

Counting Votes: Lessons from Punch-Card Voting Systems

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One person, one vote.

Voting rights are fundamental to democracy. Throughout American history, the country has experimented with various voting technologies. The use of punch-card voting systems offers a compelling case study, highlighting the intricate relationship between democracy and technology. These systems brought the promise of computerized efficiency to the electoral process but also revealed significant technical flaws. They were used extensively in U.S. elections for much of the latter 20th century but became infamous during a disputed presidential race. *The rise and fall of punch-card voting systems provide valuable insights into the impact of technology on voting rights, emphasizing the need for ongoing evaluation and improvement of voting systems, as well as the importance of public engagement in safeguarding the integrity of elections.*

Beginning in the early 19th century, the U.S. embarked on electoral reforms to enhance civic participation. By the mid-20th century, significant milestones had been achieved: women gained voting rights in 1920 (19th Amendment), American Indians in 1924 (Indian Citizenship Act), and the Voting Rights Act of 1965 dismantled barriers against African American voters. [1, 2] These developments significantly expanded the electorate, including first-time, less literate, and minority voters. Despite these legal changes, practical obstacles persisted for many voters in casting their ballots and ensuring their accurate counting. This context created an expectation that voting methods would evolve to serve a more diverse and growing pool of voters.

Hand-counted paper ballots dominated American elections from the early 19th to the early 20th century. However, this period was marred by rampant ballot fraud, including tactics like releasing false ballot counts, inserting pre-marked ballots, or discarding votes for opposition candidates. [3, 4] To combat these fraudulent practices, some states adopted mechanical lever machines (see Appendix Picture 1). These machines, though effective in reducing fraud, came at a high cost, [5] and their design presented accessibility challenges, particularly for women (see Appendix Picture 2). [6]

The punched card, initially designed by Herman Hollerith for data recording, found its way into voting systems in the 1960s. [7] In this system, voters used a stylus to punch holes into pre-printed ballots, with each hole representing a candidate or choice (see Appendix Picture 3). The ballots were then automatically tallied by computers, providing quick election results.

Punch-card systems offered several advantages. Firstly, they were cost-effective. In 1970, a county could buy 15 punch-card devices for the price of two lever machines, increasing machine availability in polling stations. [8] This led to shorter travel distances for voters and reduced waiting times, thereby enhancing voter participation. Secondly, punch-card machines were compact, lightweight, and portable. Poll workers and community groups could easily demonstrate the machines' use in various locations, including to voters in line. Thirdly, unlike lever machines, punch-card systems produced a verifiable paper trail, enabling manual recounts in cases of suspected fraud. This paper trail was crucial in safeguarding the electoral process as the voter population grew in diversity. Statistics suggested that 32.3% of the U.S. population cast their votes using punch cards in 1998. [8] The widespread adoption of punch-card systems during an era of increasing voter rights movements and demographic shifts played a pivotal role in democratizing the voting process, making it more accessible and efficient across a range of geographic contexts.

Disputes and problems surrounding punch-card ballots persisted from their early adoption, as seen in the McIntyre vs. McCloseky Indiana House race in 1984 and similar challenges elsewhere [9, 10, 11]. The primary concern was the high number of invalidated ballots due to dimpled or hanging chads (see Appendix Picture 4), which prevented the machines from recording votes. These issues often resulted from inadequate voter training and the inherent complexities of punch-card machines. The dots on these machines frequently led to ambiguities, causing hanging chads and inaccurate punches. Some voters also struggled with correctly inserting cards into the holders, resulting in misalignments and incorrect punches. These issues prompted expert Roy Saltman to advocate for the elimination of punch-card systems as early as 1988, citing their propensity to cause invalid or incorrect votes.[12]

Legal disputes over these technical flaws yielded varying outcomes across jurisdictions. In a 1984 Louisiana case, the court refused to count punch-card ballots marked only with a pencil, viewing this as voter disenfranchisement. Contrastingly, the South Dakota Supreme Court in 1993 ruled that incompletely detached chads should be counted, asserting, "That a voter displays a restrained enthusiasm in marking his ballot... should not render his effort in vain." The Illinois Supreme Court in 1990 echoed this sentiment, deciding to count partially punctured punch-card ballots in a state legislature primary race, stating, "Nothing in our election code ... requires voters to completely dislodge the chad from the ballot before their vote will be counted." These varied interpretations stemmed from election laws being subject to local legislation and jurisdictional differences. [13, 14, 15]

The culmination of these problems became evident in the 2000 U.S. presidential election. In response, the federal government enacted the Help America Vote Act (HAVA) in 2002, mandating the replacement of mechanical lever machines and punch-card voting machines in federal elections. [16] This led to a rapid decline in punch-card usage, from 40% in 1992 to 12%

in 2004, almost disappearing by 2008. [17] Yet, the question remains: why did this technology persist for so long despite well-documented accuracy issues?

Cost and budget constraints were significant factors. Punch-card voting systems offered cost savings compared to newer technologies. While the federal government set electoral policies, states chose and funded voting devices. Local governments, confronted with financial challenges, often found it difficult to update to newer systems. According to Larry Naake of the National Association of Counties, "Decisions have to be made, and people only visit the polls once a year," suggesting that voting machines had to compete with other budget priorities like public safety and infrastructure. This economic struggle may have disproportionately affected less wealthy areas, raising concerns about disenfranchisement from using outdated and unreliable equipment.[18] Furthermore, the era of 1960-1990s was marked by a lack of viable technological alternatives. Paper ballots and lever machines were available but considered outdated. Electronic voting machines were still in their early stages and expensive. Indeed, the shift from punch-card to touch screen voting machines sparked a backlash due to concerns about their reliability and lack of a verifiable paper trail. [19] Lastly, public awareness played a role. Stephen Knack and Martha Kropf, experts in voting participation, noted that "before the 2000 election, the media's primary focus was on quickly reporting vote totals on election nights." [8] Leading up to the 2000 Presidential Election, the technical nature of punch-card system issues meant that these flaws were not widely recognized by voters and election officials.

In conclusion, the story of punch-card voting systems in the United States offers a valuable lens through which to examine the intersection of democracy and technology. While these systems introduced computerized voting methods and improved accessibility in earlier years, they also revealed significant technical flaws. The persistence of punch-card technology can be attributed to factors such as cost constraints, limited technological alternatives, and a lack of public awareness regarding the extent of these issues. As we navigate current and future challenges in voting technology, the lessons from punch-card ballots remain relevant, guiding us towards more robust and transparent electoral processes.

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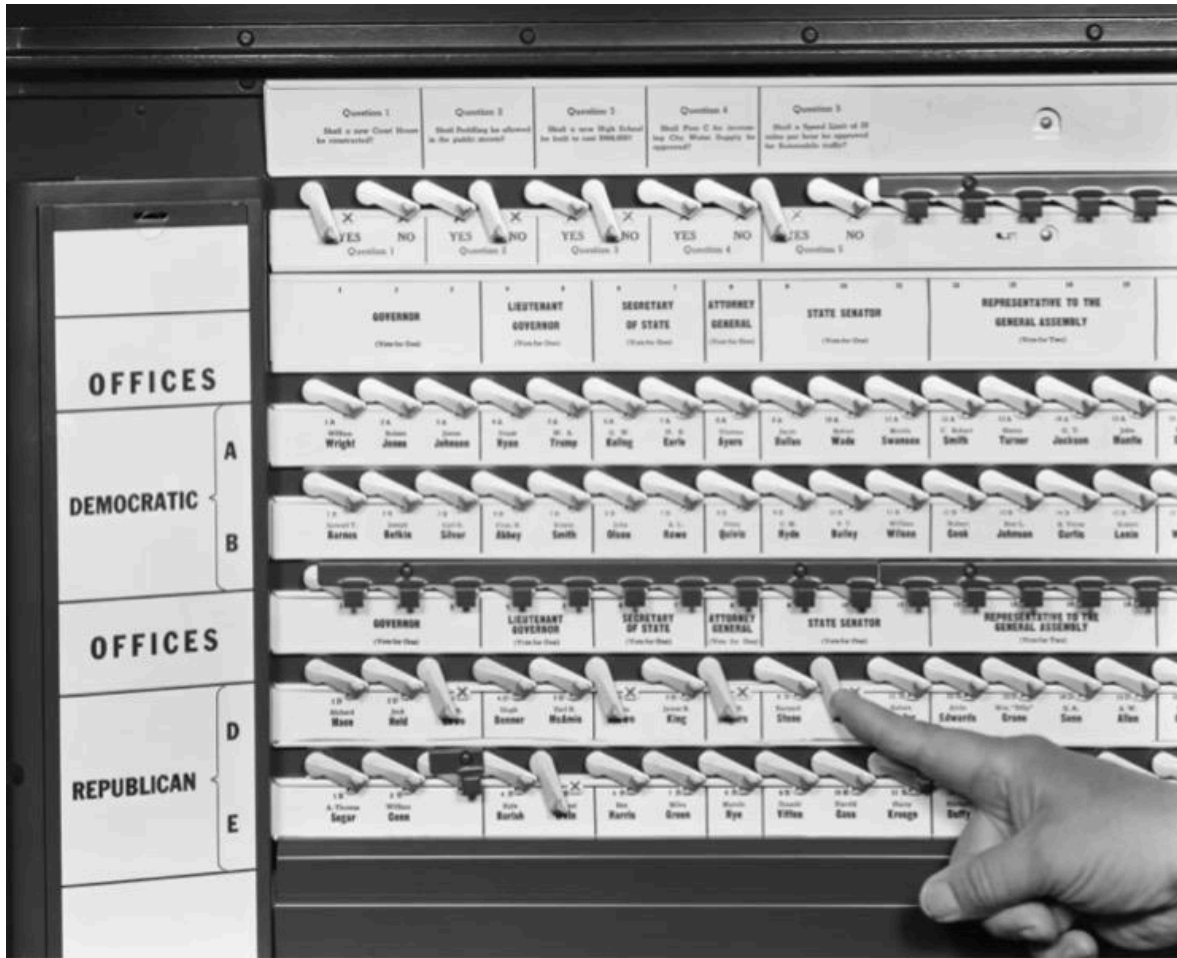
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Appendix



Picture 1. An early mechanical lever machine

The original caption on this undated photo says, "After you have completed casting your ballot, move the large curtain handle to the left. This will record your vote, wipe off the 'X' marks and return all the voting levers to an upright position, before opening the curtain."

source:<https://www.wsls.com/news/politics/2020/11/03/voting-throughout-the-years-these-photos-will-make-you-realize-how-much-has-changed/>



Picture 2. A lever machine creating accessibility challenges for female voters.

Issues with text placement and eye level on mechanical lever ballots are marked with a black arrow, while eye level is indicated with a white arrow. The ballot's top section, at a height of 67 inches, was often out of the line of sight for many voters, including women, making it difficult for them to see and reach the entire ballot.

source: Roth, Susan King. "Disenfranchised by design: voting systems and the election process." *Information Design Journal* 9, no. 1 (1998): 29-38.


NO. 124

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- A county can place 4 to 5 VOTOMATICS in each precinct and still slash election costs.


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After closing of the polls, the ballot cards, in locked containers, are taken to the nearest counting center, where standard high-speed computers take over. Computers can count a 200-vote precinct in about 15 seconds, and print returns almost simultaneously.

Computers are already being used by many counties for a variety of purposes. These computers are ideal for counting the votes recorded on VOTOMATIC ballots. Counties which do not have computers may rent them for election night at a nominal cost.

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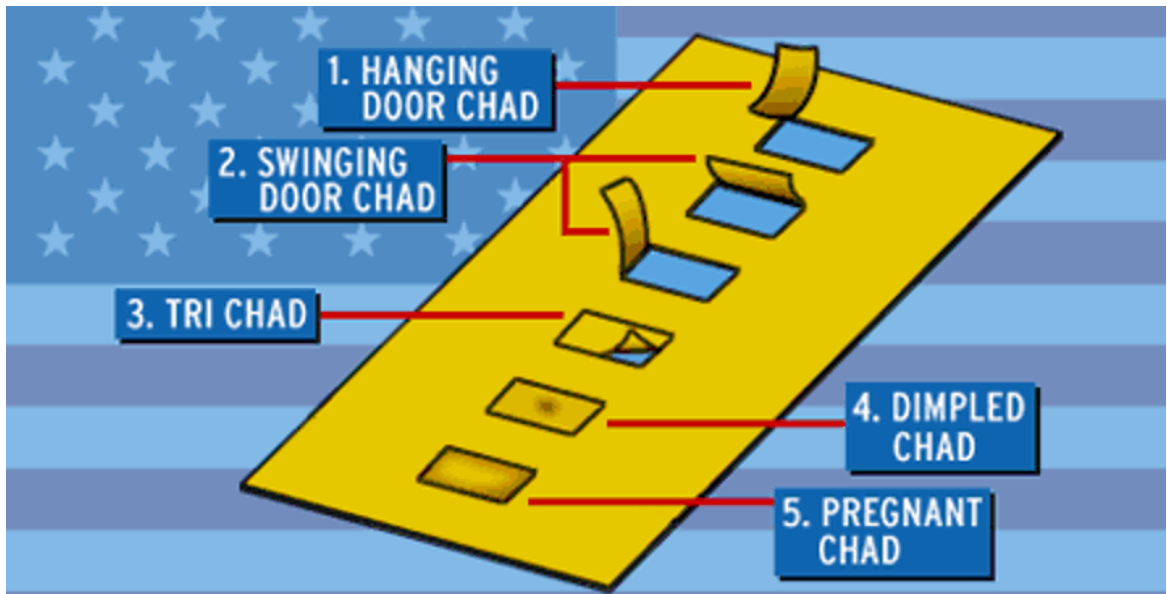


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Picture 3: The Votomatic vote recorder, a stylus-and-paper-based voting technology, debuted in the 1960s.

source: <https://x.com/amhistorymuseum/status/1059501623016374272?s=20>



Picture 4: Different forms of chads

According to Palm Beach Recount Guidelines, a chad—the punched-out section of a ballot—counts as a vote if one or more corners remain attached. A 'hanging door' with one corner attached, a 'swinging door' with two, and a 'tri' chad with three corners attached all qualified as votes. However, 'dimpled' or 'pregnant' chads, which were indented or pierced but not detached, were not considered votes.

source: <https://www.cbsnews.com/news/presidency-hangs-by-a-chad/>