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How Computers Influenced Commercial Banking

The commercial banking industry has vastly changed socially and as a service with the introduction of computing. Although the basic ideas of deposits and withdraws remained constant, technology allowed commercial banks to become more customer-orientated and provide products and services more efficiently. For example, automation facilitated the increase in demand for transactions through electronic fund transactions and ATMs, which decreased the need for human tellers. In addition, computing increased labor productivity by allowing more efficient record keeping and fraud analysis. Services like online banking also allowed the subscriber to better manage account activity, which increased trust and security. Finally, application and web development introduced a social aspect to banking. Apps like Venmo became popular among college students due to like-and-comment features with transactions. Computers evolved banking to become less dry and more intuitive to open accounts, complete transactions, analyze banking history, and make more informed investment decisions. This paper will cover the overall narrative of computers in banking, starting from the early twentieth century, when manual labor dominated the industry, to the present day.

1900-1950

The banking model in the early twentieth century was like today: there were institutions that accepted deposits payable on demand and issued loans (Rajan, 524). The model worked, but at a much slower pace (Tech Times). By 1929, Bank of America, a bank that would prove to be at the forefront of innovation for banking technology in the fifties, had 453 offices in California alone, with financial resources over $1.4 Billion (Tech Times). The most important asset to customers at the time was cash because of its liquidity and that it was the main asset people traded for goods. If you wanted to withdrawal money from a non-local branch, there was a substantial waiting time for confirmation because of shorter working hours. Checks helped

customers in this process because they acted as withdrawal slips that could be deposited at any branch, and the branches would handle the transfers (Tech Times). The shorter working hours derived from the manual updating of ledger cards and Dickensian-like handwritten books, which kept track of your account after banking hours (Tech Times). The 1920s-1950s saw improvement in efficiency with the introduction of task automation via punch card machines, first conceived by Herman Hollerith in 1890 (Ceruzzi, location 183, par. 2). These machines were used to "sort, retrieve, count, and perform simple calculations on data punched onto cards", without the need for electricity (Ceruzzi). Paribas is one of the first French banks to use these machines, and they boosted efficiency in the workplace (BNP).

1950-1980

In 1950, Bank of America started a project that revolutionized the banking industry (Bank of America). In 1950, the postwar economy boom expanded the GNP, and the U.S population reached 150 million. Naturally, demand for deposits increased and a strong workforce was needed to process checks (Bank of America). The Remington Rand UNIVAC-1 was used for general purpose computation in 1954, and it used magnetic tapes and vacuum tubes to process 12,000 characters per second (Ceruzzi, location 618, par. 1). However, Bank of America was working with GE and the Stanford Research Institute to produce a more powerful machine for banking—the Electronic Recording Method of Accounting (ERMA), released in 1955. The machine "processed checks faster and more efficiently than ever before, approximately 33,000 accounts in the time it would take an average bookkeeper to do 245… ERMA reduced the time required to process checks by eighty percent" (Bank of America). The breakthrough with ERMA came from Bank of America's development of magnetic-ink character recognition (the string of numbers you see at the bottom of your checks), which was "a technique for computers to read magnetic characters printed with a black ink containing particles of magnetizable oxide" (Bank of America). The development of such ink allowed the computer to read the characters despite any discrepancies or visual obstructions on the check. MICR was so successful, the American Banking Association adopted it as an industry standard in 1956 (Bank of America).

The rise of advancing technology lead to an increase in human capital and labor productivity in 1967-1980, and labor requirements per unit of output declined (Brand, 19). The

rise in productivity was associated with expanding customer services and the spread of branch banking that technology facilitated. Output rose at a rate of six percent per year, and employee hours at a rate of 4.6 per year over the period, mainly because of electronic data processing (Brand, 19). The increased productivity caused an eighty-four percent increase in employment and a change in desired employee skills (Brand, 21). Due to a fifty-two percent rise in demand deposit activity because of expanding customer services (Brand, 21), banks searched for a way to cut costs, which lead to the development of electronic fund transactions (EFTs) and automatic teller machines (ATMs) in the 1970s. These innovations evolved the competition in the banking industry by attracting a larger consumer base (Morisi, 31).

Banks were pressured to innovate and offer more services because the decreased costs allowed non-bank institutions like brokerage firms to offer banking services, which drove competition (Morisi, 32). Therefore, banks oriented themselves towards efficient customer transactions, an example being the integration of online teller assistance terminals (Balderston, 1115). Large computer networks and mainframe computers among branches allowed tellers to help employees manage accounts through online terminals (BNP). These terminals also helped the employee by updating high-volume customer files and accounts (Balderston, 1115). Many commercial banks adopted a batch-processing model to automate the updating of balances and ledger accounts among several financial institutions, which was implemented with advanced programming (Balderston, 1115-1116). Tellers could then consult updates the next day to inform customers of any inquired changes. The integration of EFTs and ATMs into commercial banking was the next important step in customer service.

1985 - 2000

In 1980, the Depository Institutions Deregulatory and Monetary Control Act deregulated interest rates through 1985, which facilitated growth of ATMs over State lines (Morisi, 30). Interest rates thus became a "selling point" to depositors, leading to increased competition among banks and number of ATMs (Morisi, 30). By 1993, "depository institutions supplied the 19th largest amount of computer equipment sales", out of 77 industries examined; and by 1995, 9.7 billion transactions were processed at 123,000 terminals (Morisi, 31). The cost to make a transaction with a human teller was $1.07 compared to $0.27 via a ATM in 1996 (Morisi ,31). ATMs were especially enticing due to their around-the-clock accessibility, simple, interactive

interface, and services on demand like foreign currency exchange. Another popular technology that evolved concurrently with ATMs was telephone banking, where customers touched phone buttons to complete transactions processed by computers (Morisi, 31-32). Both innovations had a role in the increase of banking productivity.

Despite the popularity of technology during this time, there were serious social implications. To save costs, banks cut jobs: employment "rose in late 1988, peaked in 1990, and fell by 89,000 until a 1992 trough" (Morisi, 34).[1] The following graphic points out the relationship in the rise of ATMs and fall in employment (Morisi, 34):

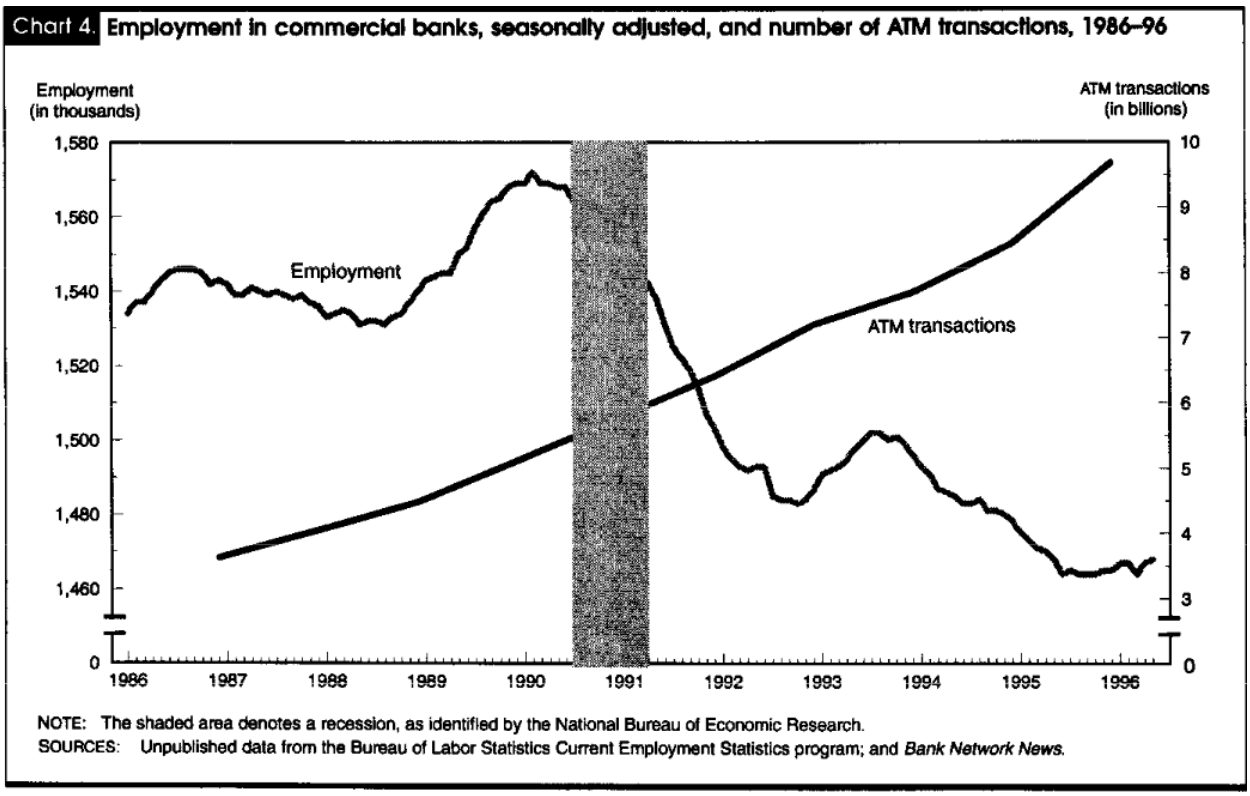

Chart: displaying an increase in ATM popularity and waning bank employment

[1] It is interesting to see the contrast between Morisi's entry in *The Montly Labor Review (vol. 119)* and Horst Brand and John Duke's *(vol. 105).* Morisi observes the decline in employment due to technology in the later 1980s-1990s, whereas Brand and Duke observe the increase in branches and employment through the 1970s. Morisi does note that technology may not have been the sole culprit of the decline. Many banks went through mergers which cut duplicate jobs (Morisi, 34-35).

Many low-skilled positions that remained were converted to part time with fewer benefits (Morisi, 34). Without counting these positions, the curves would be much steeper. Although technology certainly boosted productivity, which was necessary to compensate for consumer demand, there was an overall decline in employment in the later 20th century as ATM use increased.

2000-Present Day

The overall narrative of using technology to boost productivity continues into the 21st century. The Internet allows banks to offer online banking to help customers manage accounts and oversee transactions. The problem remains how to effectively market these services in a way that customers find appealing and accessible. As of 2003, only six percent of Americans used online banking services, and the statistic is even lower for developing countries (Nitsure, 5377-5378).

Part of the issue is that we don't spend time forming a relationship with our bank like the early 1900s. Instantaneous transactions evolved banking to be less personal. For example, the development of smartphone applications significantly decreased the physical need to transfer money. Apps like Venmo allow transactions among friends without even seeing a dollar bill. Like-and-comment features also add a social media aspect to the app, drawing in more consumers. However, these apps raise ethical questions as well, for it was reported that scammers would cancel transactions through Venmo while keeping the purchased good and shorting the seller (BBB). In addition, these apps have disruptive effects because they are much more interactive than banking apps. Although commercial banks have their own smartphone applications to transfer money, more interactive apps like Venmo decrease the popularity of bank applications, which may have negative effects on employment or stock.

The question for banks will be how to continue enticing consumers to their services and guarantee asset security (i.e the Target breach in 2013). The development of electronic chips in cards that communicate with purchasing systems to generate encrypted consumer codes to combat fraud is a recent answer, though not yet global. Although more controversial, blockchain is a distrusted ledger mechanism that came with cryptocurrency (BNP), which proves new technology will always need to be developed for changing consumer preferences. Cryptocurrency is its own discussion since one does not even need a bank account to save and

access currency, which has its own implications on employment and security. What works today may not work next year, and banks need to adapt to changes in preferences to remain productive. Fintech is an upcoming field in computer science, and banks will continue to use data and technology to personalize services for consumers in response to growing competition.

Conclusion

The development of computers in commercial banking has significantly changed the industry. Before technology, banking was slower, had more of a face-to-face relationship with customers, and emphasized cash due to its liquidity. Bank of America's ERMA expanded banking in response to postwar population growth and consumer demand, and the development of computer networks and EFTs made banking more efficient through the 1970s and 1980s. The deregulation of interest rates in 1980 gave rise to ATMs and allowed banks to cut costs but decreased jobs in the later 1980s. Because of technology, there exists several methods of transactions that involve cell phones and wire transfers, and cash is not the only asset needed to complete payments. Although this technology improves productivity and benefits the consumer, apps like Venmo can be considered disruptive because it decreases the need for social interactions and opens opportunity for scams. Security and reliability will be the two major issues as fintech companies design applications for changing consumer preferences. The modern age will see continued innovation as banks try to answer the question of how to reach an expanding consumer base in the globalized world while keeping assets secure.

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