

Effectiveness Assessment of E-Ticketing Technology Adopted to Mitigate Covid-19 Challenges for Inspectors and Field Engineers in Transportation Projects: Guidebook Development for E-Ticketing (Electronic Track of Material Delivery) Implementation

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\$ 108,000

Assessing the E-Ticketing technology to mitigate Covid-19 challenges in transportation projects

As construction of transportation projects require significant amount of financial resources, cost savings play a significant role in these projects. E-Ticketing, is a new technology which reduces project costs through less need for inspection workforce, increased accuracy in delivery of construction materials (concrete, asphalt mix, etc.), improved documentation process, and reduced project schedule. In addition, this technology increases safety of inspectors, as they do not need to locate in danger zones of projects adjacent to traffic in order to exchange paper tickets with truck drivers. Although, E-Ticketing is a very beneficial technology in construction of transportation infrastructures, several DOTs hesitate to adopt the technology and only few DOTs such as Iowa DOT and Kentucky Transportation Cabinet have pilot tested the technology. The reason behind this resistance is due to lack of sufficient research results to support the cost and schedule savings of the technology as well as lack of implementation standards and guidelines. Therefore, this study aims to analyze the effectiveness of the E-Ticketing for construction of transportation infrastructures based on cost savings, schedule reductions, and health and safety enhancement. In this regard, this study develops two quantitative models measuring the cost savings and schedule reductions using E-Ticketing in transportation projects. Moreover, this study evaluates the health benefits of E-ticketing adoption for field inspectors to reduce the probability of COVID-19 contraction as face-to-face interactions between truck drivers and field inspectors are eliminated. This study also develops a decision-making tool for adoption of E-Ticketing in different transportation projects based on their projects size, project type, complexity level, location (rural vs. urban), project timeline, and other characteristics.

Problem Statement

Collecting load of paper tickets in construction fields puts inspectors in great risks due to adjacent traffic or heavy equipment. Moreover, daily scanning and storing paper tickets for the purpose of documentation require significant amount of

time, efforts and space. In addition, due to Covid-19, in-person contacts between inspectors and truck drivers endangers field workforce health and safety. To solve this problem, E-ticketing is new technology which is developed and pilot tested in multiple states including Iowa, Kentucky, etc. Through use of E-Ticketing, the delivery and installation of materials (e.g. paving, concrete structures, earthwork and aggregate) can be tracked using various technologies such as GIS, GPS, and RFID. With the use of an app installed on a mobile phone, or tablet, it facilitates instant documentation of project data, and streamlines many facets of the construction process.

E-ticketing allows Inspectors to see when a truck is on the way, and access electronic ticket numbers with the tonnage and certified material type, enabling them to integrate the data into daily reports without having to collect each ticket manually and key it into a contractor pay spreadsheet. On-site inspectors can monitor material deliveries from a safe distance, in contrast to paper-based ticketing, which can put the inspectors in a precarious position, with traffic moving on one side and the project process (e.g. dump truck, paver, and rollers) occurring on the other. By remotely accessing the information on an electronic device (phone, iPad, etc.), the inspector can acknowledge that the truck has arrived on-site, and note material temperature, issues with asphalt mixture, station numbers, etc. The inspectors' personal exposure to potential injury while collecting tickets will be minimized. In addition, this technology will allow them to use their experience to observe other important aspects of the project and not be strictly focused on bookkeeping.

Objectives

The main objective of this study is to assist DOTs' managers and engineers reduce the costs of their projects, improve safety of their inspectors, and complete their projects timely and efficiently. This project will strive to achieve the following specific objectives:

- (1) Analyze the effectiveness of E-Ticketing during Covid-19 pandemic in



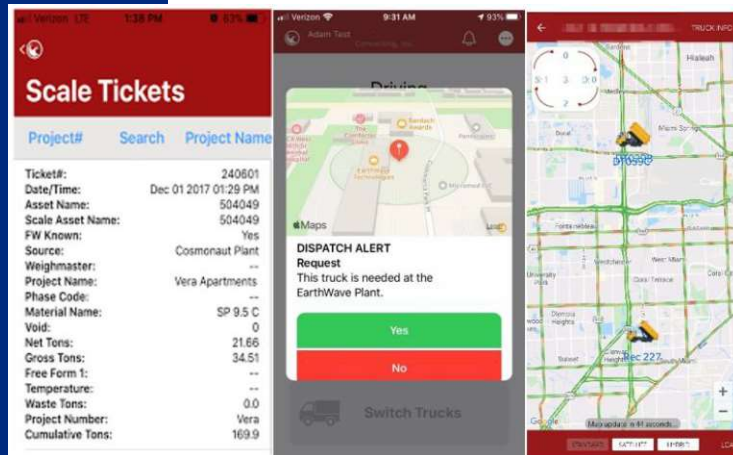
promoting health and safety of inspectors and other field workers;

- (2) Develop predictive models which measure time and cost savings due to implementation of E-Ticketing in transportation projects;
- (3) Establish a guidebook on standards and adoption process of E-Ticketing technology based on project characteristics, workforce requirements, and other project factors; and
- (4) Develop Training materials for successful implementation of E-Ticketing technology in construction and

update the training materials, based on instructional designers' criteria and learning theories. To transfer the technology, a one-hour webinar will be organized and hold to disseminate the findings of E-Ticketing effectiveness among interested DOTs' inspectors, engineers, construction directors, project managers, and other parties. The webinar flyer will be distributed using Transportation Research Board (TRB) and FHWA Listservs.

Anticipated Impacts/Benefits of Implementation

This project has significant impacts on regional 6 priorities. As this project evaluates impetration of E-Ticketing technology during Covid-19, it promotes sustainability of transportation infrastructure projects as it encourages a paperless technology. Also, as the E-Ticketing Technology is an innovative approach which saves inspectors' time and efforts while increase the accuracy of material delivery, the technology saves significant amount of money for Departments of Transportation (DOTs).



maintenance projects.

Figure 1. Screen Captures of E-Ticketing Technology

Intended Implementation of Research

The team will develop training materials and modules for e-ticketing technology, based on project participants' roles and responsibilities. The PIs will develop an instructor's manual that includes four sections for each slide in the modules: Key Message, Background Information, Interactivity, and Notes. The instructor's manual will be developed and embedded in the training materials as a footnote to the slides, and will also be provided as a stand-alone report. In addition, the team will develop a detailed participant's guide for more detailed information. The PIs will develop sets of class exercises and workshop handouts to be distributed and discussed in the training sessions. The goal of the class exercises is to expose the trainees to unexpected situations that might occur during the e-ticketing implementation, and provide them with an opportunity to discuss the best solution(s)/strategies. The team will review and

Web links

- Tran-SET's website <https://transet.lsu.edu/research-in-progress/>

Tran-SET

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes".

Learn More

For more information about Tran-SET, please visit [our website](#), LinkedIn, Twitter, Facebook, and YouTube pages. Also, please feel free to contact Dr. Momen Mousa (Tran-SET Program Manager) directly at transet@lsu.edu.

