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WHY THE WAIT?

**Using a Quantitative Formula To
Allocate Voting Machines And
Reduce Election Day Waiting Times**

FRANKLIN COUNTY, OHIO

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Leading up to the November 2008 election, the over 800,000 registered Franklin County, Ohio, voters remained apprehensive of the possibility of waiting in long lines to vote as a result of a predicted record turnout and a very long ballot. The origin of such concern was due to many voters' November 2004 experience in Franklin County when voters did experience very long lines, a very long ballot and too few voting machines.

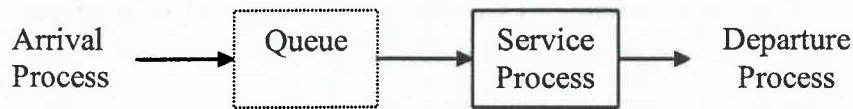
Ultimately, such anxiety was found to be unwarranted as the board, based on the experience of 2004, implemented an alternative allocation method relying on a utilization formula that moved beyond the past way of distributing machines to polling locations and properly accounted for "controls" that result in the formation of lines. Reliance on the formula and consideration of service time provided a quantitative and standardization that ultimately provided integrity and fairness to the voting process, as well as a lack of Election Day lines. Such a process and considerations are easily adaptable for implementation by other jurisdictions as it results in a reasonable and logical way to distribute voting machines based on a transparent, simulation-theory motivated process.

Historically, distribution of voting machines among precincts boiled down to the "gut instinct" of the board members. As is the case with many election officials, allocation of voting machines were baselined on an examination of the number of registered voters and the number of voters who had turned out at a precinct on previous Election Days. From that starting point, allocation then occurred based on guess work and piecemeal with consideration to polling locations known to have had previous issues. This method however failed to consider many other extenuating components that cause lines on Election Day, primarily turnout and ballot length, leaving the voting process open for criticism that preference and bias resulted in certain locations receiving more resources than others.

Rather than fall into such a trap again and in recognition that such a baseline failed to properly account for all the components that played a role for creating the real problem of long lines, the Franklin County Board of Elections choose to change its approach with the goal of improving voter satisfaction and Election Day lines. While not able to predict the unpredictable of where problems would arise on Election Day, the objective was to predict in advance where the highest chance for line formation may occur and arrange, prior to Election Day, to avoid such an occurrence and provide equal access through minimal line waiting and enhanced voting machine allocation.

The first step in this transformational course of action was the hiring by the Franklin County Board of Elections of Lextant, a Columbus company that studies consumers' behavior to make products and services more user-friendly, and Sagata, which designs computer systems based on statistical models. The consultants studied records from the 2006 election and 2008 primary to determine the service time it took to process a voter and how long it took voters to complete a ballot. They also staged a mock election which included 60 people of different ages, genders, ethnicities, and voting experience. The result of this study was a "wait line study" report and public hearing regarding why lines form on Election Day.

In addition, we now had detailed investigations regarding the “arrival rates” and “service rates” of voters.



Arrival rates are viewed as the number of voters per hours. Service rate can be summarized as how much time voting requires based on ballot length and the nature of the voting equipment.

Based on this information, the consultants devised a mathematical utilization formula for initial allocation of all of Franklin County’s 4,639 DRE iVotronic voting machines to the County’s 454 voting locations.

Number of Machines =

$$\text{roundup} \left\{ \frac{(\text{avg. voting time mins.})(\# \text{registered})(\text{turnout})}{(0.85)(13 \text{hr})(60 \text{mins.} / \text{hr.})} \right\}$$

The controls for the formula included:

- 1) The number of registered voters in Franklin County as of the close of registration;
- 2) Ballot length in each jurisdiction; and
- 3) Absentee ballot requests received.

When extracting from the initial sample, we learned a number of functional components we could use to predict Election Day activity and where we could face major lines. For example, jurisdiction wide the average voter would expect to wait 11 minutes. Most would wait 0 minutes and 18 polling locations would have average waits over 1 hour. Knowing these components, our board then created a spreadsheet to generate feasible allocations throughout our entire jurisdiction that we could adopt allocation changes in order to minimize all jurisdictions that had wait lines deemed unacceptable. We accomplished this task by increasing both poll worker staff and increasing the allotment of machines. Fortunately, all this effort resulted in minimal lines and no criticism that preference and bias resulted in certain locations receiving more resources than others.

Ultimately, we found the consideration of wait lines to be a fantastic tool when addressing machine allocation as we were able to optimize what had previously been considerably impossible, consideration of service time and ballot length in grouping to election day resources. This was accomplished though a transparent and defensible allocation with easy spreadsheet implementations that were able to generate a defensible motivated voting machine allocation.

The application of this exercise for other counties is that based on our experience, the reliance of a quantitative allocation might help other political systems and election administrators think about the waiting time implications of their allocations or initiatives. The consideration and implementation of a utilization formula provides, when the expectation of significantly high turnout exists, for a simple and quantitatively efficient way to apportion machines that accounts for variable ballot length across numerous precincts.

