Forgotten Workers of the Information Revolution: Women Keypunch Operators

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Automation proponents like John Diebold promised in the 1950s that computers would process any information at lightning speed, freeing employees from tedious routine tasks for more intellectually engaging work allowing the "development of his [sic!] inherent human capacities."[1] The lesser-known Hunt Brown, whose prolific publications include loose-leaf handbooks on office automation, stated more bluntly that automation would replace "drudgery, not people" and create more jobs for more employees who would "not be doing the same dull, drab, routine work," but would "have more interesting assignments."[2] Against this narrative of technological progress, this paper seeks to raise from obscurity the work of the mostly women keypunch operators without whose labor the introduction of computers would have been impossible.

Data occurred in corporate offices in various forms such as stamps on time cards, names and numbers on checks, and information on insurance applications and claims, phone messages, personal communications, and many others. These pieces of information differed in content as well as in shape, some being handwritten and others typewritten, and many on different paper sizes and forms. Before a computer could process a payroll or check or any other information, this data first needed to be transferred into computer-legible form. Usually, data was punched on

[1] John Diebold, *Automation. The Advent of the Automatic Factory* (New York: Van Nostrand Company, 1952).
[2] Hunt Brown, "Office Automation," Loose-leaf Collection, Part IV, Section A: Social Consequences of Automation, p. 1 and 3, and Section C: Humanities of Automation, p. 1, n.d., Folder 26, Box 69, CBI 55 Market and Product Reports Collection, Charles Babbage Institute.

a punchcard that could be read into an electronic computer. Soon, mostly women took on this essential work in the process of computer automation. Their work carried the typical characteristics of routine clerical labor: Easily supervised for speed and accuracy, it was often paid poorly. In addition, noisy machinery created unpleasant working conditions for the operators. For companies, data entry proved time-consuming and unexpectedly costly, requiring pay for large numbers of operators and machines as well as provision of often scarce office space. While data entry posed a problem across many industries, this paper focuses on the banking industry where the need to process rapidly increasing numbers of payments in a timely fashion exerted pressure for computer automation.

While computer historians have in recent years investigated issues of labor and gender, data entry work has yet to find proper attention by historians. Nathan Ensmenger and Thomas Haigh first integrated labor issues into the study of computing by revealing the efforts of (mostly male) computer programmers and systems analysts to advance and professionalize corporate computing in the 1950s and 1960s.[3] More recently, Ensmenger, Marie Hicks and Janet Abbate have integrated labor and gender approaches by studying gender in the programming profession in the United States and Great Britain. While Ensmenger and Hicks argue that advertising and professionalization attempts turned computing into a masculine domain, Abbate has shown that women carved out professional niches for themselves such as software enterprises.[4] Building on

[3] Nathan Ensmenger, *The computer boys take over: computers, programmers, and the politics of technical expertise (*Cambridge, Mass.: MIT Press, 2010); Thomas Haigh, "The Chromium-Plated Tabulator: Institutionalizing an Electronic Revolution, 1954-1958," *IEEE Annals of the History of Computing* 23, no. 4 (2001): 75-104. Also, leading edited volumes by William Aspray, Joanne Cohoon, Thomas Misa and others have brought gender issues to the field, investigating the historical reasons for the dwindling participation of women in computing.J. McGrath Cohoon and William Aspray, eds., *Women and information technology: research on underrepresentation (*Cambride, Mass.: MIT Press, 2006); and Thomas J. Misa et al, eds. *Gender codes: why women are leaving computing* (Hoboken, New Jersey: IEEE Computer Society, 2010).

[4] Nathan Ensmenger, "Making Programming Masculine." In *Gender codes: why women are leaving computing,* edited by Thomas J. Misa et al. Hoboken, New Jersey: IEEE Computer Society, 2010; Marie Hicks, "Meritocracy and Feminization in Conflict. Computerization in the British Government." In *Gender codes: why women are*

these studies, this article turns from men and women computer professionals to the work of (mostly women) keypunch operators. Doubly disadvantaged as women and as unskilled employees, keypunch operators have been written out of the standard narrative of computer history. For this conference, the women keypunch operators raise the question: Who are maintainers? Are operators maintainers? Do maintainers have gender? Identity? Class? Do they have skills? A profession? How do these categories shape their maintaining work?

United States: ERMA Check Processing

In the United States, commercial banks were among the first industries to introduce computers in an effort to address the rapidly rising number of check payments. US banks had pursued mechanization from the 1920s onwards, making electromechanical machines such as calculators, accounting and addressing machines, and punch card equipment part of their operational procedures. The problem of processing increasing numbers of check payments turned critical in the 1950s, when the number of checks had doubled in only a decade from 4 billion in 1941 to nearly 8 billion in 1952, when an average 29 million checks per business day required tedious manual handling to sort, prove, tally and route the checks through the clearing system. Often, banks already closed in the early afternoon in order to process checks before opening the next business day.[5] In addition, banks expected labor shortages. During the 1950s more American men and women married than in the previous generation, and women devoted

leaving computing, edited by Thomas J. Misa et al. Hoboken, New Jersey: IEEE Computer Society, 2010; Hicks, Marie. "Only the Clothes Changed: Women Operators in British Computing and Advertising, 1950-1970." *IEEE Annals of the History of Computing* 32, no. 4 (2010): 2-14; and Janet Abbate, *Recoding gender: women's changing participation in computing* (Cambridge, Mass.: MIT Press, 2012).

[5] James L. McKenney, "Developing a Common Machine Language for Banking: The ABA Technical Subcommittee Story," *IEEE Annals of the History of Computing* 17, no. 4 (1995): 61-2. For computing in the banking industry, see James W. Cortada, *The Digital Hand, Vol. 2. How Computers Changed the Work of American Financial, Telecommunications, Media and Entertainment Industries* (Oxford: Oxford University Press, 2006).

themselves to homemaking and childrearing at a younger age than their mothers had done a generation earlier, depleting the pool of the routine female workforce.[6]

The banking industry turned to computer automation as a solution to the check processing problem. In 1955, Bank of America announced a check processing machine that emerged from its collaboration with Stanford Research Institute, the famed Electronic Recording Machine—Accounting (ERMA). ERMA was based on magnetic ink character recognition (MICR) technology—the numerals most of us still know from the bottom of paper checks, printed with special ink in particular shapes. A vacuum mechanism allowed ERMA to grip and move individual checks at high speed to scan the account and routing information, sort the checks by the banks from which they were drawn, and calculate the sum of the checks that were to be routed together in a bundle after an employee had manually entered the amount of each check. Within a year, the American Bankers' Association recommended magnetic ink character recognition technology based on numerals—basically the technology coming out of the ERMA development—as the standard against alternative technologies, and banks rapidly introduced the new technology. By 1964, 79% of the largest US banks had converted to digital check processing technology, another 11% were in the process of doing so, and nearly all US banks encoded MICR routing numbers on their checks.[7]

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[6] Elaine Tyler May, *Homeward Bound. American Families in the Cold War Era* (New York: Basic Books, 2008 [1988]); Colin Gordon, *New Deals. Business, Labor and Politics in America, 1920-1935* (New York: Cambridge University Press, 1994); see also Jessica Weiss, *To Have and to Hold. Marriage, the Baby Boom, and Social Change* (Chicago: University of Chicago Press, 2000). While May argued that the widespread turn to family values and domestic ideals was a result of individual decisions of a generation that had experienced women's work as an unfortunate consequence of economic hardship during the Depression, Gordon argued that welfare programs helped legitimate the idea of the family wage for male workers to support their families, and that this system cemented and expanded the segmentation between male and female jobs.

[7] Cortada, *Digital Hand*, 49. Among the smallest banks, with assets of less than $10 million, 40% used automatic check processing equipment by that time, and another 40% were in the process of converting. About 66% of all banks used computers to process some or most of the check handling and account record keeping. Banks also used electronic computers for applications for savings, investment and loan processes.

ERMA's story has been told elsewhere, including the very interesting process of setting MICR as a de facto standard based on supposedly technological advantages.[8] For the purpose of this paper, I'd therefore like to make just two brief remarks about ERMA. First, ERMA presented an incomplete process of automation, with clerks still needing to manually enter the amount of each check into the machine—which, of course, was highly error-prone information. ERMA alleviated the immediate pressure on banks and their clerical labor pool; it did not eliminate manual data entry, and it never attempted a complete elimination thereof. And second, Bank of America presented ERMA as an opportunity for corporate growth to its own employees. ERMA, the bank promised in a cartoon describing the computer, did bookkeeping "faster, easier and better," allowing employees to provide better customer service because they no longer felt that customers were "interrupting" their paperwork. With ERMA, the cartoon claimed, "[o]ur paperwork problem won't hold us back—we can keep growing with California."[9] What the women clerks thought of these goals and promises remains an open question.

West Germany: Vision of Paperless Banking

West German savings banks took a very different approach to computer automation and the data entry problem. Rather than aiming at partial automation, they envisioned complete automation that eliminated the need for data entry entirely by abolishing the paper step. The need the necessary technologies and infrastructures for such a system caused a decade-long delay in

[8] For detailed accounts of ERMA and the standardization of check processing technologies in the US, see Amy Weaver Fisher and James L. McKenney, "The Development of the ERMA Banking System: Lessons from History," *IEEE Annals of the History of Computing* 15, no. 1 (1993): 44-57; McKenney, "Common Machine Language," 61-75; and Robert V. Head, "ERMA's Lost Battalion," *IEEE Annals of the History of Computing* 23, no. 3 (2001): 64-72.

[9] "Life With ERMA" in Hunt Brown, "Office Automation," Part I Section I, Folder 8, Box 70, CBI 55 Market and Product Reports Collection, Charles Babbage Institute.

banking automation, and West German banks opted to wait rather than adopt the MICR technologies offered by IBM. In the meantime, savings banks met their growing data entry needs with a newly emerging pool of part-time women employees.

The number of check payments in West German increased in the 1950s, almost doubling within four years from a postwar low of 94.44 million checks in 1950 to 157.21 million in 1954. Still, check processing did not exert a similar pressure on the German banking system as it did in the United States. Checks were considered an unsafe form of payment because writing checks without coverage was not a criminal offense, and there was no means to punish offenders. Until the 1960s, Germans preferred to pay in cash for most transaction. For example, German workers usually received their pay at the end of the week in a cash envelope, and companies began to shift to cashless salary payments only in the 1960s. However, German institutions opted against check payments, and bank transfers, standing orders and debit notes became the preferred type of cashless payments in Germany.

These three forms of cashless transactions shared an important commonality compared to checks: Rather than requiring actions by three parties, the issuer, the recipient and the bank(s), they require actions by only two parties, the bank(s) and either the recipient or the issuer. German savings banks therefore envisioned a future of paperless transactions that would eliminate the need for data entry altogether. Transfers with common features, for example all salary payments by one company, or all bills to a particular utility company, would be processed together in so-called bulk transactions. Banks and clients such as large corporations or utility companies would exchange electronic storage mediums, thus eliminating the need for paper and data entry.

Savings banks took a long-term view by planning for bulk-processing of paperless monetary transactions and optical character recognition for automatic data entry for all remaining transactions. In the meantime, they relied on a newly-emerging interim workforce to solve their immediate need for data entry: part-time women employees. Following World War II and its demographic disruptions, the 1950s German public debate had been dominated by concerns over the "crisis of the family" and calls for a return to the supposed "normalcy" of the core family with a wage-earning father, home-making mother and two to three children. Representatives of all political parties passed legislation that encoded the role of women as housewives and mothers such as the so-called "housewife marriage" (Hausfrauenehe).[10] While rising numbers of working women decried this public debate as an ideal divided from reality, frequent public discussions of "latch-key kids" (Schlüsselkinder)—the supposedly neglected children of working mothers who carried a key around their neck to let themselves into their homes after school—must have made working women feel out of step with the mainstream and conflicted about trying to meet both the demands of their work and the demands of family.

This changed in the 1960s when growing opportunities for part-time employment promised to meet the demands of at least three groups. To politicians, it promised to integrate conservative family values with the need to address the national shortage in the white collar workforce at a time when, thanks to the postwar economic boom, unemployment rates hovered around two per cent in West Germany. To housewives, it allowed earning additional income—often desired for consumer product purchases such as a television set, a couch or a car—while still taking care of housework and child care. And to banks and other employers, it promised a

[10] Passed in 1957, the legislation gave women at least in principle the right to engage in gainful employment, independent from their husband's approval, but at the same time, women remained tied to their primary duties as housewives and mothers. Robert G. Moeller, *Protecting Motherhood. Women and the Family in the Politics of Postwar West Germany* (Berkeley: University of California Press, 1993).

willing yet low-paid workforce for routine work without career opportunities without needing to accommodate for fatigue building up over a whole workday.[11]

As German savings banks shifted to electronic data processing technologies in the late 1960s, they also hired increasing numbers of female part-time employees. This newly emerging group of female part-time employees perfectly met the needs of the data processing sector. Unskilled, or trained in non-clerical fields, they were low-paid employees without opportunities for career advancement. Yet, "fresh and relaxed" every day, they achieved relatively high performance levels at their monotonous data entry jobs. A sociological study reported in the early 1960s that part-time employees excelled at light monotonous work as well as at work where fatigue led to decreased performance, for example telephone switching and keypunch operations.[12] Part-time employment in offices skyrocketed between 1964 and 1966, as small and medium-sized companies introduced punch card machines. In the words of a German historian, "[t]he Hollerith operator, who entered the data into the computer's punch card system, became the most popular unskilled transitional occupation for female office workers in the 1960s."[13] Computer automation only heightened the need for such data entry personnel, further increasing the growth of the keypunch operator workforce.

In 1972, German savings banks began to exchange magnetic data tapes for financial transactions with corporate customers, and the rate of paperless transactions increased rapidly to

[11] Also, Female part-time employees could be paid low wages because data entry was unskilled or at the most semi-skilled work, and the women were expected only to contribute to a family income, not to be the sole wage-earners. This notion of the family wage justified the lower pay for women in both the US and Germany. Alice Kessler-Harris, *A Woman's Wage. Historical Meanings and Social Consequences* (Lexington, Kentucky: The University Press of Kentucky, 1990); Moeller, *Protecting Motherhood.* In addition, women were not expected to aspire to career advancement, but rather to find satisfaction through their families, a widely held expectation that provided justification for relegating women to dead-end positions.

[12] Elisabeth Pfeil, *Die Berufstätigkeit von Müttern. Eine empirisch-soziologische Erhebung an 900 Müttern aus vollständigen Familien* (Tübingen: Mohr Siebeck, 1961), 413.

[13] Christine von Oertzen, *The Pleasure of a Surplus Income. Part-time Work, Gender Politics, and Social Change in West Germany, 1955-1969* (New York: Berghahn Books, 2007), 163.

45% by 1979.[14] The number of new part-time women now plummeted during this period, and in 1974 for the first time in years, the workforce remained virtually stable with only 495 new employees hired.[15] German savings banks thus used an interim workforce of part-time female keypunch operators for their immediate data entry needs while they significantly reduced their long-term need for data entry.

Conclusion

This paper begins to make the work of women keypunch operators visible, including the gendered dynamics of office automation. Mostly male office organizers planned work processes that created countless routine, low-paid and low-regarded positions for women. The new positions offered neither career opportunities nor the more intellectually engaging work promised by automation proponents. Yet, the women keypunch operators, whose silhouettes we are now at least beginning to see, still remain voiceless, leaving open many questions. At German savings banks, they appear to have been called "ladies", a term historically reserved as a title for the nobility that still commands more respect than the more common term *Frau* (woman).[16] Why did these ladies decide to enter the salaried workforce, and why did they do so on a part-time basis? How old where they, and what was their socio-economic background? Why did they choose to work as keypunch operators? Did they work to pay for coveted consumer products such as a new couch, a TV or a car, or were their earning a necessary contribution to the

[14] Deutscher Sparkassen- und Giroverband (DSGV), "Jahresbericht 1977," p. 35-6, Sammlung S7-251 Deutscher Sparkassen- und Giroverband, Stiftung Westfälisches Wirtschaftsarchiv (WWA), Dortmund, Germany, and DSGV, "Jahresbericht 1979," p. 36, S7-251, WWA.
[15] DSGV, "Jahresbericht 1974," p. 56, S7-251, WWA.
[16] While my mother used the term *Damen* (ladies) in her oral account of computer-related work in the bank where she was employed, I have not been able to confirm that this designation was commonly used at the time.

family income? Much work remains to be done to better understand these overlooked operators and maintainers of office automation.