

Computer and Communication System Development
among Financial Institutions in Japan

Tsuneo KUROKAWA
Associate Adviser

Computer and Data Processing Department
The Bank of Japan

Chapter 1. Characteristics of Japan's Financial System and Development of Electronic Payment

1. Japanese Financial Institutions-
General Review

Japan's banking system is based on ordinary commercial banks (13 city banks and 64 regional banks) at the nucleus and specialized financial institutions in charge of international financing, long-term credit, small business financing, and credit for agriculture, forestry, and fishery cooperatives.

As in the United States, but not in European countries, there is a sharp distinction between banking and securities activities and also insurance.

Another feature is the large and growing share occupied by the government. Government financial institutions also have specialized business areas, such as export and import, overseas investment, development, small businesses, agriculture, forestry and fisheries, and housing. Post offices absorb funds through postal savings, insurance schemes and pension plans (see Chart 1, "Organization Chart of Principal Financial Institutions").

2. Characteristics of the Payment System in Japan

1) Propensity to use cash

Checks are in wide use for payments between corporations, but are in little use between enterprises and individuals or in consumer transactions. During the 1960s, banks attempted to popularize checks, but without success. Thereafter, banks switched to the popularization of electronic payment.

This cash mentality is directly reflected in the on-line computer systems of banks. Basically, it means that systems have to operate in real time, with no lag between credit and debit.

Japanese banks have had the advantage of moving from direct payment by cash to paperless

payment by electronic fund transfer, without passing through the intermediate stage of payment by check.

2) Introduction of "Sogo" Accounts as Transaction Accounts

The number of bank accounts (typically "ordinary deposit account", which are interest-bearing demand deposit, but on which checks cannot be drawn) has increased rapidly since the late 1950s.

Despite the wide variety of private financial institutions in Japan, they are all in the same position as far as payment system is concerned: all offer transaction accounts in the form of current account and ordinary deposit accounts. Nowadays, 98% of households have deposit accounts. Electronic payments have developed through direct deposits to, and withdrawals from, ordinary deposit accounts.

Popularization of electronic payments was further spurred by the introduction of "sogo" accounts (integrated deposit accounts) in 1972. "Sogo" accounts combine ordinary deposits and time deposits intended as savings in one passbook. When an ordinary deposit account has no balance, an automatic overdraft is supplied based on the collateral of the time deposit. The introduction of "sogo" accounts has sharply reduced the number of cases when direct debits cannot be effected because of insufficient funds in ordinary deposit accounts, thereby facilitating the increasing direct debit of customer bills.

3) Popularization of ATMs

Banks have striven to popularize ATMs to rationalize banking operations and to meet the cash-oriented consciousness of the Japanese public in their daily activities. Japan has more ATMs than most other countries -- both in absolute numbers and also on a per capita basis. Major financial institutions have installed ATMs in all of their business offices, and joint utilization is widespread. Additionally, the popularization of ATMs has played a major role in the spread of the direct deposit of payrolls in employee accounts. While widespread use of direct credit, pre-authorized direct debit and

credit cards have reduced the necessity to carry cash, ATMs have contributed to the decreasing trend of the cash-ratio in money supply (M2).

4) From Bills, Checks, Cash to Direct Credit and Debit Transfers

For payments between enterprises, bills (mainly promissory notes and also bills of exchange) have been employed in addition to checks. In recent years, there has been a switch from bills and checks to credit transfers through banks from the viewpoint of rationalizing corporate payments. Corporate payments to individuals, including wages and salaries, used to be in cash, but are now shifting to direct credit transfers.

3. Development of Electronic Payment Systems

1) Development of On-line Bank Systems

(First-Stage on-line system) ... stand-alone accounting systems (such as for deposits, exchange) and inter-branch transactions

The on-line systems of banks started in the mid-1960s, initially for the on-line, real-time processing of ordinary deposits. This occasioned a marked improvement in banking services, in that deposits and withdrawals could be made at any branch of a particular bank. Since then, the on-line system has been introduced to all major areas of banking.

(Second-stage on-line system) ... integrated accounting systems (including deposits, exchange, loans and foreign exchange) and interbank transactions

The first-stage was followed by the completion of a second-stage system known as the integrated on-line system at major banks around 1975. This was characterized by the integration of various accounts for the integrated processing of banks' transactions, handling of office work, and processing of accounting with minimum input. The system has greatly contributed to the reduction of costs by enabling a greater workload to be processed by fewer personnel. It also had far-reaching implications in expanding banking activities by allowing ATM, OTM (on-line teller machines), and other terminals easy linkage with the on-line systems (see Chart 2, "Development of Electronic Banking Systems in Japan").

2) Development and Roles of Various Interbank On-line Systems

In step with the development of on-line banking systems, an interbank on-line system was developed.

The Zengin System commenced operation in 1973, and in 1981 was linked with the SWIFT system, thus completing the on-line operation of banks both in Japan and overseas.

As mentioned above, Japan's banking system has been designed on the basis of on-line, real-time processing. Nearly all financial institutions have introduced on-line systems, with smaller financial institutions operating joint systems.

Table 1, "Interbank Systems in Japan", shows the principal payment methods and corresponding interbank system.

① ATM Network

As explained above, for the rationalization of office work, labour-saving, and shortening of customer waiting time, ATMs have been installed at almost all offices of principal financial institutions, and are linked with five networks according to the category of financial institution. In each network, the ATMs of all participating banks are open to other banks participating in it. Furthermore, a joint venture, NCS (Nippon Cash Service), has been operating since 1975 and whose ATMs (installed at public places in Tokyo, Osaka and Nagoya) accept the cash cards of various banks. While utilization of a bank's own ATMs is free of charge, a charge is levied when the ATMs of other banks and the NCS are used.

The number of machines installed was around 40,000 as of the end of March, 1985, while cash cards issued exceeded 100 million compared with Japan's total population of 120 million. Deposits and withdrawals using ATMs is now firmly established in Japan.

Most ATMs are connected on-line with host computers of financial institutions. They verify the personal code number of the depositor, and check the balance in the savings account. When cash is deposited, ATMs authenticate banknotes, confirm the amount, and record it in the passbook. The capacity of ATMs has been increasing steadily. In addition, ATMs can now check balances, effect transfers to the savings accounts of others, and issue card loans (revolving consumer credit). More recently, it has become possible to obtain small amount, short-term loans by using the credit cards of credit card companies affiliated with particular banks.

Initially, cash withdrawal could only be done through the ATMs of the bank with which one had an account. However, in 1975, a joint venture, NCS (Nippon Cash Service), was established for the joint utilization of ATMs by clients. Machines were installed in public places. Furthermore, ATM sharing networks have been made according to bank category, including BANCS for city banks, ACS for regional banks, etc., so that the ATMs of any member bank of the group can be utilized. A ¥100 charge is levied when one uses an ATM not belonging to one's own bank. For interbank settlement, the clearing house, or Zengin System, is employed (see Chart

3, "On-line ATM Networks" and Table 2, "Systems for the Joint Utilization of ATMs")

Although there have emerged several instances of the joint use of ATMs by individual financial institutions belonging to different categories in certain regions, large-scale joint use is confined to cooperation within each different category of bank. However, plans for cooperation between different categories are currently being examined in order to counter the postal savings ATM service which has built up a national network, as well as to respond to the widespread needs among customers for the joint utilization of ATMs.

There are four background factors responsible for the success of ATM networks in Japan: 1) banks' internal on-line systems were already well developed; 2) high machine performance; 3) rapid diffusion of cash cards; and 4) external networks linking banks' on-line systems were fully developed. Without all of these four factors, we would not have had the success we have had in Japan.

② Bills and Checks versus Clearing House and Zengin Data Telecommunications System (Zengin System)

Local collection of bills and checks is made by local clearing houses, while inter-regional collection is made through the domestic exchange system. There are 183 authorized clearing houses throughout Japan. The largest is the Tokyo Clearing House, which is the only computerized clearing house and handles more than a third of all clearing items in Japan.

The inter-regional collection of bills and checks is effected through the Zengin System. Bills and checks are sent by mail, and information regarding whether a bill or a check has been honored or dishonored is transmitted through the Zengin System to complete interbank settlement. Around 90% of the items processed by the Zengin System are credit transfers, and collections around 10%. Remittances, which were traditionally an important item in domestic exchange have become insignificant.

The Zengin System, which is the core of the domestic exchange system, has become a giant on-line network system linking all private financial institutions in Japan.

An outline of the Zengin System is given in Chart 4, "Zengin System Configuration". Three sets of super-large computers are installed at the Zengin Center in Tokyo. Two are employed for on-line processing, while the third is used for off-line processing and serves as a backup computer. The Zengin Center and financial institutions are linked by two systems -- two Zengin terminals installed at each financial institution are connected with the Zengin Center

by exclusive communication circuits separately. For this reason, even if one of the systems breaks down, the other will continue to function.

In the case of small financial institutions, in order to build an economical system, regional centers were established in several places throughout the country to form regional networks of the same category of financial institution. These regional centers are linked with joint centers of the same category of financial institution, where Zengin terminals are installed for connection with the Zengin Center under the joint connection formula.

The Zengin Center, which plays the pivotal role for the Zengin System, is operated by the Tokyo Bankers Association, while center computers, terminals and circuits are provided and maintained by NTT.

As the volume handled by the Zengin System has been increasing more than 10% annually, capacity is scheduled to be raised from November 1987 -- a center of the same size as the one in Tokyo will be established in Osaka to provide a two-center system that will increase the safety of the entire system.

③ Magnetic Tape Editing System (ACH)

As described above, while the bulk of fund transfers is made through the Zengin System, the payment of wages, dividends, and pensions (requiring a large volume of cash transfers on fixed dates by a single payer) come under the MT Editing System (ACH), operated by the Tokyo and Osaka clearing houses for payments nationwide. The number of financial institutions participating in the MT Editing System is 105 at present.

While the ACH in the United States and the BACS in the United Kingdom process both credit and debit transfers, the Japanese magnetic tape exchange system handles only credit transfers at present. Transfer data processed by data transmission will be introduced in the Zengin System in November 1987.

④ Direct Debit

Unlike ACH in Western countries mentioned above, the MT Editing System handles credit transfers alone. Direct debit of such items as public utility bills is processed by billing corporations who deliver MTs containing debit information of customers to each bank. Such individual processing is possible because many billing corporations are large entities with high computer capability. The Federation of Bankers Associations of Japan established a standard format for contracts between customers, billing corporations, and banks, and also a standard MT format. Direct debit is used in many fields and

large debits have been accepted without question from the beginning. Payment of monthly credit card bills can also be effected through direct debit.

⑤ Same-day Settlement System of Foreign Exchange Yen in High Amounts

The foreign exchange yen settlement system is a system in embryo corresponding to CHIPS in the United States and CHAPS in the United Kingdom.

In 1980, the present system was launched whereby fund transfer instructions are brought to the Tokyo Clearing House for exchange and settlement of balances through accounts held at the Bank of Japan. The system is expected to shift to on-line processing, taking advantage of the Bank of Japan's on-line system scheduled to come into operation.

Finally, I should like to refer to the deregulation of telecommunications in Japan, which is indispensable for the development of EFT systems. The Telecommunication Law previously stipulated that public telecommunications should be the monopoly of NTT. Extensive deregulation effected in 1982 allowed communication circuit connection between enterprises, opening the way for the cash management services that banks were planning to offer. However, since message switching was still banned, it was impossible to set up interbank systems centering around message switching, except by depending on the system for which NTT supplied both equipment and circuits. This is why ATM networks and the Zengin System rely on NTT systems, although it must be added that the technical capacity and reliability of NTT are important factors in this respect.

In April, 1985, telecommunications was completely liberalized and NTT was privatized. In the future, NTT and other suppliers of communication services are expected to compete with each other in providing bank systems.

Chapter 2. Development of Electronic Banking Systems

In Japan, electronic and communication technology, including VLSI, optical fiber and satellite communications, are making rapid progress. In addition, spurred by liberalization in the area of communications, including the enactment of the Communication Business Law, the number of networks is expanding. Using lines connected to corporations and households, banks now provide firm banking, home banking and bank POS systems.

1. Firm Banking

1) Development of Cash Management Services

CMS (Cash Management Services) has been making progress. To effect fund transfer instructions on-line instead of using magnetic tape, bank computers are linked with those (or personal computers) of enterprises.

Principal features of CMS

① Accounting Information Service

Allows notification and verification of the outstanding balance of deposits, fund transfers received, and transaction details.

This service is available through the supply and receipt of documents, by telephone, telex, magnetic tape, and the voice response system employing NTT's ANSER system. Almost all banks utilize the accounting information system, which has become the most basic cash management service. In many cases it is supplied as a telephone or facsimile service. Reflecting progressive computerization in corporate treasury departments, on-line transmission services through connections between computers, or with personal computers, are becoming widespread.

② Fund Transfer Service

This service is used for the receipt of fund transfer instructions for the direct credit of payrolls, and "package transfers" or data concerning bill payments through direct debit. Direct credit instructions are generally made by "personal computer services".

③ Fund Management Service

The original objective is to boost efficiency in the concentration and distribution of funds through the automatic transfer of funds held by enterprises which have accounts in many branches of a particular bank, or banks. However, since there are no multi-bank service facilities, this service is limited to fund transfers within one bank and is not widely used. Full-scale cash management services are yet to emerge.

④ Financial and Economic Information Service

This service supplies information about financial, securities and foreign exchange markets. Substantial progress is expected to be made in this area through the building of an efficient information system in the third stage of the on-line bank system.

2) Formulation of Zengin Protocol

One of the tasks facing the builders of CMS is to facilitate the construction of networks.

For this purpose, it is necessary to standardize communication protocols and lower development and operational costs for banks and corporations.

The Federation of Bankers Associations of Japan formulated specifications of a standard communication protocol for mutual communication between computers in October 1983, and for personal computers in January 1984.

Characteristics of the Zengin Standard Communication Protocol include: (a) appropriate security because of the use of a dual password to obtain access to information; (b) high efficiency through the use of high-speed circuits (2,400 bps or more) and incorporation of a data condensation function; and (c) possibility to expand the system's functions to prepare for innovations in communication technology and new services.

Since the formulation of the Zengin Standard Communication Protocol, computer makers have developed software packages to support it. As a result, CMS employing the Zengin Standard Communication Protocol came into operation from mid-1984. More recently, CMS connected with personal computers in corporations have been increasing gradually.

3) Joint Data Transmission System

Regional banks (64 banks) and "sogo" banks (68 banks) have been operating joint data transmission systems using DDX circuit networks since the fall of 1984.

The joint systems employ magnetic data transmission to process the sending and receipt of data between banks and enterprises, which previously was effected by magnetic tape. These are national networks linking member banks and designed to provide the speedy and efficient transfer of data.

Users of the regional bank data transmission system (CNS: "Chigin" Network System) are 22 securities firms and life and non-life insurance companies, while 16 securities firms use the "sogo" bank data transmission system (SDS: "Sogo" Data Transmission System). The systems are employed mainly for the transfer of data on interest on public bonds and debentures, and payment for securities sold, as well as data on the payment of insurance money and dividends by life and non-life insurance companies (see Chart 5, "Diagram of MT Data Transmission Joint System").

Similar joint systems for agricultural and forestry cooperatives and credit associations were launched in October, 1983 and March, 1986.

2. Home Banking (Personal Transactions and Payment Systems)

1) From Cash to Fund Transfer

① Direct Debit and Credit

Preauthorized direct debit refers to a system under which enterprises such as NTT and city gas companies, instead of directly billing users by mail, present bills to banks where users have accounts, and the banks, acting upon requests from users (depositors), automatically debit depositors' accounts and credit the deposit accounts of the enterprises.

The direct debit system was first adopted in Japan in 1955, when NTT introduced it as part of its rationalization of telephone bill collection. Since 1963, direct debit has been increasingly used for the collection of public utility bills and now covers electric power, city gas, and fees for NHK TV. In addition, the direct debit system is also widely used for the monthly repayment of housing loans and consumer loans, and payment of credit card bills, insurance premiums, etc.

Direct credit is extensively used for payrolls and the automatic transfer of dividends and pensions. In particular, the spread of the direct credit of payrolls has had a big impact on other settlement systems.

② Cashless Society

Let us look at the utilization of the electronic payments system in daily household life. Salaries are paid into bank accounts, from which utility bills (electricity, gas, water, and telephone), insurance premiums, and housing loan repayments are automatically withdrawn through direct debit. These days when we go shopping, we drop by the bank and withdraw cash from an ATM with our cash card and usually pay cash for small purchases, while for large amount purchases we probably use a credit card.

Thus, the direct credit debit system plays a central role in the trend toward a cashless society.

2) EFTPOS Experiments

Off-line experiments with bank POS were first conducted in the 1972-73 period between banks and supermarkets in more than ten locations in Japan. However, none led to any practical applications. The factor responsible for POS coming into the limelight currently is that on-line connections have become possible as a result of the relaxing of both regulations concerning communications and administrative controls on banking.

① EFTPOS with Cash Cards

The first EFTPOS in Japan was introduced between a supermarket in Aichi Prefecture and a city bank in December, 1984.

This system utilizes cash cards for on-line real time processing. Registers installed at the

supermarket are linked with a computer at the bank to effect payment for purchases made with cash cards by transferring bill amounts from customer deposit account to the deposit account of the supermarket. The time zone for the utilization of this EFTPOS is between 10.00 and 19.00. The system may be used irrespective of the bank's business days and business hours. It should be added, however, that when the system is used on a bank holiday, the amount of purchases is limited and off-line settlement is made on the following business day (see Chart 6, "A supermarket/City Bank POS System").

② EFTPOS Experiment with IC Cards

Since April 1985, an EFTPOS/IC card experiment has been in progress between some city banks and supermarkets. The experiment aims at studying and testing the off-line use of IC cards for shopping at night and on holidays.

Outline of the experiment:

- (a) Users write an amount on the IC card issued by the bank using the IC card writing machine at the window of the bank, and the customer's deposit ledger is automatically reduced by the same amount.
- (b) Bills for purchases made at a supermarket using an IC card are sent to the bank through telephone circuit or by a courier on the following business day. The amount is withdrawn from the customer's deposit account -- part of the outstanding balance of the ordinary deposit account is reserved for IC card use -- and transferred to the account of the supermarket.
- (c) The limit for IC card payment is a previously recorded amount, the balance of which is reduced after each purchase. However, the amount may be increased when necessary through the procedure described in (a).

City banks have agreed on standard EFTPOS handling procedures. It is believed that the POS handling procedures of all financial institutions will be unified on this basis in the future.

3) Home Banking Experiment

Home banking, which makes it possible to engage in banking transactions from one's home, made a start in 1979 utilizing the telephone. It has since developed into a "pay by phone" service and also others utilizing the CAPTAIN System.

① Telephone Service

This service automatically responds with a synthesized voice through the bank's computer to customer telephone inquiries regarding fund

transfers credited to their deposit accounts and outstanding balances.

② Pay by Phone

The telephone service developed into the so-called "pay by phone" service in June, 1984, as a result of the extension of coverage to fund transfer transactions.

For the present, utilization of the "pay by phone" service is limited to users of push phones and fund transfers covered are restricted to those between accounts in the same bank.

③ Outlook for Home Banking

(Utilization of CAPTAIN System)

Home banking utilizing the CAPTAIN System (videotex), which began commercial service in November 1984, is also developing in Japan. The service mainly covers inquiries about transactions, fund transfers, and various kinds of information. With the cooperation of retailers and travel agencies, it is expected to develop into a home shopping service, which will make it possible to buy goods or book tickets and make payment from home. Experiments in this direction have been launched between certain banks and department stores.

(INS Experiment)

NTT has been engaged in the development of INS (advanced information communication system) with 1995 as the target year. The system aims at integrating the telephone, telex, and data telecommunications (which are linked to different networks at present), into one single network using optical fiber.

Prior to the practical application of INS, an experiment has been in progress in model areas, including Mitaka in suburban Tokyo and also some areas in central Tokyo. Banks (33 financial institutions) are also participating in the home banking and shopping experiments. In the experiment, fund transfer transactions between different banks and accounts of different people using push phone or the CAPTAIN system are possible.

For the time being, home banking in Japan has not reached the stage of full-scale practical application owing to the limitation of its coverage to fund transfers between accounts within the same bank and the high price of an adapter for CAPTAIN (around ¥220,000).

Furthermore, individuals have little need to transfer funds since most pay public utility bills through direct debit. For this reason, banks in Japan are still in an experimental stage of home banking.

Chapter 3. Advancement of Other Industries into Electronic Fund Transfer Systems

1. ATMs Supplied by Credit Card Companies and Shinpan Companies

Credit card companies are striving to expand their cashing services using ATMs. These services allow cardholders to borrow up to a certain amount (¥100,000 - ¥250,000) upon presentation of both their credit card and "cashing service record" form at related banks or card companies. Settlement of loans is made by direct debit from accounts in customers' banks.

The number of ATMs installed by bank-affiliated credit card companies has recently been increasing. These credit card companies also started the joint employment of ATMs with affiliated banks in April 1984. By utilizing the nationwide networks of ATMs operated by banks, credit card companies not only increase the convenience of their cards to users, but also hope to increase the utilization of cashing services. Holders of cards issued by bank-affiliated credit card companies have been allowed to utilize the ATMs of the banks in which they hold settlement accounts as well as the ATMs of their credit card companies.

Groups of "shinpan" companies (sales credit companies) are also planning to form networks for the joint utilization of ATMs. One such group is NICE (Nippon Credit Business Exchange), which plans to install more than 1,000 ATMs.

2. Cooperation and Competition between Securities Companies and Banks

Moves in the direction of cooperation between securities companies and financial institutions and credit card companies in the area of investment trusts called "chuki kokusai" (medium-term government bond) funds are being much talked about in Japan's financial circles.

One such move was cooperation between a leading securities firm and a credit association in Kyoto in April, 1984. They produced a product combining the ordinary deposit account of the credit association with the "chuki kokusai" fund of the securities company, which gave higher yields than the ordinary deposit account and also allowed the automatic transfer of funds between the two accounts. Any amount over ¥300,000 in the ordinary deposit account automatically goes into the "chuki kokusai" fund. This enables users to purchase "chuki kokusai" funds through the credit association and at the same time benefit from the settlement function of an ordinary deposit account.

The banking world, especially city banks, strongly opposed the move, because they thought (a) it would allow securities firms to advance

into the settlement function, which is an integral part of banking activities, and (b) also lead to a shift of funds from ordinary deposits to "chuki kokusai" funds.

However, cooperation of this type has been gradually spreading centering around smaller financial institutions such as credit associations and "sogo" banks.

Another trend is cooperation between securities companies and credit card companies. Securities companies issue ID cards that allow the electronic transfer of cash through ATMs of securities companies into a "chuki kokusai" funds, or cash withdrawals from the funds. This is very similar to the function of bank cash cards.

One securities company cooperated with a "shinpan" company in 1984 for the combination of an ID card with a credit card. In July 1985, another securities company cooperated with a credit card company it had set up and a bank-affiliated credit card company.

Holders of these unified cards can set up "chuki kokusai" funds, withdraw from the fund, use the card as a credit card and obtain cashing services. On the day preceding the settlement of credit card bills, an equivalent amount in the "chuki kokusai" fund is cancelled and transferred to the ordinary deposit of a financial institution, for settlement.

For the time being, purchase and cancellation of "chuki kokusai" funds can be made only through the ATMs of securities companies. However, the ultimate objective of securities companies is said to be the joint utilization of a national network of ATMs to be established through the unification of securities companies' ID cards and the cash cards of banks.

Banks, for their part, have opposed the concept on the grounds that the opening of ATM networks to securities companies would only benefit securities companies.

3. Electronics at the Post Office

Post offices operated by the Ministry of Posts and Telecommunications also offer various financial services including a payments system.

There are around 23,000 post offices all over Japan (compared with around 10,000 business offices of 87 banks belonging to the category of "all banks"). The giant post office network is utilized for the active expansion of postal savings in intense competition with private financial institutions.

Financial services supplied by post offices include "postal savings", and "postal transfers" and "postal money orders" as a means of funds

transfer. In addition, post offices handle life insurance and pensions.

These financial services are provided under the provisions of specific laws and operated through separate accounts for each service. More recently, however, in an attempt to intensify their orientation to becoming an integrated financial institution, post offices have started combining their services to supply various types of integrated services.

Postal savings have shown much higher growth than deposits with private financial institutions, reflecting the mammoth network of post offices. Postal savings in Japan are said to be the largest held by any single savings institution in the world. Postal transfer is a similar system to the Postal Giro in European countries. It has a long history dating back to 1906. However, most postal transfer accounts are held by enterprises and organizations, which handle a large number of bills for collection. Seldom are these accounts held by individuals. (At present postal transfer accounts total around 850,000). In most cases, payers take cash to a post office and have amounts transferred to the accounts of enterprises and organizations. Postal transfers are widely used for the payment of mail order sales, subscriptions to publications, and various membership fees.

Application of electronics to post office financial services started in the latter half of the 1970s, later than among private financial institutions.

The postal savings on-line system was launched in 1978. The first-stage on-line network linking around 19,000 post offices throughout Japan was completed in 1984, opening the way for the introduction of more advanced financial services.

In 1980, cash dispensers began to be installed in post offices, making it possible to withdraw deposits using cards (postal savings cash card). This was followed by the installation of a large number of ATMs. By the end of March, 1984, around 2,700 machines of this type had been installed and the number of post office cash cards issued had reached around 4,400,000. In 1984, multi-functional cards, combining a postal savings cash card and credit card, began to be issued.

Direct payroll credit to postal savings accounts was introduced in 1977. Direct debit for public utility bills was launched in 1982 through the combination of the postal savings system with the postal transfer system, which had been operating separately.

Rapid progress in the application of electronics at post offices and the combination of various financial services supplied by them

have thus made it possible to supply services equal to those provided by private financial institutions. Thus, competition between post offices and private financial institutions is intensifying and concern that the postal system has an undue advantage because of tax exemptions and implicit and explicit government subsidies, is growing.

In this paper, under the title "Computer and Communication System Development among Financial Institutions in Japan" for Special Session II: Japanese VLDB, I have described the past experience and present situation of electronic banking systems in Japan. I am deeply indebted to the Federation of Bankers Associations of Japan for permission to use charts and tables from its "Payment System in Japan".

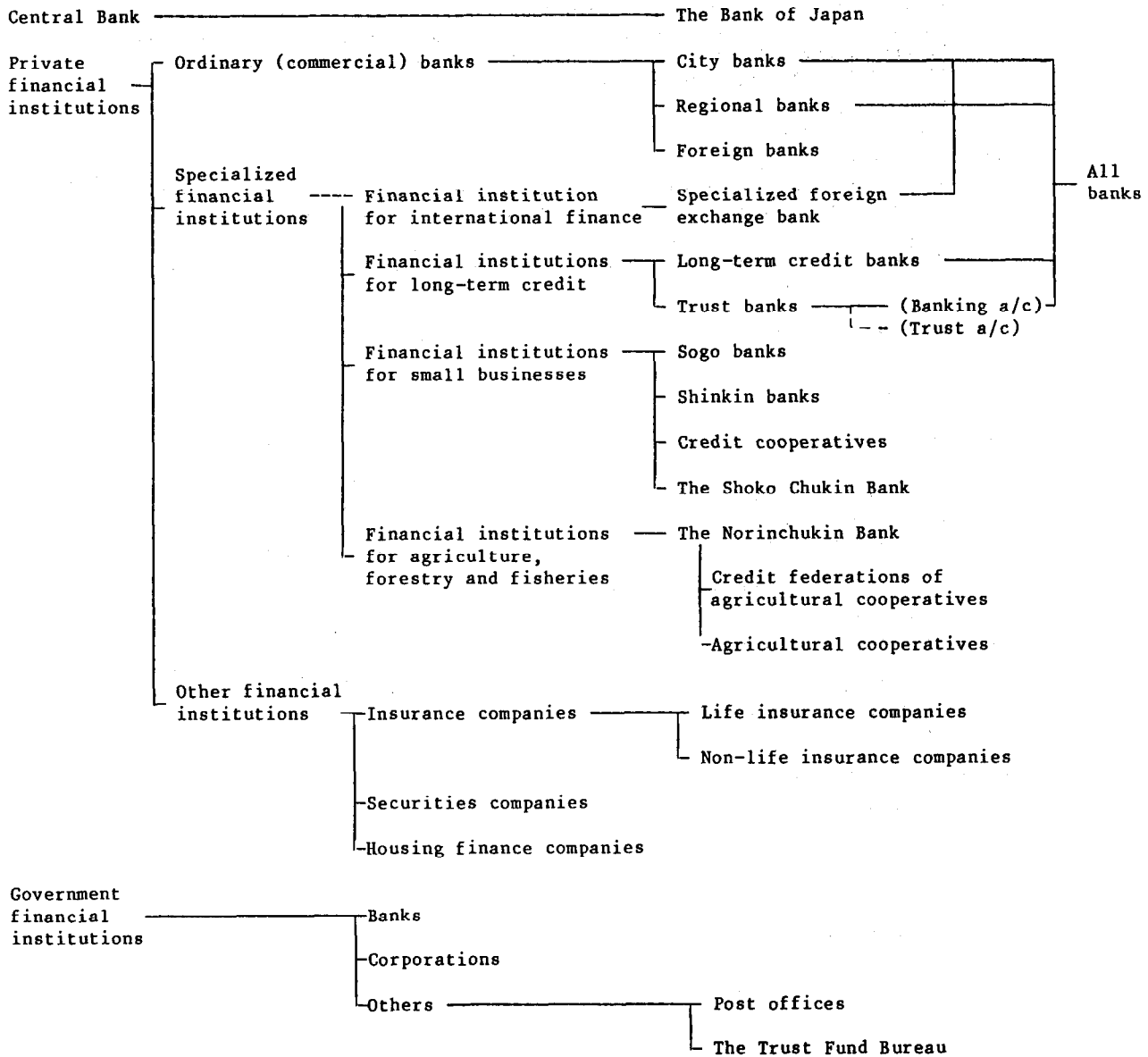
Japan's banking environment has recently seen big changes as witnessed by the movement toward the deregulation and internationalization of her financial and capital markets. Also, competition to develop new products and enter new markets has intensified, spurred by advances in computer technology and applications. A wealth of new financial products and services is steadily being introduced to respond to changing customer needs and the new business environment.

Therefore, the third stage on-line systems now being developed will be electronic banking systems geared toward the future and compatible with the rapid advance of deregulation, internationalization and electronic technology. The systems will play a central role in the management of each bank supporting integrated financial services over the long run in our advanced information age. So much development is underway, that Japanese computer manufacturers and software houses have temporarily run out of systems engineers with banking systems experience.

Third-stage on-line systems will bring the following points into focus. First, systems will enrich integrated accounting systems by promoting efficiency in all banking operations. Secondly, the information systems will be upgraded supporting the strategic planning and decision making of management. Thirdly, they will create open networks which can be used in new operations, both internally and externally. Fourthly, they will be completely secure and reliable. Fifthly, they will be flexible and allow the development of new products and services. Our image of third stage on-line systems will be outlined during the panel session.

Chart 1. Organization Chart of Principal Financial Institutions

(As of April, 1986)



Scope of Principal Financial Institutions

(As of April, 1986)

1. The Bank of Japan
2. All Banks (87) ... Member banks of the Federation of Bankers Association of Japan (excluding the accounts of overseas branches, which are separately reported every quarter).
 - A. Banking Accounts
 - (1) City banks (13) ... Daiichi-Kangyo Bank, Mitsui Bank, Fuji Bank, Mitsubishi Bank, Kyowa Bank, Sanwa Bank, Sumitomo Bank, Daiwa Bank, Tokai Bank, Hokkaido Takushoku Bank, Taiyo Kobe Bank, Saitama Bank and Bank of Tokyo (established by the Foreign Exchange Bank Law).
 - (2) Regional banks (64) ... Banks excluding city banks, trust banks and long-term credit banks.
 - (3) Trust banks (7) ... Mitsui Trust & Banking Co., Mitsubishi Trust & Banking Co., Yasuda Trust & Banking Co., Toyo Trust & Banking Co., Chuo Trust & Banking Co., Nippon Trust & Banking Co., and Sumitomo Trust & Banking Co.
 - (4) Long-term credit banks (3) ... The Industrial Bank of Japan, the Long-term Credit Bank of Japan, and the Nippon Credit Bank (established by the Long-term Credit Bank Law).
 - B. Trust Accounts ... Trust accounts of the one city bank, two regional banks and seven trust banks.
3. Foreign Banks in Japan (77)
4. Financial Institutions for Small Businesses
 - (1) Sogo banks (69)
 - (2) The Zenshinren Bank
 - (3) Shinkin banks (456)
 - (4) The Shoko Chukin Bank
 - (5) National Federation of Credit Cooperatives
 - (6) Credit cooperatives (448)
 - (7) National Federation of Labor Credit Associations
 - (8) Labor credit associations (47)
5. Financial Institutions for Agriculture, Forestry and Fisheries
 - (1) The Norinchukin Bank
 - (2) Credit federations of agricultural cooperatives (47)
 - (3) National Mutual Insurance Federation of Agricultural Cooperatives
 - (4) Mutual insurance federations of agricultural cooperatives (47)
 - (5) Agricultural cooperatives (4,278)
 - (6) Credit federations of fishery cooperatives (35)
 - (7) Fishery cooperatives (1,755)
6. Securities Finance Institutions
 - (1) Securities finance companies (3)
 - (2) Securities companies (221)
7. Insurance Companies
 - (1) Life insurance companies (23)
 - (2) Non-life insurance companies (23)
8. Government Financial Institutions
 - (1) The Japan Development Bank
 - (2) The Export-Import Bank of Japan
 - (3) The People's Finance Corporation
 - (4) The Housing Loan Corporation
 - (5) The Agriculture, Forestry and Fisheries Corporation
 - (6) The Small Business Finance Corporation
 - (7) The Hokkaido and Tohoku Development Cooperation
 - (8) The Japan Finance Corporation for Municipal Enterprises
 - (9) The Small Business Credit Insurance Corporation
 - (10) The Environmental Sanitation Business Finance Corporation
 - (11) The Okinawa Development Finance Corporation
9. Government
 - (1) The Trust Fund Bureau
 - (2) Postal savings
 - (3) Postal life insurance and postal annuities

Table 1. Interbank Systems in Japan

Instrument		Interbank System	Participants	Transactions (1984)	
				Volume	Value
Cash		ATM networks (Joint-venture and shared uses)	NCS ... city banks, regional banks, sogo banks (54 banks) BANCS ... 13 city banks ACS 64 regional banks SOCS 7 trust banks SCS 69 sogo banks SNCS 456 credit associations	In Dec. 1984 868,000 4,116,000 1,426,000 12,000 524,000 623,000	
Checks & Bills & Notes	Local	Clearing Houses (183) Tokyo C.H. ... computerized Other C.Hs ... manually processed	Tokyo C.H. Clearing members 116 (members 83) (associate members 33) Agency participants 521	All C.Hs 415 million Tokyo C.H. 151 million	¥2,244 trillion ¥1,688 trillion
	Inter- regional	Zengin System (Data Telecommunication System of All Banks)	All banks 87 Sogo banks 69 Credit associations 456 Credit cooperatives 422 Agricultural cooperatives 4,275 Others 137 (5,446 institutions with 40,904 branch offices)	344 million	¥577 trillion
Direct Credit	Indi- vidual transfer				
	MT- based transfer	MT Editing system (ACH)	Tokyo ACH City banks 13 Regional banks 56 Trust banks 7 Long-term credit banks 1 Sogo banks 28	30 million	¥5.4 trillion
Direct Debit		(no specific systems)		rough estimation 1,000 million	
Same-day settle- ment of inter- bank fund transfer in high amounts		Foreign Exchange Yen Settlement System	City banks 13 Regional banks 7 Trust banks 7 Long-term credit banks 3 The Norinchukin Bank 1 Foreign banks 44 Total 75		¥1,341 trillion

[Note] The postal giro handled 229 million transactions in fiscal 1983, though the average transaction amount was small (¥39,000, compared with ¥1,670,000 in the Zengin System).

(Source: The Federation of Bankers Association of Japan)

Chart 2. Development of Electronic Banking Systems in Japan

	1965	1975	1985
Development of On-line Bank Systems	First-stage on-line system - stand-alone accounting systems (such as for deposits, exchange) and inter-branch transactions	Second-stage On-line System - integrated accounting systems (including deposit, exchange, loans and foreign exchange) and interbank transaction	Third-stage On-line System <ul style="list-style-type: none"> o Integrated accounting systems increase o Information systems upgraded o Networks enlarged, both internally and externally o Security and Reliability o Flexibility for Development o All private financial institutions in Japan became members in August 1984 (around 5,480 institutions including 40,000 business offices). o 3 foreign banks participated as of September 1985. o Capacity scheduled to be raised from November 1987.
	Inter-bank system Zengin System	Domestic Exchange System launched in April, 1973 (87 banks, including 8,400 business offices)	<ul style="list-style-type: none"> o Sogo banks, credit associations as well as the Norinchukin Bank participated in the new system in February 1979 (708 institutions including 18,000 business offices). o System was linked with the SWIFT in 1981.
ATM Net-work		NCS (Nov. 1973), SCS (Oct. 1980) ACS (Oct. 1980), SNCS (Nov. 1980)	SOCS (Apr. 1983) SICS (Mar.1980) + TOCS (Apr.1980) → BANCS (Jan. 1984)
Network System with Customers		<ul style="list-style-type: none"> o ANSER (automatic answer network system for electronic request, Aug. 1981) o CAFIS (credit and finance information system, Feb. 1984) 	<ul style="list-style-type: none"> o FINE (Financial Information Network)
New Business & New Technology	<ul style="list-style-type: none"> o Direct credit transfer of wages and salaries (Mar. 1969) o Introduction of cash dispensers (Dec. 1969) o CD on-line (1971) o Introduction of sogo accounts 	<ul style="list-style-type: none"> o Introduction of ATMs (1979) & OTMs (1981) o Use of portable terminals (1983) o On-line connection between banks and corporations (1983) 	<ul style="list-style-type: none"> o Pay by phone (June, 1984) o CAPTAIN (Vidiotex) (Nov. 1984) o BANK POS (Nov. 1984) o OCR of handwritten slips o Automatic registration and authentication of seals

Chart 3. On-line ATM Networks

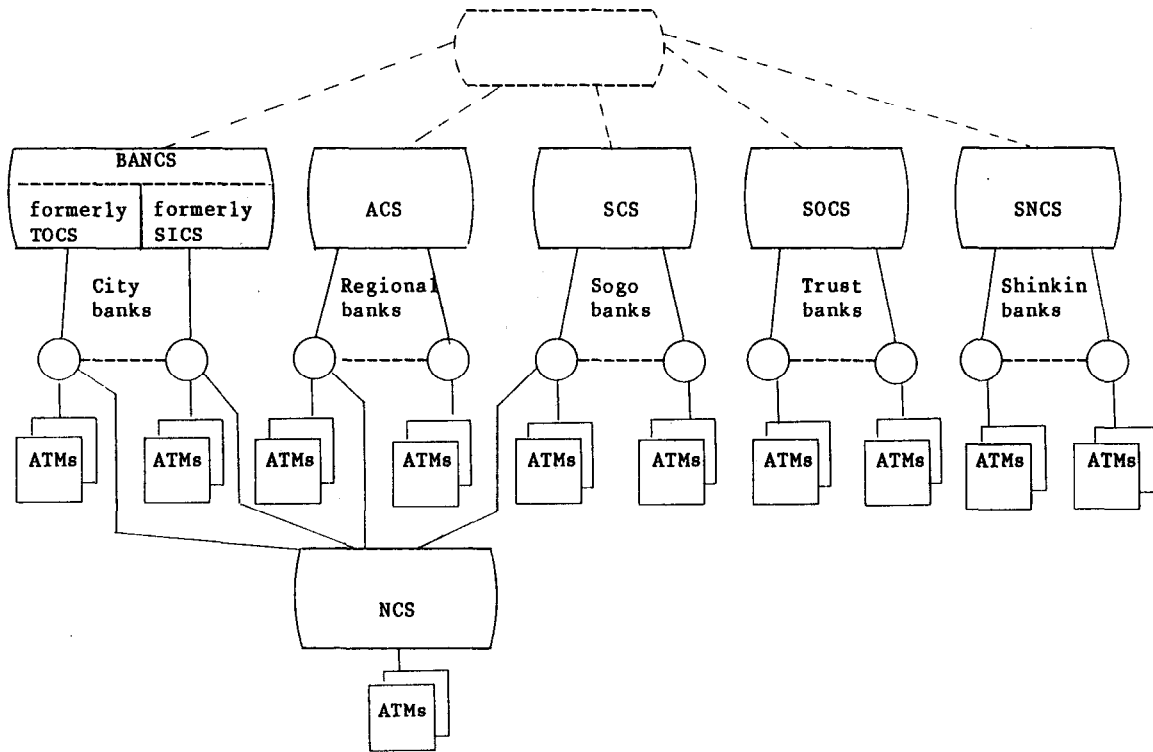


Table 2. Systems for the Joint Utilization of ATMs

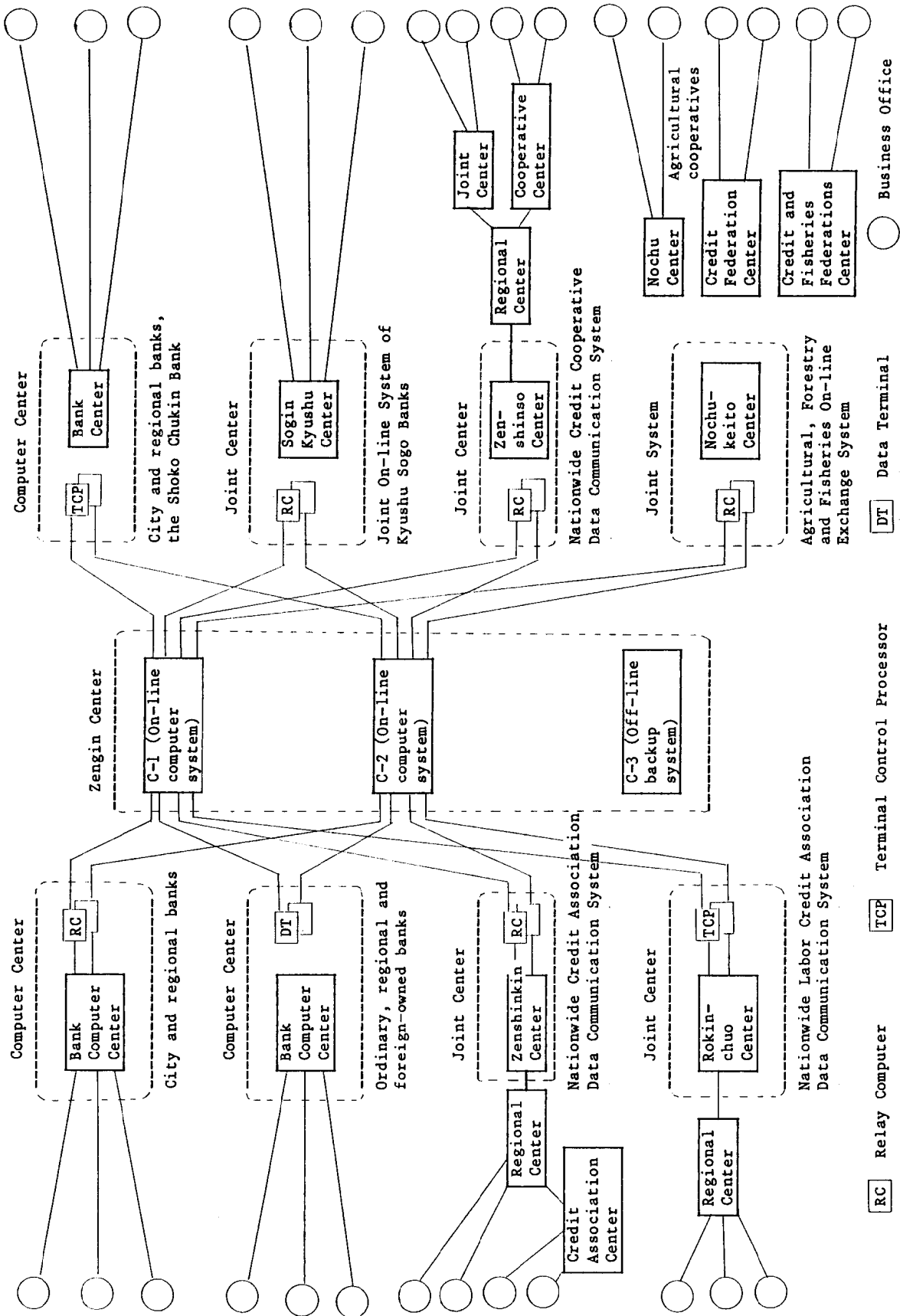
(End-March, 1985)

Name	Type of Bank	Starting Date	Number of Participants	ATMs Installed	Number of Cards Issued	Per-month Utilization (estimate)	Place of Fund Settlement
BANCS (Bank Cash Service)	City banks	Jan. 1984	13	12,201	million 43.07	million 3.16	Clearing House
ACS (All Chigin Cash Service)	Regional banks	Oct. 1980	64	12,570	34.78	1.25	Zengin System
SOCS (Shintaku Ginko On-line Cash Service)	Trust banks	Apr. 1983	7	530	1.25	0.01	Clearing House
SCS (Sogo Cash Service)	Sogo banks	Oct. 1980	68	5,690	13.31	0.45	Zengin System
SNCS (Shinkin Net Cash Service)	Shinkin banks	Nov. 1980	456	7,953	12.51	0.50	Shinkin System
NCS (Nippon Cash Service)	City banks, regional banks, & sogo banks	Nov. 1973	54	301	-	0.65	-

Note: Other financial institutions which have installed ATMs and issued cash cards include long-term credit banks, credit cooperatives, agricultural cooperatives, and labor credit cooperatives.

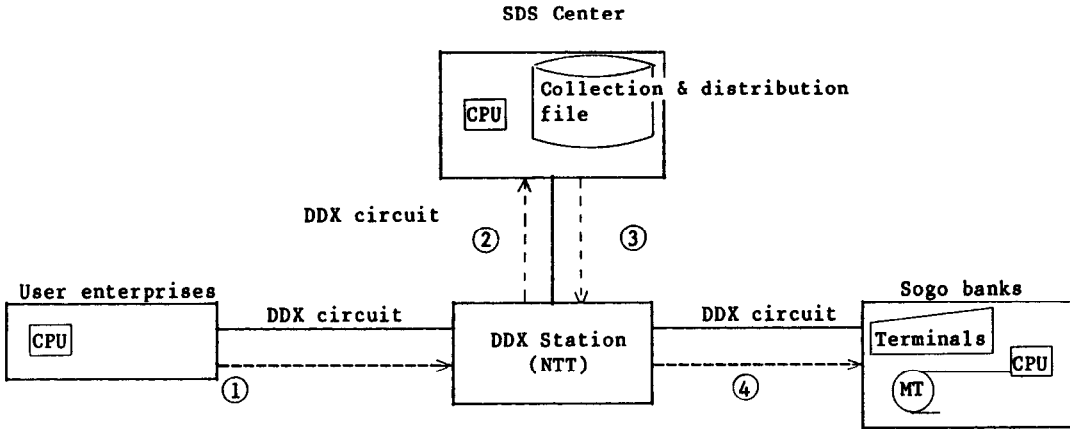
(Source: The Federation of Bankers Association of Japan)

Chart 4. Zengin System Configuration



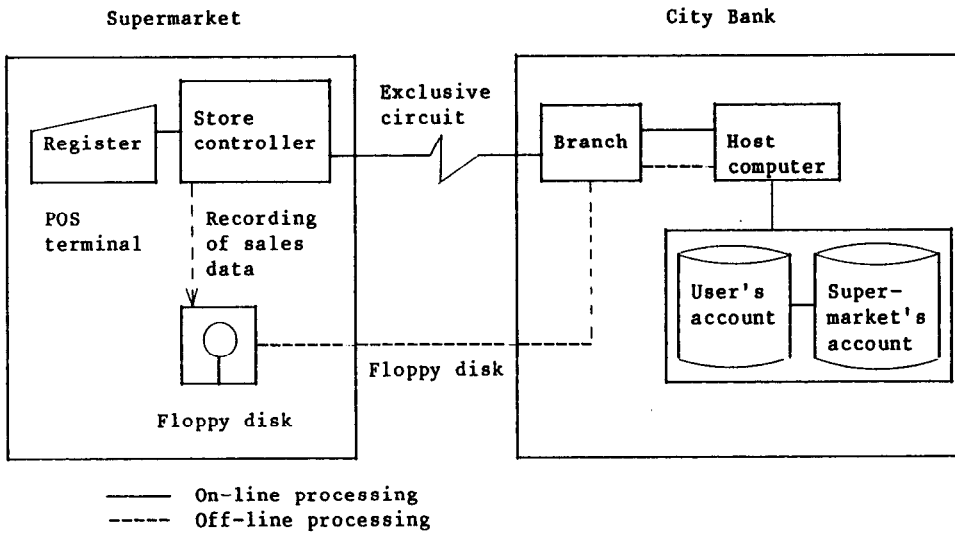
(Source: The Federation of Bankers Association of Japan)

Chart 5. Diagram of MT Joint Data Transmission System
(Sogo Bank Data Transmission System)



(Note) ... indicates fund flow

Chart 6. A Supermarket/City Bank POS System



(Source: The Federation of Bankers Association of Japan)