

# Information Technology and the Restructuring of Banking Services

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*This paper aims at contributing to the shaping of a new definition of banking. While banks have traditionally offered asset transformation, information-intensive lending, and payment services, recent advances in information processing and data communications have had such a strong influence that the provision of each of these services is now becoming distinctly separate. Thus, the conventional image of banks does not fit the reality. This paper examines the impact of new technology on banking and examines the resultant changes it has occasioned. Some policy implications are also briefly discussed.*

## I. Introduction

The Banking Law (1981) defines banking as either: (1) “the acceptance of deposits or installment savings and the lending of funds or discounting of bills or notes,” or (2) “the carrying out of exchange transactions.” A “bank” is an organization that has been licensed by the Ministry of Finance to engage in at least one of these undertakings. The United States, in its Bank Holding Company Act (1956), defines a “bank” as an institution that accepts demand deposits and engages in commercial lending. Both of these definitions are fairly accurate summations of what have hitherto been considered banks.

However, the reality has changed dramatically in recent years. As the financial service industry adapts to the progress of information processing and data communications technology, it is increasingly difficult to stick to a stable image of what banks are. For example, the advent of “securitization” means that financial services provided by banks are not necessarily connected with the lending of funds. Hence, it has become necessary to redefine banking.

In this paper we will use the traditional definition of banks to look at the financial services they have historically provided. Then we will examine the impact of new technology and resultant changes. Throughout, our basic purpose is to facilitate the formulation of new concepts regarding banking.

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In section II we will see that banks have traditionally offered three services: asset transformation, information-intensive lending, and payment services. Section III looks at the impact of advances in information processing and data communications technology on the asset transformation and information-intensive lending services of banks, and section IV examines how technology has affected payment services. In section V we will see that, while these functions have previously been integrated, they are now becoming separated and, in the process, banks are searching for new services and functions to perform. The paper concludes by briefly examining some policy considerations.

It is assumed that the reader has some prior knowledge of the history of the introduction of information technology to Japanese banking and makes no attempt to give detailed background explanation.<sup>1</sup>

## II. Basic Banking Services

The first part of the Japanese definition of banking is generally referred to as financial intermediation. Intermediary functions can be broken down into (1) the transformation of maturities and amounts, and (2) the evaluation and assumption of credit risk. To rephrase, the process of taking deposits and making loans can be conceptualized to consist of two operations: (1) the transformation of deposits into  $X$  and (2) the transformation of  $X$  into loans.  $X$  for our purposes, means hypothetical assets which are the same as loans in terms of size and maturity, but for which there is no credit risk.

The first operation involves taking deposits and investing them in a large-denomination, long-term asset with no credit risk. This is essentially the transformation of maturities and amounts. The second operation involves raising funds through large issues of long-term, safe debt and its investment in risky assets with the same maturities and amounts. The essence of this kind of operation is the evaluation and assumption of credit risk based on activities that provide information about borrowers. We shall therefore call these two operations: (1) asset transformation services and (2) information-intensive lending services.

In actual practice, it is not unusual that asset transformation and information-intensive lending services are separately provided by different banks. Banks which do nothing but accept small-lot deposits and use them to purchase government bonds or invest in money markets are, in fact, specializing in the first service. U.S. money center banks are a classic example of the opposite, or, wholesale institutions which buy all of their investment funds on the market and specialize in the second service.

Japan's Banking Law also defines another activity for banks, that of exchange or

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<sup>1</sup>Iwasa (1990) is recommended as a useful survey of the history of the introduction of technological innovation in information processing and data communications to Japanese banking.

settlement. In the broadest sense, settlement (which we shall term “payment services”) involves functioning as an agent for the delivery of funds between clients. More narrowly defined, it is the provision of settlement instruments which are socially-accepted assets in the sense that their delivery clears obligations among traders and provides finality for transactions.

Strictly speaking, the only settlement instruments recognized in Japan are the banknotes issued by the Bank of Japan (and, within specified limits, government coins), i.e. the country’s legal tender. But there is also a *de facto* recognition of other financial assets as settlement instruments provided it is guaranteed they can be converted into legal tender at a predetermined rate whenever holders wish. This is because as long as it is possible to exchange financial assets for legal tender at any time there is no need to actually convert them. Delivery of the assets is as good as delivering legal tender to settle obligations.

A principle example of such assets are demand deposits (current accounts and savings accounts) accepted by banks. In fact, for dealings involving large sums or geographically disparate parties, demand deposits offer much more convenient payment services than banknotes do, since there is an interbank transfer and exchange network that enables the delivery of demand deposits to be made quickly, safely, and at low cost. Banks which provide demand deposits for use as settlement instruments are therefore not only financial intermediaries but also suppliers of money.

We have observed that banks have traditionally offered three services: asset transformation, information-intensive lending, and payment services. These terms correspond to transformation services, asset services, and liability services in Diamond (1989), and we will examine them more closely in the pages that follow.

### III. Intermediary Activities and the Information Revolution

#### A. Asset Transformation Services

Investment projects which require a long gestation period before producing returns (which we will call long-term assets) are generally more profitable than projects that produce a yield in a relatively short period of time (which we will call short-term assets). This is known as “profit from roundabout production.” When long-term investment projects are abandoned after a short period of time, however, their profit rates are lower than those for short-term assets. (If such were not the case, short-term assets would be completely dominated by long-term assets.) The discussion which follows assumes the existence of “profits from roundabout production.”

The time profile of spending money in the future, unfortunately, is never completely certain. Unforeseen expenses are often incurred. Although long-term assets provide high profit rates, it would not be wise to invest all of one’s savings in them. At least a portion should be kept in short-term assets. While profitability might not be as high, having a

portion of one's savings in a more liquid form (for example, excess inventory or gold/jewelry) provides a hedge against the arbitrary timing of expenditures.

If every person in the economy tried to hedge independently, an unnecessarily large proportion of the economy's savings would be placed in low-return short-term assets. (This phenomenon is actually seen in less-developed countries where banking systems are not very advanced.) While all face risk arising from the uncertain timing of expenditures, it is inconceivable that everyone would incur such unforeseen expenses simultaneously or that there is a perfectly positive correlation for such risk. It is therefore possible to restructure the risk burden so that a smaller proportion of a society's savings is kept in short-term assets.

In other words, the necessity of having to make an outlay will likely materialize at different times for each person. This makes it possible for savings to be pooled and jointly invested, lowering the proportion of savings kept liquid as a hedge and raising the proportion kept in more profitable long-term assets by a corresponding amount. Mutual funds are an example of such a risk allocation system. Nevertheless, the banking system where banks keep only part of the funds they receive in short-term assets as a reserve and invest the rest in long-term assets, known as the partial reserve banking system, offers even more efficient risk sharing.

In a mutual fund, participants bear the residual risk (which remains after pooling) in proportion to the amount they invested. In contrast, for banks there are at least two different groups providing funds: depositors and shareholders, with residual risk being borne entirely by the latter (ignoring the possibility of default). The former incur no risk whatsoever, and the latter obviously receive a greater share of the profits. As long as each individual has a different attitude towards risk and holds different asset amounts, the only way to efficiently allocate risk is by this sort of disproportional scheme.

Mutual funds only allow risk to be divided in proportion to investment. However, a banking system, in which it is possible to allocate risks with more flexibility, enables the efficient distribution of the risk arising from the uncertain timing of expenditures. We term this aspect of bank activity as asset transformation services. By providing this service, banks enable a greater proportion of a society's savings to be used for fixed, but more profitable purposes, thereby contributing to more efficient investment allocation.<sup>2</sup>

It should be noted that although textbooks usually state that asset transformation services create liquidity, in the real economy they actually decrease the amount of liquid assets. A more accurate description would be to say that asset transformation services enable society to meet the demand for liquidity (or hedge against the uncertain timing of expenditures) while holding fewer real liquid assets. The provision of asset transformation services makes it vital for banks to maintain solvency and liquidity.

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<sup>2</sup>My explanation of the asset transformation service agrees, for the most part, with that of Diamond and Dybvig (1983), although I place greater emphasis on the existence of different types of claimants, i.e. depositors and shareholders.

The actual work involved in providing asset transformation services takes the form of either keeping records of deposit accounts or managing cash flow. Funds are accepted from depositors with the guarantee that they will be repaid on demand. This money is pooled, with most being invested in fixed, long-term assets, and only a small portion held in reserve. Consequently, most of the asset transformation work of banks is recording and calculating the deposit and withdrawal of funds from individual current accounts and savings accounts, to raise funds from the money market and other sources according to the institution's net cash position, and to forecast future cash positions so as to decide how much should be held in reserve and in what form.

This requires the processing of a huge volume of data, and hence computers were introduced at an early stage. In Japan, the first on-line phase of computerization took place in the mid-1960s and involved (1) computerizing the processing of individual transactions and (2) bringing individual banks on line. The second on-line phase, in the late 1970s, enabled linked processing of different transactions and created an on-line interbank network. As a result, virtually all routine data processing is now automated.

The task before the industry today is to develop systems capable of responding strategically to changes in net cash position. This is the third on-line phase which is currently under way. Banks are strengthening their accounting systems and are also placing more emphasis on computerizing information systems upon which they base their decisions. New investments in the 1990s have attempted to restructure computer systems to make them more powerful. Modern banking is, in short, increasingly becoming an automated industry.

Cash flow management is no longer just a matter of maintaining liquidity and ensuring that all claims on a bank can be paid back. Banks must also engage in asset and liability management, that is, the strategic management of the interest rate risk generated by differences in the term structure of liabilities and assets. With the deregulation of interest rates, banks hold more market-sensitive assets and liabilities, which means that changes in the term structure of interest rates have a far greater influence on their profits than ever before.

At the same time, banks also have been given powerful new methods for managing their interest rate risk in the form of financial futures, options, and interest-rate swaps. But, in order to make effective use of these instruments, banks must be able to quickly grasp their overall asset / liability positions. This requires computer systems, which, among other things, provide indispensable support in coordinating positions in different markets (such as the cash and futures markets).

Obviously, banks must be able to obtain market information and news very quickly in order to have an accurate picture of future interest-rate trends. But, it would be even better if program trading systems were available to semi-automatically adjust positions in response to the market information they receive. Computer support systems become even more important when dealings in the cash and other derivative securities markets

which constitute a significant proportion of asset transformation services.

As a related phenomenon, the revolution in information processing and data communications has also made it possible to provide financial products that enable fine-tuned risk-sharing arrangements. Many of the new products with added option clauses or services are designed to give clients as wide a choice as possible, but since they are comprised of so many different elements, they generally require an enormous amount of data processing. There is no way that risk-sharing arrangements can be made available without computer support systems, which is one of the reasons why new product development is referred to as *financial engineering*.

The conclusion to be drawn is that the efficiency with which a bank is able to provide asset transformation services is contingent upon its ability to use information processing and data communications technology. Computers have already taken over account entry, once a job open only to highly-skilled bank employees. Other aspects of banking will probably also be computerized. While human intelligence is still considered necessary for most dealing, sooner or later expert systems capable of providing equivalent skills will be born.

When this happens, almost all routine banking operations will be handled by computer. All managers will need to do is to make a few, albeit very important, decisions about their bank's strategy and, even then, they will probably be dependent on decision-making support systems. The upshot will be a complete reversal of perspective. Instead of being considered a means of accomplishing banking, computer systems will be considered the substance of banking. These changes are predictable, and will have a tremendous effect on how the banking industry is organized. (See section V for a fuller discussion of these effects.)

## **B. Information-intensive Lending Services**

These comprise four:

- (A) pre-loan evaluation,
- (B) post-loan credit management (monitoring),
- (C) assumption of credit risk, and
- (D) the provision of funds.

The first two are essentially information production activities and have been dramatically affected by the revolution in information processing and data communications. One of the consequences of this has been the separation of service D (or service C and D) from the other services.

In order to simplify, let us imagine an investment project which needs to raise outside funds in order to be carried out. Let us further assume that the entrepreneur engaged in the project has no other wealth. Therefore, the return available to the providers of funds is solely dependent on the results of the project. Consequently, the providers of funds need to know the probable profit the project is likely to generate.

However, such information is often not readily available.

Before funds can be provided, information needs to be collected and analyzed. In other words, the providers of funds need to evaluate the probable returns on the project or search for investment projects with great enough potential to justify the provision of funds. This is the work which involves unignorable costs. Doing this kind of work on behalf of the ultimate providers of funds represents pre-loan evaluation (service A).

Let us assume that an evaluation shows that a project has sufficiently high expected profitability and a decision is made to fund it. Until the investment is recovered, the providers of funds will still have to monitor how the project is conducted.

Actual results achieved by the project will be influenced not only by external factors that are beyond control but will also be contingent on the efforts of the borrower-entrepreneur. In other words, all things being equal, the greater the effort put into the project, the greater the potential rewards. If the providers of funds are negligent in their monitoring, the borrower-entrepreneur may be tempted to slacken his/her efforts. Furthermore, there is always the possibility that the funds provided may be used for something else besides the project they were earmarked for. As long as the interests of borrowers are different from those of lenders, lenders must engage in certain activities required to protect their rights.

Activities that protect the rights of the providers of funds are referred to as post-loan credit management (monitoring; service B). The main focus of these activities is: (1) monitoring whether or not the recipients of funds perform the actions they were originally contracted to and (2) taking required corrective measures should they engage in inappropriate behavior. In this sense, post-loan credit management (monitoring) is essentially concerned with the collection and analysis of information (or information production), just as pre-loan evaluation is.

There are certain economies of scale (or scope) involved in information production. For example, if the investment project is large enough that it must be funded by several different sources, it is a duplication and costly for each provider of funds to effect its own evaluation and credit management. It is obviously more efficient for a specific organization to take care of such services A and B on behalf of all. Individuals will also find that their information is more useful when other supplementary information is available. This aspect of information is what gives it economies in terms of both spatial and historical scope.

As a result, there are profits to be had from specializing in information production. Banks, in fact, can be considered organizations set up to reap the benefits of specialization in this kind of information production. As specialized information producers, they make evaluations and manage credit on behalf of ultimate providers of funds. In actual practice, this is a major component of their information-intensive lending function.

In addition, bank information-intensive lending services also involve the assumption of credit risk (service C), and the provision of funds (service D). All four services have

been integrated, but there is no theoretical necessity for the first two and the last two to be together.

Recent years have seen a phenomenon known as the "institutionalization of savings." As this trend progresses it may no longer be efficient for banks to be engaged in assuming credit risk and providing funds (service C and D). In times past, the main providers of funds were individuals, but the proportion of institutional investors (e.g. insurance companies and pension funds) is increasing, and banks do not necessarily have any advantages over more basic sources of funds when it comes to the assumption of risk and the provision of funds. Banks may even find themselves at a disadvantage when it comes to providing funds since they are obliged to meet reserve requirements.

If, indeed, the information (skills and experience) banks have accumulated gives them an advantage in terms of pre-loan evaluation and post-loan credit management (services A and B), then it may be conceivable for them to concentrate on just these two. One example of this would be the sale of loans in the form of participation. Under these arrangements, a new contract gives the buyer the right to receive cash flow stemming from the loan, but the original relationship of rights and obligations remains intact. Therefore, even after the sale, the originating bank continues to undertake credit management. Such arrangements, of course, are the equivalent of spinning off the provision of funds (service D) to concentrate on services A and B.

When participation comes with legal recourse, banks also assume credit risk (service C), but when not, service C is split off. And, when the loan is sold as an "assignment" or "novation,"<sup>3</sup> the arrangements in effect cut the loan up piecemeal. What is effectively happening in such deals is that the bank is capitalizing on its advantages with respect to services A and B and providing underwriting services as in private placement. Other loan guarantee services can also be seen as the information-intensive lending service minus service D.

The total separation of these services, however, requires more complex data processing. Separation would be almost impossible if the process were not backed up with a quick, economical system for accomplishing the necessary record keeping. The institutionalization of savings has thus combined with the revolution in computer technology (which enables a large volume of hitherto impossible data processing to be accomplished quickly and cheaply) to bring about the separation of information-intensive lending services.

The separation of fund provision services from the rest of information-intensive lending services has progressed at lightening rates in the United States, thereby allowing major U.S. banks to achieve considerable asset compression. In Japan, by contrast, loan

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<sup>3</sup>When a bank sells not just cash flow but all rights under a loan contract (but still incurs obligations), it is known as "assignment." When it sells both rights and obligations, it is known as "novation."



sales are just now being experimented with, and the separation of fund provision services has not even got under way. The reason is that there are still too many regulations in place in Japan (especially on deposit interest rates). Regulated interest rates on deposits artificially subsidize banks' fund raising and maintain an environment in which it is to their advantage to continue to engage in fund provision services.

The regulatory framework also places limits on the amount of direct fund raising open to non-bank borrowers. For example, consumer credit companies and credit card issuers are not allowed to issue commercial paper, and there has been no securitization of credit card loans either. Financial techniques like securitization result from the advances of information technology. Measures which slow down their inception may, over the short term, maintain the existing credit structure and prop up bank profits but, over the long term they will make Japanese banks less competitive internationally and could even destabilize Japan's financial system.

Regulations which inhibit the introduction of new technologies should be repealed as early as possible. Furthermore, the Basel Accord and consequent BIS capital adequacy standards have awakened Japanese banks to the necessity of consolidating their assets. Deregulation will be necessary if they are to compress their assets without damaging their organizational resources. In concrete terms this means giving borrowers other than banks the means to raise funds directly and allowing bank involvement through the provision of guarantees. Only when this is done will banks be able to reduce their assets and take advantage of their expertise in pre-loan evaluation and post-loan credit management (services A and B).

In information-intensive lending services, the factor determining the relative superiority of banks will be how well they are able to specialize in pre-loan evaluations and post-loan credit management (monitoring). Advances in information processing and data communications will have a direct influence on both these activities. For example, the expansion and spread of databases may combine with progress in artificial intelligence technology to allow credit decisions to be automated rather than relying on the experience and skill of individual bankers. Technological progress has a particularly important contribution to make in increasing the quality of credit decisions made in retail areas like consumer loans.

The automation of this work could potentially modify the nature of business relationships. Dealings between banks and corporations, at least in Japan, have tended to be long term and continuous. One of the reasons is that it has been to the banks' advantage to maintain long-term customer relations because such relationships allow them to accumulate customer information. This accumulation of information not only makes it easier to obtain additional information in the future, but also makes that information more useful. In short, information expenses are less when doing business with someone with whom you have a historical record than they would be doing business with a complete stranger. This is what has encouraged bankers to maintain business

relationships with specific customers.<sup>4</sup>

However, this explanation of the advantages of long-term customer relationships assumes that the information accumulated is non-negotiable. If information cannot be transferred to others, then the only way it has value is if it can be used by oneself. Banks must therefore continue to do business with the corporation or individual in question. But, if it is possible to sell the information one has accumulated, there is no need to maintain the business relationship. Even granting that the costs for building databases are fixed expenses, as long as there is the possibility of selling individual databases, they are not sunk costs.

Obviously, if the gathering of information is directly dependent on human factors like employee experience, then data cannot be obtained unless employees remain in the same jobs. Its sale is therefore very difficult, except in the case of a corporate acquisition or merger. But, if information is gathered in the form of a database system that is divorced from human factors, then the sale of that system will result in a transfer of the information gathered and will allow the bank to recover the costs that it has incurred. From this perspective, then, the progress of information technology will make it less advantageous to maintain long-term customer relationships and make the nature of business more temporary.<sup>5</sup>

Many suggest that the advent of firm and home banking will tend to fix business relations. This is because companies and households must currently have terminals that are specific to the bank providing such services. The purchase of necessary terminals is therefore a sunk cost. This will not, however, be the case should terminals become more standardized or should firm and home banking switch to easier-to-use personal computers. Furthermore, from the point of view of customer convenience, it is not desirable that firm and home banking services be limited to individual banks or that these services be used by banks as a way to differentiate themselves from competitors. It would be much better if an integrated service were available from some sort of financial value-added network.

Up until now, banks have been able to keep track of their customers' flow of funds because they also provided payment functions, as we shall see later. This gave banks an advantage in gathering information or at least in monitoring their customers' creditworthiness, but this advantage may become less pronounced as information technology advances. The flow of funds is generated by the flow of goods or series of commercial transactions, and it is these latter two that are more fundamental. In the past it was

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<sup>4</sup>I myself have made similar points in other writings. See Ikeo (1985, pp. 119-23).

<sup>5</sup>There is an alternative explanation of why it is advantageous to maintain long-term customer relationships: they make it possible to link current behavior to future business terms, which helps to suppress moral hazard. The suppression of moral hazard, however, requires nothing more than the transmission of information on current behavior to the parties involved in future business dealings. It is not indispensable to maintain a relationship between the two original parties.

almost impossible to grasp meaningful information on the flow of goods and the series of commercial transactions in any integrated form, so the flow of funds was the information that was closest to the source. This situation has changed with the advent of distributors' value-added computer networks. It is now possible to obtain meaningful information on the more basic questions of how goods are flowing and how transactions are doing.

Organizations able to access fundamental information sources like the flow of goods and commercial transactions (e.g. distribution companies) may, therefore, have an advantage in obtaining information over organizations able to access only derivative sources of information like the flow of funds (such as banks).

There have already been examples of this phenomenon in Japan. One is known as "trading house finance," where certain groups of borrowers can be allocated funds more accurately by going through the trading houses they do business with rather than by depending on direct bank financing. Trading house finance and similar phenomena may become more common in the future as information networks permeate.

#### **IV. Payment Services and the Information Revolution**

There is no supra-historical distinction between instruments which can and cannot be used for settling obligations. Any asset can become a settlement instrument if it is generally accepted and eventually given legal recognition. There is, however, a necessary assumption at work that says that certain assets can be delivered more cheaply, quickly, and safely than others because they are widely accepted as settlement instruments. But this assumption is not a natural function; it only works when certain institutional mechanisms are in place.

For instance, it has not been all that long since bank deposits explicitly became acceptable settlement instruments in Japan. Until the advent of a nationwide network that allowed interbank transfers and exchange, the only real settlement instrument was currency. Bank deposits were a savings instrument and not a settlement instrument in the strict sense of the term. To put it the other way around, bank deposits did not become settlement instruments until an enabling institutional mechanism was created.

What form this settlement mechanism takes and, consequently, what kind of assets are generally used as settlement instruments depends on historical circumstances, particular business practices of a country, and available technology. The current deposit-based settlement mechanism is no exception. It is built on a particular technological foundation. Thus, any change in the technological foundation can be expected to have a strong influence on the settlement mechanism.

Let us first briefly review how the current Japanese settlement mechanism works before we examine the influences of technological changes. The basic scheme involved in the current mechanism is to substitute obligations between banks for obligations between customers. Instead of handling these interbank obligations one by one, only the net value

of all obligations occurring during a fixed period (usually one day) is settled. This mechanism requires (i) an interbank system for communicating and processing transfer data (message exchange) and, (ii) an interbank system to perform the actual delivery of funds.

The basis for (i) is the clearinghouse system and the Federation of Bankers Associations of Japan's data telecommunications system, known as the *Zengin System*. The clearinghouse system has a long history; the *Zengin System* is electronic. While the latter only started operating from 1973 (in 1987 it underwent a third upgrading), it handles far more transactions than the clearinghouse system and is therefore much more important.

The requirement in (ii) is met by making transfers between current accounts (reserves) held by private banks at the Bank of Japan. This has been done on-line since the autumn of 1988 when the Bank of Japan's BOJ-NET commenced operations.

Traditionally, to effect a fund transfer, a customer made out a check or filled in a remittance application form at the bank counter. Recently, however, firm or home banking and bank POS equipment are becoming more common, and cash dispensers and automatic teller machines are also promoting automation. Since cash dispensers and automatic teller machines make it possible to link any number of financial institutions, they have led to the creation of both nationwide banking-category-specific networks and regional inter-bank-category networks. Furthermore, 1990 saw the completion of the MICS (Multi Integrated Cash Service) system, which functions as a relay between the systems of different banking categories, thus accelerating the progress toward a system where the cash dispenser and automatic teller machine networks of all private-sector financial institutions will be able to access each other. Therefore, although information processing and data communications technologies have enabled electronic automation, Japan's settlement mechanism has remained constant. In this case, the influence of the information revolution is entirely quantitative. Over the long term, however, the information revolution will also have a qualitative influence that will induce modifications in the underlying settlement mechanism. The beginnings of this can already be observed.

The quantitative influence has, quite literally, been a numerical increase in transaction volume handled. The convenience of computerization has brought about a dramatic surge in the utilization of the system. For example, the domestic fund transfer system (part of the *Zengin System*) processed an average ¥917.7 billion (or 735,000 transactions) daily in fiscal 1979. By fiscal 1989 this figure had grown to ¥6,813.8 billion (or 2,381,000 transactions). In monetary terms, volume grew 7.42-fold over the decade in question or by an average 22.2% per year; transaction volume grew 3.24-fold or 12.5% annually during the same period.<sup>6</sup>

As already mentioned, obligations between banks are not settled on an individual transaction basis. Instead, only net values for a certain time period are transferred. The

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<sup>6</sup>This data is cited from *Kin'yu* (Finance) published by the Federation of Bankers Associations of Japan.

expansion in volume, therefore, means that obligations that accumulate between banks are far larger than they used to be. For this reason, there is growing alarm over the systemic risk associated with the settlement mechanism. In its broadest sense, systemic risk also refers to physical crashes of the system or the risk of crime. More narrowly, it means a chain reaction in which the default of one participant would induce the default of all others, throwing the system itself into disorder.

The greater the obligations between banks, the more damage the default of any one bank would have on the others, and the greater the probability that other banks would not be able to absorb the damage and themselves become insolvent. The more the settlement mechanism is used, the greater damage it would do to society as a whole should it ever become dysfunctional. In short, the more a system is utilized because of its convenience, the more marked the chaos it causes if it ceases to operate.

Insolvency can arise in another way. An institution can actually have the ability to pay but be insolvent due to computer failure (there is a well known example of this in the United States). The only solution is careful maintenance and the installation of back-up systems, though the ultimate goal should be to create a system where the possibility of down time is excluded. In addition to assuring the safety of the equipment itself, steps need to be taken to prevent accidents resulting from such human factors as misoperation, illegal operation (computer crime), or wilful destruction. It is better to have several competing networks than a single monopolistic system. This not only promotes competition, it allows systems to function as each other's back-up.

Besides hardware improvements, other measures have also been suggested as ways to reduce systemic risk. Two major measures can be cited: (1) caps on the amount of credit granted specific banks or the net liabilities that can be accumulated by any one bank (or systems for managing credit-risk exposure) and, (2) a system in which the central bank pays obligations on behalf of an insolvent bank. Neither of these measures, however, are that convenient, and they are expensive. Under the current settlement mechanism, option (1) sacrifices convenience, while option (2) rewards the poor management practices of private banks.

There is, however, a third alternative: the introduction of obligation netting, a system whereby nettable obligations are netted out without waiting for the end of the transaction period. Such a system would change the obligations between banks to an individual net basis and would enable institutions to avoid building up large amounts of unsettled transactions. Still, there is no intention to apply this system to individual, simultaneous cash settlements (or the delivery of settlement instruments). Given the current technological base, individual, simultaneous cash settlements would clearly be inefficient. It is much more efficient to centralize the processing of transactions as much as possible, settling only the differences for set time blocks.

As information processing and data communications technology advance, it has already become common to deliver funds as electronic data. This kind of technological

advance will enable low-cost, real-time settlement. In other words, as electronic fund transfers progress, it may not be necessary to distinguish between the exchange of messages and the delivery of funds. It is therefore worth considering the synchronization of obligation netting and payment netting. The general adoption of such a scheme would make it possible to virtually eliminate the possibility of unsettled balances and would thus remove that aspect of systemic risk.

The transition to real-time settlement, however, will cause basic changes in banks' involvement in payment services. The primary reason banks have been the exclusive operators of the settlement mechanism is that the system of settling differences accrued during specified time blocks unavoidably involves the accumulation of unsettled balances. Such payment services could not be performed at all if institutions did not also provide information-intensive lending services. If all settlements were processed on a real-time basis, however, there would not necessarily be any unsettled balances created in the provision of payment services. Institutions offering lending services (i.e. banks) would no longer gain an advantage by offering payment services.

In other words, economies of scope would no longer function between lending and payment services, and there would be no reason for the two to be performed by the same institution. Banks would continue to have the advantage when it came to information-intensive lending services, but payment services might very well be better provided by organizations that have skill and expertise in information processing and data communications (one example being value-added network operators), or by organizations positioned nearer the flow of goods and series of commercial transactions that generate the need for settlement (e.g., distribution companies).

If real-time processing became the rule, settlement instruments would not necessarily be limited to financial assets like bank deposits for which the acceptor is guaranteed conversion into legal tender at a set rate on demand. Obviously, to be considered a settlement instrument, there must be no change in the rate at which the instrument is converted into legal tender during the time required for settlement processing. If the processing is instantaneous, however, this problem does not occur since all assets have a fixed value at any particular instant. At least, it would be possible to use beneficiary certificates from mutual funds which focus on public bond investments and entail little chance of loss of principal (such as Japanese medium-term government bond funds). As a matter of fact, progress is being made towards their use as *de facto* settlement instruments. This generally has taken the form of sweep accounts.

We have seen how advances in information processing and data communications have led to an electronic settlement mechanism and have had the quantitative effect of boosting the mechanism's utilization. In the future they will also have a qualitative effect by changing the settlement mechanism itself and, as a result, changing the range of participants and instruments employed.

Other signs that these qualitative influences are beginning to make themselves felt

can be seen in the substitution of obligations between banks for obligations between customers. There is a movement to directly net out obligations between customers. The most famous example of this movement is the one-day payment system developed by *Pharma*, a chain of retail drugstores in Japan<sup>7</sup>. The *Pharma* headquarters tabulates and manages all order booking data for its wholesalers and retail franchisees. Everything is settled according to this data using centralized processing in a joint account. What this means is that individual retailers do not have to make separate payments to each of their wholesalers. They merely transfer the amounts for all wholesalers to the joint account. The headquarters then transfers the total for each wholesaler from this account.

The use of distribution-oriented Value-Added Networks (VANs) as centralized systems for recovering accounts receivable reduces the number of settlement transactions required. If the number of wholesalers is  $m$  and the number of retailers  $n$ , the number of transactions required drops from  $m \times n$  to  $m + n$ . Other corporate groups are also establishing centers with distribution VAN-type functions in a move towards the direct netting out of obligations among group firms (the SKP settlement mechanism used by the *Sanyo Kokusaku Pulp* Group is one example). Distribution VANs already tabulate and manage data on the flow of commerce, so they could take advantage of the economies of scope by using this data to provide netting out services for the obligations incurred between different members. This is a natural side business for them.

These are all examples of what is being called Electronic Data Interchanging (EDI). In the broad sense, EDI quite literally means the electronic interchange of some form of data. But it is generally more narrowly defined as the electronic interchange of data covering the process from order booking through settlement. EDI may antiquate the traditional industrial divisions where the processing of order data is the work of distributors and the processing of settlement data is the work of banks. It may provide banks with new business opportunities and may also allow distributors to break into payment services which have so far been the exclusive province of banks.

Current distribution VANs are, however, hampered by the fact that, while they can reduce the need for settlement, they cannot bring complete settlement. Obviously, the net differences could theoretically be settled through delivery of cash, but this is far less efficient than taking the net difference to a bank and having the bank settle it. This lack of finality stems not so much from purely technological limitations as from the fact that the central bank does not permit distribution VAN operators to open current accounts for their members. However, it would be possible for distribution VANs to finalize settlement if, in the future, the central bank allowed them to handle current accounts or provide some vehicle for the settlement of large amounts by substituting electronic banknotes for paper currency.

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<sup>7</sup>Kaneko (1986) also discusses the *Pharma* example in pp. 88-91.

## V. Separation and Restructuring of Bank Services

From a historical perspective, it is hard to believe that certain services will continue to be the province of certain institutions regardless of the economic environment or technological base. Ideally, fundamental changes in the technological base should lead to changes in how services are allocated. There have been periods when bank services were part of normal commercial services. It was only later that banking and commerce were divorced as they are today. One of the predictions we can arrive at from our discussions to this point is perhaps that we are entering a new age in which some banking services will again be included among commercial services.

Advances in information processing and data communications may give distribution companies an advantage over banks in some information-intensive lending and payment services since they are positioned closer to the flow of goods and commercial transactions. Assuming that this new technological base is achieved, there will be considerable economies of scope open to distribution companies in information-intensive lending services and some payment services. As we have seen, direct access to the flow of goods and commercial transaction data makes it easier to evaluate and monitor the creditworthiness of some borrowers and, from the point of view of information processing, the netting out of obligations based on this commercial data is merely an extension of current activities.

This will be especially the case in retail finance, where costs often add up very quickly. Economies of scope will allow distribution companies to be better able to provide profitable low-cost services than existing banks. For example, Sunday banking and 24-hour banking are convenient for customers, but mean large additional costs for banks. These added costs would be relatively cheaper, however, if retailers were to provide these services since retailers already operate during holidays and late at night. In the larger cities of Japan, convenience stores have much denser networks than banks, and it would be beneficial to individuals if they could offer some financial services.

There will therefore need to be a new allocation of services between the banking and distribution sectors. In information-intensive lending services, banks will continue to take a leading role in project evaluation and financial analysis for large and significant deals. But, as regards short-term consumer finance, it is easily imagined that distributors and some manufacturers (through their financial subsidiaries) will become more important. In payment services, banks will probably continue to hold a monopoly on the delivery of large sums of money for which security is of the essence, but it will probably be advisable to allow distribution companies to become involved in the distribution of the small amounts of money required for personal transactions.

These changes in the allocation of services do not necessarily mean only an increase in competition between banks and distributors; they will also promote greater cooperation and alliances between the two industries. Distributors may move into financial



services by forming ties with banks and allowing them to use their stores as agencies. This, however, will only be possible if regulations governing stores are changed. In addition, if non-banks become involved in payment services, there will need to be changes in the nature of the public safety net. Recent debate about prepaid cards indicates the need to rethink the regulatory and safety net system.

A second forecast is that the provision of funds may no longer be a vital component of banking services. If money markets were efficient (meaning that they did not offer the possibility of profiting from riskless arbitrage transactions), then there would be no gain to be had from merely borrowing funds from the market and lending them to somebody else.

Regulated interest rates made it advantageous for all banks to be involved in the procurement and provision of funds since money raised through deposits could be invested on the money market with certain levels of profit guaranteed. The provision of funds was therefore deemed an indispensable component of banking services. Without any regulatory distortion, however, profits ought not to be obtained from only moving funds around. The proper sources of profits are such real tasks as making evaluations, managing credits and shouldering risk in the process, and from providing asset transformation services.

Regulations provide artificial subsidies, but as soon as they are repealed, there will probably be moves to separate the provision of funds from the rest of information-intensive lending services. Given reserve requirements, deposit insurance premiums, and capital adequacy regulations, it is not necessarily advantageous for banks themselves to be involved in the raising and supply of funds.<sup>8</sup> Allowing ultimate borrowers to raise funds directly would enable the avoidance of regulatory tax expenses.

Ultimate borrowers being able to raise funds directly will require the utilization of information processing technology to facilitate securitization. Banks, by providing support (evaluation and guarantees) for these activities, will reap fee income. This can be understood as a process by which banks become essentially information servicers. While the changes will allow banks to expand into related information business areas, they will also make it difficult for banks that are weak in terms of information skills to maintain their profitability.

Competition will also gear up for asset transformation services. The growth of institutional investors can, in and of itself, be seen as one factor that spurred the information revolution, and their presence means an expansion in the number of possible providers of asset transformation services to individuals and households. As assets accumulate and the elderly account for a greater proportion of the population, there will

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<sup>8</sup>The judgment, however, of whether deposit insurance premiums constitute a tax or a subsidy depends on whether they are deemed excessively high or excessively low in comparison to the value of the government guarantee which insurance provides.

be a relative decline in the growth in demand for liquidity from individuals and households, which will expand the demand for safe, high-yielding, and illiquid indirect securities. It is therefore likely that, from the viewpoint of asset transformation services, the collection of deposits will cease to be a very profitable or high-growth activity. The result for Japan will be the emergence of banks that specialize in wholesale rather than the current system in which all banks have retail divisions.

Thirdly, a trend that we can predict is a change in the industrial organization of banking that will be brought about by the increasing importance of information processing and data communications. Computer systems will be seen not merely as a means of accomplishing tasks but as the essence of banking. As this occurs, banking will become an increasingly automated industry in which large investments in computerization will be required to maintain competitiveness. This will, in turn, place an excessive burden on smaller financial institutions.

There is, however, no reason to think that each bank will have to invest in its own computer system. There may emerge an industrial organization in which there are companies that specialize in providing the computer investments whose systems individual banks will lease. Prime candidates for computer specialists may be existing associations of bankers (e.g. the Central Cooperative Bank for *Shinkin* Banks could provide these services to *shinkin* banks), but it may also be advantageous to encourage new entries into the market. Cash dispenser and automated teller machine networks in the United States are operated not by associations of bankers but by independent companies. This sort of industrial organization will mean that investments in computer systems will no longer work against the interests of smaller institutions.

If computer systems are seen more and more to be the essence of banking, individual banks sharing a specific system from a specific provider may become more like franchises in a chain, while maintaining their managerial independence. Many different capital structures are possible in franchise arrangements, and the sharing of a computer system does not necessarily imply capital ties. In telecommunications, for example, it is not uncommon for the owner and the operator of the network to be different companies. The same could apply in banking. Assuming the system provider to be independent of the banks themselves, mergers between organizations are not a necessary prerequisite to sharing systems and forging functional tie-ups.

The key to envisioning how the banking industry will be organized in the future is whether or not there are factors present which would facilitate the appearance of meta-level corporations specializing in computer investments. Even if such factors exist, whether the main candidates are associations of bankers, new entries from the telecommunications industry, or the larger city banks, will have a great influence on the competitive nature of the banking industry's organization. Obviously, if it is assumed that meta-level corporations will not be appearing, then the remaining scenario will be the largest banks with the greatest ability to invest in computer systems having greater and greater

competitive advantages.

## VI. Conclusion

I would like to conclude by discussing three policy implications (or suggestions) that stem from the above observations. First, policy should not attempt to protect existing systems and entrenched interests by impeding the introduction of new technology. With technological progress accelerating as it now is, competitiveness will be defined by how well corporations are able to utilize new technologies. No matter what the intent, responding to the situation with policies that will slow down the adoption of new technologies could eventually undermine the international competitiveness of Japanese corporations. Technological development is not predictable, and we should not fall into the illusion that we can artificially control the process. Policy should therefore offer straightforward encouragement for the natural process of technological development.

Second, policy makers need to begin rethinking the nature of the public safety net. The current safety net was designed under the assumption that bank runs were the greatest threat to the stability of the financial system. Current threats to the financial system, however, are different, as can be seen by the increasing importance placed on systemic risk. The way in which the public safety net is provided should therefore be reviewed and restructured so as to be more in line with the new technological and economic environment.

Finally, public authorities need to take the lead in standardizing networks and creating rules for them. This is especially apparent when the basic economic externality of networks is considered. The role of the authorities should not be to regulate market activities but to provide the infrastructure and public services needed to prevent market failure. If the settlement mechanism is to continue to be efficient and secure, it must, more than anything else, be technologically sound. Policy emphasis should therefore focus on providing an environment that will allow such soundness to materialize. This is the same point that was made in the first suggestion. We are merely looking at the matter from a different perspective.

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