Chapter 2

Electronic Funds Transfer Technologies and Services

Chapter 2

Electronic Funds Transfer Technologies and Services

Chapter Summary

Electronic funds transfer (EFT) consists of a group of technologies that allow financial transactions to be carried out electronically. Messages sent by several forms of telecommunication cause funds to be transferred from one financial account to another. The messages substitute for an exchange of currency or for a signed check that would bring about the same transfer. The term EFT has also come to include transfer of information critical to such transactions without an immediate transfer of funds; for example, authorization of credit or validation of checks by telecommunication. Although most EFT technologies are at most 15 years old, they are already having a significant impact on payment systems and on banks and other financial institutions. It is possible that within the next two decades EFT will transform the way Americans carry out their day-to-day commercial activities and personal monetary transactions.

Introduction

EFT is not one but several technologies, all requiring the processing and transmission of information by electronic means to effect an economic exchange and financial service. Some of these services (listed in table 1) are decentralized and are provided directly to the consumer at retail. They consist of transactions that may involve an individual, a provider of goods or services that are purchased by the individual, and one or more providers of financial services. In some eases, as in the use of an automated teller machine (ATM), the transfer is almost immediate. In others, value is conveyed by a paper instrument, such as a check, while the electronic service provides information to the recipient that good funds are being conveyed. For example, check verification services help eliminate uncertainty as to whether a check will be returned for lack of funds. Sometimes the consumer operates a machine that is used to provide an EFT service. In other cases, the consumer gains access to a service through an intermediary.

Table 1.–Financial Services –Non-EFT and EFT

I *Non-EFT financial transactions*

- Currency
- Checks and magnetic coding of checks
- Credit card services

// *Consumer orlented/decentralized EFT services*

A Services that facilitate the transfer of Informa-tlon

- Check and credit authorization
- Check verlfication
- Check guarantee
- Account status Inquiry

B EFT services that Involve direct money transfer

- Deposit
- Cash withdrawal
- Bill or loan payment
- Interaccount transfer
- Debit of transaction balance with overdraft privileges
- Credit purchase
- Cash advance

/// *Institution orriented/centralized* EFT *services*

- Direct deposit of payroll
- Preauthorized debit services
- Corporate cash management (including interbank and Intrabank transfers
- Interbank settlements and clearings

SOURCE Kent W Colton et al *Electronic Funds Transfer Systems and Crime* Pu bli r Sy sterns Eval u at O n I nc Feh ruary 1981 draft

Other EFT services (listed in table 1) are more centralized and generally are used for transfers between financial institutions, or between these institutions and large-scale users, such as the U.S. Treasury. These are also referred to as wholesale services and include wire transfers and automated clearinghouses (ACHs). Some electronic transfers take place entirely within the computer of one bank. At times individuals will participate in wholesale services, but most will not do so routinely. These centralized services are largely invisible to the consumer, and chiefly affect relationships between institutions. However, there are times when data that are identifiable with a particular individual are handled by a wholesale service; e.g., the transmission of payroll through the ACH network.

Most EFT services involve computers, automated data files, telecommunication links, and access systems. To fulfill the obligations of financial institutions to their users, and to guard against mistakes, EFT services create transaction logs and audit trails. All promise, when fully implemented, to deliver substantial cost savings. In transferring funds between accounts or institutions, the earlier in the processing cycle that data can be converted to a form suitable for machine processing, the greater the economies that can be realized. The rapidity with which EFT services become widely available depends in part on the rate of diffusion of several supporting technologies. Among these are the Touch-Tone" telephone, which allows individuals to send digital messages over EFT networks; home computers and interactive TV cables, which also provide that capability; switching and networking techniques, which facilitate the handling of large numbers of small messages generated between large numbers of comparatively dispersed locations; and improved, more secure access systems. At present, decentralized EFT devices are usually accessed by the combination of a plastic card and a personal identification number, but future systems could use handprints, fingerprints, voiceprints, or signature recognition,

Automated Teller Machines

The EFT technology that appears to have been most readily accepted and welcomed by the general public is the ATM. These provide the banking services used most often by consumers (except for loans). Most transactions can be accomplished faster and more conveniently than with human tellers, and many consumers appear to like the technology. Some use it by preference even when human tellers are available. One big attraction is service 24 hours a day, but customers who rely on this feature are, on occasion, seriously inconvenienced by finding the machine inoperative at a critical moment.

As shown in table 2, ATMs usually allow deposits to and withdrawals from both savings and checking accounts, transfers between these accounts, and queries about the account balance. Some permit the use of credit cards for cash advances. Frequently overdraft privileges are offered with accounts that are accessible through ATMs. Some ATMs have direct access to the financial institution's computer and update accounts immediately. Cash disbursements are limited to either a predefined amount or the actual account balance. Others operate independently of the institution's computer and merely limit the amount that can be withdrawn within a specified period. Actual account balances are updated daily.

ATMs may be located on or off the bank premises; most are accessible around the clock. However, because Federal courts have ruled that an ATM is a branch bank, State laws concerning branch banking limit the possible locations. The debit card used to activate the ATM may be proprietary to the

Table 2.—EFT Services and Technologies

EFT services	POS	ATM	TBP	ACH[a]
Consumer oriented/decentralized services				
A. EFT services that facilitate the transfer of information				
Check authorization	X			
Check verification	X			
Check guarantee	X			
Account status inquiry		X	X	
B. EFT services that involve direct money transfers				
Deposit		X	X	
Cash withdrawal		X		
Bill or loan payment		X	X	
Interaccount transfer		X	X	
Debit of transaction balance with overdraft privileges	X	X	X	
Credit purchase	X			
Cash advance		X		
Institution oriented/centralized services				
Direct deposit of payroll				X
Preauthorized debit services			X	X
Corporate cash management (including interbank and intrabank transfers)				X

NOTES: POS — Point of sale; TBP — Telephone bill paying; ATM — Automated teller machine; ACH — Automated clearinghouse

[a] Includes wire transfers by banks.

SOURCE: Office of Technology Assessment, and Kent W. Colton, et al., *Electronic Field Transfer Systems and Crime*, Public Systems Evaluation, Inc., February 1981 draft.

bank, offered under the logo of a credit card association, or offered by a third party without showing any financial institution identification. Both the card and a personal identification number are necessary for access. The Electronic Funds Transfer Act of 1978 requires that financial institutions make receipts available to customers at the time a terminal transaction is initiated. The act also requires that ATM transactions be shown on the periodic statement issued by the financial institution.

ATM networks may be proprietary to one institution, or they may be operated on behalf of multiple institutions by consortia or by third party operators, Networks that cross State lines limit services to conform to regulations on interstate banking.

Banks add ATMs to attract new customers and to increase the volume of accounts. In 1981, the cost of an ATM transaction, which is very volume-sensitive, reached a level comparable to the cost incurred using a human teller (l). The estimated average number of transactions per month at an ATM is 5,000, which represents one every 8 minutes around the clock, Some ATMs record as many as 20,000 to 30,000 transactions per month, or one every 1½ to 2 minutes (2). In 1979, the average deposit ranged from $137 in small communities to $248 in large communities, and the average withdrawal from $20 to $37, again depending on location (3). Thus, an average ATM deposit is much larger than an average withdrawal.

ATMs were installed at an average rate of 1,200 per year from 1974 through 1976. Fly 1979, the number had increased to about 3,000 per year, with a large backlog of orders for 1980 (4). The number of ATMs in operation in 1981 was estimated at 25,000 (5). This should double at least and could rise to 120,000 by 1990 (6). Continuing technological improvement would lower both initial and operating costs and decrease malfunctions and downtime. Changes in banking laws that would permit interstate deployment of full-service ATM networks could enhance their utility, and the availability of interstate access could be cost effective for both users and providers of financial services. Nonfinancial institutions are now offering ATM services through networks that cross State lines. However, interstate deployment by banks can be viewed as the implementation of interstate banking, Some believe that interstate banking could lead to the excessive concentration of power in a relatively few firms in the financial industry, and thus to a situation where financial markets are no longer responsive to local needs.

Point-of-Sale

Point-of-sale (POS) EFT technology deployed in supermarkets, department stores, discount chains, and other commercial facilities offers several kinds of services:

- check validation and credit card authorization,
- direct transfer of funds from a customer's account to the merchant's account by means of a debit card; and/or
- banking services; i.e., direct withdrawal of currency from (or deposit in) a depository account, using the merchant's cash drawer and sales personnel.

POS usually employs a terminal, which may be operated by a store clerk or by the customer, and a telecommunication link to customer information files within the institution providing the service (see table 3). There are an estimated 87,500 POS terminals now in service at retail locations primarily for check validation and credit card authorization (7).

One major problem with POS service is that it establishes a link only between one store (or chain) and one financial institution. It is impractical for merchants to have a terminal for every financial institution. Switching systems are needed, and although the technology is available it is not yet widely used.

Table 3.— Point-of-Sale Services

	Functions and resources at the point of sale			
	Customer operated terminal	Retailer's cash	Store personnel	Bank personnel at retailer's site
Transaction authorization	Customer uses terminal to get authorization before entering the checkout line. Terminal may imprint the check or provide a separate authorization document.	Retailer's cash may be given to the customer once authorization has been obtained.	Check for authorization and dispense cash as appropriate. Accomplish tasks to complete sale.	May operate the authorization and provide documentation to customer.
Fund transfer	Enters PIN or other information required to establish the legitimacy of the transaction.	Probably not involved. May be some cases where the retailer will permit the customer to take change in the form of cash.	Perform the standard tasks required to accomplish a sale.	Not involved.
Banking services	Terminal may be an ATM and is able to handle all aspects of the transaction. Terminal may accept deposits and issue voucher against which the retailer gives customer cash.	Retailer may accept deposits and disburse cash using the register to hold inventory of cash.	May operate a terminal and perform all or some of the functions of a bank teller.	May operate a mini-branch in the store, performing all of normal teller functions. Or may provide only limited functions and rely on customers and store personnel to accomplish most of the required tasks between them. In some ways more of a conventional branch than EFT.

SOURCE Office of Technology Assessment

Credit Card Authorization and Check Validation

Credit card authorization services are operated by card providers or by organizations that perform processing on their behalf. Clerks use either telephones or terminals to determine whether a card should be honored for a particular transaction. The decision is made on the basis of files that show the total activity of a card. Check validations can be piggybacked onto this service or may be operated independently.

There are two kinds of check validation services—those that have direct access to customer checking account balances (positive files), and those that depend on information gathered from a variety of other sources. These sources include records of a consumer's transactions with the system and data reported by participating institutions, not actual account records. Because these files contain only information that is used to disallow transactions, they are called negative files. Some systems provide only an indication that the transaction is good, while others indemnify the merchant against loss.

Both merchants and customers would benefit from a system that improves check validation and credit card authorization, especially on an interregional or nationwide basis. However, users are wary of any validation/authorization system that may cause embarrassment by unanticipated rejection at the point of sale. Consumer-operated POS terminals, which provide written authorizations that can be presented to a clerk, may be one acceptable solution to this problem.

It is projected that POS-based check guarantee and credit card validation services will be available in 10 to 40 percent of all metropolitan areas by 1985, and that 10 to 50 percent of all transactions within those areas would utilize these services (8).

Debit Cards

Direct transfer of funds from a customer's account to a merchant's account by means of EFT services at the point of sale is less common and the outlook is less certain. Today, debit card transactions are usually processed by the same facilities that process credit card transactions, differing only when the final debit to the customer's account is made. In the future, debit transfers will be accomplished electronically. Consumers would lose some maneuverability in managing their financial resources and scheduling disbursements if the debit card were to replace the credit card. However, the debit card would be convenient as a substitute for cash or a check, for instance, in supermarkets where credit usually is not available. If the cost of credit continues to increase, consumers may regard debit cards more favorably, especially as the use of ATM cards makes the concept more familiar.

The outlook is for financial institutions and joint ventures to take the lead in offering these services. They are likely to be installed first in supermarkets and shopping centers. To be economically feasible, the service requires a shared communication network and improvements in terminals, cards, magnetic tape storage, fiber optics communication, and security (identification) systems. Expectations are that by 1985, 10 to 20 percent of metropolitan areas will have access to these services, and by 1995, as many as 40 percent (9).

Telephone Bill Payment

Many telephone bill payment (TBP) services allow customers to pay bills using a home telephone to instruct a bank computer to transfer money from their account to that of a creditor. Others record the customer's verbal instructions on a tape or through the intervention of a human operator. In the latter case, there is an additional step of transforming the input for computer processing. However, the more widespread availability and use of Touch Tone® service, and the continual increase in the cost of human labor, will lead to the phasing out of TBP services that do not take input directly from the customer. In 1979, 36 percent of residences already had Touch-Tone® telephones. American Telephone & Telegraph projects that this will increase to 64 percent by 1984, and perhaps to 90 percent by 1995 (10). Present Touch-Tone@ -based services often use a voice synthesizer to respond to customer inputs. Direct voice input may be available in the future, and at least one device capable of processing voice input for a TBP application has been demonstrated.

A major drawback with TBP service is that the customer has no proof that instructions for payment have been given until a monthly statement is received. This provides the customer's only proof of payment. In case of a dispute, the customer may find it difficult to substantiate claims.

In some systems, a new customer provides a list of those who are to receive payments, and is afterward limited to that list or modifications of it. Signed documents are used as the basis for creating the list of payees and to support any changes that may be made to it. In other systems, the service provider has a standard list of those to whom payments may be made, and all customers are limited to that list. All payments to one receiver are aggregated for some period of time before being deposited to the account. Some merchants have expressed dissatisfaction with TBP since some service providers have not done a good job of coordinating with them.

Thrift institutions were motivated to offer TBP services as a means of getting around the legal prohibition on interest-paying checking accounts. This prohibition was rescinded by the Financial Institutions Deregulatory and Monetary Control Act of 1980. At the end of 1980, there were 302 financial institutions—primarily savings banks—offering TBP, and the Electronic Funds Transfer Association estimates that TBP transactions are now growing at about 27 percent a year (11). The following factors could greatly increase its future use:

- cross-marketing with negotiable order of withdrawal (NOW) accounts;
- continued increases in postal rates;
- increased charges for checking accounts;
- the addition of such services as securities transactions and catalog ordering; and
- development of the capability to encode voice inputs automatically.

The growth of cable television and its use for two-way communication could add a new dimension to TBP services. The popularity of home banking, which concentrates on financial management services such as account transfers, credit applications, and other financial information, is likely to increase as the necessary equipment becomes available in more and more households. Most major banks have plans for testing or implementing these services in 1981-82, and some financial institutions are already involved. However, the ability to either make a deposit or distribute cash via home banking services will be impossible, at least for the foreseeable future (12).

Wire Transfer

This is the earliest form of EFT, since funds have been sent by wire since the first telegraph lines were strung well over a century ago. The transfer of funds by telegraph is chiefly used to move large sums for commercial customers. Financial institutions use Fedwire, operated by the Federal Reserve System, or Bank Wire II, a service provided through a corporation owned by the banking community. Both are now being upgraded to use the newest technology. Commercial banks can connect their computers directly to the wire networks to speed up the process.

The Federal Reserve System is now assessing the question of whether large checks should be presented by wire, with paper checks following only to confirm the transaction. This would help to reduce float and achieve a long-standing goal of the Federal Reserve System.

Check Truncation

Checks cent'entionally are returned to the writer by the bank and often represent the only receipt for a payment. Checkwriters frequently are careless about filling out stubs, and rely on returned checks for a record of their transactions to support tax returns and for other purposes. But check handling and return are a costly burden for financial institutions, especially with the rising cost of postage.

With EFT, checks can be *'truncated" when deposited or at the clearinghouse; i.e., they can be recorded on magnetic tape. Checks may also be retained by the institution holding the account against which they are drawn. The accountholder then gets back only a periodic statement. Since the Bank Security Act requires that all checks over $100 be recorded, * no additional data would have to be recorded by banks other than a check reference number for easy location of the cancelled check. The account holder, however, has to maintain accurate records so that a copy of a check may be requested in case proof of payment is required. Payee information could be automated and added to the statement if there were public demand for it. However, this would require additional encoding equipment, thus increasing the cost. This information would also be added to the automated information file, which might raise further concerns about privacy.

*Recording of checks under $100 is optional. However, as a matter of routine practice, all checks are recorded.

Automated Clearinghouses

ACHS comprise a centralized EFT system that serves institutions rather than individuals, Instead of having checks sorted and physically dispatched to the debiting bank, an ACH receives, sorts, and distributes payment information on magnetic tape, which instructs banks to debit and credit accounts at a specific time. ACHS are most commonly used by large organizations for direct deposit of payroll "checks" and for collecting preauthorized consumer payments, such as insurance premiums and mortgage payments, Payment transactions initiated by individual consumers using such services as TBP can now be handled through the ACH network. As an alternative to the use of magnetic tape, an ACH can move data directly from computer to computer via telecommunication.

Originally, ACHs handled only batches of transfers, but now individual transfers can be handled one at a time. There are 32 ACHs 31 of which are operated by the Federal Reserve System. In 1979, they carried 14.5 million transactions in an average month, and transactions were increasing by about 130 percent per year.* Although 60 percent of all financial institutions (about 26,000) participate in an ACH, 75 percent of the traffic is originated by the Government for social security checks, military payrolls, and some civilian payrolls. The U.S. Treasury would like to expand its use of ACH to deliver, for example, all social security checks, all Federal employee payroll checks, and all tax refunds (13). The Treasury estimates that electronic payments cost them only $0.02 each compared with $0.17 for a paper check. Bank costs for handling a Government payment also drop from $0.225 to $0.085. The Federal Reserve System itself suffers a slight penalty; $0.01 for an electronic item compared with $0.005 for a check (14).

*Estimated; Federal Reserve ACH monthly totals, added to New York ACH private volume.

Only a few private companies use automatic payroll deposit, partly because it reduces their float. If postal rates increase sufficiently to offset the benefits of float, and if the Federal Government were to increase its use of ACHs (e.g., requiring Federal employees to accept direct deposit), ACHs should greatly expand in the future. Improvements in minicomputers and data transmission will also encourage expansion. An expanded ACH system could also be used for TBP and check truncation. Within 15 to 20 years, it is possible that virtually all financial institutions and other providers of payment services could be linked in an online, real-time system of exchanges across the Nation through the ACH network (15).

Chapter 2 References

1. "Electronic Banking," *Business Week,* Jan. 18, 1982, p. 76.
2. Linda Fenner Zimmer, "ATM Boom Ahead," *Magazine of Banking Administration,* May 1979, p. 33, and Electronic Banking, Inc. [Sept. 23, 1981 letter from Allen DeCotiis).
3. Ibid., p. 146.
4. Zimmer, op. cit., p. 33,
5. 1981 data from Electronic Banking, Inc. (Sept. 23, 1981 letter from Allen DeCotiis).
6. Based on industry studies and IBM estimates (Sept. 7, 1981 letter from Jerome Svigals).
7. Ibid.
8. Working Paper B., Electronic Banking, Inc., *EFT: The Next 15 Years* (June 30, 1980).
9. Ibid.
10. Ibid.
11. LINK Research Report, *Current Initiatives in Mass Market Transactional Services,* NRR, VOL. 2, No. 4, August 1981.
12 Ibid.
13 Information received from Department of the Treasury, Office of Fiscal Assistant Secretary, Operations Planning and Research Staff (August 1979); see also Carl M. Gambs, "Automated Clearinghouses: Current Status and Prospects," *Federal Reserve Bank of Kansas City Economic Review,* May 1978, p. 10.
14. Division of Federal Reserve Bank Operations, Board of Governors of the Federal Reserve System, *Costs, Savings, and Benefits of Electronic Government Payments (1977),* pp. 56; Earl G. Hamilton, "An Update on the Automated Clearinghouse, *Federal Reserve Bulletin,* July 1979, pp. 52-56; Federal Reserve, "The Payment System in the United States," Jan. 25, 1979, pp. 4-7. The $0.005 does not include the cost of "float.
15 Working Paper B, op. cit.