



NASCIO 2021 State IT Recognition Awards Nomination

State of Delaware

Department of Elections

Department of Technology and Information

Voter Visual Insights: Election Data via Power BI

Category: Data Management, Analytics & Visualization

Project Initiated: December, 2019

Project Completed: December, 2020

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Executive Summary

The State of Delaware is strongly committed to leveraging data as a tool to promote greater citizen engagement and understanding, as well as to demonstrate powerful impacts that data analytics can have on policy and decision-making. DTI implemented Microsoft Power BI as an enterprise-wide service offering. DTI collaborated with the Department of Elections on its need for election night reporting to showcase this tool's powerful capabilities to render data in consumable, attractive fashion for Delaware decision makers and the public.



Idea

As part of a migration to their new Election Systems and Software (ES&S) system, the Delaware Department of Elections identified an opportunity to expand beyond the vendor's solution capabilities for data analytics and visualizations related to the reporting of election results. The Department of Elections then brought this opportunity to the Delaware Department of Technology and Information (DTI) to discuss the feasibility and level of effort required to create a custom reporting solution.

What made this project distinct from similar initiatives was the fact that the election night reporting solution was not simply a custom report developed for the Department of Elections, but rather a new infrastructure that utilized data analytics and business intelligence to optimize both reporting capabilities and delivery. The election night reporting solution that was developed not only created dashboards and visualizations for what was typically standard statistical reporting, but also created a process that facilitates public access to election results data in a myriad of ways, including Microsoft Power BI. These advanced data analytics and visualizations provide all Delaware citizens with greater insights into election results for presidential primary, state primary, general elections, special elections, school elections, municipal elections, referendum elections and other ad hoc elections. The election night reporting solution not only changes the way that the Department of Elections reports election results, but also how Delaware citizens interact with them.



Implementation

This project was made possible by DTI's implementation of Microsoft Power BI as an enterprise-wide service offering. The Election Reporting project served as DTI's first true production solution utilizing Microsoft Power BI and will demonstrate the potential positive impacts that data analytics/business intelligence can have on other State agencies.

This project employed a hybrid approach to implementation. While the project typically followed the Initiation -> Planning -> Execution -> Monitoring and Controlling -> Closing waterfall method of project management, individual portions of the election night reporting solution such as Microsoft Power BI reports were developed as an iterative process more akin to the Agile process. While the election night reporting solution was developed to support all applicable election types, each individual election served somewhat as its own project phase, which was a new iteration of implementation.

Outline how the project will be assessed and what successful implementation looks like

This project was assessed based on successful completion of 4 critical factors:

- Requirements document with complete data definition of raw data from Election Systems and Software (ES&S) system;
- Technical design/Network diagram;
- Successful implementation of a solution that can be used by Elections to share Election night reporting;
- User acceptance testing and sign off by Elections.

DTI assembled a core project team to deliver the desired solution, including key individuals and groups with roles in the delivery of the election night reporting solution:

Department of Elections – The Department of Elections’ Director of Information and Technology acted as the Project Sponsor for this implementation. They were tasked with providing sign off for all products and key milestones, as well as providing all of the necessary information for DTI (i.e. sample files). The Department of Elections was also crucial during Election Night as they manually placed the XML file to kick-off the rest of the automated election night reporting process.

Data Management – Multiple representatives from the DTI Data Management team were allocated to this project. The Data Management team were primarily charged with analyzing the source XML file from the Department of Elections, creating the extract – transform – load (ETL) process, creating the Microsoft Power BI visualizations/dashboards, generating the extracts for the Web Development resource and the Associated Press to consume, and implementing the data sets for unofficial and official results within the State’s Open Data Portal.

Database Administrator – A Database Administrator was allocated to the project to create the election night reporting database, and to work with the Data Management team to deploy changes to the SQL Server Integration Services jobs.

Web Development – As there were concerns with the potential load on the Microsoft Power BI environment during elections that gained more interest, i.e. the General Elections, a web development resource was allocated to the project to develop a summary reporting website to act as a buffer between the public and the Microsoft Power BI visualizations/dashboards. This website would provide results to the public, with the option to drill down into the more detailed Microsoft Power BI reports.

System Engineering – A System Engineering resource was assigned to the project to develop the infrastructure that would facilitate the flow of data, starting with the Department of Elections, traversing through the database, and eventually being shown on the developed reporting outputs (reporting site, Microsoft Power BI reports, and Open Data Portal).

System Administration – Two System Administrators were allocated to the project to develop the scripts to move files through the election night reporting solution. One System Administrator created and monitored the script to move files from the DTI SFTP server to the database, which resided on a SQL server. The other System Administrator created and monitored the script to move files from the SQL server to the Department of Elections web server.

Security – Leading up to the Presidential Primary and General Elections, the Security team became more heavily involved in order to secure the integrity of reporting election results.

Using the existing election system migration contract in place between the Department of Elections and DTI, the aforementioned project resources charged their time to various project tasks. The estimated time to support each election is roughly between 264 – 284 total hours. During the initiation phase of this project, the project team met with the Department of Elections to propose the election night reporting solution and discuss its feasibility. Once buy-in was gained, the project team provided the Department of Elections with each individual product part (reporting site/Power BI/Open Data Portal) before each corresponding election. Once sign-off was obtained for these products, end-to-end testing took place and allowed for final sign-off from the Department of Elections.

The election night reporting solution is an internal state supported system, the key parts of which are a web server that hosts the elections.delaware.gov site, a file transfer/SFTP server, as well as a SQL database. However, the system is dependent on Election Systems and Software (ES&S), as well as Power BI.

Services run on each of the servers involved, which notify system administrators of any issues that could occur. There is also a skeleton crew on call throughout the night. On the front-end, the team has attempted to mitigate any performance degradation by creating the front-end reporting site with the capability to drill down to the Power BI reports. This was put in place with the belief that it will take the load off of Power BI.

The Security team has also implemented an application firewall service for public facing and externally hosted sites with State of Delaware content, including the election night reporting solution.



Impact

There was a stark contrast between the reporting of election results before and after the implementation of the election night reporting solution, which allowed both the Department of elections and the Delaware public to have greater insight into election results. Previous elections displayed standard statistical reporting (Figure 1) while the Microsoft Power BI reports show data in a myriad of interesting ways, also providing drill-down capabilities.

| PRESIDENT | | 432 of 432 Districts Reported | | |
|--------------------------|---------------|-------------------------------|-------------|---------------|
| | Machine Votes | Absentee Votes | Total Votes | Percent Votes |
| DEMOCRATIC PARTY | | | | |
| HILLARY CLINTON | 221,608 | 13,995 | 235,603 | 53 . 35 % |
| REPUBLICAN PARTY | | | | |
| DONALD J TRUMP | 175,162 | 9,965 | 185,127 | 41 . 92 % |
| GREEN PARTY | | | | |
| JILL STEIN | 5,868 | 235 | 6,103 | 1 . 38 % |
| LIBERTARIAN PARTY | | | | |
| GARY JOHNSON | 14,045 | 712 | 14,757 | 3 . 35 % |

Figure 1: 2016 General Election – By Office – President (Pre-Implementation)

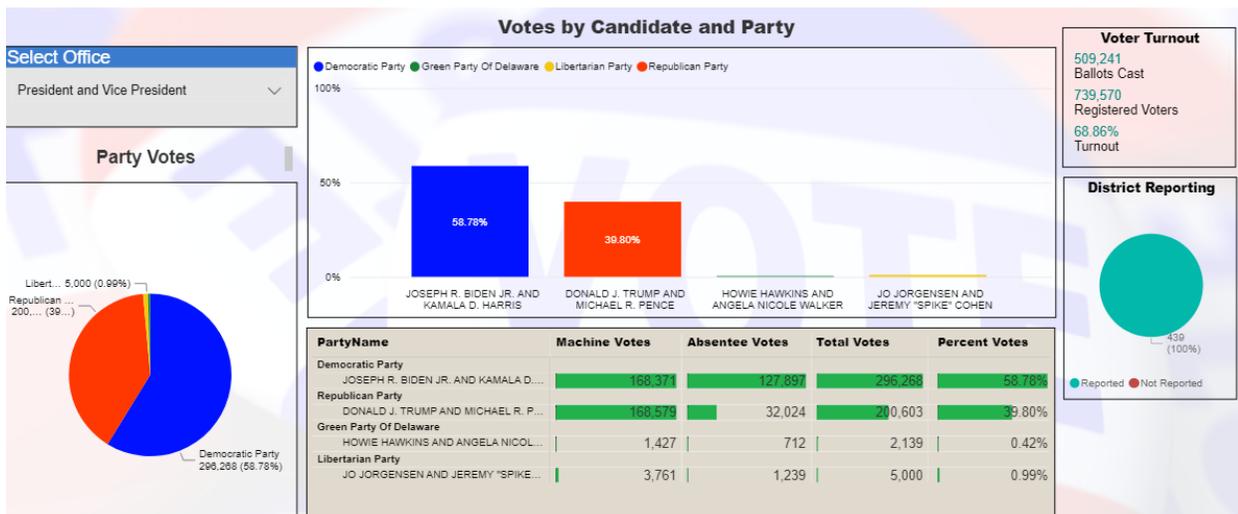


Figure 2: 2020 General Election – By Office – President (Post-Implementation)

The use of Microsoft Power BI, for the implementation of the election night reporting solution, has motivated the Department of Elections to look into other ways that they can create additional dashboards/visualizations that will give them greater insight into their own data. Figure 3, below, is a custom voter participation report that was created following the 2020 General Election.



Figure 3: 2020 General Election Voter Participation by Age Group

During this project, the Data Management team that has been working with Power BI consistently gained praise from the Department of Elections for their flexibility, quick turnaround times, and creative solutions that they brought to the table. The long-term plan for the project is to continue report development for election types that have yet to be reported on since the solution has been implemented, most notably school board elections and municipal elections. Once development and testing has been completed for these election types, DTI will transition to a support role for future elections.

This project fulfilled a need that is shared amongst many agencies, states, and even at the federal level: the need to provide the public with greater insights into data. Figure 4, below, demonstrates the level of interest in Delaware elections data. Without implementing this new election night reporting solution, the Department of Elections' reporting capabilities would have

been limited, as they would be entirely dependent on their new ES&S rather than using the outputs from the ES&S system to truly unlock all that can be gleaned utilizing Microsoft Power BI to analyze and render visualizations of the source data.

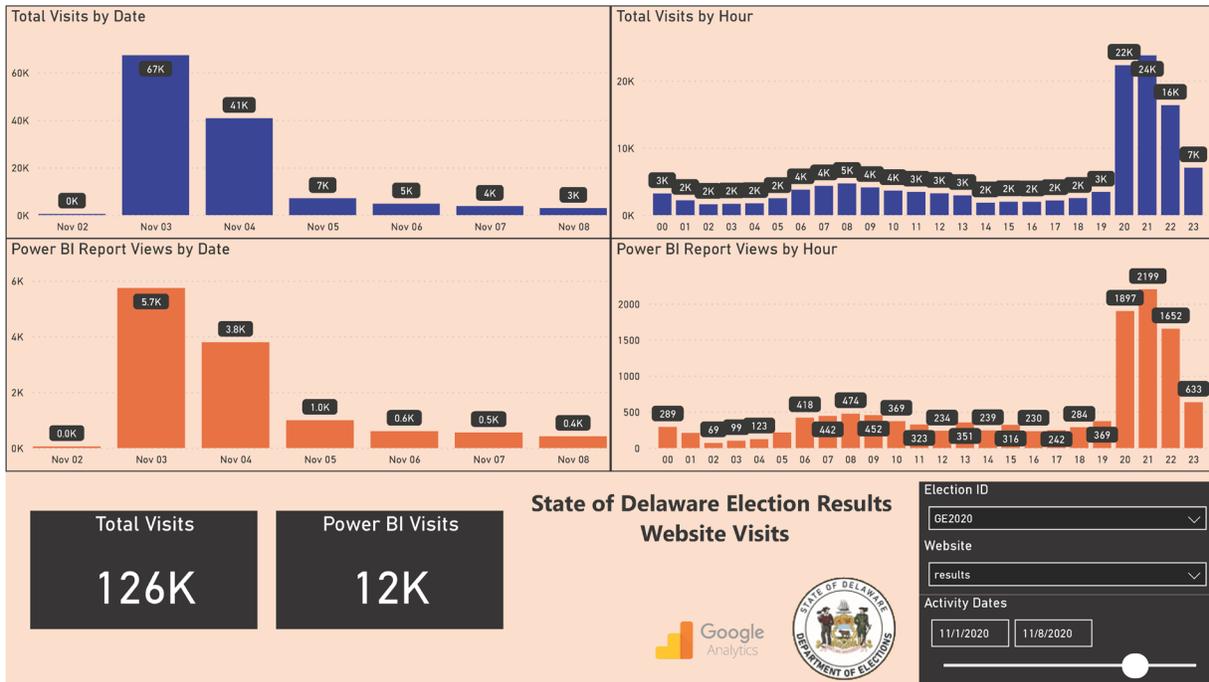


Figure 4: 2020 Election: Website Visits

While the specific need for this project was to provide detailed Delaware election results, everyone stands to benefit from data visualizations of all kinds. Whether it be for greater transparency between an agency and the public, or for the agency to improve a business process through these gained insights into their own data. This initiative also embodied one of the State of Delaware Chief Information Officer's top four priorities: enabling enterprise data analytics.

What made this project distinct from similar initiatives was the fact that the election night reporting solution was not simply a custom report developed for the Department of Elections, but rather, it showcases an entirely new infrastructure that utilized data analytics/business intelligence to optimize both reporting capabilities and delivery of data reporting in a more comprehensive manner.