

**AUTOMATED TELLER MACHINE (ATM)
NETWORK EVOLUTION IN
AMERICAN RETAIL BANKING:
WHAT DRIVES IT?**

by

Robert J. Kauffman
Leonard N. Stern School of Business
New York University
New York, New York 10003

and

Mary Beth Theisen
Leonard N. Stern School of Business
New York University
New York, NY 10006

November 1990

Center for Research on Information Systems
Information Systems Department
Leonard N. Stern School of Business
New York University

Working Paper Series

STERN IS-91-2

AUTOMATED TELLER MACHINE (ATM) NETWORK EVOLUTION
IN AMERICAN RETAIL BANKING: WHAT DRIVES IT?

ABSTRACT

The organization of automated teller machine (ATM) and electronic banking services in the United States has undergone significant structural changes in the past two or three years that raise questions about the long term prospects for the retail banking industry, the nature of network competition, ATM service pricing, and what role ATMs will play in the development of an interstate banking system. In this paper we investigate ways that banks use ATM services and membership in ATM networks as strategic marketing tools. We also examine how the changes in the size, number, and ownership of ATM networks (from banks or groups of banks to independent operators) have impacted the structure of ATM deployment in the retail banking industry. Finally, we consider how movement toward market saturation is changing how the public values electronic banking services, and what this means for bankers.

1. INTRODUCTION

The organization of automated teller machine (ATM) and electronic banking services in the United States has undergone significant structural changes in the past two to three years that raise questions about the long term prospects for the retail banking industry, the nature of network competition, ATM service pricing, and what role ATMs will play in the development of an interstate banking system. In this paper we investigate ways that banks use ATM services and membership in ATM networks as strategic marketing tools. We also examine how the changes in the size, number, and ownership of ATM networks (from banks or groups of banks to independent operators) have impacted the structure of the ATM deployment in the retail banking industry. Finally, we consider how movement toward market saturation is changing how the public values ATM services, and what this means for bankers.

In analyzing banks' use of ATMs as strategic marketing tools we will evaluate bankers' decisions to provide ATM services, to join one or more networks, and whether to charge retail customers for ATM services. We think that changes in the structure of ATM services in the retail banking industry can be best understood by evaluating what factors have been most significant cost drivers. To make this case, we have organized our thoughts as follows. We first discuss the views of the Federal Reserve Bank of Boston on network evolution, and compare the current state of the industry to some of the Fed's predictions. Then we look at the current organization of the industry, how networks are growing, and how banks assess the strategic role of ATM services. This prompts us to examine some recent changes in bank strategies for using ATMs to generate revenues. We will also discuss retail banking customers' "willingness to pay" for services in light of some substantial benefits they receive in mature ATM markets.

2. ATM NETWORK EVOLUTION: A VIEW FROM THE FED

In a paper published in 1986 Steven D. Felgran and R. Edward Ferguson (FELG86) of the Federal Reserve Bank of Boston examined

the evolution of retail electronic fund transfer (EFT) networks. Specifically relevant to this paper is their review of the evolution of ATMs from proprietary to shared networks. Felgran and Ferguson argued that this evolution results from changing cost structures and marketing strategies, and projected that the trend toward shared networks would continue barring the imposition of regulatory constraints.

According to Felgran and Ferguson, ATM networks progress through five phases: proprietary, shared, multiple memberships, direct links, and universal sharing. The phases and their key characteristics are presented in Table 1.

INSERT TABLE 1 ABOUT HERE

By 1986 many networks had passed through the proprietary and shared stages as the number of networks increased and the marketing benefits of a proprietary network were outweighed by the convenience offered to customers of networks with multiple memberships. With access to a greater number of machines, ATM use would increase and the cost per transaction would fall. As the systems evolved toward universal sharing, ATM networks would be consolidated in order to establish more efficient direct links, driving down data processing overhead. Felgran and Ferguson saw this happening in 1986 with mergers, regional joint ventures, and the establishment of direct links between independent networks. They also predicted that the change in the structure of the industry would result in competition among institutions based on the pricing and nature of ATM services.

As Felgran and Ferguson projected, consolidation, universal sharing, and direct links are all taking place within the banking industry, but the competition based on price and nature of service has not completely materialized at the retail level. Nevertheless, there is some evidence of price competition at the wholesale level, and this is increasingly being passed on to retail customers.

3. CONTINUING NETWORK EVOLUTION: SOME EVIDENCE

With the establishment of universal service within most regional networks, access to a large number of geographically well distributed ATMs has become a basic banking service that customers expect. Convenient service is the key to a successful network, and banks outside the networks often find it difficult to compete with the convenience network members can offer their customers. For example, in the Washington, D.C. metropolitan area the last owner of a proprietary network, First American Bancorp, joined the MOST network last year. Because convenience is so important to ATM users banks have not had to compete on price to the extent that was anticipated. Demand for the service is strong enough that banks can charge fees to recover some, or all of the fees they are charged for "us-on-others" interchange transactions.

Changes in Industry Structure

As consolidation has progressed, ownership of the networks has passed from individual banks to consortia and third party vendors. Non-bank operators with expertise in communications and payment systems also have joined the fray. Consolidation of ATM networks has taken many forms, from outright acquisitions of existing networks to consortia formed by banks within regions to expand the number of machines available to customers. For example, the Plus System was originally conceived by D. Dale Browning, president of Colorado National Bank in 1977 as a means of competing with bigger banks. It has since grown to be one of the largest networks in the country. In 1982 Plus was sold to a consortium of 24 banks (SNIT87).

In late 1987 MasterCard purchased the Cirrus System, Inc., a shared ATM network of national scope, from a cooperative of six banks, for a reported \$38 million. MasterCard made the purchase intending to apply technology and principles used in their credit card business to electronic banking to decrease costs and response time. Visa entered the ATM market earlier than MasterCard by purchasing a minority interest in the Plus network, another nationwide player. The purchase price was in the neighborhood of

\$5 million, and Visa took away an option to purchase Plus outright. With both major networks affiliated with national credit cards, the scope for additional marketing opportunities, including point-of-sale (POS) debit systems, was expanded. Non-bank organizations that have started networks include ADP, First Financial, and GTE, yet none compares to the scope of the positions held by MasterCard and Visa in Cirrus and Plus (MULQ87).

Spencer Nilson, author of an influential industry newsletter, predicts the industry will eventually be dominated by two major networks, similar to the domination of the national credit card market by Visa and MasterCard. According to Nilson, "since 1983 half of the top 100 banks and 30 of organizations switching transactions on ATMs joined national systems run by Cirrus or Plus" (MULQ87).

Costs and Economic Considerations of Network Consolidation

Nilson expects a shakeout in the long run that may leave some regional networks intact, as low cost entrants to the national networks. But he sees few, if any small networks surviving. Other industry experts agree with Nilson that networks are going to have to maintain a substantial volume of traffic in order to remain viable.

When Browning started the Plus System with an initial link between Colorado National Bank and Central Bank of Denver, he saw the opportunity to provide account access to his customers via ATMs across the country as an important marketing tool (SNIT87). In February 1988 Browning proposed the Plus System join forces with Cirrus to allow access to each other's machines. Browning saw the need for banks to leverage one another's base of deployed ATMs and offer universal access in order to compete against non-bank competitors such as Sears and American Express. But at that time, his proposal for "duality" was soundly rejected (KUTL88B).

The current state of affairs in retail banking competition does much to emphasize the importance of cost effectiveness, and with inter-connections between the Cirrus and Plus networks just getting underway at the national level, the stage is set for the

re-evaluation of costly excess capacity. The recent merger of the MAC and CashStream networks in Pennsylvania is another good example of rational cost-based network down-sizing. Joseph Pendleton III, Senior Vice President of Electronic Banking at Reading, Pennsylvania-based Meridian Bancorp commented to us that there have not been many changes in ATM placements in the southeastern part of the state, but where ATMs have been eliminated, obvious duplication of MAC and CashStream machines had been occurring.¹

Current Nature of Competition

Dale Browning maintains that competition is now based on cost, reliability, response times, and system uptimes instead of the number of machines and their location as it was just a few years ago. According to Browning, "[s]ystem sharing leads to greater convenience for customers, creating more usage in the form of transaction volumes, and more favorable costs to us that we can pass along to users." Browning's comments suggest that substantive refinements are being made to previous broad-brush "locate-and-process" strategies, and they are clearly in line with the push for profitability in increasingly competitive markets.

Most bankers agree they need to offer ATM services and access to a large regional, if not national, network to participate in the retail banking market. ATM services have become as basic to banking as checking and savings accounts, but many banks have charged all along via minimum checking balances, or are instituting fees. The key competitive factor in their ability to charge for this service is the level of convenience they can offer customers, with connections to foreign ATMs as a prime example. Most bankers, however, say that at best they are able to cover their costs of providing this service, but not generate significant revenue from it. According to W. Olen Thomas, Vice President of Branch Locations and Facilities with Crestar Bank, access to ATMs is

¹Interview with Joseph S. Pendleton, III, Senior Vice President, Electronic Banking, Meridian Bancorp, Reading, Pennsylvania.

viewed as a basic banking service by most bank customers. Value is added with the greater convenience offered by access to a network, and customers are willing to pay for this added convenience. Crestar has always charged their customers for use of foreign ATMs, but the amount charged is only enough to cover Crestar's cost for a transaction.²

There are other less tangible benefits supplanting the costs though; for example, the extent to which ATM deployment protects customer accounts and retail deposits, and the extent to which ATMs complement branch labor, by extending the effective service capabilities of a bank. While they are not usually quantified in standard analyses, banks are likely to exhibit the same "willingness to pay" for intangible benefits (in terms of the costs they bear) as are their customers (BANK90).

4. REVENUE OPPORTUNITIES IN CHANGING MARKETS

Despite claims by network operators and bankers that increased transaction volume will enable them to pass along cost savings to customers, there is no evidence that savings actually are being passed along to retail bank customers. In fact, a 1986 study by Sheshunoff and Company, a Texas consulting firm, indicated the trend for banks to charge customers for ATM transactions was just getting started. Of the 1300 commercial banks surveyed by Sheshunoff, 17% charged their customers for transactions on their own machines but 40% charged for interchange transactions (KUTL86).

In recent years bankers have begun to charge customers for most bank services (this has been euphemistically called "unbundling"), and there has been some speculation that many banks were not charging for ATM transactions because usage had not yet reached a "critical mass." At the time of the Sheshunoff survey, less than 15% of bank customers were considered frequent ATM users. But, most bankers ascribed the low usage to poorly targeted

²Telephone interview with W. Olen Thomas, Vice President of Branch Locations and Facilities, Crestar Bank, Richmond, Virginia.

marketing rather than pricing. The Sheshunoff survey noted banks have been able to charge significantly more for "foreign" bank transactions (interchange) than they charge for transactions on their own machines. This again suggests customers' "willingness to pay" for convenience. In 1986 interchange transactions increased 30%, while intrabank transactions grew only 1.3% (KUTL86). Today, despite the charges which increasingly are being passed on to customers, interchange transactions are still growing (MULQ87).

Many smaller banks initially decided to not charge customers for foreign transactions as a defensive measure. They saw a need to allow customers to use other banks' machines for free in order to compete with big banks that had a broad geographic presence. With the move toward universal access, however, these banks are losing as they must pay for their customers' transactions on foreign machines and are not receiving offsetting revenues from other banks' customers' use of their machines. One banker we interviewed said that larger banks had already discouraged their customers from using foreign machines prior to the merger of their networks by instituting a charge for such transactions. When the networks merged his customers increased their use of foreign machines, but his bank did not have a large enough number of machines to generate significant income from "others-on-us" transactions. They are now considering the institution of a charge for foreign transactions as a defensive measure.³

Some smaller banks have gone so far as to question the need for continued investment in ATM hardware on their part. They often do not operate enough machines to generate any significant fee income from other banks, and because they can now offer their customers use of other banks' machines, the most important consideration is to be able to offer their customers a card

³Telephone interview with Austin Kelly, Executive Vice President of Operations, Germantown Savings Bank, Philadelphia, Pennsylvania.

allowing access to the network.⁴ In the age of proprietary networks, the investment in hardware was not an option: banks had to invest in the hardware to offer their customers ATM services to compete with larger banks.

Other evidence suggests that cost savings as a result of increased transaction volumes have been passed along to network members, but not necessarily to bank customers. In mid-1988 the New York Cash Exchange (NYCE), largest among the regional networks, cut the transaction-processing fees an average of 20%. This was the third time charges had been reduced since the network was organized in 1985. NYCE was not the only network taking advantage of economies of scale to make themselves more competitive. Star System, Inc., the second largest regional network in the country (based on number of machines), also cut its prices an average of 20% in early 1988 and other smaller networks followed suit (KUTL88C).

NYCE did not change the one-time participation fee charged new members when they reduced transaction costs. These costs vary with the size of the institution and the location. Institutions in the New York metropolitan area reportedly were charged from \$5,000 to \$20,000 to join the network, and those in nearby states were charged about half those amounts. Institutions in more distant states were not charged entry fees at all (KUTL88A). From their three-tiered network entry pricing strategy we surmise that NYCE is not ready to allow universal access on their machines. Instead, NYCE's members are seeking to increase convenience to their customers, but still utilize the ATM location as a competitive tool. Since the competition in the region comes mostly from Citibank's aggressively managed proprietary network, NYCE members do not have a point of direct comparison for network entry fees; no other alternative is readily available.

⁴Interview with Linda Townsend, Senior Vice President, Century National Bank, Washington, D.C.

5. CUSTOMER 'WILLINGNESS TO PAY' AND ATM NETWORK EXTERNALITIES

Obviously, the form of ATM network arrangements has been evolving. But, paralleling this evolution is another set of changes in the way ATM network services are priced by owners to members and retail customers. In fact, we believe that there are two additional elements which have been overlooked by many analysts, which can supplement the obvious arguments concerning the push for passing on costs and improving profitability. Those elements are:

- * *Network externalities* associated with large ATM networks have never been higher, and the scope of the capabilities offered has never been broader.
- * *Increased customer awareness* of the extent to which ATM network services have matured enables them to articulate the value of those services.

"*Network externalities*" are benefits which accrue to users of a network as a network grows (FARR85, KATZ86). They embody the idea that the value of ATM network connectivity is not directly proportional to the sum of the nodes in the network from the perspective of a user. In proprietary networks, network value is capped by the efforts customers must put into searching for a "compatible" machine. And due to the likely limitations on the size of the network, users will not be covered in many places they visit. For shared network customers, it is more important to know *where* sharing occurs and *which* shared network dominates in a given region (BANK88, KAUF89). Today near universal access to the major nationwide shared ATM networks (particularly Cirrus and Plus) has created sizable benefits for the business traveler and the vacationer, as well as the day-to-day user whose search costs are greatly reduced.

Our basic argument is that bank customers are rational: they know how to value the tremendous scope of the connectivity which has rapidly become possible. If they are unable, in a word, to say what it is worth to have access to a national network, at least they can articulate how much they would have to be charged before

they would no longer be willing to pay. Clearly, not everyone shares equally in those benefits, nor are banks' customers equally interested in making use of such connectivity. Thus, in the current market for ATM services in the U.S., bankers will evidently have to exercise much care and probably some patience (so as not to alienate some customers) in setting up charging arrangements.

Figure 1 below suggests the S-shape of the "ATM network value externality curve."

 INSERT FIGURE 1 ABOUT HERE

The basic idea is that as networks grow, bank customers (and banks, which we will consider momentarily) experience the rapidly increasing benefits of connectivity. However, at some point the market becomes relatively saturated with ATMs and the network externalities that customers enjoy stop growing. When ATMs become available just about everywhere. At this point, customers can readily evaluate the benefits they receive. In fact, we think they eventually reach a point where they will think it is reasonable to pay for the service they receive, because they perceive the costs and inconvenience of having to do without it.

Of course, a few caveats go along with this argument. *First*, we haven't calibrated how many nodes are associated with a consumer's reckoning of "MAXIMUM VALUE". Clearly, this is a matter of individual taste, ATM usage and travel patterns, but most bankers should be able to make some educated guesses based on their knowledge of their bank's customer base. *Second*, banks themselves are also likely to be sensitive to the "externality benefits" of growing networks, but the number of nodes they would associate with various levels of value is likely to depend importantly on their overall retail banking strategy. With growing participation from the credit card companies and the growth of POS debit networks, there clearly is a move to make ATM networks the platform from which to launch an even broader set of financial services-related

products.

We believe there will be changes in the form of charging arrangements associated with changes in externality benefit customers perceive. These will extend to both retail customers and institutional ATM network members. Table 2 below provides an overview of how we think the changes have occurred, and what is likely to come as ATM markets move in the direction of universal access.

INSERT TABLE 2 ABOUT HERE

6. CONCLUSION

Clearly, the views on network evolution and charging arrangements we have presented here will have to stand the test of future, not just past, developments. In addition, the shape of the "ATM network benefits curve" which we have proposed is really a hypothesis, which must be verified by measuring how bank customers and banks themselves value connectivity. We are presently in the process of identifying potential participants in such a study, and would welcome comments from interested readers.

In conclusion, we believe that the framework suggested by Felgran and Ferguson of the Boston Fed still makes a lot of sense in 1990. In the long run the networks that survive will be those that can build the highest transaction volume and cut their processing costs to the bone. The credit card companies obviously feel they have a competitive edge in this area, and think credit card operations experience is transferrable to other forms of electronic banking. Browning has described the ATM as "... a utilitarian delivery device," but whether bankers will use it to differentiate their banks via services offered on the machine, or as a means of stretching their markets across state lines, remains to be seen.

All this suggests that the road to further network evolution

seems to be heading towards universal access and towards capabilities which will redefine the ATM of the 1980s for its role in the 1990s. Universal access will create scale economies that just were not possible in the past. And the "new generation of software-saturated ATMs" detailed by Paul Korzeniowski in a recent article in *Software Magazine* (KORZ89) will create economies of scope that should substantially boost the quality of ATM services, even if prices charged to customers remain stable or slightly increase. We think that consumers will accept the charges as they internalize the value of the new high functionality ATM network externality benefits.

REFERENCES

- BANK88 Banker, R. D., and Kauffman, R. J. Strategic Contributions of Information Technology: An Empirical Study of ATM Networks," in *Proceedings of the Ninth International Conference on Information Systems*, Minneapolis, MN, December 1988.
- BANK90 Banker, R. D., and Kauffman, R. J. Quantifying the Business Value of Information Technology: A Conceptual Framework and Illustration, Working Paper, Stern School of Business, New York University, November 1990.
- FARR85 Farrell, J., and Saloner, G. Standardization, Compatibility and Innovation, *Rand Journal of Economics*, 16, 1985, pp. 70-83.
- FELG86 Felgran, S. D., and R. E. Ferguson. The Evolution of Retail EFT Networks, *New England Economic Review*, July-August 1986.
- KATZ86 Katz, M. L., and Shapiro, C. Technology Adoption in the Presence of Network Externalities, *Journal of Political Economy*, 94, 1986, pp. 822-841.
- KAUF89 Kauffman, R. J., and Zajonc, P. A. Business Case for ATMs: Determining Strategic Value, *EFT Today*, June 1989.
- KORZ89 Korzeniowski, P. This ATM Generation is Software Saturated, *Software Magazine*, June 1989, pp. 77-79.
- KUTL86 Kutler, J. Banks that Charge ATM Fees Are a Minority That's Growing, *The American Banker*, December 30, 1986, pp. 6-11.
- KUTL88A Kutler, J. MAC ATM System Widens Lead; NYCE Now Ranks Second in Volume, *The American Banker*, July 1, 1988, pp. 1-16.
- KUTL88B Kutler, J. PLUS, Cirrus New Pact on ATM Sharing, *The American Banker*, February 5, 1988, pp. 1-15.
- KUTL88C Kutler, J. NYCE Lowers Transaction-Processing Fees an Average of 20%, *The American Banker*, July 1, 1988, p. 16.
- MULQ87 Mulqueen, J. T. Networking Dollars and Sense: ATMs Uniting Nationwide, *Data Communications*, October 1987, pp. 85-92.
- SNIT87 Snitzer, A. Plastic Profits, *Forbes*, August 10, 1987, p. 116.

Table 1. ATM Network Evolution: A View from the Federal Reserve Bank of Boston

PHASES OF ATM NETWORK EVOLUTION	NETWORK AND COMPETITIVE CHARACTERISTICS
1. Proprietary	Initially provides a competitive advantage to increase or stabilize market share. Potential for cost savings through reduced teller and check processing costs.
2. Shared	Increased customer convenience with access to a greater number of machines. Opportunities to reduce unit costs and generate fee income from interchange revenues.
3. Multiple Memberships	Develops in markets with high shared ATM coverage, and reduced competitive advantages of exclusive memberships.
4. Direct Links	Technical efficiencies that enable networks to proceed more smoothly to the final stage of universal service. Consists of the establishment of direct interchange arrangements.
5. Universal Service	Universal cardholder access to all machines.
<i>SOURCE: Felgran and Ferguson (FELG86)</i>	

Table 2. Evolution of Charges for ATM Services

PHASES OF ATM NETWORK EVOLUTION	INCENTIVE TO INCLUDE CHARGING ARRANGEMENTS	PREDICTED FORM OF CHARGES LEVIES
1. Proprietary	Low, since success likely to be dictated by owner's customers' acceptance.	If any, per account or per or per transaction for bank's customers only.
2. Shared	High for owners, to pay for substantial hardware and software investment. Medium for members who experience "unbalanced" foreign transaction volumes.	Fee for network membership, and per transaction switch fees. Foreign transactions charged among members, not not passed on until shared arrangements stabilize.
3. Multiple Memberships	Still high for owners, but more competitive as several simultaneous network membership choices may be be possible. Higher for members which continue to experience unbalanced foreign transaction volumes.	Fee for network membership, and per transaction switch fees. Foreign transaction charges likely to be passed on to customers.
4. Direct Links	High for owners, as they realize customers are able to "price" benefits (in terms of willingness to pay for gains in network externalities) explicitly.	Movement towards unbundled charging for institutional members, and increasingly for retail customers.
5. Universal Service	Network ownership matures as firms articulate charges for services and standardize charging arrangements.	Institutional members and retail customers accept "rational" rational charges due to clear understanding of benefits.

Figure 1. ATM Network Externalities in Terms of Number of Network Nodes

