

SPR RESEARCH PROGRAM

SECOND-STAGE PROPOSAL SUMMARY

PROBLEM NUMBER AND TITLE

26-38 Effectiveness and Applicability of Technologies for E-Ticket Assessment and Delivery to Support Construction Project Management

PROBLEM SUMMARY

E-ticketing is a paperless process involving tracking, documenting, and sharing important information about construction materials. It can also be simply defined as an electronic version of a paper truck ticket. For older methods on construction sites, the paper exchange and documentation may occur close to moving equipment, which presents a safety hazard. ODOT has trials using this software coming in the summer of 2025. Despite numerous advantages, significant challenges exist in implementing e-ticketing in Oregon. On-site e-ticketing for tracking material delivery for Asphalt Concrete Pavement (ACP) materials, Portland Cement Concrete (PCC), and aggregates is problematic in remote areas due to the absence of cellphone data service coverage. Other solutions may exist (e.g. to store data until cover becomes available to transmit), however, these are not tested. Verifying the applicability of technologies to the plants and processes is also still not known.

ODOT OBJECTIVES

This study aims to evaluate and identify the most effective e-ticketing technologies for tracking construction material deliveries in Oregon, considering regional connectivity challenges. It will assess cost-effective methods for seamless implementation, including GPS-based tracking, all while taking advantage of trials planned for the summer of 2025. Additionally, the research will analyze the feasibility of using mobile devices for truck tracking to reduce hardware costs. The findings will provide data-driven recommendations for improving ODOT's e-ticketing processes, ensuring efficiency, accuracy, and compliance with national standards.

BENEFITS

The benefits are 1) increased efficiency and cost savings, 2) enhanced material tracking and quality control, 3) improved connectivity, 4) environmental benefits, and 5) reduction in older, manual and potentially unsafe practices.

SCHEDULE, BUDGET AND AGENCY SUPPORT

Estimated Project Length: 24 months.

Estimated Project Budget: \$295,000

ODOT Support:

Larry Ilg, State Quality Assurance Unit Manager, Larry.D.ILG@odot.oregon.gov (503) 930-4880

Mike Stennett, Sr. Quality Assurance Engineer, Michael.J.STENNETT@odot.oregon.gov, (503) 318-9881

FOR MORE INFORMATION

For additional detail, please see the complete STAGE 2 RESEARCH PROBLEM STATEMENT online at:
<https://www.oregon.gov/odot/Programs/ResearchDocuments/26-38>

SPR RESEARCH PROGRAM

SECOND-STAGE PROBLEM STATEMENT

FY 2025

PROBLEM NUMBER AND TITLE

26-38 Effectiveness and Applicability of Technologies for E-Ticket Assessment and Delivery to Support Construction Project Management

RESEARCH PROBLEM STATEMENT

E-ticketing is a paperless process involving tracking, documenting, and sharing important information about construction materials. It can also be simply defined as an electronic version of a paper truck ticket. For older methods on construction sites, the paper exchange and documentation may occur close to moving equipment, which presents a safety hazard. The use of e-ticketing started to become popular across several industries during the COVID-19 pandemic. E-ticketing for construction materials simply does the following:

- Interfaces with truck scale ticket data and digitally links it to the truck
- Monitors truck movements using GPS or time-based tracking
- Confirms delivery of loads to the project as proof of delivery
- Generates a daily summary of truck tickets and travel information

E-ticketing has various advantages, including eliminating handling and sorting paper tickets, easy documentation of delivery and other pertinent information, secure data generation and storage, and faster data entry by eliminating the manual process. These benefits make e-ticketing an effective way to improve efficiency, reduce costs, and save time while maintaining data security.

Despite these advantages, significant challenges exist in implementing e-ticketing in Oregon. On-site e-ticketing for tracking material delivery for Asphalt Concrete Pavement (ACP) materials, Portland Cement Concrete (PCC), and aggregates is problematic in remote areas due to the absence of cellphone data service coverage. Other DOTs in the country have proposed satellite-based internet services, cell signal boosters, or alternative touch-free technologies, including QR codes and others, to ensure that ticket data is available at the time of delivery for tracking and yield checks on the grade. However, the applicability of those technologies to the plants and processes in Oregon is still not known. The future implementation of e-ticketing integration in AASHTOWare® makes the timing of proposing this project particularly relevant (ODOT having some trials this summer in rural areas) so that the tested technology can be evaluated as e-ticketing and AASHTOWare® become requirements for tracking material deliveries (starting with ACP) on ODOT contracts.

RESEARCH OBJECTIVES

This study aims to evaluate and identify the most effective e-ticketing technologies for tracking construction material deliveries in Oregon, considering regional connectivity challenges. It will assess cost-effective methods for seamless implementation, including GPS-based tracking, all while taking advantage of trials planned for the summer of 2025. Additionally, the research will analyze the feasibility of using mobile devices for truck tracking to reduce hardware costs. The findings will provide data-driven recommendations for improving ODOT's e-ticketing processes, ensuring efficiency, accuracy, and compliance with national standards.

WORK TASKS, COST ESTIMATE AND DURATION

- **Literature Review and Needs Assessment:** Analyze existing e-ticketing technologies, national standards, and best practices while gathering input from ODOT staff, contractors, and suppliers to identify challenges and requirements.

- **Technology Evaluation and Pilot Testing:** Assess various e-ticketing delivery methods (e.g., mobile apps, GPS, QR codes) and conduct pilot tests in the summer of 2025 in mostly rural areas and in several different regions to evaluate feasibility, accuracy, and usability.
- **Integration and Automation:** Develop a framework for seamless e-ticket entry into AASHTOWare®, addressing technical challenges and ensuring efficient data transfer.
- **Cost-Benefit Analysis and Implementation Plan:** Compare costs, savings, and scalability of different e-ticketing solutions, providing a roadmap for statewide adoption.
- **Final Recommendations and Reporting:** Deliver a comprehensive report summarizing findings, best practices, and recommended updates to ODOT's processes and specifications.

Key Deliverables:

1. **E-Ticketing Technology Assessment:** Identifying the best methods for Oregon's diverse regions.
2. **Pilot Study Report:** Findings on GPS tracking, mobile device use, and connectivity challenges.
3. **AASHTOWare® Integration Plan:** A framework for seamless e-ticket automation.
4. **Cost-Benefit Analysis:** Evaluation of financial impact and efficiency gains.
5. **ODOT Process Recommendations:** Proposed updates for improved implementation.
6. **Final Research Report:** Comprehensive summary of findings and best practices.

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IMPLEMENTATION

The following products and knowledge will be created and implemented in this proposed research study:

- The most suitable e-ticket delivery methods and technologies for different regions in Oregon.
- The most cost-effective processes for a seamless implementation of selected delivery methods.
- An evaluation report on the effectiveness of truck movement tracking using GPS or time-based processes.
- The effectiveness of using the cell phone's GPS to eliminate the need for special (and costly) GPS installations for trucks.
- Recommended updates to ODOT's specifications and processes.
- A comprehensive research report with a literature review, all research components and results, and major conclusions and research products.

POTENTIAL BENEFITS

The potential benefits of the implementation of the findings of this study to achieve a seamless E-ticketing process implementation are listed below:

- **Increased Efficiency and Cost Savings:** Automating ticketing eliminates paperwork, reduces administrative workload, minimizes data entry errors, and lowers costs associated with GPS installations by exploring the use of mobile GPS tracking.
- **Enhanced Material Tracking and Quality Control:** Real-time GPS and time-based tracking will improve oversight of material deliveries, ensuring accurate yield checks, proof of delivery, and preventing disputes.

- **Improved Connectivity and Regional Adaptability:** The study will identify the best e-ticketing technologies suited for Oregon's diverse geographic regions, including solutions for remote areas with limited connectivity.
- **Environmental and Sustainability Benefits:** Reducing paper waste, unnecessary travel, and manual processing will support ODOT's sustainability goals while improving data security and accessibility.

PEOPLE

ODOT champion(s):

Larry Ilg, State Quality Assurance Unit Manager, Larry.D.ILG@odot.oregon.gov , (503) 930-4880

Problem Statement Contributors:

Erdem Coleri, Associate Professor, erdem.coleri@oregonstate.edu (541) 737-0944

Larry Ilg, State Quality Assurance Unit Manager, Larry.D.ILG@odot.oregon.gov (503) 930-4880

Mike Stennett, Sr. Quality Assurance Engineer, Michael.J.STENNETT@odot.oregon.gov , (503) 318-9881

Jon Lazarus, Sr. Research Coordinator, Jon.M.Lazarus@odot.oregon.gov 503-986-2852

STAFF REVIEW PAGE

LITERATURE CHECK

TRID&RIP

☐ A review of TRID & RIP databases found no existing research that answers the research question

There are extensive e-ticketing implementation [studies in TRIS/TRID](#) from various states, however, much depends on the individual software and unique, aspects of connectivity due to Oregon's cell/data coverage and network.

ODOT DECISION LENSES

Climate: This research is not focused on climate and will not include analysis of climate, however, reduction in manual processes and less paper will have climate benefits.

Equity: This research is not focused on equity and will not include analysis of equity.

Safety: This research is not focused on safety and will not include analysis of safety, however, the purpose of trials for e-ticketing (in general) is because of the larger safety benefits. In older, traditional methods of data collection, the "ticket-taker" typically stands in front of the paver and takes the paper documents as the asphalt truck backs up to where the paver wants the new asphalt to be dropped during road construction. This places the person in a dangerous position between moving equipment. This research will look to improve functionality for rural settings for e-ticketing, which will support a safer data transfer process.

TECHNOLOGY & DATA ASSESSMENT

☐ No Identified T&D output

☒ At the end of this project, the implementing unit(s) within ODOT will need to coordinate the adoption of new technology or data in order to realize the full potential of this research.

It is unclear if a customized solution is needed or if off-the-shelf products can bridge the gap between the technologies. iCare will probably be needed for any solution implemented.

CROSS-AGENCY IMPACTS

- List ODOT partners or impacted units. ODOT Construction and ODOT Maintenance Operations are impacted by the results. Potentially, ODOT procurement and Construction Claims will be impacted if e-ticketing research solutions are achievable.
- Justin Moderie, reviewed this proposal as part of the CM ETG review. The PM ETG did not select this one. His comment was that he was happy CM ETG selected this and would support it, however, he noted there were other priorities ahead of this concept.
- Identify any issues of concern raised by an ODOT partners. Note expected mitigation that addresses these concerns.
 - 1) Emergence of Starlink (partnering with T-Mobile) may greatly reduce concern of this not working in rural areas. This issue may also be solved with satellite based technologies (no need for research).
 - 2) This may be just a business decision to switch cell phone carriers for ODOT to solve the problem.
 - 3) There was a concern that ODOT Construction Section has several initiatives and some may have higher priority than rural e-ticketing issues.