered one of the "stakeholders who must be considered and should be satisfied." Since the Bank of Japan Law states that "the Bank must always maintain close contact with the government and communicate sufficiently with it to ensure that monetary and financial adjustment is consistent with the government's basic economic policy, given that such adjustment forms part of the government's economic policy," the needs of the regulators "must be considered." On the other hand, that law also states that "the autonomy of the Bank in the conduct of its business must be given due consideration," thus ensuring the Bank's independence. Although 55 percent of the Bank's capital comes from the

government, the Bank's investors are not allowed to exercise voting rights and are not allowed to participate in management. Therefore, in some cases, the needs of regulators may not be met.

As a result, BOJ has a neutral viewpoint, which can aim to create a system that is desirable to a variety of stakeholders.

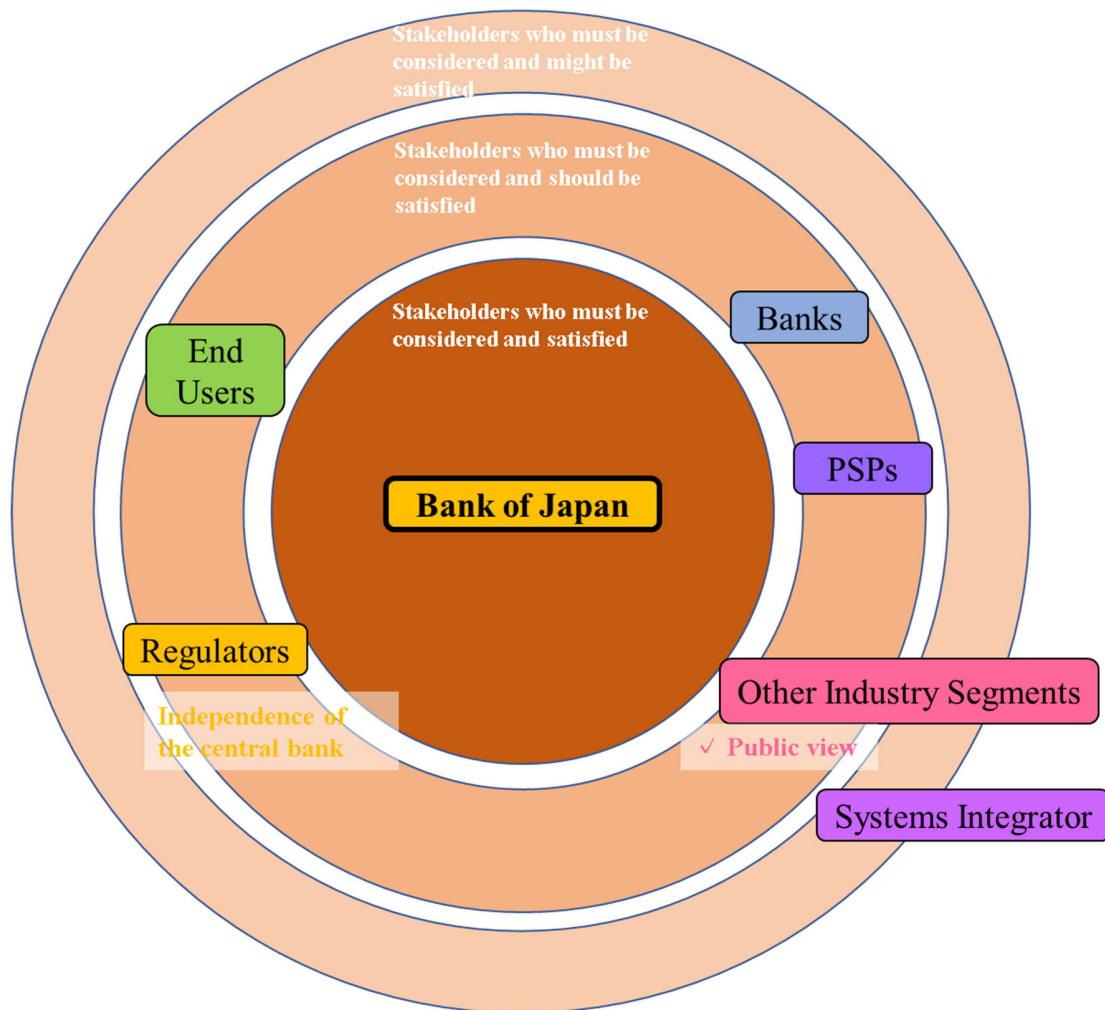


Figure 4 Bank of Japan's viewpoint on stakeholder prioritization

2.7.2.3. PSP's viewpoints

A dominant PSP can also provide the functionality expected of a retail payment infrastructure if the conditions are right. The PSP provides the payment services of an individual company, but if the market share of that service is overwhelmingly high, it can be expected that the payment

counterparties are also using the same service. Therefore, the need to ensure interoperability with other companies' payment services will be extremely low to begin with.

In addition, especially for the PSP remittance function, it is expected that network externalities will work to encourage potential users to use the service through word of mouth by existing users. This is because existing users who already find the service convenient may be encouraged to use it when making payments with a third party, if that third party is not already using the service. Such an effect is expected to increase the market share of the service. In Japan, there is no company with a dominant market share in retail payment services, but if a PSP with a large enough market share emerges, it could provide the functionality expected of a retail payment system. Therefore, PSPs are included here as potential retail payment system providers. We do not include system integrators among the stakeholders to be considered, since the PSP often develops the systems by itself.

Figure 5 shows the order of priority of stakeholders from the PSP' viewpoints. Since the PSP operate under the Funds Settlement Act, the needs of the Regulator, especially the FSA, must be met, so the Regulator is one of the stakeholders who must be considered and satisfied.

For the PSP, end-users are one of the stakeholders who must be considered and should be satisfied or might be satisfied. One of the most important ways for the PSP to maximize their profits is to increase the market share of their services. To secure users, they try to satisfy user needs for cheap and excellent UI services, but they do not try to improve interoperability with other companies. One possible explanation is that it is better not to have interoperability with other companies in order to effect users through word-of-mouth based on network externalities. The second possible explanation is that by providing payment services, personal information

centered on end-user payments can be accumulated, and since this information will lead to new business opportunities, there is a motivation to control the portability of this data.

Since increased interoperability would make it harder to monopolize end-users' personal and individual company information, which could lead to a loss of competitive advantage, companies tend to be unwilling to emphasize interoperability with other companies. As for Investors, it is necessary to return profits to their shareholders, but it is not considered necessary to consider even the needs of individual shareholders. The needs of shareholders can be satisfied if the needs of the company to make profits are satisfied. The PSP does not consider the needs of banks and other industry segments.

As a result, the PSP tends to focus on profit by trying to meet the usability needs of end-users while paying attention to customer retention, which has caused the lack of interoperability among different payment services. The PSP tends to try to improve the situation by gaining a larger market share.

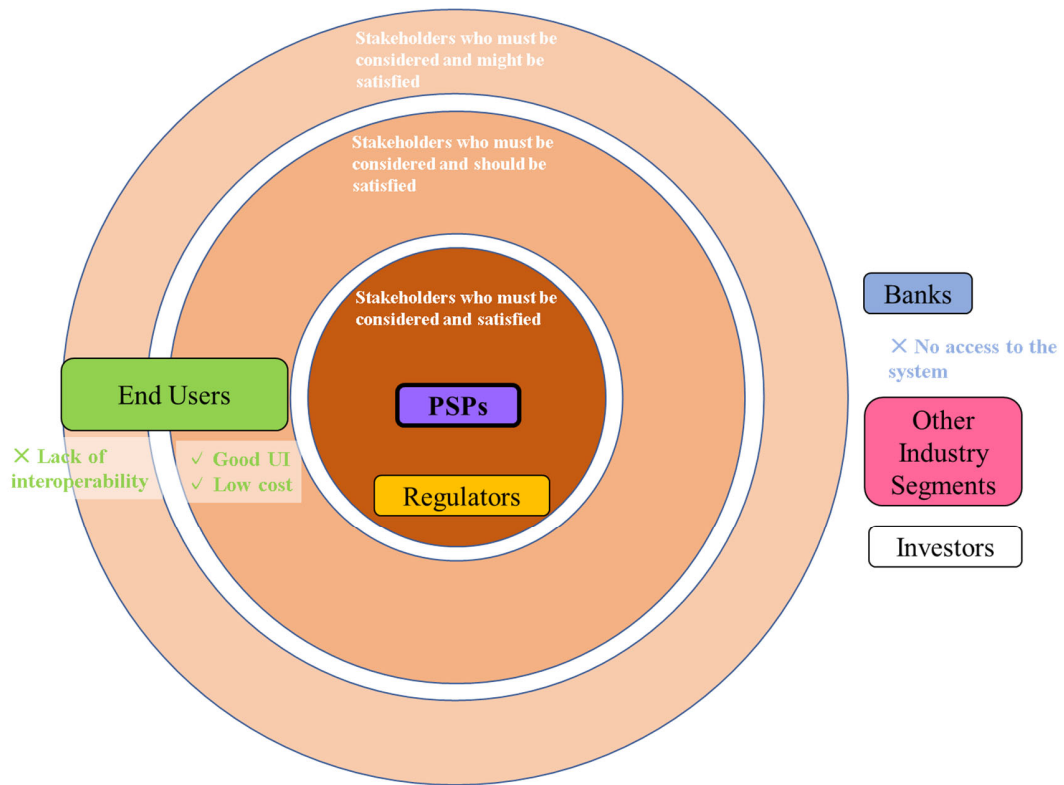


Figure 5 PSPs' viewpoint on stakeholder prioritization

Figure 6 compares the perspectives from each of the above stakeholders. This comparison shows that the BOJ's perspective is the most neutral and balanced.

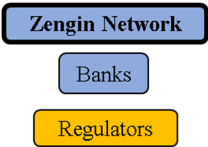
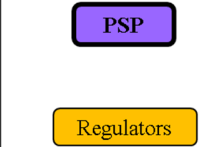
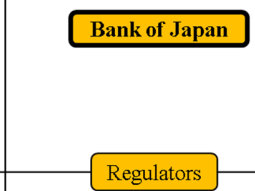
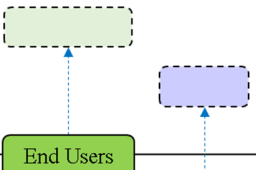

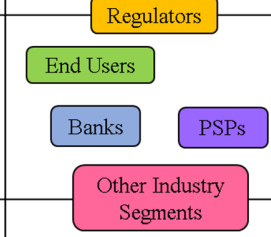
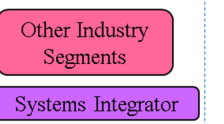

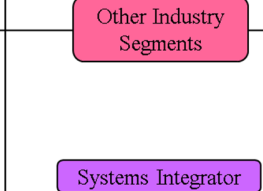

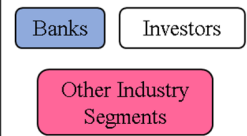

| <i>Stakeholder types</i> | <i>Viewpoints</i> | | |
|---|---|--|---|
| | <i>Zengin Network</i> | <i>PSP</i> | <i>Bank of Japan</i> |
| Stakeholders who <u>must be considered and satisfied</u> |  |  |  |
| Stakeholders who <u>must be considered and should be satisfied</u> |  |  |  |
| Stakeholders who <u>must be considered and might be satisfied</u> |  |  |  |
| Other stakeholders |  |  |  |

Figure 6 Comparison of viewpoints on stakeholder prioritization

2.7.3. Stakeholder Needs

Table 5 and Table 6 summarize the main needs of each stakeholder. They show that each stakeholder has different needs due to their different roles and entities. By recognizing these

differences, it is possible to predict to some extent how the stakeholders will behave, and to develop measures to guide them to the desired system.

Table 5 System owner needs (not inclusive)

| <i>Main Categories</i> | <i>Sub Categories</i> | <i>Main needs</i> |
|------------------------|--|---|
| Owners | 1) Japanese Bank's Payment Clearing Network (Zengin-Network) | <ul style="list-style-type: none"> - Safety and Security - Stability - Fulfillment of Banks' needs |
| | 2) Bank of Japan (BOJ) | <ul style="list-style-type: none"> - Ubiquity - Efficiency - Safety and Security - Speed - Fulfillment of needs of wide stakeholders |
| | 3) Payment Service Provider (PSP) | <ul style="list-style-type: none"> - Profit - Safety and Security - Speed - Fulfillment of end-users' needs |

Table 6 Stakeholder needs

| <i>Main Categories</i> | <i>Sub Categories</i> | <i>Main needs</i> |
|------------------------|-----------------------|---|
| A) End-Users | A1) Consumers | <ul style="list-style-type: none"> - Efficiency: Low cost - Ubiquity: Wide acceptance, great UI, and data portability |

| | | |
|------------------------|--------------------------------------|---|
| | | <ul style="list-style-type: none"> - Safety and Security: Protected privacy - Speed: Fast to pay |
| | A2) Business and Government | <ul style="list-style-type: none"> - Profit: Improvement of work efficiency - Ubiquity: Wide acceptance, great UI, data portability - Efficiency: Low cost - Safety and Security: Protected data - Speed: Fast to pay |
| | A3) Retail Business | <ul style="list-style-type: none"> - Profit: Improvement of work efficiency, business opportunities - Ubiquity: Customer base of personal users, great UI, data portability - Efficiency: Low cost - Safety and Security: Protected privacy - Speed: Fast to receive |
| B) Participants | B1) Banks | <ul style="list-style-type: none"> - Profit: Sales retention, fulfillment of needs of end-users - Efficiency: Low cost to participate - Safety and Security |
| | B2) Payment service providers (PSPs) | <ul style="list-style-type: none"> - Profit: Customer acquisition, fulfillment of needs of end-users - Ubiquity: flexible access to the system, great UI - Efficiency: low cost to participate - Safety and Security |
| C) Operators | C1) System owners | See the needs of "A) Owners" |
| | C2) Systems integrators | <ul style="list-style-type: none"> - Profit: sales retention - Safety and Security: reduction of the risk of too much transaction |

| | | |
|-----------------------------------|--|---|
| | | - Fulfillment of needs of owner |
| D) Regulators | D1) Bank of Japan (BOJ) | - Stability: low systemic risk of payment - Efficiency |
| | D2) Financial Services Agency (FSA) | - Stability - Promotion of financial industry |
| | D3) Japan Fair Trade Commission (JFTC) | - Enhancement of competition and innovation |
| | D4) Cabinet Secretariat | - Economic growth |
| | D5) Ministry of Economy, Trade and Industry (METI) | - Stability of card payments - Economic growth - Promote industries |
| E) Other Industry Segments | E1) B2C business companies | - Profit: customer acquisition, fulfillment of needs of end-users - Personal Information about references and credibility - Personal contacts |
| | E2) B2B business companies | - Profit: customer acquisition, fulfillment of needs of end-users - Customer information about references and credibility - Customer contacts |
| F) Investors | F1) Direct investors | - Profit: return of investment, fulfillment of needs of customers |
| | F2) Potential investors | - Profit: opportunities of investment, fulfillment of needs of customers |

3 Reference Cases of Overseas Payment Systems

This section provides examples of countries that have established or are planning to establish new instant payment systems as a reference for the design of retail payment systems. First, the cases of UK, Australia, US, Sweden, and Singapore are discussed in Section 3.1, and the study process is presented for each country. Next, Section 3.2 does not focus on the target countries, but presents country case studies for each notable feature of retail payments. These will serve as reference material for the design options for retail payment systems in Japan in Chapter 4.

Efforts have been underway in various countries to transform retail payment systems into immediate new systems. However, the details of these efforts vary from country to country. This section introduces some of the efforts to review retail payment systems for reference to be used in the design of retail payment systems in Japan.

3.1 Reference Cases

This section presents examples of retail payment systems in countries that have established or are planning to establish new instant payment systems. The cases of UK, Australia, US, Sweden, and Singapore are discussed in this section, and the study process is presented for each country.

In the UK, from the perspective of competition policy in the financial sector, the government has taken the lead in envisioning the future of the retail payment systems under the leadership of

various stakeholders, and has promoted system development, serving as a role model for other countries. In Australia, reforms have been promoted by the regulatory authorities proactively gathering the opinions of various stakeholders while keeping a variety of information open. In the US, efforts are underway to improve the lack of interoperability, drawing on examples from other countries. In Sweden, the retail payment systems has been examined in the process of private banks taking the initiative to provide services that users demand in cooperation with banks. Singapore has also created new policy instruments, such as legislation to ensure interoperability, while flexibly adopting measures necessary for its own country, taking the example of the UK as a reference.

3.2 Trends in the Reference Cases

This section presents examples of retail payment systems in countries that have established or are planning to establish new instant payment systems. The cases of UK, Australia, US, Sweden, and Singapore are discussed in this section, and the study process is presented for each country.

In Japan, there are many diverse payment service providers. Therefore, this section does not refer to cases where a particular service has a high market share, such as in China, but to the UK, Australia, US, Sweden, and Singapore, which have a system where payment service providers participate in a common system. In addition to these countries, reference was also made, where appropriate, to other countries that showed significant trends for each characteristic.

Table 7 shows the interbank immediate payment systems and mobile money transfer systems in the retail payment sector for the main countries referred to. In this paper, the term "retail payment system" is used as a broader concept that includes legal systems, but here it refers to payment infrastructures in a narrower sense.

Table 7 Retail fast payment systems in reference countries

| <i>Perspectives</i> | <i>Countries</i> | | | | |
|----------------------------|----------------------------|------------------------------|-----------|-----------------------------|---|
| | <i>UK</i> | <i>Australia</i> | <i>US</i> | <i>Sweden</i> | <i>Singapore</i> |
| Systems | NPA, PayM | NPP (New Payment Platform) | FedNow | BiR, Swish | FAST, PayNow |
| Consultative bodies | Payments system Task force | Real-Time Payments Committee | Fed | Swedish Bankers Association | National Payments Council |
| System owners | Pay.UK | NPPA | Fed | Bangirot | The Association of Banks in Singapore (ABS) |

UK

In the UK, as a background, the lack of competition and innovation in the banking industry has long been a problem. It has been an early adopter of a fast payment system, and is already in the process of conceptualizing its next system.

The impetus for reviewing the retail payment system came in 2000 when the Minister of Finance commissioned a committee of experts to conduct a study on "Innovation, Competition, and

Efficiency in the Banking Industry” (Don Cruickshank, 2000). It is worth noting that the competition authorities have since issued a study report, which states that the Office of Fair Trading (OFT) may also consider payment systems to be an "essential facility" from a competition policy perspective. 2004 saw the OFT launch the Payments System Task force was established to discuss the ideal instant payment system (Office of Fair Trading, 2004).

In 2008, the banking industry launched a new instantaneous electronic payment service (FPS) (Faster Payments Scheme Limited., n.d.), but the UK continued to discuss payment systems and move toward building a next-generation system. In 2014, the Payment Systems Regulator (PSR) was established to oversee the entire payments sector of the banking industry in order to bring competition and innovation to the payments sector (Payment Systems Regulator, 2015). In 2015, the Payment Strategy Forum (PSF) was established by the PSR to exchange views with private sector organizations, including consumers, businesses, governments, regulators, banks, challenger banks, fintechs, and other experts with a wide range of payments interests. In 2016, the PSF published “A Payments Strategy for the 21st Century” (Payments Strategy Forum, 2016). In it, the NPA concept was proposed to introduce a new payment mechanism instead of the existing system, with a remittance function and a layered structure for other functions. In 2017, the “Blueprint” for the future of UK payments was published to introduce NPAs in stages by 2025, and the NPA project was initiated (Duckworth & Clements, 2017). The Bank of England issued a discussion paper on CBDC in 2020 (Bank of England, 2020, 2021b), and in 2021, a more concrete viewpoint was presented in the form of "New forms of digital money” (Bank of England, 2021a).

As described above, in the UK, from the perspective of competition policy in the financial sector, there has been administrative intervention, and based on this, the future of the retail payment system was quickly envisioned through discussions among various stakeholders, and concrete system development has been promoted for a long period of time. The UK's move to review its retail payment system is faster than that of other countries, and is considered to be an example for other countries to follow.

Australia

In Australia, as background, there was a situation in the early 2000s in which the inter-charge fees for credit and debit card payments were discussed and regulated mainly by the Reserve Bank of Australia (RBA), the Australian regulator and central bank (Reserve Bank of Australia, 2002). As for the impetus for reviewing the retail payment system, a consultation was initiated by the Payments System Board (PSB) in 2010 to discuss the gap between the targeted payment system and the current situation, and in 2012, a conclusion was reached on the future strategy to address the following: making retail payments more immediate, expanding the operating hours of small payments, expanding remittance information associated with payments, and implementing addressing functions (Reserve Bank of Australia, 2012). The New Payment Platform (NPP) as a scheme was launched in 2018 (Reserve Bank of Australia, 2018), and an NPP sandbox was also established to “help third party service providers and software developers to learn and test the NPP’s capabilities via the available sample NPP APIs” (NPP Australia Limited & SWIFT SCRL, 2021). In Australia, a variety of information is kept as open as possible, and domestic discussions tend to take the form of official organizations, such as the government publishing consultation papers and gathering input from various quarters.

US

In the US, the trigger for rethinking the retail payment system was a speech by the Chairman of the Fed Financial Service Committee in 2012, in which he declared the Fed to be a "continue to be a partner and catalyst as the industry moves forward in the years ahead" (FEDERAL RESERVE BANK OF CLEVELAND, 2012).

The Payments Task Force was established to promote this reform and published two reports in 2017 (Faster Payments Task Force, 2017a, 2017b). In the reports, the task force stated that while other countries have solved the lack of interoperability in their payment systems by having a single provider offer payment services, the US is in a different situation. The task force stated that in the US, multiple competing payment solutions that meet the criteria have emerged, and that the challenge can be solved through a "market-driven approach" where multiple infrastructures offer payment systems for the same purpose.

In 2019, the FedNow concept of a system that combines clearing functionality with Real Time Gross Settlement (RTGS) was presented, and the plan was to build a settlement system for real-time settlement with finalization in central bank accounts to be available in 2023-2024 (Federal Reserve System, 2019). In parallel, discussions on CBDC are underway: in January 2022, the Federal Reserve presented a paper on CBDC and requested input from stakeholders (BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM, 2022).

Thus, in the U.S., activities are underway to improve the lack of interoperability in particular while allowing multiple payment systems and referring to examples from other countries.

Sweden

In Sweden, the review of the retail payment systems was not driven by policy, but by the market driven process" led by private banks. Based on a background of high IT literacy and a certain level of coordination among banks that were exhausted after the collapse of the bubble economy, the social infrastructure was implemented in a highly operational state. In 2002, a consortium of major Swedish banks was formed for the purpose of developing a general infrastructure for electronic certificates, forming Financial ID-Teknik BID AB, the basis for BankID, which was launched in 2003 (Finansiell ID-Teknik BID AB, 2022). The Swedish national ID and personal identification number integrated with name and electronic certificate were widely used in government services and private services such as Internet banking and e-commerce, and became widely used in the country.

In 2012, Swish, a single common interbank mobile remittance interface, was launched (Getswish AB, 2022). It was built in collaboration with the major banks, taking into account the size of the country's market and with the goal of preventing excessive competition.

Swish authenticates individuals using their Bank ID, which is linked to their national ID and bank account, and utilizes their verified cell phone number as an alias. Thus, in Sweden, the retail payment systems have been reviewed in the process of private banks.

Singapore

Under its Smart Nation initiative, Singapore has adopted payment reforms from the UK in order to expand the use of electronic payments. In 2005, MAS (Monetary Authority of Singapore)

signed an MOU with the UK FSA (Monetary Authority of Singapore, 2005). In 2014, FAST, an instant payment system, became operational (The Association of Banks in Singapore, 2022). The Smart Nation initiative, announced by the Prime Minister Lee Hsien Loong in 2014, aims to make Singapore “an outstanding city in the world for people to live, work and play in, where the human spirit flourishes” (Government Technology Agency, 2022). In 2017, the government announced the promotion of six strategic national projects in Smart Nation, one of which was a project in the area of electronic payments. In the same year, the National Payments Council (NPC) was established by the MAS, which planned to promote the development of seamless payment solutions, including PayNow, and introduce new legislation to protect consumers' interests and promote innovative payment solutions. 2017 saw the PAYNOW, a P2P payment/remittance system, introduced (The Association of Banks in Singapore, 2021). In addition, the Payment Services Act of 2020 was enacted to ensure that the MAS exercises its interoperability powers as needed in the "Designated Regime System for Payment Systems" to ensure a means to prevent fragmentation of payment instruments under the Payment Services Act Article 25 and 26.

Thus, Singapore has also created new policy instruments, such as legislation to ensure interoperability, while taking a cue from the UK case and incorporating what is necessary for its own environment.

As noted above, the reform of the payment systems in the UK has been preceded by a movement in other countries to review their immediate payment systems, with some influence from the UK reform.

3.3 Characteristics

This section presents country case studies for each notable feature of retail payments, rather than by country. The countries covered are not limited to those listed in the previous section. In particular, case studies will be presented for the following characteristics:

- System entity, system development entity, and governance structure;
- Non-bank access;
- Effectiveness criteria;
- System structure; and
- Regulation on interoperability, open API, and card payment fee.

There are various forms of system entities in each country. There are significant differences among countries in terms of the degree of involvement of central banks and governments in the review of retail payment systems and the degree of involvement of the public and private entities in the operation of the systems. Regarding the effectiveness criteria, in the US, the effectiveness criteria required for retail payment systems have been defined in detail and published. As for the structure, many countries have adopted a layered structure in which a variety of functions are provided by APIs. The functions are provided in order of priority of user needs. As for regulations on interoperability, there is an example of legislation to ensure that the regulator has the means to exercise their authority to seek improvements in interoperability when necessary. As for regulation of APIs, the degree of government involvement varies from country to country, with some governments strongly involved in open APIs, while others leave it to the market. For

card payments, many countries have imposed caps on merchant fees or interchange fees, which affect merchant fees.

System Entity, System Development Entity, and Governance Structure

In the UK case, the new retail instant payment system is NPA. The main entity for the provision and development of the NPA is “Pay.UK.” “Pay.UK” was the New Payment System Operator (NPSO), which was a joint venture between Bacs, C&CCC (Cheque and Credit Clearing Company), FPS and UKPA (UK Payments Administration) and it was renamed into “Pay.UK” in 2019 (Pay.UK, 2022). The consolidation is one of the key elements put forward in the strategy developed by the Payments Strategy Forum. The strategy identified that multiple payment systems were unnecessarily complex, time-consuming, and costly for PSPs to participate in, creating barriers to direct entry for PSPs and, in turn, limiting competition in the downstream market, which led to the policy merger (Payments Strategy Forum, 2016). It is also worth noting that the PSR (Payment Systems Regulator) has been actively involved in governance, issuing open letters to Pay.UK in 2018 and 2019 (Payment Systems Regulator, 2018, 2019). Thus, it can be said that the UK NPA is originally a banking industry organization, but operates in a state of active governance by the government while merging several organizations in a policy manner. Furthermore, “PayM,” a mobile payment service using phone numbers, was launched by the Payments Council. Although the Settlement Council was the industry's self-regulatory body, it was assessed as having failed to perform its strategy formulation function in a manner that reflected the needs of all stakeholders (HM Treasury, 2021). The network technology is provided by Vocalink (Mastercard, 2021).

In the US case, the new instant payment system planned is FedNow (Federal Reserve Banks, 2020). The FedNow Service is planning to launch in 2023. The FedNow service will be provided by the Fed, the central bank, and the Fed continues to recruit engineers. During the development process, a FedNow Pilot Program was planned and 110 organizations were announced to participate in (Federal Reserve Banks, 2021b). It is supposed to "support the development, testing, and adoption of FedNow services, as well as facilitate the development of services and use cases that take advantage of FedNow's capabilities." Only companies with a Fednow account can participate in the FedNow system, and non-banks are not allowed to participate (Federal Reserve Banks, 2021a).

In the Australia case, the new retail immediate settlement scheme is the New Payment Platform (NPP). The NPP is mutually owned by 13 organizations. They are mainly banks, but also payment service providers and payment solution providers. "NPP Australia Limited" was formed in August 2014 to oversee the build, operation and management of the Platform (NPP Australia Limited., 2022b). NPP Australia's Board of Directors consists of 13 directors, including a chairman and three independent directors, four of whom are independent of shareholders. In addition, four board committees provide guidance and support to the board in fulfilling its oversight responsibilities in key areas (NPP Australia Limited., 2022a).

In the Singapore case, the improvement is being achieved by implementing PAYNOW against FAST (Fast and Secure Transfers), an instantaneous payment system. FAST is operated by Singapore Clearing House Association (SCHA) and developed by Voca-link. As an initiative of MAS, a National Payments Council has been set up with the participation of stakeholders such as

payment providers, the business community, industry associations, and payment organizations to promote the use of FAST. Measures to promote the use of the product were discussed. One of the measures proposed was the introduction of PayNow. It is a P2P funds transfer service provided by ABS (The Association of Banks in Singapore) available to end-users of 10 participating banks and 3 participating non-banking financial institutions; bank participation began in 2017 and non-banking financial institutions began participating in 2021 (The Association of Banks in Singapore, 2021). Thus, the structure in Singapore is such that the government intervenes to provide a forum for absorbing the needs of diverse stakeholders, sets policy, and then the banking industry implements it.

In the Swedish case, instant payments are settled through BiR (Betalingar i Realtid), a payment system owned and operated by Bankgirot (RIKS BANK, 2021). There, Swish, a mobile money transfer interface, is offered as an immediate payment. Swish was launched in 2012 in cooperation with six major Swedish banks. Swish is provided by Getswish, a company owned by seven banks, with four other banks also participating in Swish. The Swedish case has the characteristics of a banking industry that has proactively cooperated to provide convenient services for their users.

As noted above, each country has its own diverse forms of system entities. There are significant differences among countries in terms of the degree of involvement of central banks and governments in the review of retail payment systems and the degree of public-private involvement in the operation of the systems.

Non-bank Access

In the UK and Hong Kong, which has its own system that differs from China's, non-banks have already been allowed to participate in 2018 (Hong Kong Monetary Authority, 2022; Pay.UK, 2022). Singapore also allowed non-banks to participate starting in 2020 (Monetary Authority of Singapore, 2020). In the UK, non-banks licensed as e-money operators or payment providers are now allowed to participate in the FPS for small payment systems. In the UK, it is possible to open a central bank current account and settle directly, or not open a central bank current account and outsource settlement to one of the banks (Bank of England et al., 2019). As of the end of September 2020, there were nine non-banks participating in the FPS, including TransferWise and CreDec.

On the other hand, in Australia and the US, non-bank access has adopted a cautious approach. In Australia, the central bank asked the NPPA (New Payments Platform Australia, the governing body of the funds settlement system) to consider non-bank participation. However, the NPPA responded that it would not be appropriate from the perspectives of "governance," "capital adequacy," "liquidity," "risk management," "BCP," and "information security" to allow connection to entities that do not hold banking licenses. They responded that if a new regulatory framework were to be prepared by the authorities, they would consider it (NPP Australia Limited., 2019).

In the US, many comments were received regarding FedNow, stating that direct participation by non-banks would increase the risk to the service and the payment system as a whole, and the plan is to disallow direct participation by non-banks (Federal Reserve Banks, 2021a).

Thus, there are divergent decisions about nonbank participation from country to country. This is thought to be due to different trends in the way banks behave and the level of growth of non-banks in each country, and the need to accommodate the participation of non-banks.

Effectiveness Criteria

The US is the only country this research found to include the detailed effective criteria for retail inter-bank payment system. In the US case, the effectiveness criteria required for retail payment systems are detailed and publicly available. Table 8 shows the Faster Payments Effectiveness Criteria for payment systems identified by the Faster Payments Task Force. The criteria not only describe the conceptual characteristics of the payment system, but also subdivide them into four categories: "Very effective," "Effective," "Somewhat effective," and "Not effective" for each item. Specific criteria are provided for evaluation at each level. In the U.S., after these criteria were made public, a process was undertaken in which proposals for specific services were solicited from a wide range of private sector providers, and the proposals were evaluated using these criteria (Faster Payments Task Force, 2016). From the perspective of soliciting proposals from the private sector, making these criteria public is an effective method. In other countries, the Effectiveness Criteria are usually defined in terms of principles and necessary characteristics for the establishment of a retail payment system, so it is rare for the United States to define the Effectiveness Criteria in such detail.

Table 8 Faster Payments Effectiveness Criteria (Faster Payments Task Force, 2016)

| | | |
|----------------------------|------|--|
| UBIQUITY | U.1 | Accessibility |
| | U.2 | Usability |
| | U.3 | Predictability |
| | U.4 | Contextual Data Capability |
| | U.5 | Cross-Border Functionality |
| | U.6 | Applicability to Multiple Use Cases |
| EFFICIENCY | E.1 | Enables Competition |
| | E.2 | Capability to Enable Value-Added Services |
| | E.3 | Implementation Timeline |
| | E.4 | Payment Format Standards |
| | E.5 | Comprehensiveness |
| | E.6 | Scalability and Adaptability |
| | E.7 | Exceptions and Investigations Process |
| SAFETY AND SECURITY | S.1 | Risk Management |
| | S.2 | Payer Authorization |
| | S.3 | Payment Finality |
| | S.4 | Settlement Approach |
| | S.5 | Handling Disputed Payments |
| | S.6 | Fraud Information Sharing |
| | S.7 | Security Controls |
| | S.8 | Resiliency |
| | S.9 | End-User Data Protection |
| | S.10 | End-User/Provider Authentication |
| | S.11 | Participation Requirements |
| SPEED (FAST) | F.1 | Fast Approval |
| | F.2 | Fast Clearing |
| | F.3 | Fast Availability of Good Funds to Payee |
| | F.4 | Fast Settlement Among Depository Institutions and Regulated Non-Bank Account Providers |
| | F.5 | Prompt Visibility of Payment Status |
| LEGAL | L.1 | Legal Framework |
| | L.2 | Payment System Rules |
| | L.3 | Consumer Protections |
| | L.4 | Data Privacy |
| | L.5 | Intellectual Property |
| GOVERNANCE | G.1 | Effective Governance |
| | G.2 | Inclusive Governance |

System Structure

In the UK case, a recommendation was made by the Payments Strategy Forum that a layered architecture should be adopted. It was pointed out that "past systems were slow to change and acted as a brake on innovation" because in the past non-layered systems, multiple participants, including competitors, had to collaborate on the changes and agree to implement and test them. By having the ability for each layer to separate its capabilities from those above and below it, it is possible to change or create a new component, such as an overlay service like Paym, and still maintain service characteristics without affecting all other participants. Therefore, they argued that the layered structure offers various advantages such as flexibility, compatibility with existing systems, and resilience. They also noted that these overlay services could be developed competitively or cooperatively.

In the US case, FedNow indicated that it plans to offer value-added features such as a payment request function and tools to assist participants with payment inquiries, reconciliation, and exception handling, but did not specify whether the system would be layered in structure or provide APIs. Many of the solutions submitted against the payment system effectiveness criteria explicitly indicated that they would provide APIs, but this appears to have been the result of a decision that it was better to provide APIs as a result in order to meet the expected performance. In relation to existing systems, the plan is to offer FedNow services by leveraging FedLine Solutions, the infrastructure that the Fed provides to companies to support the provision of payment and information services (Federal Reserve Banks, 2022).

In the Australia case, one of the features of the NPP is its layered structure. In the NPP, the NPPA is structured in such a way that APIs for various overlay services are provided, and the NPP is considering which features to prioritize first, depending on the needs of users. In the NPP sandbox, sample APIs are made public and an environment is provided for third parties to test these APIs.

In the Singapore case, PayNow is an overlay central address service that runs on top of the FAST payment system. Non-banks were allowed to participate in both FAST and PayNow in 2020. Non-banks can connect directly through a new API payment gateway developed by the Direct FAST Working Group (DFWG) to participate in them (Monetary Authority of Singapore, 2020).

In the Swedish case, immediate payments are settled by BiR (Betalingar i Realtid), a payment system owned and operated by Bankgirot. The central bank, Riksbank, and the banks are able to use Swish through a solution in which the banks have a special clause for BiR in RIX, the central bank's settlements system, which acts as a guarantee against payment. It should be noted that in the future, when immediate settlement is further expanded, it was recognized that this is not an adequate arrangement and may represent a risk to financial stability, and as a result of analysis by the Riksbank, a new service for immediate settlement, RIX-INST, was developed. Two APIs are exposed by Swish: the Swish Commerce API is used to process payment requests, refunds, and QR codes at the terminal; the Swish Payout API is used to solve the need for instant payments from businesses to the many people in Sweden. Swish launched in 2012 and has gradually expanded its capabilities: Swish for companies in 2014, Swish for e-commerce in

2016, swish QR codes in 2017, payment requests in 2020. In 2021, payouts and an app for companies will be available (Getswish AB, 2022).

As mentioned above, many countries have adopted a layered system structure, in which various functions are provided through APIs. The functions are provided in order of priority of user needs.

Regulation on Interoperability

In Singapore, the Payment Services Act 2020 was enacted to ensure that the MAS has the means to exercise its interoperability powers and prevent fragmentation of payment instruments, if necessary, under the Payment Services Act Article 25 and 26. Here, interoperability refers to interoperability between settlement accounts and settlement systems and between settlement systems. Specifically, the MAS may “direct a firm to either (a) become a participant in a settlement system or (b) enter into an arrangement with the operator of a settlement system, or both, on such terms and conditions as the authority deems appropriate” under the Payment Services Act.

In considering such a direction, the Authority shall take into account whether interoperability is in the interest of the public, the interests of current participants and operators of the payment system, the interests of future participants, and such other matters as the Authority considers relevant. In this manner, there is an example of interoperability regulation that has been legislated to ensure that regulators have the means to exercise their authority to seek improvements in interoperability, if necessary.

Regulation on Open API

The UK was the first country in the world to legislate open APIs (Open Banking Standard); in 2014, the Ministry of Finance declared itself a world leader in "open banking." In the UK, open banking was initiated in 2017 by the Competition and Markets Authority (Competition and Markets Authority, 2021).

In the EU, PSD2 requires banks to open their open APIs to access from PISPs (Payment Initiation Service Providers) and AISPs (Account Information Service Providers). The method of doing so must be in accordance with open standards and in a secure manner (EUROPEAN COMMISSION, 2020). As a result, it effectively obliges banks to provide standardized open APIs.

Australia's approach is unique: in 2017 the Australian government introduced the Consumer Data Right (CDR) in Australia; the CDR allows consumers to access and control their data. CDR will first be applied to the banking sector, followed by the energy sector. It is now proposed that the telecommunications sector will follow suit (Australian Competition and Consumer Commission, 2022).

As can be seen, governments in some countries are strongly involved in open APIs, while in others they leave it to the market.

Regulation on Inter-change Fee or Merchant Fee of Card Payments

Many countries have imposed caps on merchant fees and interchange fees, which affect merchant fees, for card payments. Interchange fees of card payments are fees paid by acquirers to issuers, set by international brands, to facilitate the growth of credit card transactions. Because acquirers pay interchange fees out of the merchant fees they receive, high interchange fees affect merchant fees. South Korea and India have imposed caps on merchant fees. The US, EU, and Australia have imposed caps on interchange fees. In Australia, the disclosure of interchange fees is regulated; in the EU, it is done based on an agreement between the authorities and operators; and in the US, it is done voluntarily by operators (Ministry of Economy, 2022).

In this section, we have introduced some characteristic examples of the features of retail payment systems in various countries, such as system entities, system structures, and regulations. It is necessary to study the system design according to each country's situation, referring to these examples from other countries.

4 Architectural Design Options and Analysis

This chapter analyzes the possible designs for the Japanese retail payment system based on the Japanese environment. To this end, first, this paper identifies the desired payment system performance and functionality (Section 4.1). Second, the paper presents a list of architectural options for the retail payment system (Section 4.2). Third, the paper combines those architectural options to create several new possible design options for the retail payment system (Section 4.3).

Fourth, the paper evaluates those design options (Section 4.4). Through this process, the paper discusses new designs that can improve the current Japanese retail payment system and what is needed to implement them, given the Japanese environment.

4.1 Desired Performances and Functions

In designing a system, it is advisable to specify what performance and functionality the system needs to provide. This makes it easier for the system to meet the needs of its stakeholders and allow for efficient system design.

This section discusses the desired performance and functionality of a retail payment system in Japan, based on the needs of Japanese stakeholders. Specifically, these requirements are defined by picking out what is considered important from the issues raised in the review of payment systems in various countries. It also examines the functions required for Japan's retail payment system by referring to the functions designed in interbank retail payment systems in various countries.

The performance required of the retail payment system should first be discussed by the parties concerned and the conclusions should be made public. Then, we propose to focus on ubiquity, efficiency, security/stability, speed, governance, and legality as the required performance of the Japanese retail payment system. Regarding the functions required of the Japanese retail payment system, it is possible to divide them into two types of users, end-users and system participants, and then consider the functions to be provided to each type of user.

Desirable functions from the end-user's point of view would be to provide contact points with the payment system such as channels, identification, authentication, and authorization, and to provide basic payment functions. Users also prefer to be able to freely manage their own payment data and payment authorization so that they can take advantage of a variety of services.

Desirable functions from the perspective of system participants include an interface for joining the system, and clearing and settlement functions for completing payments. Participants desire to be able to manage enhanced data exchange and mandate management functions so that they can participate in some way in the payment system and provide convenient services to end-users.

Table 9 shows the performance requirements for the Japanese retail payment system. The performance requirements are organized into six main perspectives.

Table 9 Desired performances perspectives

| <i>Main Categories</i> | <i>Perspectives</i> |
|------------------------|--|
| Ubiquity | <ul style="list-style-type: none"> - End-to-end Interoperability - Usability <ul style="list-style-type: none"> ➤ Payer is always in control ➤ Applicability to Multiple Use Cases - Enhanced Data Capability - Cross-Border Functionality - Financial Inclusion |
| Efficiency | <ul style="list-style-type: none"> - Open to competition and innovation - Low fees - Scalability and adaptability |
| Safety and stability | <ul style="list-style-type: none"> - Security |

| | |
|------------|---|
| | <ul style="list-style-type: none"> - End-user data protection - Safety and stability of the financial system |
| Speed | <ul style="list-style-type: none"> - Real time (confirmation of payee and request to pay) - Prompt visibility of payment status |
| Governance | <ul style="list-style-type: none"> - Effective governance - Open and transparent |
| Legal | <ul style="list-style-type: none"> - Innovation-friendly legal framework |

This table was constructed from a review of the literature on retail payment systems in each country.

The first perspective shown in Table 9 is ubiquity. A retail payment system should be seamless and inexpensive for everyone to use. To this end, it is important from the end-user's point of view that money can be transferred to anyone against anyone else, and interoperability between payment services must be ensured for this purpose. The operation of the system needs to be easy and convenient. The person making the remittance needs to be able to check the status of the remittance process and give various instructions as he or she sees fit. The remittance needs to be able to respond to a variety of use cases according to the needs of each individual. An environment that allows for the exchange of additional payment information associated with each remittance is also necessary. From the user's perspective, it is desirable to be able to send money without being aware of national borders. It is also desirable for the system to provide appropriate financial inclusion according to the creditworthiness and other circumstances of each user.

The second perspective is efficiency. The retail payment system should operate efficiently and continue to improve. To this end, the system should be one that encourages innovation through competition among firms. For users, it is desirable that the cost to use the system is low. In

addition, the system should be flexible enough to respond to an exponential increase in the frequency of payments.

The third perspective is safety and security. A retail settlement system should be able to reliably and stably fulfill users' settlement instructions, securely manage data, and support the stability of the financial system. To this end, sufficient security should be ensured and services should continue to be provided in a stable manner. Even if multiple companies have access to end-user data, end-users prefer to have their data protected and to keep their privacy. It should also support the stability of the financial system in a broader sense, not limited to payments.

The fourth perspective is speed. Retail settlement systems should be fast. From the end-user's perspective, settlement should be immediate. It is also desirable that the end-user be able to check the information on his/her account in real time.

The fifth perspective is governance. This is positioned to effectively maintain and continue to improve the first four perspectives. The retail payment system should have appropriate governance to continue to ensure that they are desirable systems for stakeholders. Therefore, the governance of the payment system platform should be similar to that in other business platforms, including who oversees security, who has access to the system, what the accessing entities can do, how to ensure the quality of processing large volumes of transactions. It is desirable that the first four perspectives be effectively maintained and continually improved, with a well-designed approach to such things as how to detect illegal transactions. They should also be open and transparent to stakeholders.

The sixth perspective is Legal. This is necessary for the protection of stakeholder rights, which is difficult to achieve through the first perspective to fifth perspective alone by the private sector.

Retail payment systems should be regulated to an appropriate extent by an innovation-friendly legal framework. The system should be easy for companies to understand and less likely to discourage new initiatives by companies. The problems with the Japanese retail payment system introduced in Chapter 2 and the desired performance described above can be organized as shown in Table 10. We use the table to evaluate the design options for each retail payment system in section 4.4.

Table 10 Relationship between the problems in Japan and the desirable performances

| <i>Categories of Desirable Performances</i> | <i>Problems in Japan</i> | |
|---|------------------------------|---|
| Ubiquity | Interoperability | There is incompatibility between different payment services. |
| | Data Openness | Banks' updating APIs are relatively late in being released. Similar APIs are not provided by non-bank payment services. |
| Efficiency | End-User Fee | Bank transfer fees have been reduced but remain high. |
| | Merchant Fee | There is a structure where merchant fee is easy to get high. |
| Safety and Stability | Security | There are payment service providers with low levels of security. |
| Speed | Clearing of Merchant Revenue | Non-bank mobile payment services take longer to deposit sales. |
| Governance | Stakeholder Coverage | Banks lead the payment system, and it is challenging to reflect end-users' needs. |
| | None-Bank Participation | Non-bank cannot participate in the Zengin-system. |

The functions were organized into two categories of users: end-users and system users. The system users include both companies participating in the payment system and third parties accessing end-user accounts on their behalf to utilize the payment system. The functions for these two different user types overlap a lot, but by separating them, we can see the different

parts. The following are desired functions for the retail payment system, referring to the discussions in the review of payment systems in various countries.

Desired Functions for End-Users

Channels

Channels are the tools used by end-users to access the services provided by the retail payment system in order to take advantage of the payment services offered by the system. They include websites, telephones, stores, and most notably, smartphone applications.

Authentication

Authentication is “to verify the origin of a message or to verify the identity of a participant connected to a system and to confirm that a message has not been modified or replaced in transit” (Bank for International Settlements, 2016). In practice, authentication is performed for end-users whenever they begin using the service. In the case of in-person interactions, identification, authentication, and authorization are verified verbally. In smart phone applications, these are verified online. When using the service, identity is verified in a manner appropriate to the risk of the activity.

Payment

Payment is a series of basic functions for settlement; the process of payment is completed by clearing and settlement. From the end-user's perspective, the system must be able to meet the needs of a variety of use cases, such as recurring payments, payments to merchants, P2P transfers, and cash withdrawals. The end-user has the following functions: 1) payment initiation, where the end-user gives payment instructions; 2) payment cancellation, where the end-user cancels a payment that has already been made; 3) return payment, where the end-user returns a payment that has already been made; and 4) clearing and settlement, where a corporation requests multiple different payments at one time. The function of bulk payment for requesting a payment from another party and the function of requesting a payment from another party are functions for remittance instructions. It also includes related functions, such as instructing a payment to entrust a third party to make a payment, read payment status to check the status of a payment, and payment notification to notify the status of a payment in a push type manner. Payments should also be able to accommodate cross-border payments.

Enhanced Data Exchange

Enhanced data exchange is the capacity to attach data to a payment to allow a recipient to easily identify what the payment relates to. The information associated with each payment includes personal messages and customer information about the purchase of goods and services.

Mandate Management

Mandate management is a feature that allows end-users to delegate authority, such as their settlement instructions, to third parties based on user authorization. It includes mandate creation, instruction of a mandate payment, and mandate amendment.

Customer Awareness and Education

Customer awareness and education is to provide appropriate information and education to users in order to increase the security of their payments.

Data Sharing & Data Analytics to tackle fraud and financial crime

This is to utilize customer payment data to prevent fraud and financial crimes and protect customer assets. It also includes the sharing of KYC (Know Your Customer) information.

Desired Functions for Participants and Third Parties

Interfaces

The interfaces are the point of contact for companies participating in the payment system and third parties accessing end-user accounts on their behalf to utilize the payment system. For companies participating in the payment system, it is desirable to have different access methods depending on their needs. For example, both direct and indirect connections to the payment system could be allowed. Another option could be a direct or indirect connection to the settlement system provided by the central bank. For third parties accessing end-user accounts on behalf of the end-user, it is important that a convenient API be provided. It is desirable to have

clear guidelines for API connections and standardization of data exchange, such as ISO20022 for messaging standards. An environment for connection testing could also be provided as a support tool for API connections.

Authentication for End-Users

Tools should be available to help simplify the authentication for end-users, either by companies participating in the payment system or by third parties accessing end-user accounts on their behalf.

Clearing and Settlement

In order for companies participating in the payment system to be able to provide end-users with a payment service that allows reciprocal transfers to other companies' accounts, there needs to be a mechanism for clearing multiple transactions and ultimately settling them in the central bank account to complete the transfer.

In addition, the settlement should be able to support cross-border settlement. To this end, the message format should conform to international standards.

Enhanced Data Exchange

The provision of enhanced data exchange capabilities will create room for value-added services using that data.

Mandate Management

Mandate management allows third parties with access to end-user accounts on behalf of end-users to provide more flexible services to end-users.

Data Sharing & Data Analytics to Tackle Fraud and Financial Crime Related Activity

By utilizing customer payment data, fraud and financial crime can be prevented and more secure services can be provided to end-users.

In this section, desirable functions for the retail payment system were examined by organizing them into two categories: end-users and participants of the system. Although there are many desirable functions common to the two types of users, analyzing the two separately provides a direction that is useful for designing a more appropriate system since their perspectives of needs are different.

4.2 Architectural Options

The purpose of this section is to organize the architecture choices that shape the possible design options of the retail payment system. The design options for a retail payment system consist of a combination of options from several architectural perspectives.

The main architectural aspects of the retail payment system include entity, performance requirements, structure of the system, non-bank access, and regulatory changes. For each of these perspectives, multiple options exist. Although each option has a different degree of desirability, it is not possible to choose the most desirable option for every aspect for a realistic retail payment system design. Therefore, it is necessary to know the characteristics of the alternatives for each architectural perspective in order to select a design.

Table 11 shows architecture alternatives that shape the possible design of a retail settlement system. For each of the issues, a choice is made, and the combination of choices results in a single payment system design. There are multiple options for each issue, and each option is evaluated differently. It should be noted that the evaluation here does not take into account feasibility or social cost of implementation. Moreover, selecting the architectural option with the highest evaluation for each issue does not necessarily result in the optimal design.

Table 11 Main architectural options to define design options

| <i>Architectural options</i> | <i>Possible architectural options</i> | | | |
|---|--|--|--|-------------------------------------|
| The entity that provides the retail payment infrastructure with large market share | Central bank | Banking industry | Dominant PSP | No entity with a large market share |
| Performance requirements | Published | Not published | - | - |
| Infrastructure for overlay services | Fully provided | Partially provided | Partially provided (if regulated successfully) | Not provided |
| System construction | Build a new system - Layer & Module | Modify the current system - Package | Wait for the current service to gain market share | - |
| Non-bank access | Access to both clearing system and settlement system | Allow access to clearing system only | Do not allow access to clearing or settlement system | - |
| Regulatory intervention | No regulatory intervention on interoperability and payment-related fee | Card payment interchange fees disclosure | Combination of multiple policy interventions (*) | - |

Legend: Superior, Medium, Inferior

**Combination of the following:*

- *Interoperability regulations,*
- *Open API regulations,*
- *Card payment interchange fees disclosure or payment-related fee regulations, and/or*
- *Intervention in the cost of operating the domestic exchange system.*

The entities that could establish a retail payment system in Table 11 include the central bank, the banking industry, and a dominant PSP. The governance of payment systems in Table 11 is closely tied to the issue of the payment system providers. The first option is the Bank of Japan (BOJ), the central bank in Japan. Globally, there are examples of central banks establishing and operating retail payment systems, such as in the United States. Some central banks are also considering issuing retail CBDC, which, if issued, could ultimately provide the functionality of a retail payment system. This is the option that is considered the strongest as a method of governance of the payment system, since an entity with a neutral perspective would be responsible for the construction and operation of the payment system. The second option is the banking industry. The Zengin-system is run by the banking industry, and the alternative is for the people of the Zengin-Net to review their system or build a new one. Governance under this approach would involve the establishment of a third-party committee to take into account the needs of the various stakeholders. For example, the Zengin system is run by the banking industry, but with a third-party committee. The third option is a dominant PSP. This does not mean that they directly provide public payment system infrastructure, but if the service provided by a company holds a high market share, the result will be that it will be widely used like public infrastructure, which is the case for this situation. In this case, with regard to the governance of the payment system, the governing body is composed of only a single company, and there is no

governance that directly takes into account the needs of the various stakeholders. It is assumed that the competition policy authority will provide guidance only in the case of some competition-restricting behavior.

There is another perspective related to the entities. It is the entity that develops the payment system. In the case of the PSP, it provides the service, but in the case of the BOJ and the banking industry, the development is often outsourced, with engineers who have technical backgrounds. For example, the Zengin-system is a service provided by NTT Data on an outsourced basis. It would be more flexible and less expensive to provide the service in-house, but this would require securing engineers and providing personnel benefits.

We did not include the option of a diverse stakeholder organization providing a retail payment system as a possible option. In the UK example, we did not find any examples of such entities providing even interbank retail payment systems, although organizations made up of diverse stakeholders do provide a mobile payment app.

Another perspective is whether performance requirements for the retail payment system are clarified and made publicly available. The Faster Payments Task Force in the US has identified performance requirements for payment systems that can go anywhere, compiled them into criteria, and made them publicly available. The criteria were used to solicit technical solutions from the private sector and to evaluate individual proposals.

As for the structure of the system in Table 11, the first option is to create a new system from scratch, separate from the existing system. The option is to combine multiple modules in a layered structure to create a whole system. Systems created in recent years are likely to be this method. The second option is to modify the existing system. It requires the creation of a system that combines all necessary functions as a single package. Rebuilding the Zengin-system is considered to be this option. Especially when an old program is updated and built up, it often happens that the code is extremely large and complex in design, which is called spaghetti code. In such cases, reworking the code will require considerable effort and will be highly difficult. This option is not suitable, especially when the existing system is like a spaghetti code where it is difficult to make drastic changes. The third option is not to change the existing payment system, but to wait until an individual company's payment service gains a high market share. In Japan, however, payment services are in such disarray that it would be difficult to achieve this in a short period of time. In the case of the UK, access to both is granted, while in many other countries, access only to the retail payment system is granted. In the case of Japan, the direction to allow non-bank access to the retail payment system has just been indicated, and specific connection requirements are being discussed.

There are two perspectives on non-bank access: access to the main retail payment system, and access to the system for settlements managed by the central bank. In the case of the UK, access to both is granted, and in many countries, only access to payment systems is granted, or there is a movement to grant such access in the future. In the case of Japan, the direction to allow non-bank access to retail payment systems has just been indicated, and specific connection requirements are being discussed.

The degree to which and how much regulation is applied as a government regulation varies. One of them is the issue of the degree of regulation of fees associated with merchant payments in Table 11. Internationally, there are a number of cases in which there are caps on interchange fees set by brand companies and fees charged to merchants for card payments. The strongest option is to impose a cap on such fees. A weaker option would be to put in place a governance structure to prevent such fees from becoming too high. The second option is to require brand companies to disclose interchange fees that they set on their own to design incentives for issuers and acquirers. This interchange fee has attracted attention because it is paid by the acquirer to the issuer and is structured to influence the fees charged by the acquirer to the merchant. In Japan, an investigation by the Fair Trade Commission has recommended that card brand companies disclose interchange fees to the public, but this has yet to be done.

Another issue of regulations is how to make sure the interoperability. In Singapore, the authority to ensure interoperability was given to the regulator of the payments sector. If a payment service provider has gained a large market share but is not participating in a widely used payment system, and thus interoperability is compromised, the government may, after conducting the necessary investigations and if necessary, authorize the payment service provider to participate in the payment system. The authority was granted to require the participation in the system. One point of contention is whether to clarify such authority.

The next issue of regulations is the degree of regulation of open APIs. In Japan, banks are obliged to make efforts to open their APIs. There is no regulation for PSPs. Under these circumstances, banks and PSPs each have a choice of whether to mandate API disclosure,

impose an effort requirement, or do nothing additional. In Japan, the degree of regulation of banks was settled in the form of an effort requirement rather than a mandate after various discussions.

The design of a retail payment system is composed of a combination of options for various perspectives. Therefore, it is important to organize the options for the various perspectives, as in the analysis in this section.

4.3 Design Options

This section identifies several design options that would be desirable by combining each of the retail payment system architecture options described above. These designs would solve some of the current problems to a certain degree and have a minimum level of feasibility. When taking a broad view of the retail payment system, there are numerous ways in which the current system could be improved. Since the methods employed vary widely depending on the entity improving the retail payment system, this section lists different options depending on that entity. For the sake of efficient evaluation, this section excludes those options that are clearly impractical and includes a few ambitious options, but also those that are likely to be as effective as possible.

The following five possible design options are possible solutions to the current challenges.

Design 1: Bank leading scenario by rebuilding the Zengin-system

Design 2: Bank leading scenario by utilizing "Cotra" system

Design 3: Bank of Japan (BOJ) leading scenario of payment system

Design 4: BOJ leading scenario of retail CBDC

Design 5: Dominant PSP leading scenario of mobile payment service

Table 12 provides a breakdown of each option. Figure 7 shows the focus of each option and provides a picture of which way P2P and in-store payments can be expanded. This section discusses each in detail.

Table 12 Architectural options

| <i>Architectural options</i> | <i>Possible Design Options</i> | | | | | |
|---|--|---|---|--|--|---|
| | <i>0. Status-Quo</i> | <i>1. Zengin-system</i> | <i>2. Cotra System</i> | <i>3. BOJ Retail System</i> | <i>4. Retail CBDC</i> | <i>5. Dominant PSP Service</i> |
| The entity that provides the retail payment system with large market share | No entity with a large market share | Banking industry | Banking industry | Central bank | Central bank | Dominant PSP |
| Performance requirements | Not published | Not published | Not published | Published | Published | Not published |
| Infrastructure for overlay services (including APIs) | Partially provided | Partially provided | Partially provided | Fully provided | Fully provided | Partially provided (if regulated successfully) |
| System construction | Wait for the current service to gain market share | Modify the current system - Package | Build a new system - Layer & Module | Build a new system - Layer & Module | Build a new system - Layer & Module | Wait for the current service to gain market share |
| Non-bank access | Do not allow access to clearing system | Allow access to clearing system only | Allow access to clearing system only | Allow access to clearing system only | Access to both clearing system and settlement system | Allow access to clearing system only |
| Regulatory intervention | No regulatory intervention on interoperability and payment-related fee | Combination of multiple policy interventions (*1) | Combination of multiple policy interventions (*2) | Card payment interchange fees disclosure | Card payment interchange fees disclosure | Combination of multiple policy interventions (*3) |

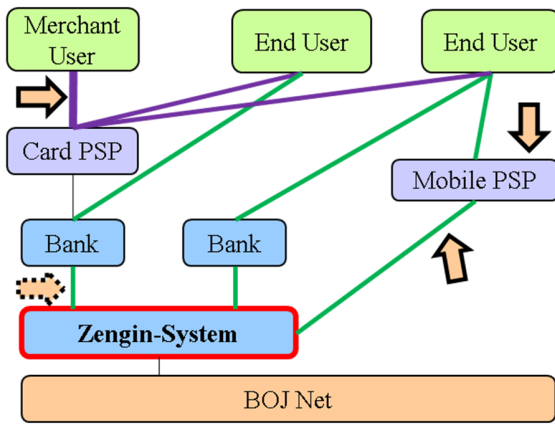
Legend: Superior, Medium, Inferior

*1 Payment-related fee regulations, intervention in the cost of operating the domestic exchange system, and open API regulation on the dominant PSP

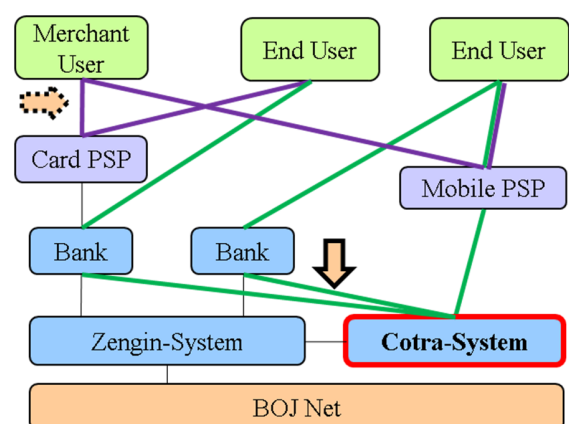
*2 Interoperability regulation and card payment interchange fees disclosure

*3 Interoperability regulation, card payment interchange fees disclosure, and open API regulation on the dominant PSP

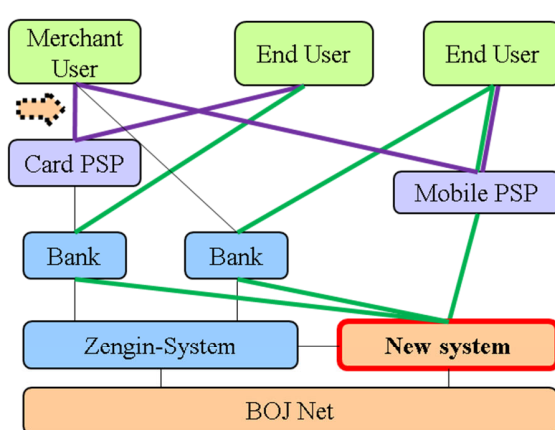
Design 1. Zengin-system



Design 2. Cotra system



Design 3. BOJ retail system & 4. Retail CBDC



Design 5. Dominant PSP service

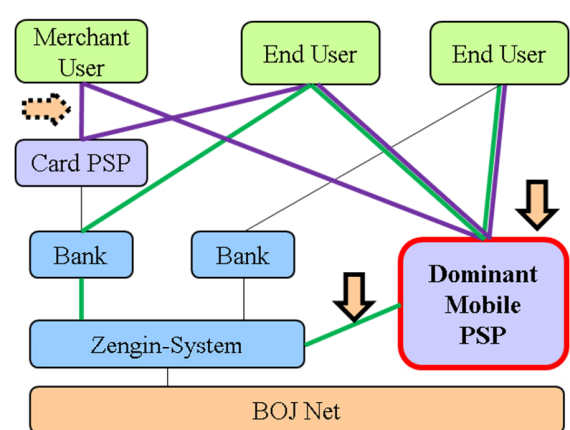


Figure 7 Focuses of possible design options for the Japanese payment system

Design 1. Bank leading scenario by rebuilding the Zengin-system

The first possible design option in Table 12 is to improve the situation while making effective use of the Zengin-system. This option assumes that the Zengin-system, which is open to nonbanks, will be utilized as efforts to open the Zengin-system to nonbanks, which is currently being undertaken. The option also assumes that the Zengin EDI (Electronic Data Interchange) system will be used to exchange settlement information. The Zengin EDI system (ZEDI) is the system that replaces B2B bulk transfer messages with XML messages (ISO20022), as shown in Figure 8. It is a system built separately from the Zengin-System. In order for companies to introduce ZEDI, they need to spend money on system development, and the environment is such that other companies must also introduce ZEDI in order to gain sufficient benefits, which is a challenge for its diffusion. A task force has even been established to promote ZEDI. Because of the challenges to the diffusion of this system, this option does not offer much promise for the smooth exchange of payment information, at least in the short term.

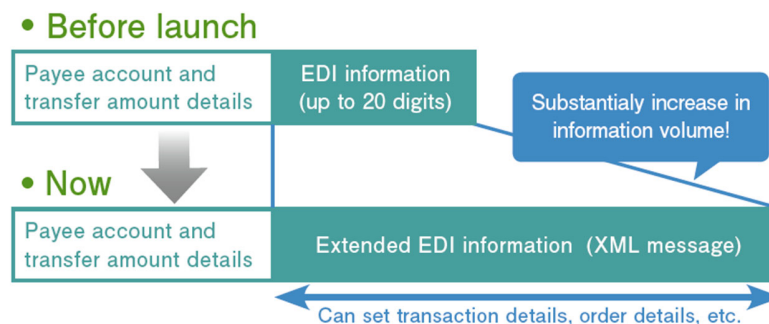


Figure 8 Zengin EDI (ZEDI) system (Japanese Banks' Payment Clearing Network, 2010)

In this design option, the entity building the retail payment system is assumed to be the banking industry, specifically Zengin-Net.

In terms of governance over the system, a third-party committee called the Zengin-Net Expert Committee has been established, and it is assumed that this committee will continue to be used. This committee has been reviewed in recent years in terms of how it operates and has expanded its efforts to pick up the needs of various stakeholders. Originally, Zengin-Net was created within the banking industry, and it is not practical to change the organization's membership itself.

This option assumes that no public disclosure of system performance standards would be made. The performance requirements for outsourcing system development do not appear to be publicly available. The Zengin-system has been developed by the same system integrator for many years. It is said that when system development is outsourced to an external system integrator, the need to request the same system integrator increases and lock-in is likely to occur, which may be the case. In addition, the option of publishing detailed system performance standards would be impractical, as it would not be of great benefit to the banking industry.

This design option assumes that the infrastructure supporting the overlay service would be partially provided. The Zengin EDI system operates separately from the Zengin-system and provides a system for exchanging information related to settlements. However, open APIs are left to each bank and are not included in the Zengin EDI system. In addition, the use of the Zengin EDI system by companies is limited, and discussions on how to popularize this system are ongoing. It would not be realistic to build another, more versatile system for overlay, by providing a more complete infrastructure, while discussing the popularization possibilities of the existing system.

As for the structure of the system, this option assumes that a group of component systems would be built together in a package; in the Zengin-system, a system built in the COBOL language has been in use since the 1970s, with continuing improvements. In Japan, it has been pointed out that many companies' IT systems have problems such as aging technology, bloated and complex systems, and black boxes, resulting in systems that are a drag on management and business strategies and cause high cost structures (Ministry of Economy, Trade, and Industry, 2018). It would be unrealistic to make drastic changes to this structure.

This option assumes that the way to migrate from the current system would be to make minor changes to the current Zengin-system, rather than creating a new system from scratch.

This design option assumes that non-bank access to the payment system would be allowed. Non-bank access has not been allowed in the past, but recently there has been a move toward allowing non-bank access to the Zengin-system, and specific connection conditions are currently being discussed. In Japan, the opening of access to the BOJ-Net has not been discussed. When the government policy to allow non-bank access to payment and settlement systems was announced, a change in direction from the policy that has been in place since the 1970s, BOJ-Net was not explicitly included in the scope of the policy. Therefore, it is not feasible to include BOJ-Net as an additional target in the future unless the BOJ itself feels the need to do so.

As for regulation of interoperability, this option has in mind the clarification that the government has the authority to direct PSPs with a larger market share to participate in a widely used payment system. This would ensure interoperability by directing PSPs that do not participate in the Zengin-system to participate it, even as the market share of services offered by PSPs that do not participate in the Zengin-system grows. Since all banks are participating in the Zengin-

system and interoperability is ensured among their services, there is no need to consider addressing banks.

As for regulation of open APIs, the assumption here is that PSPs participating in the Zengin-system will also be subject to the open API effort requirement currently governing banks. The idea of imposing an effort obligation only on those PSPs that are responsible for payment services and are positioned well enough to participate in the Zengin-system has a certain persuasiveness from the perspective of equal footing. The direction of changing open APIs from a duty of effort to a duty of obligation is highly challenging in light of past history, and it is unrealistic to include an open API obligation among the options expected of the existing Zengin-system.

Regarding the approach to merchant fees, this design option envisions a separate regulation for card settlement fees. As far as what this option expects from the Zengin-system, it will not cover the solution to the problem of high fees for the main payment methods in store payments, so such a strong measure will need to be combined with it.

As for the entity to develop the system, this design option assumes an external system integrator. Due to the shortage of human resources and other factors, in-house development in the short term does not seem feasible.

Design 2. Bank leading scenario by creating a second system

The second design option in Table 12 envisions government involvement to improve interoperability and strengthen governance by leveraging existing third-party committees in the banking industry for the ongoing Cotra Project.

The entity that would build the retail payment system under this option is Cotra Ltd. Cotra Ltd is a legal entity established with investment from five metropolitan banks. The company is currently studying the possibility of launching a person-to-person remittance service as early as fiscal year 2022. They are aiming for both scalability and flexibility through the APIs while maintaining the network scale of the existing infrastructure.

As for how to apply governance to the system, at this time, there is no specific governance that specifically incorporates a third-party perspective, but this design option envisions strengthening governance by utilizing the Zengin-Net Expert Committee and placing this system on their agenda as well.

This design option assumes that the performance criteria for the system would not be made public. The option of publishing detailed system performance standards would be impractical, as it would not be of great benefit to the banking industry to publish detailed system performance standards.

As for the infrastructure supporting the overlay service, the Cotra project will open APIs and service functions will be "extended according to needs" (Japanese Banks' Payment Clearing Network, 2022). This will allow overlay services to be provided according to needs.

The structure of the system is envisioned as a layered structure. In the Cotra project, an infrastructure layer utilizing the J-Debit infrastructure will be provided, and service layers such as "direct applications," "bank-affiliated pay," and "non-bank-affiliated pay" will be constructed through APIs (Japanese Banks' Payment Clearing Network, 2022).

In terms of how to migrate from the current system, this design option assumes that a new system will be built. Utilizing the J-Debit infrastructure to which a number of banks are already connected, Cotra's service is planned to be launched in early 2022.

This design option assumes that non-bank access will be allowed. It has been announced that non-bank payments can also participate in the Cotra project.

Regarding regulation of interoperability, this design option assumes that banks with high market share will be encouraged to participate in the Cotra project. In the Cotra project, individual companies will decide whether or not to participate. For example, Japan Post Bank, which has the largest market share of bank accounts, has not announced its participation yet. The government could improve interoperability by encouraging banks with high market shares to participate, so that the majority of accounts to which salaries are transferred would be able to use Cotra transfers.

No restrictions on open APIs are envisioned. The API will be opened in the Cotra system.

No approach to merchant fees is envisioned. This option assumes that the expansion of relatively inexpensive mobile payment services will improve merchant fees for retail payments.

Design 3: Bank of Japan (BOJ) leading scenario of payment system, and

Design 4: BOJ leading scenario of retail CBDC

These design options assume that the BOJ will establish a new retail payment system. Design 3 and 4 are quite similar. This paper assumes two main differences between them based on the expectation that CBDC is a currency similar to cash.

The first difference is the speed of settlements. In the case of Design 4 CBDC, once the remittance instruction is given, the entire settlement is completed in real time. To this end, the end-user would have a CBDC that is capable of immediate settlement, and to support this, the payment providers that offer services to end-users would have access to the central bank's system. They would also need to be able to complete payments offline. On the other hand, for Design 3, a retail payment system provided by a central bank that is not a CBDC, the real-time nature of the transaction settlements can be less real-time than the CBDC's system. We assume that if the payment looks like a real-time settlement to the end user, there will be no problem even if the actual settlements take longer. This option assumes that the central bank will consider how real-time the system should be. In doing so, it would consider the balance between the systemic risk of settlement avoided by processing settlements literally in real time and the systemic efficiency of a netting process that takes some time.

The second difference is the presence or absence of a legal tender nature. The system in Design 3 is only for financial institutions and does not have legal tender, but Design 4, which issues CBDC, assumes that the system will have legal tender through legal reform. Cash bills have mandatory legal tender, and it is desirable from the user's perspective that CBDC also have this

legal tender as much as possible. Design 4, CBDC, is expected to have legal tender nature, to be accepted as a means of payment, and to be used as a means of payment everywhere, just like cash. Therefore, this option assumes that CBDC will also be widely accepted as a means of payment in store settlements, for example. However, if we were to make CBDC have the same compulsory acceptability as cash, we would be forcing stores to accept CBDC in store settlements. It would be initially costly for some stores to be able to accept electronic payments, and in general, current payment services require stores to pay a portion of their sales to the payment service provider as a commission, and such running costs would be incurred as well. Therefore, it is necessary to consider what kind of policies need to be implemented in order to make it possible to use these services anywhere in the real world. It should be noted here that the Bank's stance on CBDC as it relates to this issue emphasizes its policy of "not crowding out private operators," but this does not mean that it cannot lower payment and settlement fees. Currently, the Bank already provides a means of payment in the form of cash that does not charge settlement fees, and the issuance of CBDC can be viewed from the perspective of making cash more convenient. Even if CBDC increases the convenience of legal tender, it would maintain a certain level of business opportunities for existing payment service providers. It would also be possible to provide business opportunities for private operators by setting a cap on the use of CBDC accounts or by making them indirect and leaving the use of payment-related information to intermediary service providers.

Therefore, Design 4 assumes that both the Bank and the government seek to change the cost structure to lower payment fees to a certain degree, and that the government takes the lead in providing policy support for stores to accept CBDC, while requiring stores to have a system for

accepting CBDC that is similar to cash. Design 3, on the other hand, assumes a situation in which store acceptance of a retail payment system provided by a central bank that is not a CBDC could be limited to the same extent as current retail payment services.

The current CBDC discussions centered on the BOJ seem to envision something in between Design 3 and 4. In other words, it is one in which immediate settlement is provided for the first of the above-mentioned issues, while the second issue is not expected to be as acceptable as cash. However, this paper proposes that CBDC be examined with a view to enhancing the legal currency and acceptability of the second point. Given that in some other countries, the central bank and the regulator may be the same organization, we believe that in the long run, the BOJ, in cooperation with the Financial Services Agency and the Ministry of Economy, Trade and Industry, could work to improve the acceptability of CBDC, while seeking changes in the cost structure that could lower settlement fees to some extent through oversight. In the long term, this should be considered.

These design options assume that the Bank would establish a new retail settlement system. In terms of governance over the system, these design options assume that the entity building the system itself will take a neutral perspective, which is a natural and desirable direction.

These design options assume that the performance criteria for the system will be made public. In terms of how to migrate from the current system, these options assume that a new system will be built, so a layered structure is assumed for the system structure. As for the infrastructure supporting the overlay service, the design options assume that it will be provided based on that structure.

As for non-bank access, we assume that it will be allowed. In particular, for CBDC, it is also likely that non-bank access will be granted to the BOJ-Net. Since the provision of this system is expected to ensure a high level of interoperability and to expand inexpensive mobile payment services, we do not envision any restrictions on interoperability or payment service fees.

Design 5: Dominant PSP leading scenario of mobile payment service

Design 5 in Table 12 assumes that a dominant service with a sufficiently large market share is provided by a single dominant PSP to achieve the functions expected of a retail payment system.

This design option assumes that the entity establishing the retail payment system is a PSP, which provides a single payment service as a fund transfer provider. Specifically, the first possible case of the envisioned PSP is an entity that provides mobile payment services that can be used for both person-to-person transfers and in-store payments, which have been offered as services in recent years. The second possible case of PSP is that of an e-money provider that offers e-money services that can currently only be used for in-store settlements, but which will expand its mobile functionality to include person-to-person remittances. In any case, they are payment services provided by PSPs that allow cash-out.

In terms of governance over the system, it is envisioned that the governance structure will not be changed, but that policy interventions will be made as needed through competition policy.

This design option assumes that the performance standards of the system are private. This is because it is impractical to be involved in the governance of the system since it is only one service of one operator.

Regarding the infrastructure supporting overlay services and regulation of open APIs, this design option assumes that partial APIs would be provided to the extent that banks currently provide them, by applying the same open API opening effort requirements for PSPs accessing the Zengin-system as for banks.

As for the structure of the system, this design option assumes that the existing PSP service will be expanded in market share, and in many cases, it will be a layered structure. In terms of how to migrate from the current system, this design option assumes that mobile payment service providers would continue to utilize their current services or extend their existing systems to be able to handle person-to-person transfers as well.

It is assumed that non-bank access will not be allowed. Since this is a service of a single entity, it is not envisioned that banks or non-banks will participate in this service. It is also not expected to have the same effect as a pseudo-participation in the system through an updated API, and although it is assumed that an obligation to make an effort to open APIs will be imposed as much as banks do, it is unclear whether enough updated APIs will be made public.

As for regulation of interoperability, it is envisioned to require participation in a widely used payment system when sufficient market share is gained. Specifically, it is envisioned that interoperability with other banks and non-banks would be ensured by requiring participation in the Zengin-system and/or Cotra when a payment service that has acquired a large market share emerges.

We do not envision an approach to merchant fees. It is assumed that such fees would be lower than those for card payments.

This section identified several design options that would be desirable in combining architectural alternatives for the retail payment system. In constructing the design options, several possible options were presented, with the main axis being the main provider of the system. The options presented are designs that can solve the current problems to a certain degree and still have a minimum level of feasibility. In this way, by providing multiple possible options, the direction of the actual response to be adopted can be efficiently explored.

4.4 Evaluation of Design Options

The purpose of this section is to evaluate possible design options of the retail payment system. This section focuses on the analysis in Table 13, which presents an evaluation of possible design options.

Comparing the possible valid design options along the multiple parameters in Table 13, it can be deduced that Design 2 (Cotra system for the banking industry) is the best option from the perspective of rapid transformation in the short term, while Design 4 (Bank of Japan-led payment system) and Design 5 (Bank of Japan-led retail CBDC) appear to be the more favorable options in the long run.

Table 13 evaluates each design option according to its performance metrics.

Table 13 Evaluation on design options

| <i>Design Options</i> | <i>Evaluation perspectives</i> | | | | | | |
|---------------------------------------|----------------------------------|--|--|--------------------------------------|---------------------------------------|-----------------------------|------------------------|
| | <i>Interoperability</i> | <i>Data Openness</i> | <i>End-user Fee</i> | <i>Merchant Fee</i> | <i>Clearing of merchant revenue</i> | <i>Stakeholder Coverage</i> | <i>Speed of Change</i> |
| Design 0. Status-Quo | Low | Limited | Bank transfer: high | Card payment: high | A few or several days | Improving | Low |
| Design 1. Zengin System | High | Partially open (if regulated successfully) | Reasonable (if regulated successfully) | Moderate (if regulated successfully) | Real time | Improving | Medium |
| Design 2. Cotra System | High (if regulated successfully) | Partially open | Reasonable | Moderate | Real time (if regulated successfully) | Improving | High |
| Design 3. BOJ Retail System | High | Open | Free | Moderate | Real time | Wide & Neutral | Medium |
| Design 5. Retail CBDC | Especially High | Open | Free | Low | Real time | Wide & Neutral | Low |
| Design 6. Dominant PSP Service | High (if regulated successfully) | Partially open (if regulated successfully) | Free | Moderate | Real time (if regulated successfully) | Narrow | Low |

Legend: Superior, Medium, Inferior

Designs 1, 3, 4, and 5 in Table 13 are superior in terms of interoperability. These options ensure a high level of interoperability since both banks and non-banks can participate in a common system and make retail payments. On the other hand, Design 2 and 5 provide a lower level of interoperability. Design 2 does not cover the accounts of banks that do not participate in these options, so if some banks do not participate in the system, the interoperability will be limited. This design option assumes that the government would require banks that do not participate in the system despite having a certain market share to join the system, thus ensuring a certain level of coverage, but not total coverage. However, a trend could occur whereby when a large number

of banks are in that system, the remaining banks would voluntarily join that system in order to avoid being less convenient than other banking services. In addition, Design 5 assume a case in which a single payment service provider's service has a large market share and is not compatible with the services of other companies. And in order to improve the situation, the design option assumes to take the regulation on the interoperability. Therefore, the interoperability of Design 5 from the end-user's perspective is also lower than in the other options.

In terms of Data Openness, Design 3 and 4 are the best. These options assume that not only pure money transfers but also payment information associated with money transfers can be exchanged with each other, so data openness is high. The other options, on the other hand, are expected to have lower data openness. Since Design 1 assumes that PSPs are obligated to make efforts to implement open APIs in the same manner as banks, a certain level of improvement is expected. However, it is only an effort obligation, and the design option assumes that it will be difficult to make progress in the release of APIs, especially for updating, and data openness is relatively low. The Cotra system in Design 2 assumes data exchange functions and the use of standard formats, which is expected to ensure a certain level of data openness. While this design assumes that banks will be encouraged to participate in the Cotra system, there is uncertainty as to its effectiveness. Design 5 also assumes that both banks and PSPs will be required to open APIs to the public as a measure to increase data openness, since there is no common system and data openness will be low if nothing is done. If this is widely implemented, data openness will be high, but there is uncertainty about its effectiveness.

In terms of End-User Fee, Designs 3, 4, and 5 basically assume no end-user remittance fee.

Design 1, on the other hand, assumes that existing bank transfers will be used and that a certain fee will still be imposed, albeit cheaper than before, but still will be relatively high. Design 2 is expected to be cheaper than Design 1, but may not be free because the fees will be set by the financial institutions participating in the Cotra system.

In terms of Merchant Fee, Design 4 of CBDC may be the cheapest, followed by Designs 2, 3, and 5, and Design 1 will be the most expensive. Design 4 may be the cheapest, depending on the results of the study on how to provide a function similar to cash with no settlement fee. For Designs 2, 3, and 5, it is assumed that mobile code payments with relatively low merchant fees will spread, so the fees paid by stores will be relatively low in total. Option 1 assumes that mobile code payment is not so widespread and that card payment is widely used as it is now. This design assumes a situation where card payment fees are regulated, which would be an improvement over the current situation. However, overall, the fees from the store's perspective will be higher than other designs. This design assumes that bank transfers will never be used as a payment method in physical stores. It assumes that bank transfers require users to pay a fee, and that there is an incentive not to choose bank transfers to avoid this. Therefore, we assume that it will not become the primary means of payment to stores.

In terms of Clearing of Merchant Revenue, Designs 1, 3, and 4 would be real-time, while Designs 2 and 5 could be real-time, depending on the outcome of the regulation. In Designs 1, 3, and 4, since both banks and PSPs participate in a common payment system, stores can make payments from the wallets of the stores to which customers send money, thus eliminating the

need for a sales deposit procedure in the first place. In Designs 2 and 5, if the interoperability regulation is successful, or if a bank or PSP with a high market share decides to participate in the common payment system on its own, it will be done in real time, as in the above designs.

However, if such a situation does not materialize, the process of depositing sales will be time-consuming.

In terms of Stakeholder Coverage, Options 3 and 4 are the most desirable, followed by Designs 1 and 2, and Design 5 is the least desirable. In Designs 3 and 4, a single entity, BOJ, operates the system with a neutral perspective and involves a variety of stakeholders in system operations. In Designs 3 and 4, the banking industry operates the system, but a neutral perspective is more likely to be ensured since the system is assumed to be governed by a third-party organization. In design 5, a for-profit company operates the system, and the needs of other stakeholders are less likely to be taken into account in the structure.

In terms of Speed of Change, Design 2 is the fastest, Designs 1 and 3 are the next fastest, and Designs 4 and 5 will take considerably longer. The Design 2 Cotra project is underway and is expected to be in service early in 2022. The regulatory enhancements included in the options will take more time, but by launching the service first, there is no need to wait for the expansion of users. For Options 1 and 3, more time is expected to be required. For Option 1, the Zengin-system has been modified approximately every eight years to date. While that period could be shortened, it is expected to take longer to revamp the system. Option 3 would also require a certain amount of time to create a new system. This is because it takes time to create a system

from scratch, taking into account the needs of the various stakeholders. Designs 4 and 5 will take even longer. For design 5, it will take a considerable amount of time for a dominant service to emerge in Japan, where payment services are in disarray, and it may not happen. As for Design 6, it will take a considerable amount of time to develop it from the situation where there are currently no plans to issue it, and also to proceed with policies for stores to promote it after various studies.

Concentrating on the perspectives discussed here, the analysis suggests that in the long run, the provision of a retail payment system by the BOJ with a neutral perspective (Design 3 and 4) would be the best design. In particular, Design 4, although time-consuming, has the most room for improvement of current problems if it can be achieved. From the perspective of promoting change in the short term, the most desirable option would be government involvement in the ongoing CoTra of person-to-person money transfer services in the banking industry in order to increase the number of participating banks (Design 2). It is also possible that these options could be pursued simultaneously. Therefore, the preferred policy would be to encourage the BOJ's discussion of retail payments, while at the same time adding the necessary regulations to modify the person-to-person money transfer services that are underway in the banking industry in a more desirable direction.

5 Conclusion

This study makes several recommendations regarding the review of the Japanese retail payment system. Regarding the analysis of targeting scope and current problems, the retail payment system should be viewed not as a narrowly defined clearing system, but as a broadly defined system that includes related legislation, and the current system's problems should be addressed. Regarding stakeholder analysis, it is very important when analyzing the complex structure of the retail payment system. While the central bank has a neutral perspective, the perspectives of banks and the PSP are biased, and their points of view make it difficult to meet all of the needs of users. Therefore, it is desirable to either let the central bank operate the retail payment system or establish a governance structure that allows the banks and the PSP to operate the system but with external pressure. In terms of specific ways to review the retail payment system, the most desirable design option in the long term is for the BOJ to provide a retail payment system with a neutral perspective, and in the short term, the most desirable design option is for the government to get involved in Cotra, a person-to-person money transfer service that is underway in the banking industry, to increase the number of banks participating in the service. It is desirable to promote these design options simultaneously.

Future work not covered in this study includes the following issues.

- The overall direction of this study should be verified based on undisclosed information to better reflect the actual situation.
- Stakeholder analysis should be more realistic and specific.
- To examine the programmability of the new retail payment system in detail.

- Consideration of regulations for wallet functions and cross-agency regulations.
- Consideration of measures from the perspective of account switching.
- Consideration of micropayment facilitation.
- Consideration of end-user data portability across sectors.

5.1 Recommendations for Japan

Recommendations for the design of Japan's retail payment system are as follows.

A) Analysis of Targeting Scope and Current Problems

The retail settlement system should not be viewed as a system for clearing in the narrow sense, but in the broad sense, including related legislation, and should seek to resolve problems in the current system. The purpose of the review of the retail settlement system is to resolve the problems in the current system. There are a myriad of ways to solve the current problems through the choices of the entities operating the narrowly defined payment system and their decisions, and depending on their choices, additional regulation may well be unnecessary. Conversely, the narrowly defined payment system may not solve the current problem and may result in the need for additional regulation. Therefore, the consideration of a retail payment system should include the regulatory approach.

In addition, it is desirable for government decision-making in individual areas within the retail payment sector to take a broad view of current issues. For example, there are multiple retail

payment-related laws and ministries with jurisdiction over these laws and ministries, and if each of them does not take a broad view of the big picture before addressing individual areas, a lack of consistency and inefficiencies may occur. In addition, something such as a review of the regulatory structure, as has been done in the UK, would be an additional option.

As the multiple options proposed in this paper differ in the degree of regulatory reinforcement incorporated, it is likely that the regulatory approach will vary depending on the reality of the private sector initiatives. While checking the trends of the situation, such as the participation rate of banks in the Cotra services they are promoting, the degree of market share of the dominant PSP, the actual status of banks' efforts to update APIs, and the expansion of cashless payments, it will be necessary to determine the degree of government intervention while monitoring the changes in the degree of feasibility of each design option. The degree of government intervention will need to be determined.

B) Stakeholder Analysis

Stakeholder analysis is important in the analysis of a retail payment system because it is a system involving a wide variety of stakeholders, which creates complexity in the evaluation of the system. Depending on which entity leads the reform of the retail payment system, the targets to be emphasized as stakeholders will differ, and the overall system design needs to be based on these targets.

Users of retail payment systems are particularly important stakeholders, and governance needs to be designed to meet their needs. From the perspective of banks and PSPs, the structure is not

necessarily designed to meet all of the overall needs of retail payment system users, which are both end-users and the retail payment system participants. Users include corporate and individual end-users, as well as banks and PSPs system participants. From the perspective of banks and PSPs, their needs are only partially prioritized. Therefore, it is desirable to either entrust the operation of the retail payment system to an entity with a neutral perspective, such as a central bank, or to build a governance structure that is subject to external pressure to prioritize the needs of users who are less likely to be prioritized, bearing in mind that the perspective of banks and PSPs is likely to be biased.

C) Concretize the Desirable Payment System

Section 4.1 summarizes the proposed functions and performance perspectives that are desirable in the Japanese retail payment system. While using this as material, it is necessary to stimulate discussion among stakeholders on what kind of retail payment system is desirable and to present policy perspectives in details. Such retail payment system design principles can provide consistency in the design policy for more specific system design, and will also be useful in evaluating the system that has been built.

D) Evaluation of Possible Design Options

In making a decision on the design of a retail payment system, several possible design options should be listed and then these design options should be compared and evaluated using multiple evaluation perspectives. Otherwise, too much focus on one particular perspective of evaluation may lead to ignoring other aspects that should be considered, which may have unintended side effects. Architects of the retail payment system need to evaluate them comprehensively, taking

into account a variety of viewpoints. There are multiple problems that must be solved simultaneously. Therefore, they need to make decisions based on multiple evaluation perspectives, while also finding a balance between the degree of resolution of current problems.

E) Specific Actions

As indicated in Chapter 4, in the long term, the design option of the BOJ providing a retail payment system with a neutral perspective, and in the short term, the design option of government involvement to increase the number of participating banks for Cotra, a person-to-person money transfer service underway in the banking industry, are the best design options. These can and should be pursued simultaneously. The expected responses from each stakeholder are as follows.

First of all, this study expects a proactive approach in the BOJ. As indicated in the BOJ-led design option in Chapter 4, the provision of a BOJ-led retail payment system has the potential to significantly improve the current challenges without the need for tighter government regulation. Currently, the BOJ is conducting stakeholder discussions and demonstration tests with CBDC in mind. First, the BOJ should carefully discuss how to make CBDC have legal currency and similar acceptability to cash, with a view to providing policy support to stores that accept CBDC. Stakeholders should not exclude such issues from their discussions, and should take a broad viewpoint, taking into account policy support that the BOJ alone cannot provide. In addition, the study also hopes to deepen the discussion between the Bank and stakeholders on possible response policies to concerns regarding the issuance of CBDC. Furthermore, from the perspective of payment system oversights, the Bank should look into the future participation of

banks in the Cotra system and consider whether it is possible to indicate its stance that it is desirable for many banks and PSPs to participate in the system.

Second, this study expects the government to expedite the necessary discussions and deliberations on regulation. Regulations on interoperability should be discussed primarily at the FSA. As many banks and PSPs should participate as a result, it is possible to take a method to encourage voluntary responses through communication with the industry, without necessarily changing the regulations. In terms of current developments, it will be important to consider how to encourage participation in Cotra, which some banks are pursuing, if the convenience of users will be compromised if banks and PSPs with high market shares do not participate in the system. Next, regarding the fee structure of retail payments, this study believes that priority should first be given to discussing card payments, which have relatively high merchant fee rates. There have been discussions at the Ministry of Economy, Trade and Industry (METI) that have taken up interchange fees as an agenda item, and it would be desirable to accelerate these discussions and at least reach a state where interchange fees determined by card brand companies are made publicly available. In addition, in the future, it will be necessary for the FSA and METI to discuss regulations on merchant fee rates for a variety of retail payment methods, not just card payments. As the acceptance of cashless payments increases, there will be situations in which the fee rate must be lowered or the adoption of cashless payment methods will come to a standstill. We hope that the FSA and METI will prepare to study the regulation of merchant fees for such retail payment methods in general.

Regarding open APIs, Design 1, which utilizes the full banking system, and Design 5, which expects PSPs to be dominant, envision the expansion of regulations for open APIs. They assume that the effort requirement to open APIs, which is required of banks under current regulations, would be expanded to include PSPs that access the Zengin-system.

If the other options are not feasible and the government is looking to implement these options, we expect it to consider such a regulatory framework.

Regarding competition policy, we hope that the Japan Fair Trade Commission (JFTC) will continue its efforts to ensure a competitive environment by conducting ongoing investigations in the payments field. Regarding interbank fees for bank transfers via the Zengin-system, the fact that the component of the operating cost of the domestic exchange system includes a portion equivalent to profits and that the operating cost is set on a per-transaction basis could be an incentive to limit the frequency of small-value payments. We expect the Fair Trade Commission to present its views on whether these are acceptable from the perspective of competition policy.

Third, this study expects Cotra to provide functions for mandate management and for enabling the exchange of settlement-related information, and to design a system that does not provide incentives to limit the frequency of remittances. Regarding mandate management, we expect Cotra to open its API to the public and then devise a way so that third parties who use the API do not have to deal with complicated procedures when they start using the API. The ideal environment would be one in which contractual relationships with financial institutions participating in the system are established through a single procedure, rather than through

separate contracts with each bank, as is the case with banking APIs. Regarding the exchange of payment-related information, we expect Cotra to manage the platform so that the data format can be standardized as much as possible. In terms of designing a system that does not provide incentives to reduce the frequency of remittance, if the system is structured to increase costs for participating financial institutions as the number of transactions increases, it is assumed that these costs will be passed on to end-users. Therefore, we expect the design to allow multi-frequency payments with micropayments in mind.

Fourth, this study expects Zengin-Net to build a plan for a major renewal of the system in the future. It is worth pointing out that the Zengin-system is written in COBOL and has become a black box as the generation of engineers changes. It is noted that large systems with spaghetti code are challenging to update (Jansen Slinger et al., 2013). Therefore, there is a possibility that the current system will not be able to survive simply by continuing to modify it in the future. We hope that they will openly discuss plans, including human resource development, for a major renewal in the future.

As noted above, there are many things to consider when reviewing the retail payment system. It is necessary for stakeholders to have a close perspective and take the necessary steps in the direction of improving the current situation as much as possible.

5.2 Future Work

Future work not covered in this study is as follows.

A) Analysis Based on Non-Public Information

The analysis in this study was based on publicly available information, and future research should verify the direction indicated in this study based on additional non-public information. In the payment field, there is likely to be a large amount of important information that is not publicly available, such as that related to the specifications of payment infrastructure and non-public information held by stakeholders. It is necessary to approach such information, conduct more realistic analysis, and modify the direction indicated in this study to be more realistic as necessary.

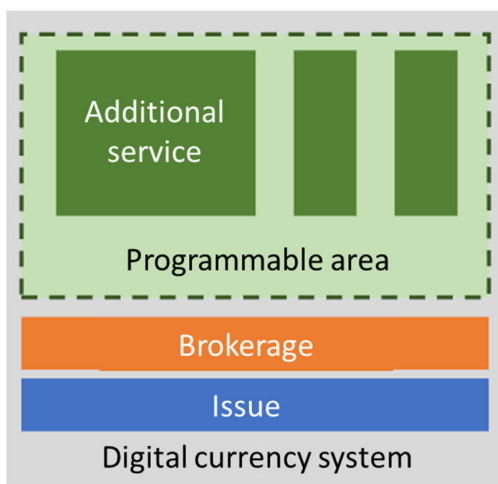
B) Stakeholder Analysis

The stakeholder analysis in this paper is stated in general terms and requires a more realistic and specific analysis. First, the stakeholder trends described in this study are on a macro level, taking into account the organization as a whole, but the actual situation may differ in individual micro cases. For example, different departments within the same company may have different positions. In another example, from the perspective of a system operating entity actually operating a new system, the opinion of a key person in that organization could be slightly different from the perspective of the organization as a whole. Therefore, it is necessary to modify the results of the analysis to be more realistic and detailed by knowing what the operational reality is through communication with the people involved.

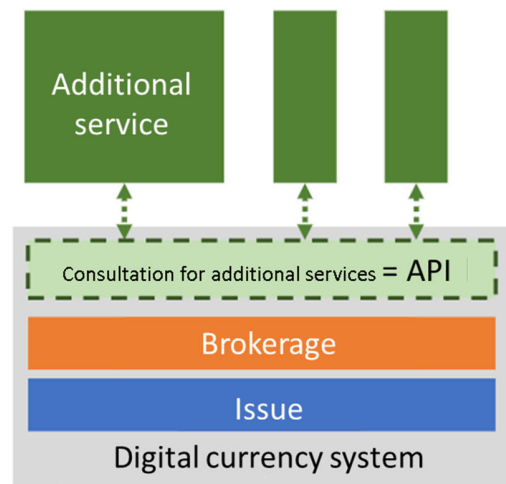
C) Programmability

When building a new system, it is necessary to consider how to provide Programmability. Figure 9 shows two ways to provide programmability: the first is to provide a programmable area, and the second is to open an API. The relationship between these retail payment systems and programmable areas will need to be studied in detail in the future.

1) Provision of programmable implementation



2) API Release



English translation of the BOJ's presentation material

Figure 9 Programmability in CBDC (Bank of Japan, 2022)

D) Details of the Model for Indirect Retail CBDC

A more detailed analysis of indirect retail CBDC issuance patterns is needed. Typical distinctions are made with respect to the account type and the token type. In the account type, the BOJ provides the end-user with a personal account, but outsources the account management operations to an intermediary institution. In the token type, CBDC is issued to the intermediary,

which in turn transfers the CBDC to the end-user. The details of these indirect retail CBDC models need to be explored.

E) Regulatory Framework

With regard to regulation, this paper addressed those related to interoperability and payment fee rates, which would be of great benefit to users when they are improved. However, in the area of payments, there are still issues to be discussed, such as how regulations should be applied to wallet functions and the complexity of procedures from the perspective of operators due to the fact that regulations are cross-ministerial. Further discussion is needed to make the regulations more innovation-friendly.

F) Account Switch

In the UK competition policy, in addition to reviewing the retail payment system, there was also awareness of the problem of fixed accounts used by users, and discussions were underway to create an environment that would allow for easy switching of contracts and other arrangements tied to accounts. In Japan, discussions are underway to allow users to also add fund transfer agency accounts as payroll transfer accounts, but efforts to do so are behind schedule. In addition, there are indications that the direction is to set up one account per citizen that is linked to the official "My Number." If such a move is likely to lead to a situation where the accounts used by users in Japan are more likely to be fixed, how to improve this situation will need to be considered.

G) Micropayments

More specific examination of what is needed to facilitate micropayments is needed. One of the background reasons why small payment systems should be more efficient could include the expansion of micropayments, including M2M (Machine to Machine) payments, in the future, but this study does not address the issue of micropayments. It is necessary to examine the position of micropayments in a common payment system based on the prospect of what forms of micropayments will expand.

H) End-User Data Portability

The Consumer Data Rights (CDR) introduced by the Australian government in Australia in 2017 is thought-provoking in this study; CDR will be applied not only to the banking sector, but also to other sectors, including the energy sector. While data from the payments sector is useful for customer information, it could also be used to provide new services by including information from other sectors. And that further increases the need for personal data privacy protection. In the future, it will be necessary to conduct analysis that takes into account the relationship with customer data in other fields, not only in the payment field.

As noted above, there are a number of issues that cannot be covered in this study. Further research is needed in the future.

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