

The Automated Clearinghouse System: Moving Toward Electronic Payment

*James McAndrews**

In the late 1960s, when a group of California banks first suggested the idea of an electronic system to make low-value, recurring payments—the Automated Clearinghouse (ACH)—some people predicted that the ACH would overtake checks as the main way of making payments. Why then are relatively few payments made through the ACH? After all, the competition between checks and an electronic form of payment seems like a race be-

tween a turtle and a hare. Checks (the turtle) have to be physically moved by hand, truck, and air from place to place to reach the check-writer's bank, while electronic payments (the hare) move in a flash over telephone wires.

Electronic payments have a speed advantage over checks. In addition, each electronic transaction is cheaper to process than a check. Nonetheless, other considerations give the tried-and-true technique of payment by check an edge in the contest with its electronic rival. First, the difficulty of finding cheap and effective ways to electronically communicate which particular bills have been paid by ACH has slowed its acceptance. Second, creating and

* James McAndrews is a senior economist in the Research Department of the Philadelphia Fed.

maintaining the ACH has required large, fixed-cost investments by both banks and corporate users, which can offset the per-item cost advantage of ACH processing. Third, a person who pays by check can benefit from the time between when the check is written and when funds are finally transferred from her account; this is called float.

Expectations that ACH payments would overtake checks were too optimistic, but many specific uses of ACH have proven successful. Most notably, an estimated 30 percent of the U.S. work force now have wages and salaries directly deposited into their bank accounts by ACH payment. We'll explore why this and some other uses of ACH have been successful and discuss the history, organization, and current developments in ACH to get a sense of direction for the future of this payment system. To do so, we first need to understand how ACH works.

BASICS OF THE AUTOMATED CLEARINGHOUSE

The Automated Clearinghouse (ACH) is an electronic system that connects banks so that they can transfer funds between accounts in different banks. While it was not always so, today's ACH system is all electronic: banks use computers linked to a computer at the processing center and relay payment information over telephone lines.¹

The ACH system was designed for small, repetitious payments such as payrolls, mortgage installments, insurance premiums, and utility bills. Repetitious payments are well suited to ACH because they allow the one-time costs of setting up the authorization for payment to be spread over multiple transactions.² The ACH was also designed so that, like checks,

ACH transactions can be returned, for example, due to insufficient funds. To allow for returns, money actually changes hands from one to four days (depending on the nature of the transaction) after the payer's bank is notified of the ACH transaction to be settled.³

ACH transactions can be one of two types: credit or debit. A *credit* transaction is initiated by the payer: the customer of an electric company, for instance, relays to her bank her account number at the electric company along with the electric company's deposit account number and bank. Each month the customer can then phone the bank and initiate an ACH credit transaction that will transfer the amount of her bill to the electric company. In the case of a set billing amount, the customer can arrange for that amount to be sent automatically every month. Alternatively, a *debit* transaction is pre-authorized by the payer but is initiated by the payee. In this case the customer signs a form authorizing the utility to debit her account each month. The utility sends her a bill and then initiates payment for the bill at some agreed-upon date.

Including the costs of accounting, mailing, processing, and transportation (but not including the benefits of control of timing or the information costs of a payee's attempting to determine who paid their bill in a credit transaction), the cost of an ACH transaction is estimated to be roughly half the cost of a check

²The costs to enroll a person in a federal government direct deposit program were estimated to total \$6.94 in 1981; \$1.32 of this cost was incurred by the depository institution, and the rest was incurred by the federal agencies using the program. See William Dudley, "A Comparison of Direct Deposit and Check Payment Costs," Staff Studies No. 141, Board of Governors of the Federal Reserve System, November 1984.

¹See the March 1986 and the April 1986 issues of the *Economic Review* of the Federal Reserve Bank of Atlanta for information on the history and problems of implementing ACH.

³Another electronic payment system, the Fedwire—the Federal Reserve System's high-value funds transfer network—does not allow returns and transfers money the same day the bank is notified.

transaction.⁴ A recent survey, conducted for the National Automated Clearing House Association, shows that, for the respondents to the survey, the total bank processing cost of an ACH item averaged 5.7 cents, while the total bank processing cost of a check averaged 10.5 cents.⁵ Bank processing costs for check-writing or for ACH bill-paying services are reflected in the fees, explicit or implicit, that banks charge their customers. The payer of a check, however, may derive benefit from float (float is the value of money between the time the payee's bank account has been credited and the time the payer has money removed from her bank account), which means the *payer* may prefer a check even though the cost of processing an ACH transaction is lower than the cost of processing a check.⁶

ACH HISTORY AND ORGANIZATION

The idea for an automated electronic clearinghouse for interbank payments was developed in 1968 when the San Francisco and Los Angeles clearinghouse associations formed a committee to study how to create an electronic clearinghouse. This led to the first automated clearinghouse, operated by the Federal Reserve Bank of San Francisco, in 1972. During the 1970s other regional automated clearinghouses were also formed. The Federal Reserve System supported these private-sector developments

by operating most of the clearinghouses. The private-sector clearinghouses developed the rules and procedures for making ACH transactions.

In 1974 the American Bankers Association formed the National Automated Clearing House Association (NACHA). Its charter was to develop an interregional network, establish uniform rules nationally, and expand the types of transactions then available. By 1978 the national network, managed by the Federal Reserve System, was operational. Today it processes transactions for well over 20,000 depository institutions.

Three regional clearinghouses, Arizona, New York, and Hawaii, process their own regional ACH transactions. Visa, the credit card association, created an ACH that began competing with the Federal Reserve's system on a national basis in 1991.

In 1995 the Federal Reserve will consolidate its own ACH activity into a single clearinghouse facility, which, along with the improved computing equipment now available and the revised software for ACH, is expected to reduce costs. With the consolidation of the Federal Reserve ACH system into one national clearinghouse, the private-sector ACH operators recognized the need to establish a national clearinghouse to adequately compete with the improved system of the Federal Reserve. (Visa has operated its system nationally since 1991, but the majority of its users are from the West.) As of April 1994, the private-sector ACH exchange (PAXS), consisting of the Visa ACH and the New York and Arizona clearinghouse associations, offers its members a national ACH service. (See *Private vs. Public ACH*.)

ACH GROWTH

The number of ACH transactions has nearly tripled since 1986 and their value has more than tripled.⁷ (See Figure, p. 19.) Most of this growth has come in private, rather than government, transactions because the federal government

⁴See David B. Humphrey, *The U.S. Payments System: Costs, Pricing, Competition and Risk* (Monograph Series in Finance and Economics, nos. 1 and 2, New York University, 1984).

⁵See *Direct Payment Market Analysis*, prepared for the National Automated Clearing House Association, Herndon, Virginia, by the Payment Systems Institute, January 1994.

⁶Scott E. Knudson, Jack K. Walton II, and Florence Young, in "Business-to-Business Payments and the Role of Financial Electronic Data Interchange," *Federal Reserve Bulletin*, April 1994, pp. 269-78, calculated that the value of float to businesses in 1993 ranged from about \$0.86 to \$1.12 per check.

Private vs. Public ACH

The private-sector ACH exchange (PAXS) began offering national ACH processing in competition with the Federal Reserve System in April 1994. If the banks whose customers are party to the ACH transaction are both using PAXS, settlement will occur using the Visa settlement system. If only one of the banks involved is using PAXS, the transaction is settled using the Fed's system.

A notable difference between the Fed's system and Visa's is that the Fed's system settles by an exchange between the parties of the gross amount of funds owed, while Visa's settles by the parties' exchanging only the net amount of funds owed. A bank makes a payment to another bank by sending funds, typically balances on deposit at the Fed, to the other bank. In a gross settlement system the banks that are party to offsetting transactions must hold sufficient balances to exchange the gross amounts of the underlying obligations when payment is made. In a netting system the parties take advantage of offsetting transactions, and only the party that owes the larger amount needs to send funds.

Netting by using PAXS reduces the amount of deposits that banks need to hold at the Fed. For example, if First Bank owes Second Bank \$50,000 in one transaction and Second Bank owes First Bank \$200,000 in another transaction, gross settlement means First Bank will have to hold at least \$50,000 in deposits, and Second Bank will have to hold at least \$200,000 in deposits before the transaction settles.^a Netting means only Second Bank would have to hold deposits when the transactions are settled, and only \$150,000, the net amount owed when payment is made. Banks find it desirable to reduce the amount of deposits they must keep at the Fed because they could place those funds in alternative investments that pay higher returns. Banks that send and receive large numbers of ACH transactions would be attracted to a netting service.^b

But netting can also expose the parties to increased risks, precisely because fewer reserves are available in a time of liquidity crisis.^c If a large member of a netting group were to fail to settle on a given day, the other members of the group would be forced to quickly find extra reserves, or they too would be unable to settle. This might lead to a cascade of failures to settle.

Unlike the Fed, which can stem such a cascade by creating bank reserves, a private-sector settlement system must plan on some other way to stem the spread of such failures to settle, should such occur. Under certain circumstances, the Visa system relies on unwinding.^d In an unwinding, if a particular bank should fail to settle at the time appointed for the bank to deposit the amount it owes other banks in the system, Visa would remove that bank and all its associated transactions from the day's settlement. After doing this unwinding, Visa would recast settlement with the other banks in the system. If a settlement failure occurs a second time, Visa would not attempt net settlement again, sending all the transactions to the Federal Reserve for settlement instead.

While unwinding transactions in a large-dollar-value settlement system poses a significant risk of systemic failure, it's less of a problem for transactions in a small-dollar-value system such as ACH. For example, the July 1992 transactions data for the Third District (described in footnote b) indicates that the system could have settled via unwinding each day had the largest net debtor failed.

^aThis simple example presumes that banks do not overdraw their accounts at the Fed during the day. Although banks may overdraw to a limited extent, the Fed encourages them not to exceed those limits. See George R. Juncker, Bruce J. Summers, and Florence M. Young, "A Primer on the Settlement of Payments in the United States," *Federal Reserve Bulletin*, November 1991, pp. 847-58, for a discussion of the settlement process of the Fed.

^bThe reduction in reserve account balances in moving from gross to net settlement appears to be substantial. For the 10 banks that were the largest users of ACH in the Third Federal Reserve district and all the banks in the U.S. that had ACH transactions with at least one of these, the average daily gross payments for July 1992 were \$1.34 billion; multilateral net payments were only \$214 million, just 16 percent of the gross payments.

^cSee Patrick Parkinson and others, "Clearance and Settlement in U.S. Securities Markets," Board of Governors of the Federal Reserve System, Staff Study 163 (March 1992), for an extended discussion of the risks in settlement systems.

^dIn addition to unwinding in a settlement failure, Visa uses an extensive array of risk-control devices. The description of Visa's system is taken from "Proposal to the Board of Governors of the Federal Reserve System for a Net Settlement Account for the VisaNet Automated Clearing House System, May 1990," provided to me by Visa.

was an early convert to ACH. Today, ACH transactions are concentrated in four types.

Government Payments. The federal government has been a leader in using ACH. The Social Security Administration, the Department of the Treasury, and the Department of Defense have expanded the use of ACH considerably. Over 85 percent of Social Security benefits are paid by ACH. The federal government began using ACH for direct deposit of payrolls as early as 1975.

In addition to being a leader in paying Social Security benefits and wages through ACH, the U.S. Treasury and the Department of Defense both have programs under way to convert to ACH most payments to their vendors and contractors. In the Treasury's program, called Vendor Express, over \$61 billion in payments were made through the ACH, compared with \$44 billion made by check (and \$209 billion by wire transfer—used for high-dollar-value payments) in fiscal year 1992. In the Department of Defense program over 28 percent of major contract payments are currently made by ACH.

The federal government's use of ACH is likely to expand, since one of the recommendations of Vice President Gore's National Performance Review for the federal government is to use ACH to reimburse expenses for its employees, to make payments to other agencies of the govern-

⁷Transaction volume for the ACH was about 2 billion payments in 1992, with a value of \$7.8 trillion (see Figure). This compares with 57 billion checks written in 1991 for a dollar value of \$66 trillion.

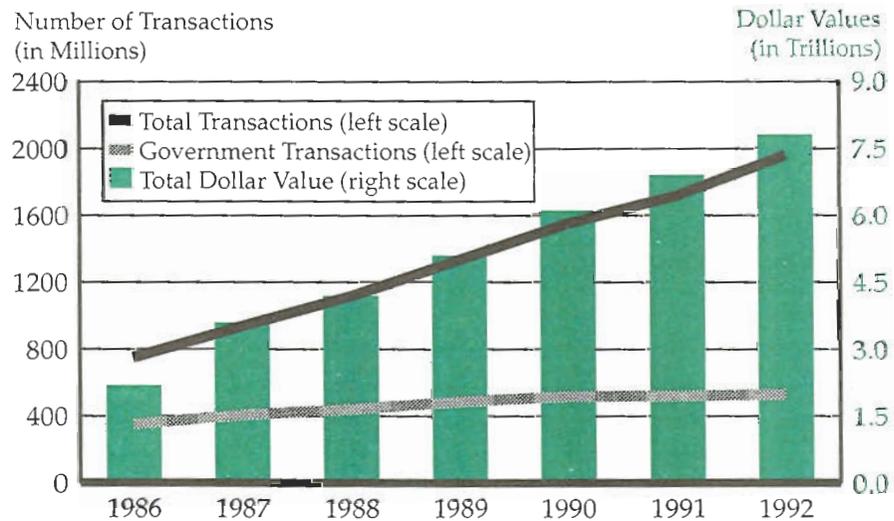
ment, and to pay for purchases from private firms.

Direct Deposit of Payrolls. As mentioned earlier, an estimated 30 percent of the U.S. work force uses ACH for direct deposit of their wages, an increase from just 4 percent in 1984. This makes direct deposit the most common use of ACH and the one with which people are most familiar. Direct deposit of payroll is an example of a credit transaction.

Both parties often prefer direct deposit. Studies have found that direct deposit is less costly than check payment, making ACH attractive to employers.⁸ Furthermore, an employer could

⁸Dudley, 1984 (see footnote 2 for complete reference), and David B. Humphrey and Allen N. Berger, "Market Failure and Resource Use: Economic Incentives to Use Different Payment Instruments," in David B. Humphrey, ed., *The U.S. Payment System: Efficiency, Risk and the Role of the Federal Reserve* (Kluwer Academic Publishers, 1990), pp.45-86.

FIGURE
ACH Transaction Volume



Note: All dollar values in trillions
Source: National Automated Clearing House Association

cause hardships for its employees if it attempted to exploit float by drawing checks on an out-of-state bank, for example, to take advantage of the time between when the checks were written and when the money was actually transferred to their employees' accounts. The long-term nature of the employment relationship mitigates employers' incentive to exploit this advantage of checks. Employees frequently prefer ACH because, with direct deposit, they avoid trips to the bank to deposit paychecks. Often, such trips can take place only at lunch time when banks are congested, so direct deposit avoids a waste of time and energy.

Consumer Bill-Paying. Paying bills by ACH is potentially a major convenience for people. According to NACHA, of the almost 2 billion ACH transactions made in 1992, 800 million were consumer bill payments, twice the number of 1989.⁹ However, this represents a small share of the approximately 20 billion bill payments made annually by consumers. About half of all ACH bill payments are for insurance premiums, while the remaining payments are evenly split among mortgage loans, utility payments, and auto and other loans.

Customers can benefit from this service because it reduces time and postage in preparing and sending bill payments. Companies can benefit by reducing processing costs through handling fewer checks and obtaining payment in a timely fashion, which allows the company to better manage its cash needs.

Corporate-to-Corporate Payments and Cash Concentration. The main business use of ACH has been for "cash concentration." This ACH transaction allows units of a widely dispersed company to send money to a central deposit account. By doing this the company can economize on deposits, rather than having a large amount of money in several accounts across the

country. ACH has allowed companies to do this much more quickly and at a lower cost than was possible by check.

The payment of bills by one company to another, while a potentially beneficial use of ACH, is still overwhelmingly done by check. According to NACHA, in 1992, of the more than 10 billion trade payments made, fewer than 10 million were made by ACH.¹⁰

WHY HASN'T ACH GROWN MORE RAPIDLY?

While government use of ACH and the use of ACH for direct deposit of payroll have seen impressive growth, the growth of ACH in consumer bill payment and corporate trade payments has been slow. Partly this reflects technological advances that have increased the speed of check collection and processing. Because of technological developments in automated reading and sorting machines, a great deal of electronic sophistication is now used in processing checks. More rigid collection times and disbursement times for check availability, mandated under the Expedited Funds Availability Act of 1988, along with improved technology, have reduced delays in check collection, reducing float and increasing the acceptability of checks to payees.

In the case of consumer bill-paying and corporate trade payments, ACH payments also have some unique features that have made it difficult for ACH to gain ground on checks.

Whose Bill Is It? Paying bills using ACH has encountered two primary difficulties in gaining acceptance. First, in setting up a preauthorized debit transaction, in which a company directly debits the customer's account, the customer gives up the freedom to delay payment if she is temporarily short of funds. Instead she must make sure the money

⁹These data on transaction volumes were supplied by NACHA.

¹⁰These data on transaction volumes were supplied by NACHA.

is in her account before the company initiates the ACH debit transaction, which may require greater attention on the customer's part; this effort may not be worth the savings in time and postage of writing and mailing checks. In addition, for many people, writing a check acts as a reminder to verify checking account balances and to put money into their checking accounts to ensure that the balance is large enough to cover the checks they have just written.

The second difficulty of making bill payments occurs with credit transactions. Many companies do not accept bill payments by ACH—only a check will do. The bill-payment service of Germantown Savings Bank in Philadelphia vividly illustrates this point. Germantown Savings has had a telephone bill-paying service since 1979, and many customers use it. Over 45,000 payments are made each month through the service to more than 21,000 different firms. However, only 172 of these firms accept payments by ACH. For all the other firms, Germantown Savings must write checks to pay the bills.

Why do many firms choose not to accept bill payment by ACH? Because they are not likely to reap any cost savings by doing so. A credit transaction could arrive on any day of the month, and to easily find out the account number of the customer making payment, the company needs a computer link with its bank so that the bank can transfer the invoice information in machine-readable form. Even then, the firm must learn how to interpret the standardized account information encoded into the ACH payment, information which, with check payment, would arrive with the check on the company's own customized invoice. Furthermore, the company must maintain a system to read this information and update its accounts in response to the payment information. This process of learning and maintaining systems to read new ways of conveying information can be costly: witness the difficulty the U.S. has had in

attempting to convert to the metric system of measurement. Thus, the total cost to the company of an ACH transaction may end up being higher than the cost of accepting payment by check.

As a result of these control and information cost considerations, consumer bill payment has not made as much progress in displacing checks as many had hoped. Some new attempts at solving these problems are being made, especially in utility-bill payments. Utility payments are repetitive, and most important, only a small amount of information needs to be sent along with payment—the account number of the customer.

Several of the regional automated clearinghouse associations have taken the lead in promoting the use of ACH for the payment of utility bills. In particular, the Hawaiian ACH Association, the Mid-America Payment Exchange in Omaha, and the Mid-America Automated Payment System in Cleveland all have conducted marketing efforts to promote the use of preauthorized automated utility-bill payment.

The Hawaii program has probably been the most successful: more than 20 percent of the customers of the Honolulu Board of Water Supply, for example, now pay their bills through ACH, compared with a national average of less than 3 percent of utility bills paid by ACH. Furthermore, about half of all signups between September 1990 and September 1991 took place during the three months of an advertising campaign.

Pacific Bell has created another innovation in paying utility bills through ACH. Its system allows a consumer to call a telephone number, review the amount of her bill, and then instruct the company to debit her account on a particular day. This system solves the problem of the consumer's feeling that she doesn't control the timing of her payment in a debit transaction, while it preserves the merchant's preference, when choosing between debit and credit trans-

actions, for the easier-to-process debit transactions.

Your Format Is Not Talking to My Format.

For corporate trade payments a different problem arises.¹¹ Whenever payment is separated in time from delivery of the purchased item, information must accompany the payment to match it to the corresponding delivery. Often the information can be quite complex. Corrections to the invoice may be needed, or multiple invoices may correspond to a single payment. Until the early 1980s ACH was unable to convey such potentially large amounts of information along with the payment instructions.

The problem facing ACH was choosing a standard format for the information accompanying a payment. For example, suppose a firm wishes to send payment information to another firm. To do so, the first firm (or its bank) must translate its own internal format for the information into a standardized format, and the receiving firm must then translate the standardized information into its internal format. If the standard chosen by the ACH is cumbersome or not widely used by firms in other applications, the translation step could be costly and would ultimately inhibit the use of ACH.

At the time that the ACH was created, firms were just beginning to engage in electronic data interchange (EDI). NACHA recognized the need to send information along with payment and, in 1983, created a type of transaction, called the corporate trade payment (CTP), to include both payment and invoice information. However, the CTP turned out to be incompatible with the direction of the emerging standards used in EDI; therefore, a receiving firm's computer could not understand the message sent. NACHA soon understood that the CTP format was flawed. By 1985 NACHA devel-

oped another format for information, the corporate trade exchange (CTX), which was compatible with the new standards in EDI and which has proven much more successful, its use growing, according to NACHA, by 153 percent in 1992.¹² Undoubtedly, the difficulty in finding a standard and the slow acceptance of the agreed-upon standard have slowed the acceptance of ACH for trade payments.

DEVELOPMENTS IN POTENTIAL ALTERNATIVES TO ACH

Check-processing technology has improved over time, with the use of lockboxes spreading and with progress in developing check truncation using digital imaging. Developments in electronic payment systems have occurred as well, including point-of-sale systems and corporate credit cards. All of these potentially could compete with ACH.

Lockboxes have become an important method for firms to collect payments. With a lockbox, a company directs its customers to send their payments to a post office box. The firm's bank then collects the mail, deposits the enclosed checks, and then sends the firm information about who paid. The information sent by the bank to the firm is sometimes sent electronically by having the customer enclose with payment a document that can be read with an optical scanner. When payment is received, the bank scans this document and then sends this machine-readable information to the firm. This form of collection quickens the availability of checks and, in some cases, takes advantage of electronic processing.

Check truncation, which involves taking a digital image of the check at the bank of first deposit and, thereafter, simply sending the digital image electronically to the payer's bank,

¹¹See Scott E. Knudson, Jack K. Walton II, and Florence Young, 1994 (see footnote 6 for complete reference), for a comprehensive overview of the issues raised in this section.

¹²See Bernell K. Stone, *One to Get Ready: How to Prepare Your Company for EDI* (CoreStates Bank, 1988), for more on the development of the CTX transaction.

reduces the transportation cost of a check. If the imaging technology becomes more developed, and if use of the system grows enough to allow the high capital costs of the system to be spread over a large number of items, the processing cost could be less than that of processing a paper check. And truncation would offer consumers the benefits of familiarity and control that they enjoy with check-writing, although their checks would not be returned to them. However, the challenge of creating a successful system is similar to that of developing the system for corporate trade payments by ACH: agreeing on, developing, learning, and maintaining technologies to convey payment and invoice information electronically; and ensuring that such technologies are sufficiently easy to use that they will be adopted on a widespread basis.

Point-of-sale (POS) systems are becoming more popular in grocery stores and gas stations, places where both cash and checks are used, and for payments that are less repetitive than those primarily suited to ACH. The POS systems often settle their interbank balances by ACH, so to that extent they are complementary to ACH.

Corporate credit cards that feature monthly bills providing detailed information (sometimes available in electronic form) that a business needs to monitor and account for the purchases it makes are now being offered by banks. Such a service eases many problems in making low-value purchases by reducing the time and effort it takes to process and verify invoices. The transactions feature of corporate credit cards is another competitor for payments that are less repetitive than those best suited for ACH.

CONCLUSION

While the Automated Clearinghouse has not eliminated the check as a means of payment, specific uses of ACH have been successful. In particular, direct deposit of payrolls and the government's use of ACH have shown significant growth. In consumer bill-paying and corporate trade payments, obstacles to greater use of ACH are gradually being overcome.

The obstacles to more widespread use of the ACH include the difficulty of agreeing on, developing, learning, and using new ways of communication that can easily convey invoice information, and issues of consumer control of the timing of payment.

These obstacles are being overcome in specific types of payments: utility payments require little additional information to be conveyed, are repetitive, and are an area of healthy growth in the use of ACH; corporate trade payments are also an area of growth, in part because of the adoption of the CTX transaction format, which is compatible with other, more commonly used forms of electronic communication. However, many corporate payment invoices are complex and require that a large amount of information accompany payment, and these payments, even if repetitive, are less likely to be made by ACH.

New methods of payment are now being developed that have specific advantages over ACH for certain kinds of transactions. Thus it appears that the future will hold not just one type of payment method but many, including paper checks, lockboxes, check truncation, point-of-sale systems, and the Automated Clearinghouse.