The Payments System: Problems, Fantasies, and Realities

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The number of checks in the United States has been growing rapidly, and is projected to reach about 23 billion this year.[1] In another ten years truly staggering amounts of paper will require processing by the banking system if present trends continue.

Even with the help of MICR[2] encoding and processing, banks are experiencing difficulties in handling the growing number of checks. These difficulties are compounded by a noticeable scarcity of qualified bank personnel, and one effect is to accentuate the obstacles that the ever-expanding volumes of resultant credit extension, or "float", put in the way of a smoothly functioning monetary system. It seems obvious that these difficulties promise to mount as check volume continues to increase.

This article reviews the problems and current efforts directed to solving them.

THE PROBLEMS

The basic problems arise because, under present laws and practices, the check, once it is deposited in a bank, must be handled by people and processed by machines and must be presented to the payor bank—the drawee—for payment. Check operations are complex, in large part because check volume is so high and the average check is subject to multiple handling. The number of checks dwarfs that for other methods of funds transfer, although the dollar value of checks is only about half the total for all money transfers, according to the 1967 study by the Bank Administration Institute (BAI) (see chart). The same study found that the average check is handled in 2.6 banks and sometimes more than once in a single bank. About 70 percent of all checks drawn in the year of the study were "transit items", that is, were sent for collection through the banking system. Transit items are sent to the drawee either directly or indirectly through clearing houses, correspondent and other banks, Federal Reserve Banks, or some combination thereof. The study found that Federal Reserve Banks play an especially important role in the check-collection process, as they received over half the transit items in 1967. The larger the size of the sending bank (if a Federal Reserve member), the greater is the reported likelihood that it would send its transit items (other than local clearing items) to the Federal Reserve Banks.[3]

[1] Estimates of check volume come from several sources, forming a cluster substantiating the figure given above.

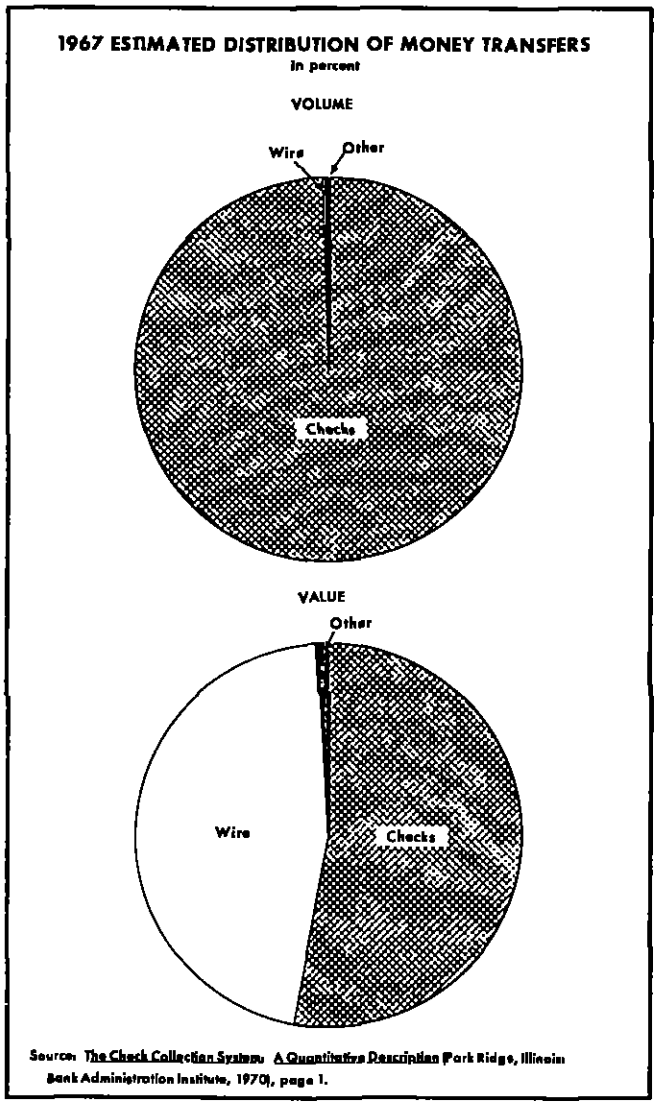
The Bank Administration Institute estimates, on the basis of a 1967 survey, *An Electronic Network for Interbank Payment Communications* (Park Ridge, Illinois, 1969), that the annual volume in that year was 18.7 billion checks; and in another more recent study, *The Check Collection System: A Quantitative Description* (Park Ridge, Illinois, 1970), it assumed an annual growth rate of 7 percent to 8 percent.

In early 1969, the Chairman of The American Bankers Association's Automation Committee, in an unpublished memorandum to the Association's Monetary and Payments System Committee, forecast check volumes of 21.75 billion for 1969, 23.49 billion for 1970, and 34.50 billion for 1975, based upon average yearly increases of 8.6 percent.

In "Changing Manpower Requirements in Banking", *Monthly Labor Review* (September 1962), page 989, Rose Wiener asserted: "Checks cleared through Federal Reserve Banks account for only a little more than one-fourth the total, but their rate of increase seems indicative of the overall trend." The number of checks on commercial banks handled by the Reserve Banks rose from 4.6 billion in 1965 to 6.5 billion in 1969, an average yearly increase of 8.5 percent.

[2] MICR is an acronym for Magnetic Ink Character Recognition.

[3] The study found that the larger banks ($1 billion and over in deposits) sent 86 percent of transit items to Federal Reserve Banks for clearance, while the smaller banks (up to $10 million in deposits) sent only 5 percent. Other factors also influence the proportion of checks sent to the Federal Reserve Banks. The enactment of par clearance statutes, such as the Minnesota 1968 legislation, could increase the proportion by making more checks eligible for Federal Reserve Bank handling.



Source: The Check Collection System: A Quantitative Description (Park Ridge, Illinois: Bank Administration Institute, 1970), page 1.

One of the most acute problems related to the processing and physical handling of checks is that of finding and keeping qualified and efficient personnel. This was one of the conclusions of the 1969 Automation Survey conducted by The American Bankers Association (ABA), and it is a matter of frequent comment by knowledgeable bankers. It is probable that this problem does not exist with the same severity in all parts of the country, but indications are that it is pervasive, in business generally as well as in banking. Whatever may be the long-range prospect, it would appear likely that, for the short run, the most optimistic view is that the situation will get worse before it begins to get better. Hence it seems that personnel shortages in banks, particularly as they affect check handling, will have a more and more serious adverse impact upon the efficiency of the collection process in the years just ahead. A pessimistic view of the future would, on the other hand, raise the specter of a banking system whose channels of payment would be so clogged with paper that a progressive degeneration would set in and ultimately require the abandonment of that system in favor of some jerry-built system of the future.

Increasing use of high-speed data processing machines has helped to improve the productivity of employees engaged in handling checks and has enabled banks to cope with the growing volume of this paper. A check carries information identifying the payee, the payor—or drawee—bank, and the drawer; and, in effect, it tells the payor bank to pay a stated amount to the payee, or order, for account of the drawer. Encoded on standardized checks, in magnetic ink characters that are machine readable, is information identifying the drawer and the drawee bank and stating the amount; this information qualifies the check to pass through automatic sorting machinery that, with the aid of human hands, combined with the appropriate form or forms of transportation, will enable a particular check finally to "come home" to its destination—the drawer's account in one of the thirty-odd thousand banking offices in the country—and to be charged to that account if it is "good", and returned if it is not. Despite the use of machine techniques, time is required for manual processing and for the physical transportation of the paper—at what sometimes seems to be a snail's pace—between banks.

One important aspect of our check-collection procedures is the creation of "float". Float is essentially the double counting of the same deposits, and it arises because banks typically credit a depositor's account with the amount of a check before the check issuer's bank account is debited.[4]

Float consists of the so-called "bank" float and Federal Reserve float. A check in the process of collection between two commercial banks always contributes to bank float. Checks presented to a Federal Reserve Bank for collection become part of Federal Reserve float and are removed from bank float if the depositing commercial bank

[4] Timing delays also cause a discrepancy between the records kept by deposit holders and the records of their deposit kept by banks; this is known as "mail" float. See "A New Measure of the Money Supply", *Federal Reserve Bulletin* (October 1960), pages 1102-23.

receives credit in its reserve account with its Reserve Bank (which is effected automatically on the basis of a prescribed time schedule) before the Federal Reserve Bank receives payment or remittance therefor. Thus, a given check may initially be part of bank float and subsequently become a portion of Federal Reserve float.

Both bank float and Federal Reserve float are quite volatile, and have tended to mount with the increase in check volume.[5] Bank float can be measured only imperfectly and distorts the data on monetary aggregates, such as the money supply. Wide swings in Federal Reserve float distort the reserve positions of banks and make the open market operations of the Federal Reserve System more difficult.[6]

Float, however, provides a distinct benefit to banks and depositors. Bank float adds to the cash and "due from" bank balances that are important in measuring banks' liquidity positions. Of course, any increase in these balances adds to the banks' willingness and urge to lend or invest. Even more significant is an increase in Federal Reserve float, which adds to the high-powered reserves of the banking system, provided there are no offsetting open market operations by the Federal Reserve System. In any event, it is apparent that the benefits of Federal Reserve float are distributed disproportionately among banks. Those that are some distance away from a Federal Reserve office appear to be the primary beneficiaries and, in addition, are only remotely affected by any offsetting Federal Reserve open market operations. Depositors are also beneficiaries of float because there are delays before the checks they issue are charged to their accounts, while deposited checks are credited immediately (though the balances are not necessarily available for immediate use). On the whole, this state of affairs tends to give them the use of their funds for longer periods of time. These various benefits have led to some resistance to change, even though the costs of check processing and of slow payments are high.

Despite these obstacles, the desirability of shortening or eliminating payment delays has long been recognized; some thought has been given to ways it might be done; and some action—though perhaps not enough—has been taken.

PROPOSALS FOR IMPROVING THE PAYMENTS SYSTEM

The proposals thus far advanced have been of three general kinds, all designed to bring about the speedier transfer of funds: (1) those which, contemplating the continued use of the check as a written order on paper for the payment of money, would attempt to shorten the time now required to move the information on the paper from place to place, either by routing the checks to the payor banks more efficiently or by substituting electronic messages for paper messages to move the information on the check some part of the way to its destination; (2) those which would register that information on magnetic tape before it entered the banking system, and would pass the information through the banking system on tapes or by means of wire bridges between banks, the accounting being handled as at present, though on the basis of magnetic tape items rather than paper items; and (3) those which envision the gradual development of a nationwide computer-communications network through which instantaneous money transfers could be ordered and made, utilizing depositor-operated terminals remote from the computers on which the depositor's account records were stored.[7] The first class of proposals would hasten check collection; the second and third would tend to eliminate checks as a method of payment.

The proposal—that checks be routed more efficiently so that they can be presented and paid (or returned unpaid) sooner—certainly has its supporters, but a far greater amount of attention is being directed toward the utilization of the technological advantages that the computer and high-speed communications lines are thought to afford. Certainly the use of paper from the beginning to the end of the collection process is, at best, conceived of as a phenomenon which will inevitably taper off (if not

[5] Elimination of float, as might be envisaged by some of the proposals outlined below, could bring revolutionary changes to the theory and management of money. See G. Garvy and M. R. Blyn, *The Velocity of Money* (New York: Federal Reserve Bank of New York, 1969), pages 92-94.

[6] Federal Reserve average daily balance-sheet float, on a weekly basis, for the year 1969 ranged between a low of about $2.0 billion and a high of $3.6 billion.

[7] The mass of published material on the automated aspects of check collection and the other proposals described could not be listed here conveniently and economically. The author has been guilty of contributing to this situation; some of his published articles in this general field, having a legal tinge, are listed below: "Mechanized Check Collection", *The Business Lawyer* (July 1959), pages 989-1007; "Electronic Brains for Banks", *ibid.* (April 1962), pages 532-47; "Check-out Time for Checks", *ibid.* (July 1966), pages 931-45; "An Item is an Item is an Item: Article 4 of the UCC and the Electronic Age", *ibid.* (November 1969), pages 109-19.

disappear) because of the higher speed with which electrons can, under ideal conditions, move from place to place information on which payment is to be based.

While paper continues to be used, various schemes are being proposed for the purpose of speeding up the time of payment, in the hope that they will, if they work, partially compensate for the slow movement of paper, and thus blunt the undesirable effects noted above. But since these proposals appear to depend for success upon the consent of the payor banks to make early payment, and since those banks would, if the schemes were put into effect, be losing funds earlier than they now do, it is difficult to suppose that, without some compensating advantages, banks would generally be willing to make payment before the law required them to. If compensating advantages have been thought of, they have not thus far been put forward publicly.

The proposal to use electronics for moving the information on checks part of the way to its destination (the so-called "truncation" method) does not seem to have taken hold, though publicly proposed at least four years ago.[8] Both operational and legal objections to the proposal have been raised; these seem to have tempered the initial enthusiasm with which it was received. Although a somewhat similar plan is in operation on a pilot basis in Sweden today, the impediments to successful transplants, in business systems as in heart surgery, are too well known to call for more than mention.

USE OF MAGNETIC TAPES TO EFFECT PAYMENTS

Magnetic tapes are now being used by the American banking system for such things as the payment of payrolls; they are also being used by the London clearing banks for interbank debit transfers (functionally analogous to the paper check) as well. The SCOPE[9] project in California (a joint venture of the San Francisco and Los Angeles clearing houses), initiated in April 1968, seems to be pointed in this same direction. The New York Clearing House, too, has a group actively pursuing this matter on the East Coast.[10] Questions of message format (among many others) are very important, for a decision must be made in each of these projects, quite early on, whether compatibility is to be sought on a local level only, or whether it must relate to some national standard of compatibility as yet unformulated. Waiting for a national standard to evolve may well frustrate early completion of such projects; what may ultimately be needed is the exertion of some wise and strong leadership on a national scale to create such a standard and bring it into use.

To the extent that customer-generated magnetic tapes enter the banking system for the purpose of bringing about money transfers, paper is eliminated, the amount of handling by both machines and human beings is reduced, and delays in payment, and thus float, tend to drift toward more tolerable levels. However, undertakings of this sort now on the march are so puny, in relation to the total problem, that some time will elapse, assuming that these efforts are continued and expanded, before they begin to chip away at the amount of credit extension that flows from the operation of the present paper-burdened payments system.

PREAUTHORIZED PAYMENTS

"Preauthorized payments", a term often used in connection with both "credit transfer" and "debit transfer" systems, is a means of assuring that the debtor's bank of deposit will pay his recurring bills, whether level or variable in amount, without recurring action by him.[11] Preauthorized payment plans are not the exclusive prerogative of nonpaper payments systems; in some countries they have been operating successfully on a paper basis for decades. The American psychology is not, it appears, hospitable to such schemes unless the depositor-debtor is offered some economic inducement for prompt payment (such as a discount or the nonaccrual of extra charges) in order to secure his participation. The success

[8] *Hearings*, Subcommittee on Legal and Monetary Affairs, House Committee on Government Operations (February 9, 1966). The specific suggestion made was that it might one day be possible for the Federal Reserve Banks to present all checks received by them on their own premises, and transmit facsimiles to the drawees by electronic means. The paid checks would be retained by the Reserve Banks subject to requests for retrieval made by the drawers. The sending banks would be given immediate credit for the checks and the drawee banks would be immediately charged, subject in each case to reversal if an item were not finally paid.

[9] SCOPE is an acronym for Special Committee on Paperless Entries.

[10] Banks in Seattle, Indianapolis, and perhaps other places are investigating the possibility of SCOPE-like projects.

[11] A "debit transfer" system is one in which an item containing a request or order for the payment of money is received by the banking system from a depositor who is to receive payment if the item is honored by the drawee after receipt; and a "credit transfer" system is one in which the first impact on the banking system is the receipt by the paying bank from its depositor of an order to pay money, to the debit of his account, to credit an identified account in the same or another bank, which is also identified.

of the insurance premium draft plan (under which appreciable economic benefits are reaped by a participating depositor-debtor)[12] and the failure of other preauthorized payment plans to take hold when no such benefits can be realized seem to offer ample verification of this thesis. There are some straws in the wind which suggest that preauthorization plans will receive increasingly active attention in the very near future. If this occurs, it should prove an interesting and helpful development.

ELECTRONIC PAYMENTS

The most ambitious of the proposals thus far made for improving the payments system contemplates the gradual development of a nationwide computer-communications network through which money transfers could be effected, utilizing depositor-operated terminals remote from the computers on which the depositors' account records were stored. Proposals of this sort usually include such features as: (1) a machine-readable identification card[13] with a built-in verification factor of sufficient reliability, (2) a credit rating with overdraft privileges (for depositors with steady income or assured assets), (3) a system of preauthorizing repetitive payments, and (4) an online terminal at each place where payments might be originated by a depositor.

Apart from the rather obvious questions of sponsorship, customer acceptance, the possible need for changes in the legal environment, and the effect of such a system upon the structure and functioning of the banking system, there are two aspects of the proposal for a nationwide computer-communications network, which, for the present at least, induce caution in embracing it. They merit comment. The first of these is identification; the second, communications.[14]

IDENTIFICATION. It is apparent that the matter of identifying and legitimating each order to pay out of an account under such a system is of high importance. If a malefactor could readily penetrate the system to order unauthorized payments, there would be little confidence in it, nor use of it. To counter the threat of penetration, various proposals have been put forward for identifying an account holder before a payment can be made from his account. None of these has as yet been proved to be wholly acceptable, if the goal is to exclude the possibility of successful deception, or if the expense of detecting a would-be malefactor is so high, when weighed against the losses his success could cause, as to be economically unjustifiable.

The prerequisites of a successful identification system, for this purpose, include: (1) an identification device that is difficult to counterfeit to the point of being virtually self-authenticating and (2) a technique for establishing, without subjective human intervention, that the user of the device is the person to whom the device pertains. It seems to be accepted that absolute identification is an unattainable goal at present; the best that can be expected now is a very high degree of probability.

While claims have been made that some identification devices are virtually self-authenticating (in the sense that they are almost impossible to counterfeit), the validity of those claims does not seem to have been publicly demonstrated, or tested on a sufficiently wide scale to induce confidence in them.

At one time great hopes were entertained for the voice-spectrogram technique, involving what are commonly called "voice prints" as a means of identification. It seems to have lost much of its former glamour, in the view of some technicians.[15] Another proposed technique is the

[12] In these plans, which generally relate to life insurance policies, the insurance policyholder authorizes his insurance company to initiate at regular intervals—usually monthly—drafts on his bank, chargeable to his checking account, to pay the premiums. The policyholder also authorizes his bank to honor these drafts upon presentment. The policyholder enjoys an economic advantage, as well as a convenience, in these preauthorized payment plans. Insurance companies usually charge a higher premium for monthly rather than yearly payment plans, but in the case of preauthorized monthly payment plans the premium is lower than that in conventional monthly plans.

[13] In some circumstances, the present check system places reliance on identification cards; their experimental use in connection with the cashing of New York City welfare checks is said to have reduced losses markedly. These cards will also be used as an identification medium in connection with the expanded food stamp program in New York City this year. "Welfare Recipients to Get I.D.", *The New York Times* (April 8, 1970), page 30.

[14] This is not to say that a comparison of the costs of the present system with those of the proposed system will inevitably be decided in favor of the proposed system. Enough is known, however, to suggest that more detailed cost studies than have yet been made will tend to favor the new system, if certain assumptions as to minimum traffic volumes are made.

[15] A recent article, "Identification of a Speaker by Speech Spectrograms", appearing in *Science* (October 17, 1969), concludes that "the available results are inadequate to establish the reliability of voice identifications by spectrograms". The authors (Richard H. Bolt, Franklin S. Cooper, Edward E. David, Jr., Peter B. Denes, James M. Pickett, and Kenneth N. Stevens) state: ". . . the experiments reported thus far do not provide a direct test of the practical task of determining whether two spoken passages were uttered by the same speaker, or by two different speakers . . ." and "Reliable machine methods for voice identification have not yet been established".

reduction of fingerprint patterns to a digital base, and yet another is that of "hand geography", under which relatively constant characteristics of the hand—length of the fingers, width of the knuckles, distance between joints, etc.—are reduced to formulae which are registered digitally in a card that can be read by a machine and compared with the characteristics of the hand, proffered as that of the account holder, which is being viewed by the machine. Other more exotic identification systems, such as a "body-odor sniffer", linked to a register of the body-odor characteristics of the account holder contained in the identification device itself or in the memory of a remote computer, have also been spoken of, but their projected cost might well be too high to justify their use to protect only moderate bank balances from depredation.

A "nonphysical" technique is that of the secret number, a number known only to the legitimate device holder and embedded magnetically but invisibly in the device. The user must key-in this number when using the device in order to make it work.[16] Such a technique has been enjoying limited use and may be adequate when the amounts at stake are not very large but, if they were large, its use would no doubt be thought imprudent.[17]

COMMUNICATIONS. The notion that the high-speed communications channels, necessary for the routing of payments instructions from point of origin to point of destination, are obtainable simply by asking for them is, at present, a sheer myth. The channels must be of "voice grade", i.e., capable of carrying telephone conversations. It is a matter of common experience even in an ordinary telephone conversation that such lines do not function without occasional imperfections of service, such as fadings, echoes, distortions, and even unexplained breaks in the transmission. These phenomena do not seriously impair communications in all cases (for the human mind will sometimes supply imperfectly heard, or unheard, parts of conventional speech patterns) but in some they do. However, when it is recalled that in this new payments system humans are not to intervene in communications between computers, it will be appreciated that, because the "artificial intelligence" of the most advanced computer is far from being a match for the human mind, the occurrence of these phenomena will impair effective communication between computers on a much grander scale than is the case with human beings.

Apart from defects in communication, once a proper connection has been made, are those incident to establishing connection, e.g., inordinate waiting for dial tones, busy signals, wrong numbers, erroneous "intercepts", and others of that stripe.[18] These defects affect human users emotionally; while computers through the third generation do not experience emotions, the occurrence of these defects would, if computers were to try to establish connections automatically, delay effective computer-to-computer communication and could also compromise the security of the communications system itself.

However, the outlook is not completely bleak. The communications companies are expending appreciable effort and money to improve their facilities. In addition, during the past year or so, a great number of parties have applied to the Federal Communications Commission (FCC) for authority to operate microwave systems that would lease communications channels to banks and other organizations. For instance, several applications by affiliates of Microwave Communications, Inc., have been made to the FCC for permission to provide special service common carrier microwave systems. Among the routes proposed so far are: (a) Chicago and St. Louis (approved by the FCC, but now in litigation), (b) Chicago and New York, (c) San Diego, California, and Everett, Washington, (d) Chicago, Minneapolis, and St. Paul, and (e) New York and Boston. Other companies, too, have applied for these routes, among others.

Several months ago, in what was described as the largest single filing for new communications facilities in history, the University Computing Company submitted to the FCC a proposal for a $375 million microwave radio system to serve thirty-five major metropolitan centers across the country. The company sees a broad potential market for its services in banking, insurance, manufacturing, petro-chemical, food retailing, securities, and transportation fields. A press statement in connection with the application notes that the system not only would interface with computers and teletype machines, but would also

[16] A prominent bank has experimented with this method.

[17] Stanford Research Institute, "A Techno-economic Study of Methods of Improving the Payments Mechanism", a 1966 study prepared for the Federal Reserve System Subcommittee on Improving the Payments Mechanism, page 78; *AFIPS Spring Joint Computer Conference* (1967), Vol. 30, page 288; *F.C.C. Docket 16979—In the Matter of Regulatory and Policy Problems Presented by the Interdependence of Computer and Communications Services and Facilities, Response of International Business Machines Corporation* (March 1968), pages I-66-67.

[18] "Phone Users Cite Service Decline", *The New York Times* (November 22, 1969), page 1; "Forecasting Telephone Needs Root of Service Problems", *ibid.* (November 23, 1969), page 32.

provide ready access to and from digital xerographic-type machines, thereby permitting transmission of facsimile and other types of graphic information six or more times faster than today's voice circuits.[19] The Bell System and Western Union have petitioned the FCC to deny this application.

Many organizations, within and without banking, have the payments system under study. A partial list of these is contained in the BAI report on check collection. Most prominent within banking (apart from those mentioned above) are the ABA's Monetary and Payments System (MAPS) Committee, with four task forces—marketing, economics, legal/legislative, operations/technology—and the Federal Reserve's Steering Committee on Improving the Payments Mechanism (SCIPM). Some of the Federal Reserve Banks have also launched investigative efforts of rather wide compass to include inquiry into matters in this field.

The work of these groups, much of it directed to the solution of rather narrow problems, could no doubt be coordinated better than it is, if the environment were ideal; but it is not. For one thing, it is not clear on the basis of the track record up to this point who would be able and willing to do the coordinating; moreover, the pace of the whole effort would surely be determined by the coordinator, if one existed. The efforts toward coordination, so far, have failed flatly, involved too limited a group, or moved too slowly (or too fast) for some of the participants.

Governor George Mitchell, the Chairman of SCIPM, recently concluded a talk[20] by saying:

> The banking industry and the Federal Reserve have the major responsibility for achieving steady progress toward an electronic payments mechanism. I suspect an outsider would judge that neither of us is working at full capacity to do so.

The author, who is not altogether an outsider, would tend to agree. Strong leadership, and wise, will indeed be needed to bring current proposals (or others of equal promise) to flower in good season.

[19] Other significant developments bearing upon the possibilities just discussed include the following: (a) A computer-based credit authorization system—called Omniswitch—for Master Charge and all other charge and credit cards. Formed by First National City Bank and the members of Eastern States Bankcard Association, the system will provide all participating merchants with a single local telephone number to obtain sales authorization for card purchasers. Bank of America and American Express Company have recently announced their plan to establish a similar nationwide credit card authorization service corporation that would be open to all charge-card issuers. (b) The United States Post Office announcement of the awarding of a contract to General Dynamics (Electronics Division) to make a state-of-the-art study to examine all methods of applying electronic technology to the mails, including microwave and laser-beam methods of transmission. Among the many possibilities the study will explore is visual delivery of mail on a home facsimile printing device. (c) The appearance on the market of terminals designed to transmit information regarding a retail sales transaction from the situs of the sale to a computer.

[20] "The Needle in the Paper Stack", an address before the Senior Banking Forum of the American Institute of Banking, Kansas City, Missouri, March 19, 1970, in which Governor Mitchell explored the progress being made toward an electronic payments system. One of the few encouraging signs he noted in his scan is the newly designed Federal Reserve communications system that initially will handle a twelvefold increase in transactions and can be expanded to accommodate perhaps one hundred times the present volume of wire transfer transactions. When the system is in full operation, messages will be switched automatically between Federal Reserve offices, and with this capability it is possible to envisage that the system will some day allow the automatic routing of funds-transfer messages originating at a member bank or clearing center through the Federal Reserve communications system to the appropriate receiving banks. The system is not quite ready to function; the switch has been installed in Culpeper, Virginia, and at present is being readied for testing.