Texas Department of Transportation

CENTER FOR TRANSPORTATION RESEARCH

PROJECT SUMMARY REPORT

0-7028-01: Integrated SiteManager and Pavement Analyst Database on an Online Platform

Background

Texas Department of Transportation (TxDOT maintains several databases to track material, construction, and performance information for roadway projects: materials and test records in the SiteManager (SMGR) database; construction related information in TxDOT Connect or Design and Constructions Information System (DCIS); in-house maintenance activities in Compass (formerly known as Maintenance Management System (MMS)); and performance measures in the Pavement Analyst (PA) database. In a recent project, 0-7028, data from the SMGR and PA databases were compiled and analyzed to study the influence of material properties on the long-term pavement performance. Several pavement sections were also selected for site visits to validate results obtained from the compiled data. The comparison of the filed observations with the compiled data revealed that there was a need to incorporate maintenance activities to accurately capture the performance of materials and construction practices. Furthermore, currently TxDOT does not have a system to evaluate the performance of materials and assess the effect of modified and new specification Items on the long-term pavement performance. This research study was conducted to integrate material, construction, maintenance, and performance information, and to deploy the unified data on a commercial system licensed by TxDOT so that Division and District personnel can access and interact with these data on a regular interval or an as-needed basis.

What the Researchers Did

The research team extracted material and project related information from the SMGR and DCIS databases, and pavement surface conditions, distress measures, and locations of all contracted and in-house construction and maintenance projects identified for four-year planning cycles from the Pavement Analyst database. The research team queried, integrated, and processed these data on Tableau Prep Builder. The integrated data on Tableau Prep Builder were directly connected to the source SMGR and DCIS databases, which were updated on a regular interval. The research team then utilized this integrated data to develop Tableau dashboards for easy visualization, analysis, and interaction. The integrated data-sources and dashboards were published on Tableau-TxDOT server that could be accessed by different Divisions and Districts. Feedback from TxDOT personnel were sought to identify the specific needs of Divisions and Districts. In addition, the research team developed guidelines for managing and operating the dashboards. A text guide and a video guide were developed to demonstrate how one could use the dashboards to view, study, and compare long-term performance and distresses of projects, specification Items, and mixture constituents. Furthermore, steps to add additional data-sources and create new dashboards utilizing the additional data-sources were provided for future management and expansion.

What They Found

Value of research

The research team prepared a Value of Research (VoR) report including the economic and qualitative benefit areas and the economic benefit calculations for TxDOT

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and the state.

A unified online application to track material performance
The research team developed a unified online application that
• integrates material, construction, maintenance, and performance measures;
• locates projects on a geographical map on a highway section for different Districts and Maintenance Sections;
• visualizes long-term pavement conditions and distresses for projects, specification Items and mixes, and material constituents;
• estimates the total dollar value spent on construction and maintenance activities for a given section;
• summarizes available material information, material sources, and Quality Control Quality Assurance (QCQA) efforts;
• determines the age of pavement surfaces;
• compares state-wide, district-wide, and maintenance-section-wide performance for projects, specification Items, mixes, and/or characteristics – including but are not limited to locations, traffic, highway type, and material properties – selected by a user; and
• presents pavement performance in the form of pavement condition measures and surface distresses.

What This Means

A first-ever unified system
The research team developed a unified system that integrates materials, construction, maintenance activities, and pavement surface performance measures for the first time. The developed system incorporates maintenance activities in determining the total dollar value spent on pavement sections and the age of pavement surfaces.

An online application
The integrated data-sources and dashboards are published on Tableau-TxDOT server which can be directly accessed by TxDOT personnel from different Divisions and Districts, and the material and project data are updated on regular intervals. Divisions and Districts will be able, in near real time, to evaluate the materials performance, assess the effect of modifying an existing specification Item or introducing a new specification Item on the long-term pavement performance, and ultimately benchmark the material characteristics and QCQA efforts.

An investigative tool
The developed system can be used to analyze the historical performance of projects, specification Items or mixes, and constituent materials. The dashboards can be used to flag unsatisfactory performance, trace back the materials and construction practices associated with such performance, and identify the root cause or initiate further investigation.

A foundational framework
The flows and the dashboards developed in this study present the foundational framework for the integration and tracking of performance of materials and construction practices for other design-build projects and pilot projects introducing new or modified specification Items. Such a tool may help in identifying primary modes of pavement distress to be considered in the development or modification of new specifications. Furthermore, this tool may be expanded by adding laboratory test results data, which in turn may be used to relate test results to the field performance and evaluate the appropriateness of laboratory tests.

For More Information

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