



Etrick-Matoaca Library, Chesterfield County, VA

CHESTERFIELD COUNTY IMPROVES REGIONAL INFRASTRUCTURE PLANNING WITH LONG-TERM FORECASTS AND WINS NATIONAL AWARD

Chesterfield County, located in the state of Virginia, is recognized as the “17th Best Place to Live in America” and “One of the 100 Best Communities in America for Young People.” The county also has the lowest crime rate in the Richmond Metropolitan region, so the residents flock to live there. For Chesterfield County residents, businesses, and visitors, there is an evolving need for access to public schools, parks & recreation sites, and public libraries as the county continues to grow.

CHALLENGE:

Chesterfield County was growing so fast, nine percent since last census, that demographics were shifting, and stakeholders needed to make sure the “model of excellence in public education” stayed intact. The growth dynamics in any county presented challenges for school planning, ranging from enrollments in particular facilities up to where new facilities should be built. With the median costs for elementary, middle, and high schools at \$35M, \$50M, and \$75M respectively, finding the right locations and subsequent population zoning is important.

Chesterfield County’s primary goals were to be more transparent with its taxpayers and demonstrate why decisions were made when building new schools, and to better plan for where to build schools and how big they should be. After creating a one-year forecasting model, Chesterfield found that the rate of accuracy was only of 90%. With the desire to improve on the accuracy findings, Chesterfield County planned to develop a five-year prediction model that forecasted enrollment for schools in the county and prove that the school investments were a necessity. Additionally, the model needed to help discover insights to make

data-driven decisions in the development of not only schools, but other capital facilities to ensure fiscal responsibility for the taxpayers.

SOLUTION:

After a Data & Analytics pilot and the discovery that the model had to go past one year and include other sources of data to be accurate, Catapult helped Chesterfield County create a more accurate five-year forecasting model to help make data-driven decisions in school development, such as building new schools or shifting school boundaries. Catapult validated and consolidated data from 60 schools over a 15-year timeframe, including demographic and 20 years of housing data with additional sources of data, into a data warehouse for reporting and analysis. Using machine learning and Power BI, data sets were mapped and results to insights were written to a SQL server to visually report the forecasting of school enrollment in different areas of the county. Catapult also used Azure ML Suite to build and validate production-ready time series forecasts. The data-driven visual dashboards developed, helped Chesterfield County find insights to plan for future school developments. It also helped specific school districts plan for certain needs, determined by the school enrollment forecast.

“*When a county is investing as much as \$35 million or more in an elementary, we have one chance to make that decision and we want to make sure we make that decision right.*”

Allan Carmody, Former Finance Director,
Chesterfield County

RESULTS:

The model predicts for a 5-year forecast horizon and shows geographical student growth decoupled from the school districts, making this model one more accurate than the legacy one-year model. Catapult worked with the County's data engineering team to build a new dataset based on housing parcels – a “parcel level” approach. This enabled Catapult to build a new model that could predict student growth to various levels of geographic aggregation, such as neighborhood and census tract. The approach was successful and was integrated into the County's planning process.

Catapult also partnered with the County's IT analysts and transferred knowledge of data science skills so they could apply the same approach to forecasting the need for building new fire stations, or other infrastructure needs throughout the County.

The forward-thinking county of Chesterfield increased the county's overall data maturity and transparency to all stakeholders. With a successful student demand forecasting model, the county has begun to expand in other ways of modernizing their analytics infrastructure.

The elasticity of the cloud allows state and local government agencies to consolidate their data from many sources into an environment where they can take full advantage of high-grade security features, data at scale, advanced analytics, and machine learning capabilities. These combined capabilities enable public sector analysts or data scientists to build better models, GIS team to add high-quality layers of geospatial data, and the users to consume the results in easy-to-digest dashboards and reports.

TRANSFORMATIVE IMPACTS:

BUILT A SECURE ML PLATFORM

Leveraged Azure Machine Learning Studio and Azure Data Factory to securely connect to Azure SQL databases and Azure Data Lakes and enable streamlined model deployment.

IMPROVED ACCURACY

Improved accuracy of long-range school enrollment forecasts using the County's own schools, demographic, real estate, and planning data, relative to existing statistical models designed on state-level population.

UPSKILLED ANALYSTS

By working alongside Catapult experts, the County's data analysts gained valuable data science skills to start building their own use case and using the model to make data-driven decisions when evaluating public facilities.

AWARD WINNER:

Chesterfield County was recognized with the **2022 National Association of Counties Achievement Award** for this engagement, a project titled: **Forecasts for Communities: Data-Driven Populations Projections**. “The cross functional team included Deputy County Administrators; Budget, Parks, and Library Directors and subject matter experts; technology leaders and staff; and data engineers and data scientists from Catapult Systems, a Microsoft Gold Partner.”

[Learn more about this award.](#)