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AUTOMATION IN BANKING

BY

DONALD P. MATTESON
B.S., Union College, 1954

RESEARCH REPORT

Submitted in partial fulfillment of the requirements
for the degree of Master of Science
in the Graduate Studies Program of
Florida Technological University, 1972

Orlando, Florida

118374

PREFACE

It has been estimated that the Apollo Program, which placed a man on the moon, each year produced enough paper work, that if put on one stack, would reach to the moon. The forthcoming Space Shuttle Program will require even more documentation; however, present plans call for very little paperwork. The necessary documentation will instead be created, updated and retained in a large computer data base with access throughout the country. Present technology will support this system.

The banking industry has been faced with a similar problem in the processing of demand deposit records (checks) and other repetitive tasks. Banks have made progress in automating certain tasks, but up to this date, they still have a paper intensive system. Present technology would support a new system centered around large computer data bases.

Any computer system that would service fourteen thousand banks and processes twenty-two billion checks annually would be a significant event in the electronic data processing industry. It might also effect the way business is done in this country.

This paper was undertaken to explore the progress in bank automation and how it will effect the banking industry, the electronic data processing industry and the average citizen.

I wish to thank the many people who took time from their work to enlighten me on the present state of the art in banking. I would specifically like to acknowledge Mr. Louie Human, vice-president, and Mrs. Deloris Corbin, head bookkeeper of the First National Bank, Titusville, Florida;

Mr. David Myers, vice-president, and Mrs. Eleanor Free, head bookkeeper of the First Citizens Bank and Trust Company, Titusville, Florida; Mr. Kenney, vice-president of the City National Bank, Cocoa, Florida; Mr. Walter Dodson, president of the Brevard National Bank, Titusville, Florida; Mr. Richard Malpass, chief of operations, and Larry White, manager, Florida Data Center, Orlando, Florida; Mr. Thomas Hardy, chief of operations, Florida Information Services, Orlando, Florida; Mr. Lem Schmidt, operations, Florida Data Sciences, Inc., Orlando, Florida; Mr. Donald Burkhardt, sales, Burroughs Corporation, Orlando, Florida; Mr. Randy Ray, sales, National Cash Register Corporation, Orlando, Florida; Miss Connie Mack, head teller, and Mr. Earl Jones, president of the First Federal Savings and Loan Association, Titusville, Florida.

I would especially like to thank Mr. Bradley Curry, Jr. of the Trust Company of Georgia, Atlanta, Georgia, for his assistance on portions of this report dealing with Electronic Fund Transfer Systems. Mr. Curry is one of the prime movers in the Atlanta Project and provided material on this project that I could not have gotten otherwise.

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INTRODUCTION

Banking, as it now exists, encompasses a number of activities centered around the collection and movement of funds. Webster defines banking as "the business of establishing a common fund for lending". In addition to this, modern banks have branched out into other fields such as trust services, data processing and credit cards. About 90% of the business conducted today is paid for by checks written on commercial banks demand deposits.

The banking industry is undergoing a period of change brought about by the advent of automated data processing. Just how revolutionary these changes will be is not yet clear. Bankers themselves are not in full accord on the proper business of banking.

According to John Reed(1) of the First National City Bank in his correspondents bank forum speech, "First is the fundamental question of what business markets we are in: in other words, what are our products and what service do we perform." Later on in the same talk referring to processing and accounting services, he said, "The changing payment mechanism will force bankers to decide whether or not this processing business is in fact part of the business of banking or a by-product that will slip from our control with changes in technology."

Present computer technology will support new methods in banking(2,3). Programs, made possible by automation, are now under way that are changing the way banks do business with each other and with their customers.

✓ I. HISTORY OF BANKING

It is useful to review the history of banking in order to gain perspective for evaluating the problems and prospects for automation.

While banks have changed character over the years, they have existed in some form since the beginning of recorded time. Archeologists have uncovered clay tablets from ancient Babylonia which date back as far as 2000 BC. One of these tablets was inscribed as follows:

Warad-Ilish, the son of Taribaum, has received from the sun priestess, the daughter of Ibbatum, one shekel of silver by the sun-gods balance. This sum is to be used to buy sesame. At the time of the sesame harvest, he will repay in sesame, at the current price, to the bearer of this document(4).

✓ In 1587, the beginning of modern banking took place in Venice, Italy. The term "bank" comes from the Italian word "banco" meaning bench. Early Italian banks carried on their business at a bench in the street(5). Their business was borrowing money at one price and loaning it at a higher price.

✓ An interesting development took place in England during the 1600's. The goldsmiths of England had strong vaults where they kept their precious metals. Many people brought their money to the goldsmiths to be safely stored and the goldsmiths in turn issued them receipts. The notes were easier to carry than coins, so people began using them for money. In this way, the goldsmiths became bankers and their notes were accepted by almost everyone as money.

Banking in this country began in colonial days at the centers of trade (Boston, New York and Philadelphia). These banks were unregulated and depended on the bankers

business accume and honesty to remain solvent. Unfortunately, many did not remain solvent and this cast doubt on the solvency of all banks. Bank notes were not generally accepted outside their local communities. This combined with a shortage of hard money made commerce between communities difficult.

In 1791, Congress chartered the first bank of the United States. It was run conservatively and prospered. It was unpopular with people outside the New York City area because it redeemed notes on other banks for hard cash as fast as horseback could carry them. This caused many small banks to fail and communities were left without banks or specie. In 1811, the charter of the first bank of the United States was allowed to run out.

The War of 1812 was financed by the issue of bank notes from the various state banks. History repeated itself. Bank notes became increasingly plentiful and their value became increasingly less. Speculation and money disorder flourished. A second bank of the United States was chartered in 1816 to correct this situation. The charter was again allowed to lapse in 1836 for the same reasons as in 1811.

From 1836 to 1865, the country was in a period of rapid business expansion. Prudence and caution were not in temper with the times. A description of this period is given in the text Money and Banking.

These were a few examples of sound banking during this period, but on the whole, the era of state banking was a sorry episode in American banking history(6).

Banks with inadequate capital could print notes with little or no intention of providing currency as good as species. Bank failures occurred frequently and when economic crisis occurred, they failed in waves.

By 1865 there were 16,000 independent banks each issuing bank notes. With so many bank notes of different

✓ design, counterfeiting was easy, which further weakened the confidence in the money system.

In 1865, Congress enacted the National Bank Act. This set up a system of national banks which were supervised by the controller of the currency. It also established money backed by the U. S. Government called national bank notes. This money was accepted at par value throughout the country and became the principal medium of exchange. A tax of 10% on money issued by state banks made the issuing of bank notes unprofitable by those banks. The National Bank Act established the dual system of banks (national and state). This system endures today.

The Federal Reserve Act of 1913 established 12 regional Federal Reserve Banks to more closely supervise the banking system and to provide for the expansion and contraction of credit. By 1935 notes issued by the Federal Reserve system had replaced the national bank notes.

The many bank failures of 1933 caused Congress to pass the Federal Deposit Insurance Act which insured individual accounts up to 5,000 dollars. This insurance continues in effect today; however, it has been increased to 15,000 dollars per account.

The Federal Deposit Insurance Corporation audits the accounts of all member banks. Banks are also subject to audit by the Federal Reserve Board and the controller of the currency. State banks must also stand state audits. This multiplicity of audits is not as inefficient as it might seem since each of the government agencies recognizes the others audit.

Banks may be classified as members of the Federal Reserve system (national banks) and non-members (state banks). Each of these categories may be split into members and non-members of the FDIC.

State banks are by far the more numerous; however, national banks have much larger assets. These assets represent only 5% of the credit made available through the

banking system. Deposits in 1972 total 540 billion dollars(7).

During the first half of the 1900, checks on demand deposit accounts largely replaced all other forms of settling debts. The creation of the federal reserve districts in 1913 facilitated the clearing of these checks. Prior to that time a check might go all around the country and take a month to clear. The handling of checks was a manual process and remained so until 1958 when electronic processing of checks was introduced. This was made possible by advances in computer technology. Today, 95% of settlement of debts is done by checks. This represents over 21.5 billion checks per year worth over a trillion dollars(8).

History of Automation

Not much took place in the way of automation banking prior to the advent of large digital computers in the mid fifties. Prior to that all check handling was manual and all bookkeeping was by manual entries. Two events did take place sometime ago that later proved most useful and necessary to automated check handling. Approximately forty years ago, the Federal Reserve System (FRS) devised a numeric code that described which Federal Reserve district and branch a check was to be sent to for clearing. This number was to appear in the upper right-hand corner of each check of any bank using the FRS as a clearing agent. The second event was when the American Bankers Association devised a code which assigned each city or area a number and each bank within the area a number. This was placed on the check using a hyphenated number. In 1955, the FRS began to use automated check sorting equipment and it was a simple matter to require each bank to print on the bottom of their checks this routing number in magnetic ink.

In 1958, the first electronic processing of checks occurred in Chicago. These checks were punched cards and

they used the already well developed punch card machinery to sort and read in computer entries. This effort had two drawbacks, (1) Punch card equipment required cards in good condition and not all checks were in good condition. This caused high reject and error rates; (2) Most checks were not on punched cards nor were they likely to be. Nevertheless, this method sputtered on until the development of the magnetic character reader. This reader incorporated into a sorting machine, allowed checks to be read for their amount and account number, provided that information was on the lower edge of the check in magnetic ink. Banks wishing to take advantage of automatic data processing were required to have the account number as well as the FRS routing number encoded on the bottom of the check in magnetic ink. A third entry, the check amount, is encoded on the check by the bank when it is received. In 1967, the FRS required all banks using its clearing house facilities to use magnetic ink character recognition (MICR) on its checks(3).

A survey conducted by the American Bankers Association (ABA) reveals the following profile of automation in banking(9).

	1963	1966	1969	1972
ON Premise	3%	6%	8%	9%
OFF Premise	4	15	41	47
Plans for Automation	9	10	3	6
No Plans	84	69	48	38

The one hundred and sixty banks with assets over 500 million dollars have on premise computers with some on-line services to tellers and management. Many of the medium size banks also have on premise computers that are used in the batch mode to service themselves and smaller correspondent banks.

Some of the banks that have on premise computers have excess computer capacity which they market. This business is offered at very little profit to the bank with

the idea that this service will bring in additional banking business. The following results are of a survey of the type of EDP services offered(10):

Payroll	92%
Account Reconciliation	67%
Correspondent Bank Service	42%
Accounts Receivable	37%
Labor Distribution	29%
Professional Billing	22%
Mortgage Servicing	19%
Sales Analysis	18%
Inventory Analysis	18%
Mailing List Service	17%
Accounts Payable	16%
Utility Billing	13%

Larger banks that have on-line accounting use real-time data to make hour by hour decisions in the deployment of funds. For instance, if one million dollars were accumulated during the day, it could be wired to the FRS and earn 111 dollars overnight.

II. BANK AUTOMATION IN CENTRAL FLORIDA

Commercial Banks

In order to get a firsthand view of bank automation as it is being practiced by commercial banks in central Florida, four banks were visited. A computer center servicing one of these banks was also visited. As a result of conversations with the employees of the banks and the computer center, it was clear that the methods they used were typical of methods and facilities used by other central Florida banks.

In the last few years, many banks have been absorbed into one of the Florida bank holding companies. These holding companies set up their own data center to service their member banks. Independent banks also use these centers. The survey revealed the following common mode of operation (see Figure 1, p. 9).

The "on us" checks are sent to a data center at the end of each day. The data center also receives from the clearing houses the "on us" checks. These two items comprise the total "on us" items. These items are read into the computer through the check reader. The checks are then sorted by account number and sent to the bank for filing. The data from the checks is used to update the accounts. A daily print-out is then supplied to the bank which shows previous balance, the days activity and the new balance.

Savings accounts are handled in a similar manner. Deposit and withdrawals are each encoded on a piece of paper and processed just as a check. Of course, there are no incoming items from a clearing house for these accounts.

The cost of data processing varies only slightly between data centers and from bank to bank. The cost to

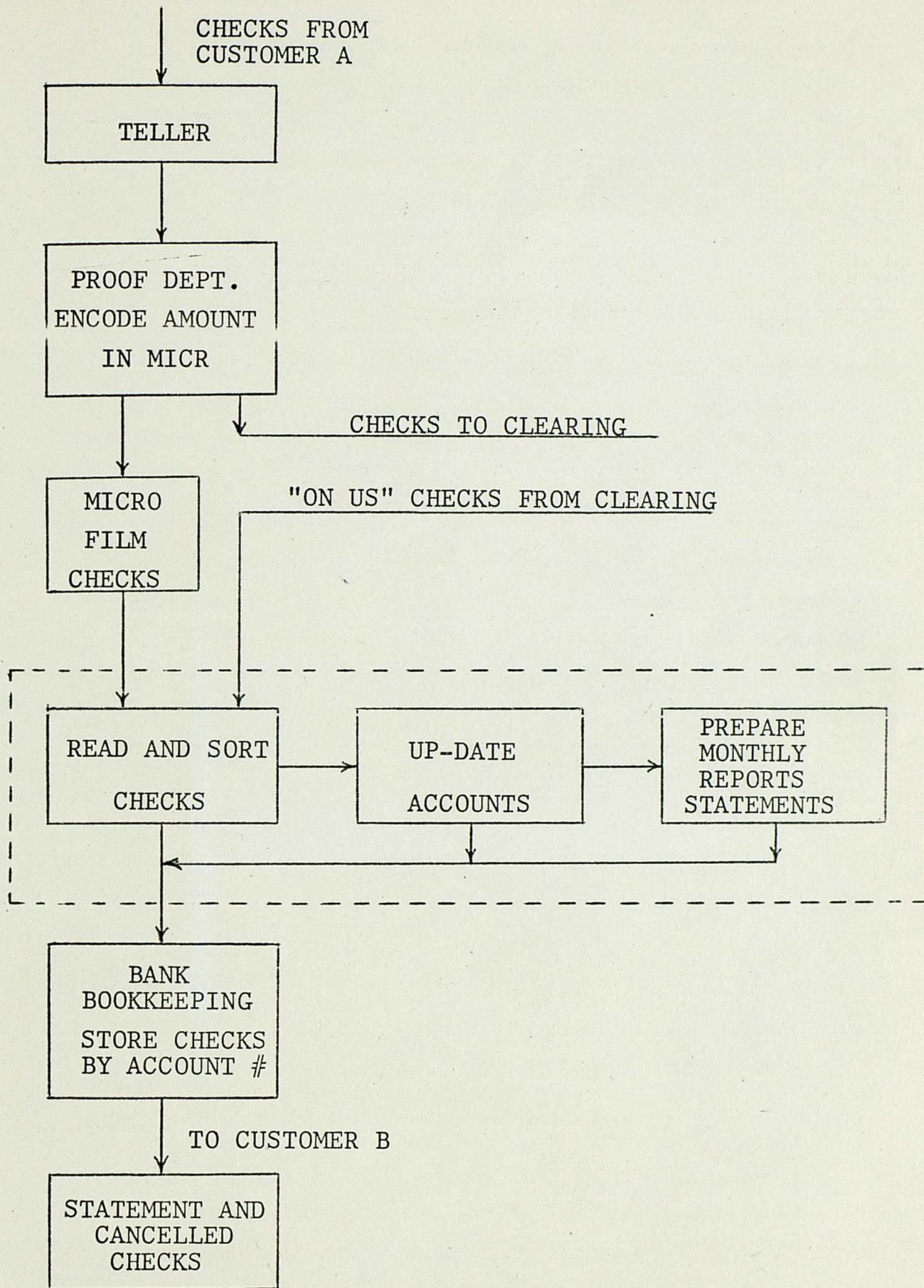


Fig. 1.--Commercial Bank Automated Bookkeeping Data Flow

service each transaction whether it be check or deposit, costs 1.25 cents. Demand deposit accounts cost approximately 15 cents per account per month to service. Savings accounts also cost approximately 10 cents per month. Additional fees are levied for servicing of special accounts or other special services.

First National Bank of Titusville

First National Bank of Titusville is owned by the First Florida Bank Corporation Holding Company and is serviced by a data center in the Orlando Bank and Trust Company. First National has assets of 22 million dollars, services seven thousand checking accounts and five thousand savings accounts. The First National has a data processing bill of approximately 3,000 dollars per month. When they went to automatic data processing in 1968, the bookkeeping staff was cut from 10 to 4. At a monthly cost per bookkeeper of 350 dollars, this represents a payroll reduction of 2,100 dollars. It is estimated that the present level of business activity would require two additional bookkeepers which represents an additional payroll savings of 700 dollars for a total of 2,800 dollars. This is approximately equal to the data processing cost; however, the bank officers are totally satisfied with the service because of the accuracy of accounts and visibility provided by the periodic reports.

First Citizens Bank and Trust Company of Titusville

The First Citizens Bank and Trust Company of Titusville is serviced by a data center in the First National Bank of Orlando. Citizens Bank has assets of 37 million dollars and services six thousand checking accounts and four thousand savings accounts. This bank employed 23 bookkeepers in 1968 prior to automation. This figure has

dropped to 5. Neglecting any increase in business in the interim, this represents a payroll savings of 18 people at a cost of 350 dollars each per month, for a total of 6,300 dollars. Their data processing is done by the First National Bank in Orlando. Their data processing bill is approximately 5,500 dollars per month. While this does represent a savings of 800 dollars per month, this figure would not, in itself, make a bank want to clamor for automation. However, bank officers indicate that they would be willing to continue data processing services under less favorable economics because of increased account accuracy and increased visibility produced by the daily, weekly, monthly, semi-annually and yearly reports. Moreover, the decrease in the bank payroll provides new space in the bank building.

City National Bank of Cocoa

The City National Bank of Cocoa (one of the independent banks in the state not owned by a holding company) uses automatic processing of their demand deposit accounts but not their savings accounts. City National Bank has assets of 17 million dollars.

Brevard National Bank of Titusville

Brevard National Bank of Titusville has recently been purchased by the Florida National Bank of Florida holding company. It continues to use the data processing facilities of the First National Bank of Orlando. Brevard National Bank has assets of 10 million and automates demand accounts, savings accounts, and installment loans.

Florida Data Service

Florida Data Service is a data center wholly owned by the First Florida Bank Corporation, a bank holding com-

pany. This data center services fourteen area commercial banks including the First National Bank of Titusville. It is located in the First of Orlando Bank Building.

The center's facilities consist of a Burroughs check reader and sorter, a Burroughs B500 main frame, a 1600 line per minute printer, a Mohawk Data Science key-to-tape machine, and several key punch machines.

The data center uses batch processing for both demand deposit and savings accounts. Checks are received during the day from clearing houses. The account and the amount are transferred to magnetic tape. At the end of the day, "on us" checks are received from each bank, and are likewise read and recorded on magnetic tape. These two tapes and a third tape containing the previous days account status, are processed into a new tape with the latest account status and activity. The checks from a clearing house have a lower priority in the event of insufficient funds; thus, putting the burden of bad check collection on the other banker. Savings accounts are updated in a similar manner by processing check-like slips of paper which were made up in the bank at the time of the deposit or withdrawal.

The programming language is Cobol and the software package was supplied by Burroughs.

The commercial banks discussed in this report all use the remote data center concept. Such a concept is mandatory since singly they could not justify the high equipment costs.

This center presently employs a staff of twenty with a monthly payroll of approximately 20,000 dollars. It pays a computer leasing charge of 18,000 dollars per month. It services fourteen banks which produce a monthly income of 40,000 dollars. According to Larry White, manager of Florida Data Services, he could handle twice the bank business with his present equipment and the addition of three more employees. Mr. White also estimates that the minimum

staff to keep the center in operation is fourteen employees (nine operation personnel and five key punch operators). With its present volume, the center is about at the break-even point from bank business alone (see graph of income and expenses, p. 14). This center processes its bank business on second and third shifts and markets its unused first shift time for non-banking activities such as payroll and utility billings. This additional business requires software support. Two additional programmers are required to support monthly billings of 10,000 dollars (this figure could vary widely depending on the type of service and the length of time the customer was retained). Their computer center could handle approximately 20,000 dollars worth of outside business before equipment limitations were encountered.

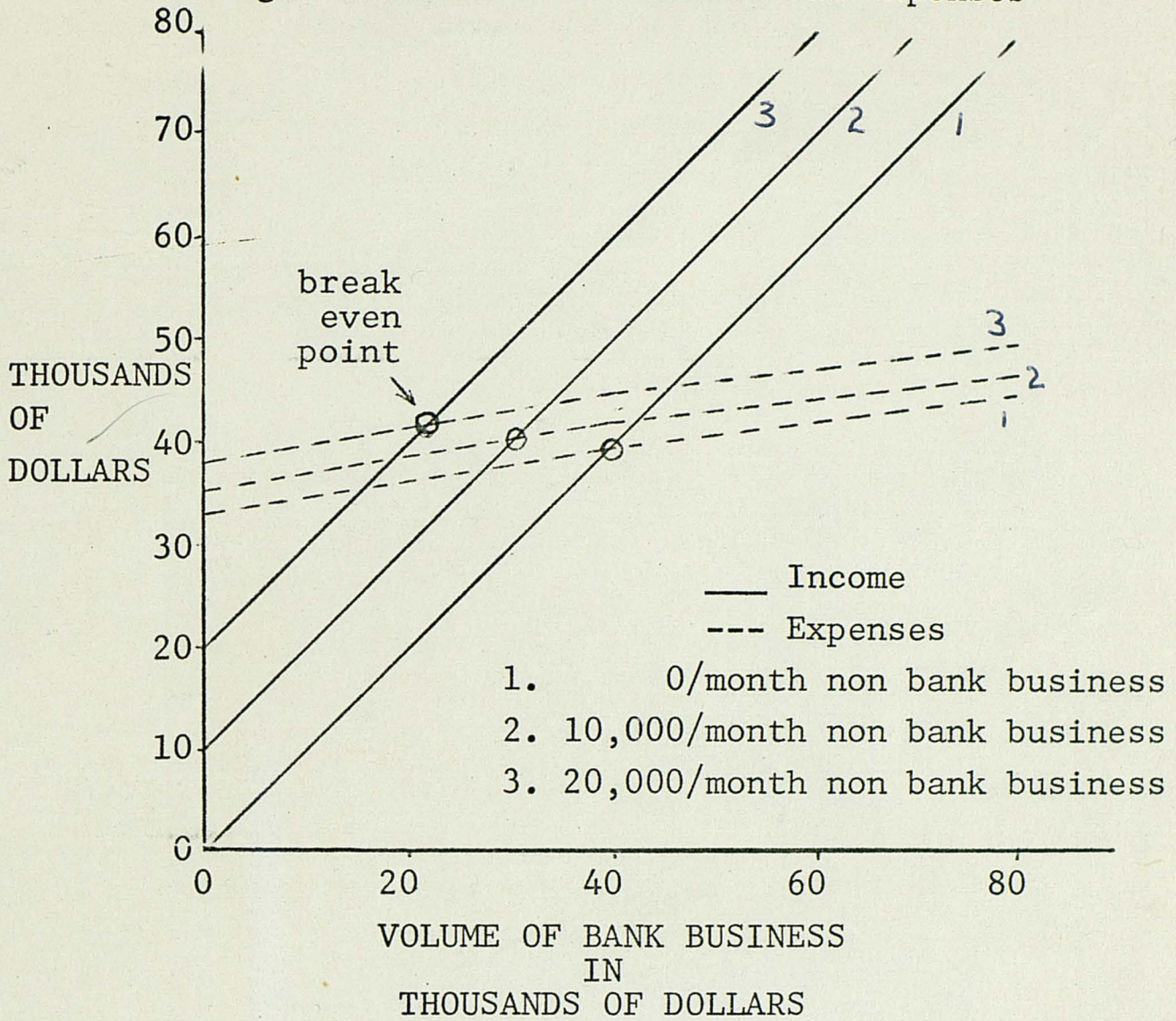
Savings and Loan Associations

Savings and loan associations do not have the problem of paper handling that commercial banks do; however, they have automated the handling of their savings accounts and to some degree their loan accounts. Savings and loan associations that have assets over two hundred million dollars usually elect to maintain their own data processing center. There are eight in the state of Florida that do so--mostly in the Miami area. The other associations have joined together to form an organization which handles their automatic data processing needs.

Florida Infomanagement Services

Florida Infomanagement Services (FIS) is a company wholly owned by 82 savings and loan associations, 44 of which use its EDP services. All user associations must be stockholders in FIS and this investment offsets conversion expenses for which there is no charge to the user association.

Fig. 2.--Data Center Income and Expenses



Expenses per month for bank business

volume	0	\$40,000	\$80,000
COMPUTER LEASE	18,000	18,000	18,000
RENT	500	500	500
PAYROLL	14,000	20,000	23,000
MISC.	<u>500</u>	<u>1,000</u>	<u>1,500</u>
TOTALS	33,000	39,500	44,500

Expenses per month for non bank business

volume	0	\$10,000	\$20,000
PAYROLL	0	2,000	5,000

The FIS Data Center handles 81,000 transactions per day and maintains accounts on 700,000 savings, mortgage and loan accounts. The computer center has a total staff of nineteen employees. Customer billing is based on a 25 dollar per month, per terminal, connect fee and a charge of 10 cents per month per account. The sophisticated bookkeeping programs found in the time sharing environment are not needed. The associations are not billed on their activity, but rather their capacity for activity and the storage required to support them.

FIS facilities consist of four Burrough B500 computers, fourteen disk modules with 40ms access time and two disk modules with 20ms access time. The 40ms disks have 80,000 words of twenty-four character storage. The 20ms disks have 40,000 word storage. Two systems are used for on-line services and two are used for back up as well as non-routine information requests. One computer is used to service the Burroughs TC700 terminal and one to service the less sophisticated Burroughs B606 terminal. There are also nine FDSI (Florida Data Services, Inc.) terminals being serviced.

The computers do not support the terminals in a true time sharing method but rather a modified serial time sharing technique. The routine proceeds as follows: The computer poles the terminals for activity. If a terminal responds, the computer will send an interrogation command. This process called "handshaking" connects the computer to that terminal exclusively. The terminal sends the computer information--account number, account balance, deposit or withdrawal amount. The computer looks up the account and sends the terminal information on what is required to update the passbook including unposted interest, withdrawal or deposit information, any "no book" transactions that may have taken place and the new balance entry. The reception of this message to the terminal is checked using several techniques including length of message and parity. If a

satisfactory transmission is not received and an acknowledgment sent back to the computer, the computer will retransmit the message. If this doesn't work after five tries, the computer gives up and goes on to the next terminal. Without transmission difficulties, the normal transaction may tie up the computer for four seconds. With 178 terminals on one computer, a theoretical delay of seven hundred and twelve seconds is possible in servicing a terminal. In practice the delay seldom exceeds fifteen seconds at peak activity periods.

Programming for this system was done in assembly language by Data Dimensions, an Orlando firm, at a cost of approximately 100,000 dollars. The program is written in advance assembly language.

Computer equipment is leased for approximately 30,000 dollars per month. The decision to lease was based on the uncertainty of how quickly the equipment would become technically obsolete. This uncertainty made conventional economic comparisons too risky. The monthly lease costs were well defined; however, it was uncertain if purchased what period the equipment cost could be amortized over or what its salvage value would be at any time. Additional factors were the anticipated difficulty in getting rid of obsolete equipment and the likelihood of better maintenance service from the vendor if his equipment could be removed easily.

First Federal Savings and Loan Association of Titusville

The First Federal Savings and Loan Association of Titusville is serviced by FIS. It services 12,000 savings accounts and 2,500 loan accounts and has assets of 39 million dollars.

Bookkeeping personnel requirements have been reduced by four and the number of tellers by two. The latter because the length of time necessary to service a

customer has been approximately cut in half. This represents a reduction in payroll of 2,100 dollars vs. an expense of 1,400 dollars per month.

A less tangible benefit stemming from the reduced customer service time was that increased business could be handled with the existing number of teller booths. This was a fortunate development since the building could not be expanded or remodeled to accommodate more booths. It has extended the useful life of the building for an undetermined number of years. They also list as intangible benefits (1) increased customer satisfaction from more rapid service, (2) increased accuracy of bookkeeping, (3) better control over their business as a result of the reports from the data center, (4) the issuing of interest compounded daily (not practical with manual bookkeeping).

III. BANK AUTOMATION IN THE FUTURE

There can be little doubt that the banking industry is on the verge of some sweeping and revolutionary changes. Some new programs already in the implementation phase are:

Electronic fund transfer system
Point of sale clearings
Automatic bill payment

The more exotic checkless society is still a long way off; however, the above-mentioned programs will not only effect the way banks do business, but the way people do business, and within the next few years.

Electronic Fund Transfer System (EFTS)

About 21.5 billion checks were written against deposits in commercial banks during 1970, and within ten years, the commercial banking system will have to process twice this number(2). Current technology is adequate to handle the projected volume through 1980, without the breakdown experienced in other industries that handle large quantities of paperwork. Nevertheless, increasing costs in this still labor-intensive function will encourage the development of a more streamlined payment system to handle fund transfers. The processing of bookkeeping entries through computers--paperless entries--instead of checks is technologically and operationally feasible, and offers considerable potential for reducing manual handling and expense. The largest banks in sixteen cities, which account for more than a third of the nation's checks, have found that even with present automated equipment, the labor cost for check processing is approximately twice the annual rental cost of the equipment. This high labor cost is

leading bankers to consider further changes to reduce paper handling(2).

EFTS vs. Paper Distribution System

Electronic data processing and transmission remove many of the limitations of paper processing, but in turn, they impose some new limitations or constraints on system design and economics. In general, the major differences between paper and electronic message communication systems are the following:

1 Paper distribution systems have a low start-up cost and their message content is very flexible. Electronic systems have a relatively high start-up cost and require greater standardization in message content.

2 The total cost of paper systems varies almost directly with the message volume and with the total number of times the paper is handled. On the other hand, the cost per message of an electronic system generally decreases as the volume increases because there are relatively great economies of scale in electronic cost/capacity ratios. The greatest cost allocation in an electronic system is usually the cost of capturing the data originally. In high volume operations the cost of subsequent data manipulation is minimal.

3 In paper distribution systems, time in process is almost directly related to the number of message handlings and distance. Time in process in an electronic distribution system may be relatively unaffected by the number of handlings or by distance.

In summary, electronic systems are generally superior in communication situations characterized by high message volume, standardized message content, limited references to original documents, high speed performance and multiple use of data. Paper systems are most useful in situations where volume is relatively low, message content

is variable, original documents are required, speed is not critical and data is used only a few times(11).

Check Distribution

One study of checks written on accounts in large banks located in large cities indicate that 1/3 were written by individuals, 20% of these were for \$7.50 or less, 15% were for \$75.00 or more. Individuals wrote 60% of their checks to businesses of which a third were retail stores(2).

A study of the checks written in the Atlanta area is displayed on the following page.

Project SCOPE

Project SCOPE (Special Committee on Paperless Entries) is a system designed for commercial banks in California that began operation this spring. This program calls for the substitution of information recorded on magnetic tape for checks. Periodically, as preauthorized by their customers or employees, companies will prepare tapes containing payment information. These tapes will be submitted to the companies' banks, which will extract entries for their own depositors and then send those for other banks to the Automated Clearing House (ACH). The Federal Reserve Bank will act as the ACH during the California pilot test. Accounts among banks will be settled using balances maintained with the Federal Reserve. After verifying the entries for preauthorization, each receiving bank will post debits and credits to its depositors' accounts.

The major emphasis of the program will be to encourage the use of preauthorized payments, which will reduce the amount of paper moving within the banking system. For a fully automated payroll, for example, the employer will generate a tape showing the amount to be credited to each employee. The tape will be delivered to

★
ACH

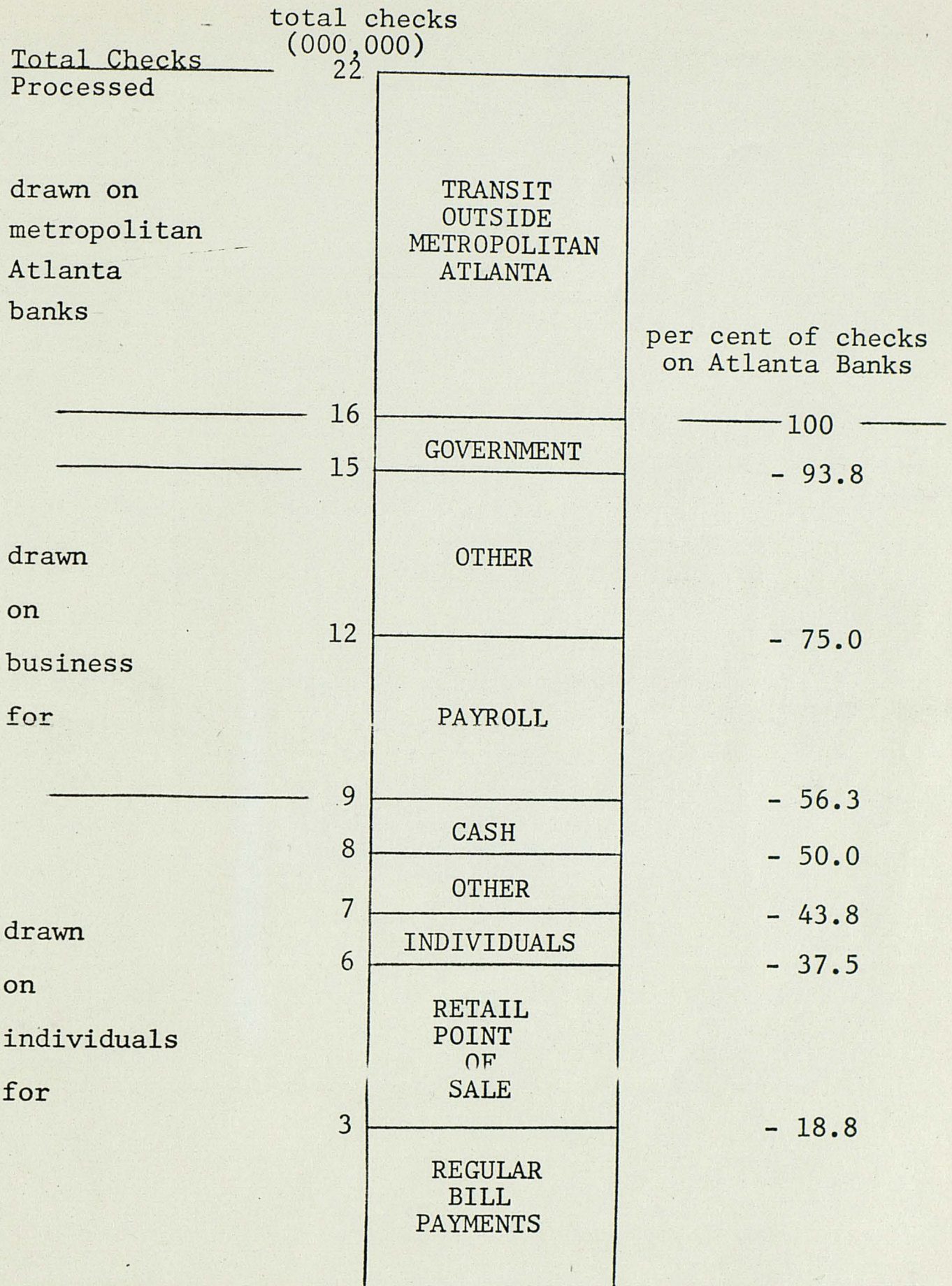


Fig. 3.--Distribution of Atlanta Checks - December 1969

the employer's bank where the payment information will be prepared for transmission to the ACH. The individual may also authorize his own bank to make certain payments from his account--a stated amount monthly to a savings and loan association that holds his home mortgage, for example. He may also authorize payment of other fixed amounts, such as insurance premiums, installment loan payments, and, eventually, amounts that vary within stated ranges, such as utility bills.

Russell Fenwick(13), the Bank of America vice-president who serves as chairman of SCOPE, says the consensus is that 12% to 13% of the recurring billing check volume is amenable to this system and SCOPE projects a 15% penetration.

He also said "Our studies show that 18% of check volume is for payroll purposes. Over three or four years we hope to handle 35% of that 18%."

On the conservative side, this would represent a total of 8% of the check volume or roughly 12 million checks per month in California. The principal roadblock to the success of SCOPE is customer acceptance of preauthorized payment of bills. Customers fear loss of control, and difficulty in correcting errors, with very little benefit to them in return.

Atlanta Project

A project similar to SCOPE but more ambitious is underway in Georgia, called the Atlanta Project. This project has completed the research phase under the direction of the Georgia Institute of Technology. Once the data was collected, analyzed and published, the university personnel were phased out and replaced by a staff composed of bank personnel on loan from the commercial banks, Federal Reserve personnel and technical marketing consultants. These people have produced a report published in March '72

outlining a plan to bring to the Atlanta area a comprehensive EFTS. Although the ideas are not startlingly new, the recommendations can lead to major evolutionary changes. If implemented, they will affect the way each individual pays for services rendered. The major features of this program are:

Direct Deposit of Payroll--nothing new here over the earlier discussed SCOPE plan.

Bill Check--the Bill Check is an attempt to overcome the customer resistance to preauthorized payments by modifying the authorization mechanism.

Under various forms of preauthorization, the consumer signs an agreement with the firm and/or his bank authorizing his bank to pay a specific bill when presented by the firm. The principal disadvantage of such systems is that the consumer cannot pay a part of the bill if he so desires, and funds are transferred from his account on a specified day each month.

The Bill Check system, as the name implies, involves a single document which serves two purposes. The consumer receives a bill with a space provided for his signature and the amount he wishes to pay. When the bill comes due for payment, the Bill Check customer signs his name, fills in the amount, and sends the document to the firm. The firm will place the information into a computer processable form and send it to the customer's bank. From this point, the system is identical to the present check clearing process, except electronics are used instead of paper.

When the individual receives his bank statement, he will find his usual cancelled checks and a clear descriptive statement of his Bill Check payments. Once the system is operational, all the customer has to do is supply the firm with a signature card authorizing collection of whatever amount he indicates each month from his bank account

and showing his checking account number.*

Point of Sale Transfer System (POS)--this third feature is the most significant from the consumer standpoint. This system will consist of a large number of terminals at merchant locations connected to a large computer and communications network. In its full operational state, POS will offer the ability to verify checks from merchant locations, thus increasing the acceptability of each individual's check at no inconvenience to him. It will also provide a data entry and authorization device for credit cards. This will make the credit card more convenient and universally acceptable as a form of bill payment. Finally, a "cash card" will be introduced which may serve as a credit card or, by a special entry on the terminal and the insertion by the user of a three-digit secret code, it will transfer the amount of a purchase from a customer's checking account to a merchant's account.

The Hemstead Program

The Hemstead Long Island Bank is doing some pioneering work with point of sales terminals. The system involves a magnetically encoded plastic card and a three unit terminal and works as follows: When the bank customer makes a purchase, he hands a plastic card containing a three digit secret code to the merchant. The code imbedded in the card is known only to the customer. The card also contains the customer's account number. The clerk enters the sales slip into the printer, and then inserts the customer's card into a card reader. The customer enters his secret code in the verifier. The sale is transmitted to

* Comment--this system places the burden of collecting authorizations on the merchant. Also, it places the responsibility of concentrating the data and putting it in useful form to the merchant. Other systems like "super check" provide the merchant with this service.

the computer which automatically transfers the dollar amount of the sale from the customer's account to the merchant's account.

The card also contains charge card credit features in that it has a built-in delayed payment option. For those customers who wish to exercise this option, there is a thirty-five day grace period without incurring any interest charges during that time. If the customer's checking account balance does not cover the due payment, the bank makes a line of credit available at a lower rate of interest than existing credit and charge plans.

Check Truncation

Check truncation shortens the flow of physical checks through the banking system. This is accomplished by electrically capturing the data on the check when the check enters the clearing system. The physical checks are recorded on microfilm and destroyed. The captured information, however, continues to flow through the system by way of electronic media until the payor account is debited. The payor receives his monthly statement with details of each check; however, he does not receive canceled checks.

The disadvantage is that all the information on the check must be converted to electronic impulses. This includes the date, the payee's name, the amount of the check, the payor's bank and bank account. Only the last two are available on the check as magnetic ink characters. In order to convert the information to electronic impulses, the information must be manually entered, or a new process must be devised to convert the information. A study performed as part of the Atlanta Project recommended optical character readers as a solution. Existing technology would have to be advanced to provide improved input speed and increased data compression. The potential market for an efficient truncation system is estimated to represent 50

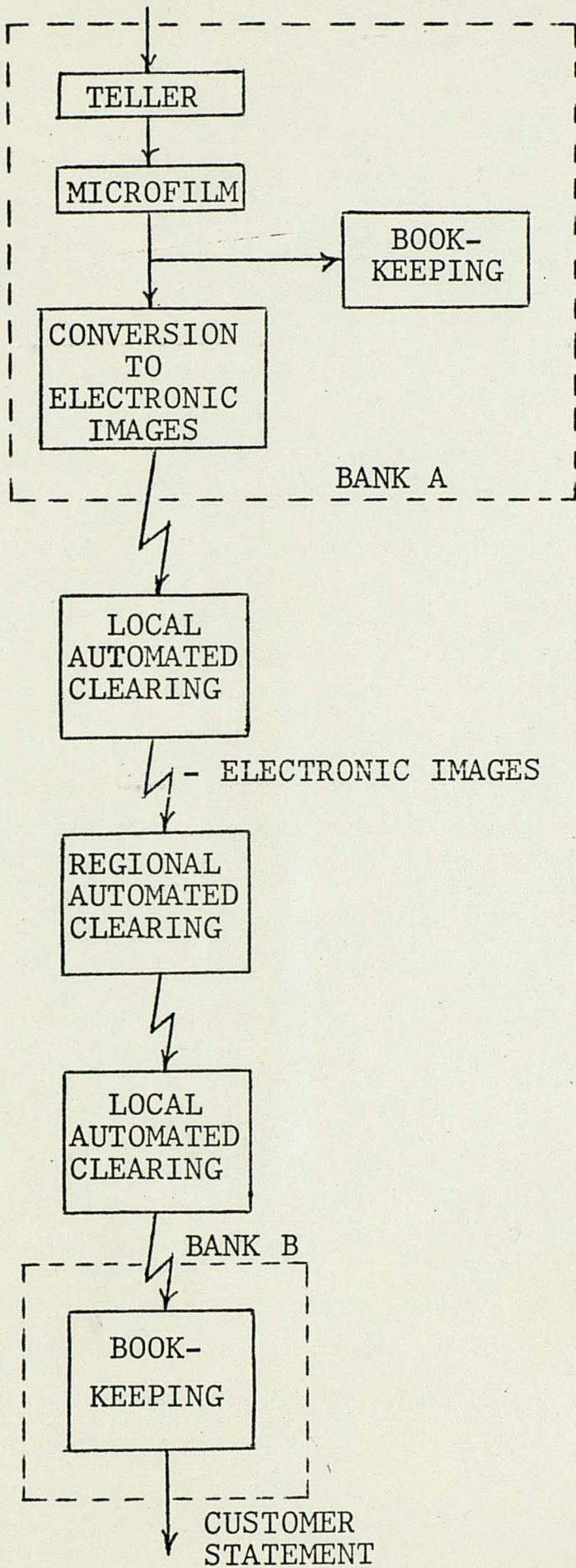


Fig. 4.--Truncated Check Flow Diagram

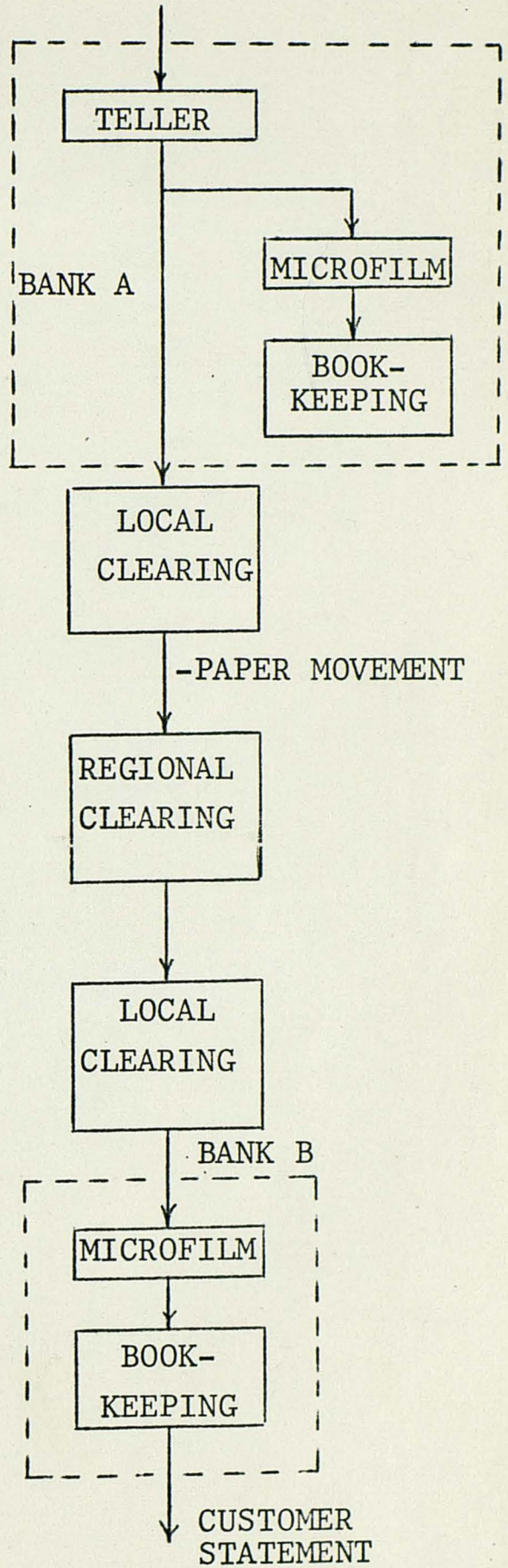


Fig. 5.--Check Flow Diagram

million dollars in annual equipment rental(12). Development efforts to produce an efficient system would seem justifiable on the part of manufacturers.

This concept has been much discussed but never implemented, nor are there any plans to implement it at this time. Nonetheless, the presently planned EFTS (including direct deposit payroll, electronic bill payment, and point of sale fund transfer) could eliminate only 30% of the total check volume. This means that 70% of the clearing system would continue to benefit from any truncation scheme. The Atlanta Project study estimates that truncation would result in a 20% reduction in all processing costs(12).

Federal Reserve System Wire Service

Some banks have been transferring funds by wire since 1950. This system called bank wire is not universally applied nor is it primarily applied for the settlement of demand deposit accounts. The FRS has undertaken a major campaign to reduce the 5 billion dollar daily float, and in so doing, has uncovered some interesting facts. That is checks of over 10,000 dollars represent 1/3 of 1% of the total volume of checks but are almost 1/2 the dollars transferred(14). The FRS instituted a wire service which caused instant transfer of these funds while the checks were then processed in their normal way. This system is now being expanded to include amounts down to one thousand. There is a possibility of including all checks in this system.

If this concept were expanded, it might be possible for a bank receiving a check, to make an entry into a national network which would debit a person's account at some distant bank and credit the amount to the bank. The check could then be processed in the normal way with the data processing network maintaining a knowledge of its progress

in clearing. While this concept does not eliminate the paper, it does eliminate the float. It also could eliminate all types of fraud except forgery.

Bank Credit Card

At the end of June 1972, according to the Federal Reserve Board, there were 15.7 million active Bank Americards and Master Charge accounts with outstandings of 3.56 billion and annual sales of 6.5 billion. This is an average of 227 dollars per account. The number of banks participating is 9,366 and the number of merchants is 1,162,000(15).

Five years ago, there were 79 banks offering charge card services to five million households. Presently there are thirty million households using bank charge cards and the next five years this is predicted to increase 25% and volume will increase 200 to 300%(2).

All this activity has not proved as profitable as the banks may have wished. A survey by the Federal Reserve Board showed that overall, the banks lost 1.79% in 1970(14). Their performance is not uniformly bad, but vary by location. The Richmond district averages losses over 15%, New York 7.8% losses, Atlanta 5% profit, and West Coast banks a profit of 1.64%. The survey showed that three quarters of the banks were doing better this year than last, and only 8% said they were doing worse. Seventy-one per cent of the banks that started in the last two years had losses over 2%. Less than a quarter of those starting five years ago had losses that high. The conclusion from these figures is that experience helps cure bank card problems.

Banks charge the merchant a 3 to 5% negotiated service charge for credit card transactions. From this charge, they must cover their processing costs and losses. Losses run about 2% for credit losses and 0.5% for fraud.

Chase Manhattan Bank is experimenting with point of sale terminals as a way of reducing these losses. Perry Hudson, Jr., vice-president of Chase Manhattan, gives cost justification figures showing that investment in terminals in a small portion of merchant's stores will pay out over a five year period by reducing both fraud and credit losses. By checking each transaction, a quarter of the credit losses could be stopped and 80% of the fraud losses eliminated. This would be accomplished by putting terminals in the 4.5% of merchant locations that produces 90% of the dollar volume(16).

The bank credit card system has not been automated beyond that of bookkeeping and the present system does not offer much opportunity for greater automation. System modifications are possible and the point of sale terminal could become a vital part of this system. Both Master Charge and Bank Americard are pushing ahead rapidly with their own authorization system.

A competitive system run by the National Data Center (a private company) uses a toll free phone line to a data center where operators interrogate an on-line system for credit information. This company provides credit status on gasoline company credit cards as well as the two major bank credit cards.

Super Check

There are several isolated programs under way that incorporate several payments on one check. The concept is that a customer itemizes on one check the amount of several bills to be paid. He then signs the check which authorizes the total payment. The bank in turn credits to each creditor the specified amount, and debits the customer's account. This cuts down the number of checks the bank must handle and the customer must write. The creditors like it because it reduces his paper handling load. The bank likes

it because it increases the balance of customer accounts and brings in new accounts. The disadvantage of this approach is that the super check is not amenable to present automation methods. This means that a clerk must manually extract the data from the check and enter it into the computer. Some bank customers have been willing to pay a fifty cent service charge for this service, but the acceptance has not been universal. The banks that are trying this are not pushing for general acceptance because they are not sure that even with the service charge, that it is economically feasible(17).

Credit Transfer System

Credit transfer has already been discussed in a few of its possible forms (preauthorized payments, super check). The Europeans have a well developed system called Giro (pronounced Gēro) operated throughout the continent by the post offices and some banks since 1920. (A person using this system authorizes a credit transfer from his account to another account in the system. His account is debited and the authorization (credit) travels through the system until it reaches the proper account (or person).) (This form of "Reverse Transfer" has many names including Direct Payment System, Credit Transfer, Electronic Funds Transfer Letter, and the Direct Flow System.) (They all share one thing in common; that is, the system is the reverse of our present method of handling checks. Instead of debits being transferred through the system until they reach the payor's account; credits are transferred through the system until they reach the payee's account) (see Fig. 7, p. 31).

(The system offers one small advantage in that it eliminates the return items for insufficient funds, stop payment, and most forgery (since the payments destination is known).) It also creates a positive float instead of the negative one in our present system.

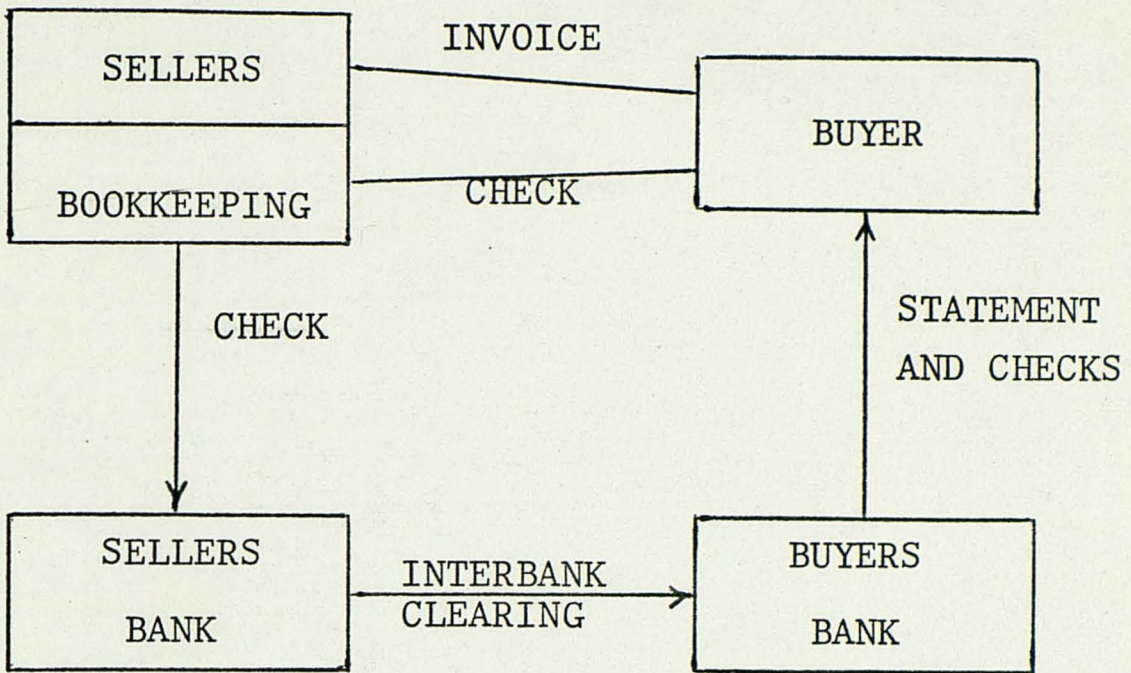


Fig. 6.--Debit Transfer Flow Diagram

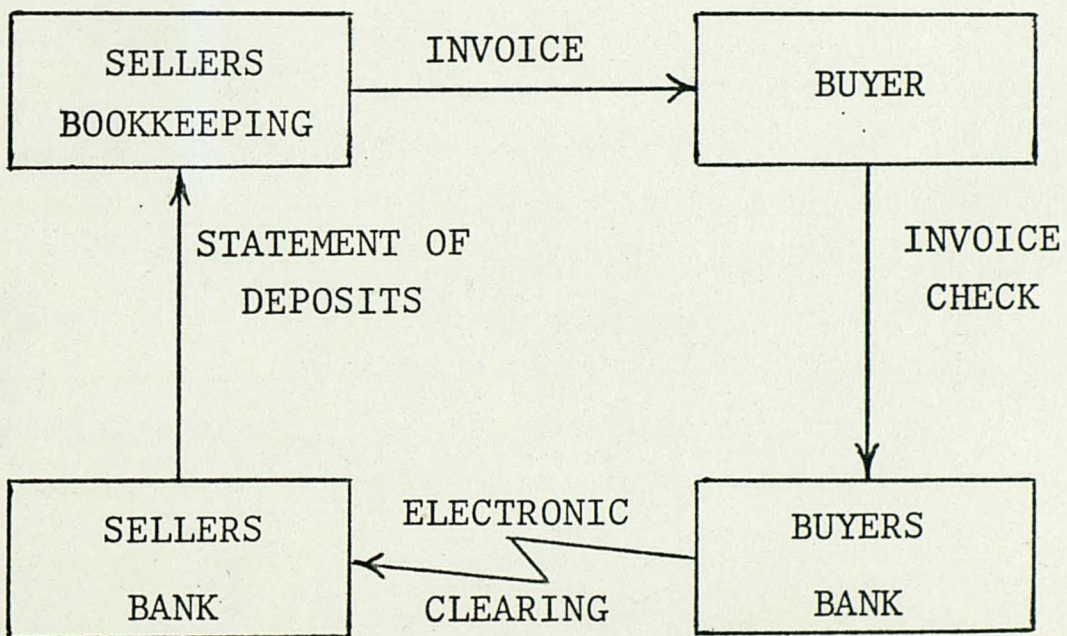


Fig. 7.--Credit Transfer Flow Diagram

The real worth of such a system to future banking would be its measure of adaptability to EDP. As it has been implemented up to this time, there has been no such advantage. Where the system is functioning, it uses paper for the data flow. As such, it is little changed from the check flow systems. Each unit record must be processed, sorted, transported, and handled in the way checks are handled. Indeed, the two systems can operate in parallel since they require the same equipment.

The principal difficulty of automating either the debit or credit transfer system is converting all the information found on the check into electrical impulses. For full automation, the following information is required:

1. The payor's account number.
2. The payor's bank.
3. The payee's account number.
4. The payee's bank.
5. The amount of the transaction.

For the customer's satisfaction, it may also be necessary to record the payee's name and the payor's name. If the first five items can be entered economically, the other two pieces of information can be cross referenced or looked up electronically.

An innovation to the credit transfer system has been proposed which promises to solve the entry problem. This method is called the standardized invoice by George C. White, Jr., vice-president of the Irving Trust Company(18). Under this plan, an invoice is sent which has a tear-off portion similar to a check. This section has encoded the payee's bank, account number, and the invoice amount; all recorded in MICR. When the payor receives the invoice, he removes the unnecessary portion and affixes to this section, a strip of MICR which identifies his bank and account number. Now that all five essential pieces of data are available on MICR, the payor signs the document and forwards it to his bank.

The Hunt Commission Report

The president appointed "the Presidential Commission on Financial Structure and Regulation" to look into the rules and regulations that govern our financial institutions. The commission was made of prominent businessmen and bankers headed by Reed O. Hunt, retired chairman of the board of Crown Zellerback Corporation. After two years of study, the commission made its findings known in December 1971(19). Their recommendations were that there be more overlap of activities of the financial institutions. Specifically, they recommend that savings and loan associations and credit unions be allowed to provide demand deposit services for individuals. Also they recommended that interest be allowed on demand deposit accounts and that the restrictions on interest for all accounts be removed.

The removal of many restrictions which have created special purpose institutions, will bring a new element of competition to banking. Heightened competition should induce banks to offer more services. If the cost of these services could be passed on to the customer, this could become another element in bank earnings.

IV. SUMMARY

The banking industry has made considerable progress on the road to automation. In the 1950's, standards were established and programs implemented in Magnetic Ink Character Recognition (MICR) and the bank wire system. In the 1960's, banks installed and improved internal computer systems. Some progress has been made in speeding up the processing of transactions within the banks with computers, but the movement of checks between banks during the 1960's, did not speed up or change. Automation, up to this time, has had little effect on the way banks do business with the public. So far in the 1970's, the major changes have been the Federal Reserve Systems wire network and the clearing house associations' efforts such as project SCOPE and the Atlanta Project. By the 1980's, banks should provide for point of sale transactions and financial analysis for corporations and individuals.

George C. White(20), vice-president of the Irving Trust Company, in an address to the 47th National Convention of the Bank Administration Institute said:

We must broaden our thinking from the payment system as just transferring dollars, to the payment system as the entire processes from the generation of the requirement to pay through the settlement of the customer's account. In my personal opinion, if we do not broaden our thinking, we will see national non-banking organizations take the payment systems away from the banks.

The question of customer acceptance hangs over each new scheme but in the long run the outcome can be predicted based on two criteria (1) is it cheaper and more convenient than existing methods; (2) does it offer a service the customer is willing to pay for.)

While a few banks have ventured into such concepts as super check and point of sale transactions, most banks are willing to sit on the sideline to allow the situation to clarify. Most banks have fresh memories of the start-up problems of credit card programs. Another factor in the reluctance of banks to venture into these new areas is that there is no strong outside competition to force them.

Much has been written about Electronic Fund Transfer systems in the past five years. In an address to the "Payment System Symposium of '72", R. H. Long(3), assistant director of research of the Bank Administration Institute said:

Now, studies can only tell you so much. You reach the point where further studies will do little to add to the store of knowledge on the subject. Eventually you have to do something. I believe we are now entering that phase of the EFTS march.

The data processing equipment available today is more or less amenable to supporting these projected activities. It will obviously be necessary to expand these facilities to handle the new programs.

V. CONCLUSIONS

Automatic data processing has had little impact on the commercial banking industry up until now. Some book-keeping chores have been automated; however, the paperwork has not been reduced nor have any great efficiencies been achieved. Savings in bookkeeping expenses barely offset the cost of automatic data processing. Banks continue to do business with their customers and with each other in the same way.

Some programs now under way seek to modify the system to take advantage of the potential savings that data processing offers. Project SCOPE, the Atlanta Project and the Hemstead Program are attempts to modify the system by substituting electronic images for some of the records. Each offers the bank customer some benefits in reduced time effort and paper in performing bank transactions. For the customer, this is a glimpse of benefits that would come if the programs were more far ranging and were supported by all the banks across the country. Of course, there are benefits for the banks also in terms of increased efficiency. Studies have shown that the present system can function until 1980. R. H. Long(3) in a speech before the Payment Symposium '72, likens this situation to the fellow who fell from the top of the Chase Manhattan Bank. As he passed the 16th floor, he was heard to say, "So far, so good."

There is considerable interest in the banking industry for an automated banking system. The Federal Reserve System is on record as supporting an inter-bank Electronic Fund Transfer System. They have been as good as their word in the Atlanta Project and project SCOPE, where

they are acting as the central clearing house. In a recent article, John Reed and Richard Lekachman(21) of First National City Bank say:

In short, the major pressures for change in the check payments mechanism originate from neither the market nor from internal economic stress. The pressures are almost exclusively of government origin--the Federal Reserve System's desire for a reduction in float and the threat of competition from other financial institutions which the Government can authorize to compete directly with the commercial banking system.

The FRS has traditionally provided services in support of interbank transactions, which banks may use at their option. An automated interbank system might be expanded by banks into a system that would reach into the bank-customer relationship. Such a system must have broad bank participation and might never be successful if participation were optional. There would be the feeling on the part of some to wait until the system were more fully implemented so that the benefits of participating would be greater.

One could imagine that if there were one large bank (as in some European countries) that controlled all the nations banking activity, that a clear timetable would now exist and that we could all look forward to the benefits. Free enterprise has, instead, left us with 14,000 independent banks, each able to establish its own priorities and timetables. In light of such a fragmented system, it is encouraging to see Project SCOPE and the Atlanta Project under way, since they each represent the cooperation of a large number of banks.

The rate at which the banking industry will proceed from this point is uncertain. R. H. Long(3) in his address of April 20, 1972, before the Payments System Symposium '72, said:

It must be clear to any observer that the banking industry does not yet have the internal social

cohesion to implement and manage this technically possible system. }

Later on in the same address, he addressed his comments to additional services that a bank might offer a customer when he has the computer power in place to handle Electronic Funds Transfer System (EFTS).

From my point of view the tempo of experimentation is increasing; therefore, the successful combination may be one you've heard about at this conference, or it may be the one you hear about next week or the one you're conducting in your bank.

When this combination of systems and services emerges and is recognized, EFTS development will move from the experimental phase to the crash program implementation phase and this will usher in a new era of banking.

If it does not emerge from banking research, it may surface in some other financial industry and that too will usher in a new era of banking.

In the final analysis, it is more a matter of time that is at stake, rather than a question of whether the banking industry will be extensively automated. Bits and pieces of what will be a new system are now being implemented. Ideas will change and modifications will be made; however, these pieces will grow together and the next ten years should produce a nation-wide integrated Electronic Funds Transfer System. }

The mature automated banking system will provide for point of sale funds transfer, credit transfer through authorized bill payment, and debit transfer through the use of conventional checks. The point of sale transfer system will operate on a seven day a week, twenty-four hour a day basis. (Any customer with funds in the bank will have nation-wide access to them, and any merchant may have funds instantaneously transferred to his account from anywhere in the country (see flow diagram on the following page).)

Such a system will require a time sharing computer for each bank. Small time sharing computers are available without peripherals for approximately 25,000 dollars.

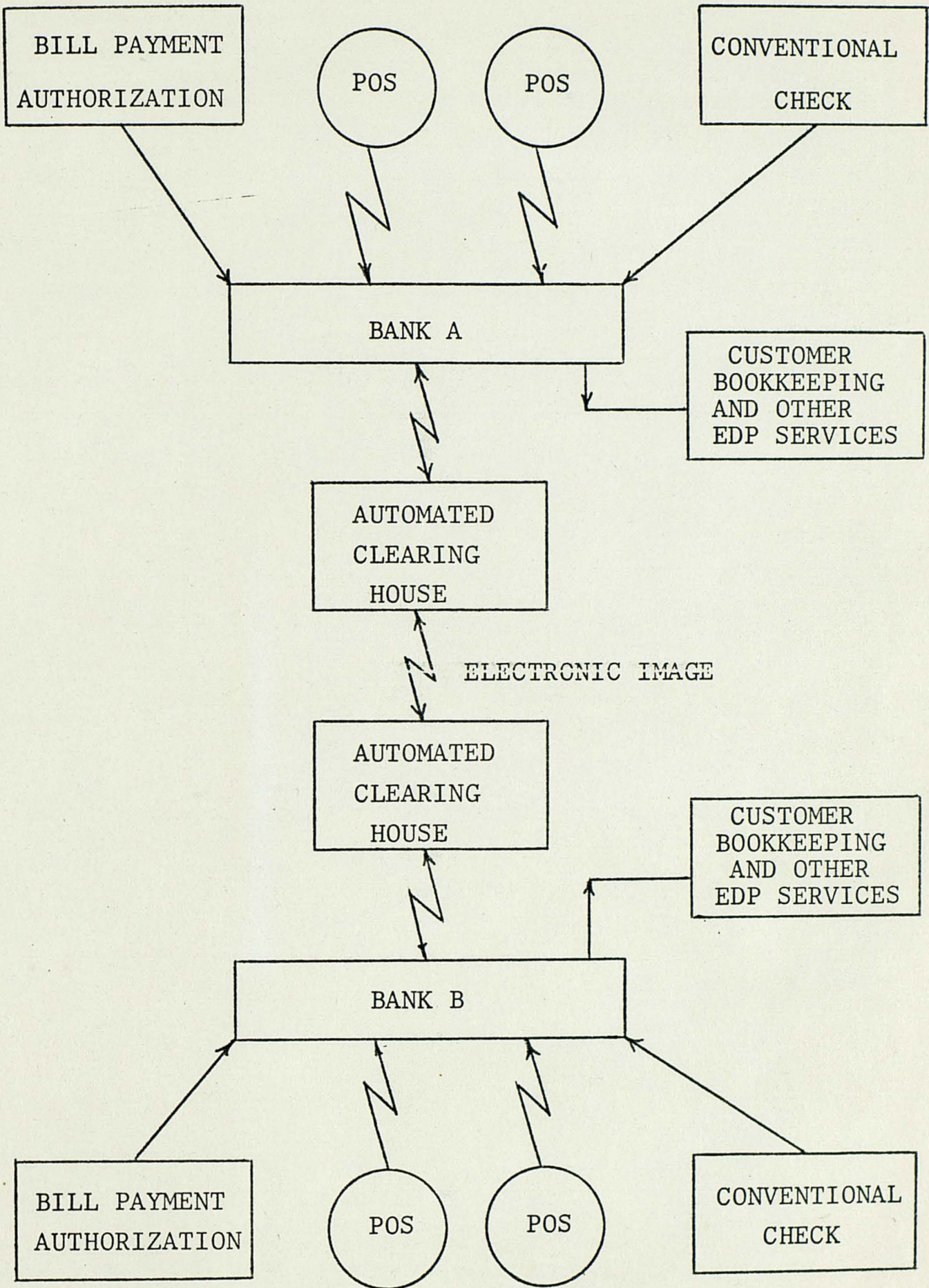


Fig. 8.--Fully Automated Banking System Flow Diagram

Peripheral equipment would at least double this cost. Using this figure as a conservative estimate of each banks requirements, the approximately 14,000 banks will require a total investment of 700 million dollars. Additional facilities for automated clearing houses will be required which should push the costs well over a billion dollars. The cost of communication facilities to support this network is not included here. Additional support will be required for software and maintenance. The size of this investment could be justified by a sizeable reduction in the 5 billion dollar per day float in the FRS(22). Arthur D. Little(2) estimates that an effective electronic funds transfer system will be operating in fifteen years and possibly much sooner.

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