



Activity-Based Costing, Government and Business Intelligence

By Dr. Ramon Barquin

*President of Barquin International
&
BeyeNETWORK Government Expert*

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In the first Tuesday in November came and went, and the midterm elections are now behind us. You may be pleased or disappointed in the results; but, whichever the case may be, it may have sharpened your mind and whetted your appetite with respect to the topic of elections. Hence, it might be an appropriate time to revisit the topic from a different analytical perspective: voting systems. Not all elections are conducted the same way, and the results can vary tremendously depending on the approach and methodology. It's an interesting subject not just given the timing, but also because the implications are so crucial to the way we rule ourselves in democratic societies.

Mind you, the diversity of electoral systems boggles the imagination, both in terms of numbers as well as in complexity. They have developed and evolved over the centuries depending on how different societies have needed to utilize elections as a governance tool for selecting leaders and resolving differences peacefully.

If we focus on voting systems for selecting leadership, or representation, they fall into three types: 1) Plurality/majority systems, 2) Proportional representation systems and 2) Semi-proportional systems. (Note: For an in-depth treatment of the topic, see *Behind the Ballot Box: A Citizen's Guide to Voting Systems*, by Douglas J. Amy, Praeger Publishing, 2000.)

In the U.S., we are most familiar with the first type, "plurality/majority" systems, since these are of the winner-take-all variety that dominates our elections. But even within this category, there are a several flavors including plurality systems – the one with the most votes wins – as well as those that require a winner to have a majority of the votes – over 50% – thus often requiring one or several run-offs.

"Proportional representation" systems are quite popular in most parts of the industrialized world, particularly Western Europe. Their intent is to ensure the proportional representation of political parties in legislatures. Its most frequently seen version is the party list system, whereby each party presents a list of candidates in a specific order; and depending on the percentage of votes obtained by each party, they elect that number of representatives to the legislature, chosen in strict order from the party list. This puts enormous pressure within each party for coming up with the right ordering algorithms. While many mature political parties use democratic approaches such as primary contests, or equivalent, to decide the order in which candidates will appear on their lists, there are often more controversial approaches such as deciding on the basis of seniority, incumbency, lottery or combinations of the three. There are also a number of parties where the lists are elaborated in the classic "smoke filled rooms" of Boss Tweed fame.

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The third type of system, “semi-proportional,” tends to be rare and includes cumulative and limited voting approaches. These voting systems apparently produce more proportional results than plurality/majority systems, but less proportional results than fully proportional systems.

The language of voting systems is mathematics, but the intent of elections is social governance, and sometimes there is a certain amount of dissonance between the two. Ultimately a democracy’s legitimacy depends on fair and frequent elections, but fairness is often in the eye of the beholder, and winners are more likely than losers to accept the results of an election. Hence the rules that determine how votes are counted and how a winner is finally chosen must be clear and transparent. But because of the natural suspicion of electoral opponents as to whether the “system” is biased in the other person’s favor, this is often very difficult to accomplish.

In U.S. presidential elections, we still use a system that is based on electors. As a result, when we vote we are merely selecting an intermediary representative who in theory is committed to cast a vote for a specific candidate in the Electoral College. This unique entity currently has 538 electors, one for each senator and another for each congressional district in the state, hence proportional to its population compared to the rest of the country. But it gives each state a minimum of three electoral votes, independent of its population, and that has the potential to make a big difference in the outcome.

These electors are nominated according to rules set on a state-by-state basis, and there is usually no guarantee (and no recourse) if they change their minds and vote for a candidate other than the one they were elected to support. Because this system is so arcane and with the potential to be manipulated, it is under attack in the few countries where it is still used. (India, Australia, Canada and the U.K., primarily, though the British are going to vote on reforming it in 2011.) We Americans often complain about the scheme, but are not yet at the point where we are serious about changing it. Hence, as with the metric system, we are still one of the remaining holdouts in the world.

Returning to our analysis of voting systems, the majority approach so popular in the U.S. is fraught with complications once we have more than two candidates. As a matter of fact, we have often seen the impact of just adding one more person to a slate and how a splitting of the vote among the two most popular nominees can easily give a plurality to the third party, hence causing the least popular candidate to be the winner.

One way of addressing that problem was proposed by French mathematician Jean-Charles de Borda back in the 18th century. He suggested that instead of casting a vote for a preferred contestant, that electors rank the candidates in some preferential order. By assigning points to each position in that ordinal scale, one could compute aggregate values and come up with a winner who, in theory, would never be the least popular nominee. That said, the Borda method was also prone to be gamed, and it often mathematically selected candidates that were not the majority’s preferred choice. This doomed it for many societies, and it certainly is one of the reasons why we never adopted it in the U.S.

It was another French mathematician, Laplace, who devised the runoff system by insisting that a winning candidate must have more than half of the votes of an electorate in order to be legitimate. That led to a series of schemes that were based on having sequential elections where candidates with the least amount of votes are eliminated and the top ones go on to second and even third rounds until the final runoff yields the desired result.

Proportional representation is the ideal to which we aspire in many of our elections in the U.S. – the desire to have the will of the majority be respected as expressed through the ballot box and that it be fair in the distribution of voting power so that it addresses the geographical distribution of our population. In fact, apportionment by state of our representatives to Congress was the reason our Founding Fathers mandated a decennial census in our Constitution. But our system generates the mathematical possibility of having a candidate garner the largest amount of votes and still lose, as has happened three times in our republican history.

Beyond that, there are situations where the stakes are so high that we may want a different standard. This is often referred to as supermajority, and its main use is to protect the minority. Examples of this are the fact that a 60% majority is required to bring cloture in the U.S. Senate to end a filibuster. A two-thirds majority of both houses of Congress is needed to propose an amendment to the Constitution. 75% of the state legislatures must approve an amendment of the Constitution in order for it to be ratified.

These midterm elections did not make use of the Electoral College nor apply supermajority schemes, yet they will have a significant impact on our political scene. And the diversity of approaches and voting systems at the state and local levels makes each American election a patchwork and a lab. Depending on where we live, we may be exposed to systems such as, Single-Member District Plurality, Two-Round System, Instant Run-Off Voting, At-Large Voting or some combination of these.

Beyond the mathematical aspects of voting systems, we have the physical characteristics of the voting artifacts and paraphernalia, such as the ballot, the ballot box, the voting booths, the voting devices, the mechanical devices to assist in the counting, etc. (We will leave Internet voting for another day, since that in itself is worthy of another article.)

After our controversial election of the year 2000 (of “hanging chad” fame), Congress passed the Helping America Vote Act (HAVA) and created the Elections Assistance Commission to certify voting systems. However, we are still very far from where we should be.

Lest we be despondent with our messy experiences around the country electing our representatives, remember that many societies have struggled for centuries in their attempts to ensure transparency and fairness in a tamper-free electoral environment. In order to minimize the influence of the powerful families and elites in Venice, here is what the citizens of that nation-state lived with for over half a millennia in order to elect a doge, supposedly the “shrewdest elder” in the land. (For a full treatise on this complex elective scheme see: [Miranda Mowbray and Dieter Gollmann, "Electing the Doge of Venice: Analysis of a 13th Century Protocol."](#))

“Thirty members of the Great Council, chosen by lot, were reduced by lot to nine; the nine chose forty and the forty were reduced by lot to twelve, who chose twenty-five. The twenty-five were reduced by lot to nine and the nine elected forty-five. Then the forty-five were once more reduced by lot to eleven, and the eleven finally chose the forty-one who actually elected the doge.”

In short, elections tend to be the arbiters of our future, and the way in which we vote and how we decide elections depends increasingly on science and technology. It would seem that there is ample opportunity for business intelligence practitioners to make a contribution toward improving such a vital tool in our governance.

About the Author

Dr. Ramon Barquin is the President of Barquin International, a consulting firm, since 1994. He specializes in developing information systems strategies, particularly data warehousing, customer relationship management, business intelligence and knowledge management, for public and private sector enterprises. He has consulted for the U.S. Military, many government agencies and international governments and corporations.

Dr. Barquin is a member of the E-Gov (Electronic Government) Advisory Board, and chair of its knowledge management conference series; member of the Digital Government Institute Advisory Board; and has been the Program Chair for E-Government and Knowledge Management programs at the Brookings Institution. He was also the co-founder and first president of The Data Warehousing Institute, and president of the Computer Ethics Institute. His PhD is from MIT. Dr. Barquin can be reached at rbarquin@barquin.com.