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COVER PAGE

Innovation Study Title	Information Visualization: The Road to the Future
Category	Technology and Tools
Jurisdiction Name	City of Overland Park, Kansas – Public Works Department
City/County Manager	Bill Ebel, City Manager
Population	177,029

Submit Innovation Study for an Alliance Innovation Award **Yes [ ]** **No [x]**
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Information Visualization: The Road to the Future
Synopsis

Program Summary

Similar to many government agencies nationwide, the City of Overland Park, Kansas is faced with a growing infrastructure and a decrease in available funding for maintenance. Since the advent of pavement management systems in the 1980s, the City has collected vast amounts of information related to the condition of local roadways. While the information provides staff with the current and historical conditions of the street network, it remains difficult to convey to the Governing Body what ramifications todays decisions will have on tomorrows funding requirements.

Public Works staff was tasked with developing long-term modeling software to accurately predict street conditions and summarize the information in a succinct format for presentation to decision makers. As a result of this directive, new architecture was applied to the existing pavement management software and new reporting features were developed. The new methodology also included implementation of a GPS enabled data collection device used on high-volume arterial roadways.

The system was implemented in spring 2011 and used extensively in the development of a new maintenance philosophy, while at the same time providing the Governing Body with focused information necessary for adoption of the City's 2012-2016 Budget, which includes increased funding for street maintenance.

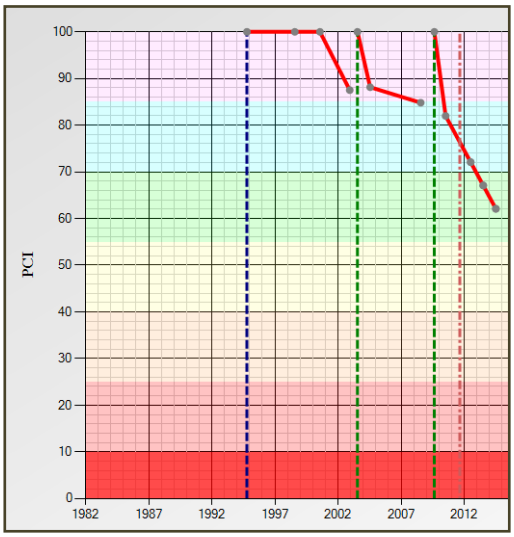
Outcome

During the summer of 2010, preliminary studies reviewing the City's current maintenance planning policies were presented to the Department of Public Works management team. The studies included recommendations that eventually became the foundation for the innovative changes made to the maintenance program. Recommendations included several key goals, which are listed below:

- More user-friendly software interface and reporting mechanisms
- 5-year planning capability
- More accurate and comprehensive prediction model (street classification for surgical solutions)
- Consistent and easier data collection for high-volume arterial streets

The program development was completed in spring 2011, and it became apparent that all of the stated goals were met or exceeded. The unexpected benefits from the development allow for even greater simplicity for decision making and additional benefits listed below:

- Unlimited planning horizon with associated visualization
- Allows for rating the effectiveness of maintenance treatments over time to identify inefficient maintenance practices and best timing for treatments
- Implementation of new condition rating system for high-volume arterial streets
- Advanced toolset for maintenance planning decisions

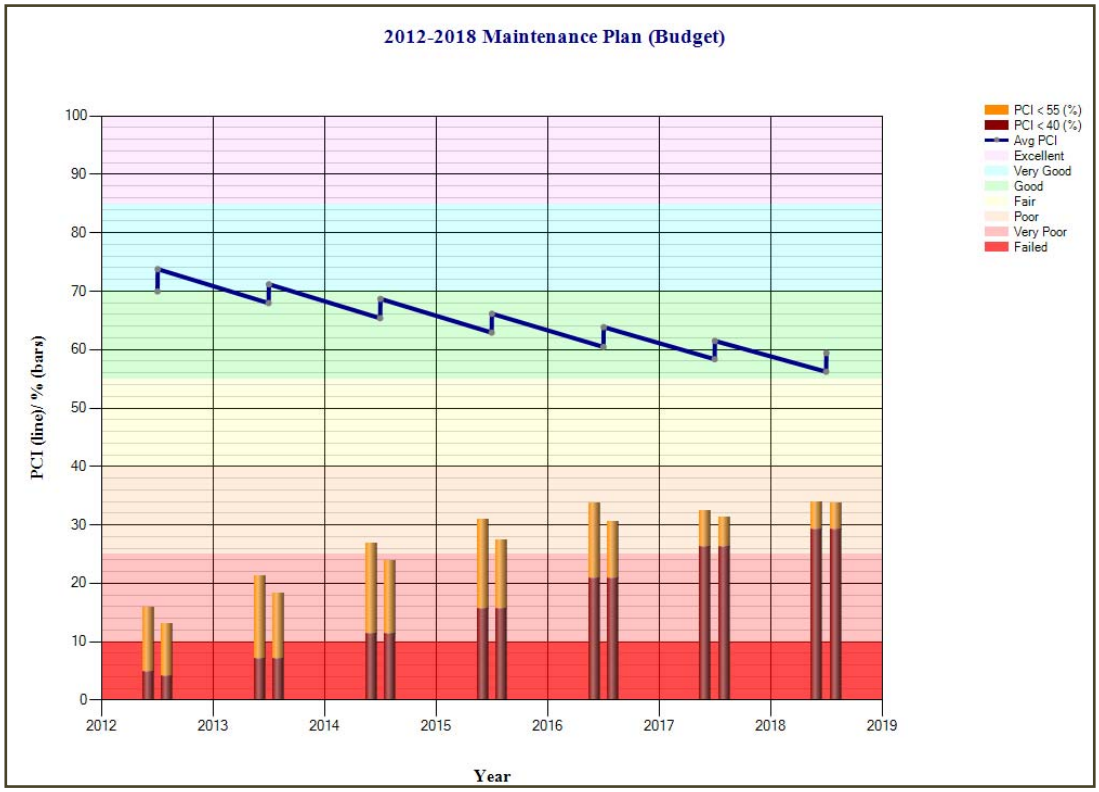


Costs / Savings

Implementation of the program depended primarily on utilizing development tools already licensed and in place. The work was completed by a small group of existing City staff and is estimated to have taken 400 man hours. The program's largest direct cost was the purchase of a new GPS enabled data collection device ("Roughometer III") at $15,000 from an Australia based company, ARRB Group.

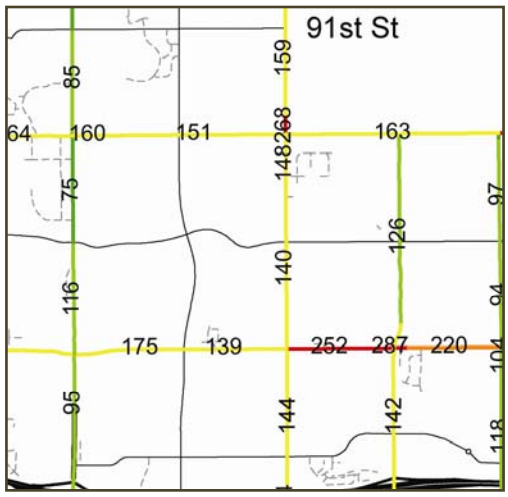
While the cost to develop the program was minimal, the savings realized have been and are projected to be substantial. By their nature, street maintenance funding requirements grow exponentially the longer the treatments are deferred. The program provides long-range planning tools and visualization that demonstrate the effects of deferring maintenance to later years. While it is difficult to quantify the savings associated with this benefit, it is known that preventative maintenance treatments are approximately six times cheaper than a major rehabilitation and 60 times cheaper than a complete reconstruction. Other cost savings are realized through:

- Use of alternative maintenance treatments for certain street classifications that are 10-50 percent cheaper than the existing treatment being employed
- Reduced staff time for multiple tasks, including evaluating candidates for the annual maintenance program, and presentations to the Governing Body
- Better understanding of pavement performance through visualization



Innovative Characteristics

The existing pavement management system and corresponding maintenance philosophy were in place and virtually unchanged, since 1988. At the same time, the roadway infrastructure in Overland Park grew approximately 75 percent and began to age, requiring substantial maintenance. While tax receipts continued to increase throughout the prosperous 1990s and 2000s, adequate resources were available to fund the maintenance plan based on the existing philosophy. When the 2008 financial crisis began to impact the maintenance budget, the plan was largely underfunded resulting in substantial deferrals of preventative maintenance treatments. The tax increase required to bridge the gap was not realistic; thus, a different and innovative approach was needed:



- Long-term modeling capability
- GPS enabled data collection device to streamline condition measurement on high-volume arterial roadways and summarize results for instant use by multiple Public Works Divisions
- Visualization of results including Arc-GIS maps and animated exhibits, multi-layered Excel spreadsheet representations, and programmatic plots of individual street and network performance
- Project implemented as a design-build effort for maximum efficiency

Obstacles & Results Achieved

The implementation of the program went smoothly, with several obstacles that were overcome through education and training. The biggest challenge was presented in the form of the timeline expected for completion of the project. The ever changing economic situation required quick responses to inquiries and analysis of multiple scenarios. A design-build approach was adopted to solve this issue and was instrumental in meeting the timeline.

The political aspect of the maintenance planning process also played a large role in the development of the new maintenance philosophy. A popular, yet more expensive and less effective, treatment was proposed to be replaced with a cheaper, more effective treatment that was abandoned due in part to resident complaints. The program visualization helped to educate and inform the Governing Body as to the best engineering solution, which also resulted in cost savings.

Information Visualization: The Road to the Future

Innovation Study Components

Innovation/Creativity

The street maintenance planning in Overland Park, Kansas involves three divisions in the Public Works Department, as well as the Governing Body. The updated pavement management system improves the organization by streamlining the planning process and helping to facilitate communication across the divisions. Further, it summarizes results of the long-range prediction model through visualization to aid decision makers (Governing Body). It is often difficult to communicate such a large amount of data during the small amount of time the individuals have available for this issue. The visualization of large-scale amounts of numerical data into one or several simple maps and figures helps avoid this roadblock.

Several new technologies were used in the development of the program. Elements of Arc-GIS were embedded in the database user-interface, allowing for a seamless interaction between the two systems; data and geospatial. The ability to use selection tools in a graphical interface allows for multiple changes to be made to the model and rerun in a short timeframe with a recalculated budget. The team was also able to create a time-lapse "movie" showing the gradual effects of a selected model scenario.

A data collection device has been utilized, since 2005, to measure the condition of high-volume arterial roadways, but without a location feature. The new Roughometer implemented in 2011 includes GPS coordinates in the output, which allows for point condition readings and reduces the record keeping tasks of the test drivers. In addition to a localized reading map, the point conditions are summarized into an average condition rating for the entire road segment and mapped. Having both maps available to staff allows not only long-term maintenance planning, but also stop-gap treatments for immediate response.

The Roughometer III was purchased from ARRB Group, out of Australia, in 2010. The company is a leader in road and transport research and a trusted advisor of governments worldwide for technical input and solutions.

Outcomes Achieved

As they have done throughout the course of history, roadways play a vital role in the development and operation of a city. The residents and business community, in the City of Overland Park, expect a well maintained, efficient roadway network for transport. The ability to project long-term maintenance needs provides confidence to shareholders that the City can and will continue to provide first-class services into the future.

The visualization of maintenance planning makes the technical information much easier for consumption by the general public. It allows them access to the data that otherwise would have been unfiltered and limited to City staff. The health of the Overland Park community has improved as a result of this program because it helps to improve the City's most valuable asset.

Applicable Results and Real World Practicality

In uncertain economic times with little room for inefficiency, quick and inexpensive solutions provide governments with valuable tools to adapt to ever changing conditions. The street maintenance planning program, developed by the innovation study team, is applicable to many government organizations without large budgets to focus on research and development. Although it is an in-house software program, the long-term modeling and visualization portions of the program can be replicated by other agencies. Additionally, the results obtained from the research on the effectiveness of various maintenance treatments will be shared with other local maintenance departments.

Innovation Study Presentation

The innovation study is a PowerPoint presentation with accompanying visualizations. There will also be ArcGIS components included in the presentation. Handouts that summarize the key points will be provided as a resource for conference attendees to take back to their respective organizations.