

**Research Project Work Plan**  
**for**  
**STATEWIDE DATA STANDARDS TO SUPPORT CURRENT AND FUTURE**  
**STRATEGIC PUBLIC TRANSIT INVESTMENT**

SPR 803

Submitted by

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for

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**1.0 Identification**

1.1 Organizations Sponsoring Research

Oregon Department of Transportation (ODOT)  
Research Section  
555 13<sup>th</sup> Street NE  
Salem, OR 97301 Phone: (503) 986-2700

**(If federal funds are used)**  
Federal Highway Administration (FHWA)  
Washington, D.C. 20590

1.2 Principal Investigator (ODOT requests only one per institution or firm)

J. David Porter, Ph.D., Associate Professor (PI)  
School of Mechanical, Industrial and Manufacturing Engineering  
Oregon State University  
204 Rogers Hall  
Corvallis, OR 97331 Phone: (541) 737-2446  
Email: [david.porter@oregonstate.edu](mailto:david.porter@oregonstate.edu)

1.3 Technical Advisory Committee (TAC) Members

Matthew Barnes, ODOT Public Transit section  
Jamey Dempster, ODOT Public Transit section  
Becky Knudson or Designee, ODOT TPAU  
Kathy Holmes, ODOT Rail section  
Grant Humphries, TriMet  
Doug Pilant, Tillamook County Transportation District  
FHWA

1.4 Research Coordinator-

Josh Roll, ODOT Research Section Phone: 503-986-2853

1.5 Project Champion

Hal Gard  
ODOT Rail and Public Transit Division

## 2.0 Problem Statement

At the national level, some transit agencies are providing rich and informative data [1]. However, Oregon public transit agencies vary in terms of their level of technical expertise and resources available to collect and share data. Much of the data required for understanding, planning, setting policy, and prioritizing investments in the statewide transit network is not easily available or not available in any standardized format. In particular, ridership data is not available in a standard format, and ridership data collected varies significantly by transit agency. Some transit agencies have only limited data in a variety of formats, and other agencies have comprehensive ridership data. The lack of standardized ridership data (a GTFS for ridership) makes it impractical for organizations like ODOT to obtain detailed real-world information about large scale transit networks.

### 2.1 Background and Significance of Work

Effective decision making relies on accurate real-world data. ODOT and Oregon transit providers have taken large steps forward in understanding Oregon transit services by facilitating the creation and maintenance of General Transit Feed System (GTFS) data used by the Google Transit Partners Program for over 60 Oregon fixed route transit services. ODOT is taking advantage of GTFS data by investing in the open-source, web-based *Transit Network Analysis* software tool [2]. Despite these efforts, large information gaps still remain.

## 3.0 Objectives of the Study

The goal of this research project is to develop a ***public transit ridership data standard*** for all Oregon public transit agencies to follow for the purposes of improved data collection, storing, sharing, reporting, and analysis. These core functionalities of the standard will be supported with the development of open-source, web-based tools for use by transit agencies, ODOT, regional planners, modelers, and vendors.

### 3.1 Benefits

- ODOT and public transit agencies will gain access to data used to formulate information needed to make effective and efficient data-driven decisions;
- ODOT will obtain data necessary for performance metrics and FAST/MAP-21 reporting at lower costs;
- ODOT and public transit agencies will save time and resources through data standardization, gaining more information with less labor hours or data collection costs;
- An open data standard can improve perception of transit agency transparency and public awareness of available transit services [1];
- The data standard will provide clear direction to transit agencies when deciding what equipment technology to include when purchasing new buses. ODOT does not expect transit agencies to immediately implement new technology, but the data standard will make data expectations clear;

- A well-crafted data standard, complemented with supporting open source software tools, has the potential to be adopted broadly by transit agencies, analysis tool vendors, and vendors of passenger information collection systems;
- This work is potentially of interest to the National Transit Database (NTD), which lacks detailed ridership data [3, 4].

#### 4.0 Implementation

Results of the development, validation, and testing of the public transit ridership data standard as well as the open source, web-based software tools that will facilitate its use will be documented in the final report for ODOT Research. The source code generated in the development of the open source, web-based software tools will be routinely uploaded to GitHub. Video tutorials to quickly introduce potential users to the functionality offered by the software tools will be produced. It is also anticipated that the results of the project may be presented at relevant transportation related conferences and submitted in the form of journal/conference articles to appropriate journals.

The Rail & Public Transit Division (RPTD) and the Transportation Planning and Analysis Unit (TPAU) of ODOT will support continued operation and maintenance of the public transit ridership data standard. In particular, RPTD partners will be invited to use and test the public transit ridership data standard and open source, web-based software tools.

The public transit ridership data standard is expected to facilitate the sharing of ridership data, and improve understanding, planning, setting policy, and prioritizing investments in multi-agency transit networks.

#### 5.0 Research Tasks

***Task # 1: Perform a comprehensive review on the current state of the art and state of the practice of transit ridership data.***

***Review state of the art:***

Perform a comprehensive literature review to develop an accurate understanding of the current status of transit ridership data as it exists in Oregon, across the US, and internationally. The literature review will focus on the analysis of currently existing data types, formats, structures, resolution, validity, completeness, and availability.

Additionally, information will be gathered on both currently existing and future ridership data collection, storage, sharing, reporting, and analysis technologies. The main sources of information will include academic journals, community forums, web searches, transit agency publicly posted ridership data.

***Review state of the practice:***

The review of the state of the practice will be performed by collecting data directly from stakeholders (e.g., transit agencies, governmental organizations, city planners, civic groups, transportation consultants, technology vendors, etc.) via different instruments, including (but not limited to) interviews, surveys, discussions, and/or online comments. The direct interaction and (when practical) face-to-face meetings with stakeholders will

be vital in (1) understanding of how ridership data are collected and used to facilitate policy analysis, planning, travel demand modeling, and operations, and (2) determining the salient requirements, structures, and functions of the public transit ridership data standard to be developed in Tasks #2 and #3. The OSU research team will secure Institutional Review Board (IRB) approval(s) for any required interview/survey protocols before these are sent out to stakeholders.

Time Frame: 4 months  
Responsible Party: Porter (OSU)  
Cost: \$18,000  
Deliverable: The results of Task #1 will be synthesized into an interim report.  
TAC Action: Review interim report and provide feedback to PI. Revisions will be incorporated into standard by Principal Investigator (PI).  
ODOT Action or Decision: Review TAC advice, discuss with PI, and if necessary direct PI to make changes to project documents.

***Task # 2: Preliminary design and development of a public transit ridership data standard.***

Establish preliminary critical and desired parameters (i.e., data elements) of the public transit ridership data standard through findings of Task #1. Design initial syntax, semantics, and degree of flexibility of the public transit ridership data standard. Determine how the public transit ridership data standard will inform and enhance the general transit feed specification (GTFS) standard. Conduct an iterative revision process of the public transit ridership data standard through repeated interaction with involved stakeholders. Determine a set time length and method to receive comments and requests in anticipation of issuing a final draft of the data standard.

Time Frame: 4 months.  
Responsible Party: Porter (OSU).  
Cost: \$36,000  
Deliverable: Preliminary design of public transit ridership data standard.  
TAC Action: Review revised version of public transit ridership data standard and provide input to PI. Revisions will be incorporated into standard by PI. Process will be repeated until satisfactory to ODOT.  
ODOT Action or Decision: Review preliminary standard and provide feedback.

**Task # 3: Issue final draft of public transit ridership data standard with implementation recommendations.**

Based on the results of Task #2, release final draft of the public transit ridership data standard. The final draft release will include high-level recommendations on the implementation and operational uses of the public transit ridership data standard based on the varied abilities of Oregon public transit agencies. The method for the release will be informed by the way the GTFS standard is represented and modified. Collect sample ridership data from Oregon transit agencies to fit into the data standard developed in this task. The sample ridership data could be used in Tasks 4 and 5.

Time Frame: 3 months.

Responsible Party: Porter (OSU).

Cost: \$27,000

Deliverable: Final draft of public transit ridership data standard.

TAC Action: Review final draft of public transit ridership data standard and provide input to PI. Revisions will be incorporated into standard by PI. Process will be repeated until satisfactory to ODOT.

ODOT Action or Decision: Work with Oregon public transit agencies to refine high-level recommendations on the implementation and operational uses of the public transit ridership data standard. ODOT Research Section will publish the interim report of public transit ridership data standard.

**Task # 4: Develop functional and technical requirements of the open source, web-based software tools to support the public transit ridership standard.**

Based on all previous findings, and specifics of the final draft of the public transit ridership data standard, determine the functional and technical requirements of the open source, web-based software tools needed to support the data standard. Construct a detailed methodology, schedule, and work distribution for the software design, development, and testing.

Time Frame: 3 months.

Responsible Party: Porter (OSU).

Cost: \$9,000

Deliverable: A technical memorandum will be submitted to ODOT outlining the functional and technical requirements of the open source, web-based software tools to support the public transit ridership standard.

TAC Action: Review functional and technical requirements interim report and provide input to PI. Revisions will be incorporated by PI. Process will be repeated until satisfactory to ODOT.

ODOT Action or Decision: Review technical memorandum and provide feedback.

**Task # 5: *Develop and test open source, web-based software tools to support ridership data standard.***

The open source, web-based software tools will help transit agencies construct and validate a customized version of the public transit ridership data standard that fits their needs. It is also anticipated that the software tools will facilitate the creation or conversion of ridership data in the new transit ridership data standard developed by this project. Different views will be provided to different stakeholders to visualize, analyze, and query authentic ridership data sets representative of the Oregon public transit system. Any software developed under this work will be licensed using the Massachusetts Institute of Technology (MIT) open source license. The TAC will review the work and provide input at two TAC meetings during the period of this task.

- Time Frame: 10 months.
- Responsible Party: Porter (OSU).
- Cost: \$63,000
- Deliverable: Open source, web-based software tools to support ridership data standard.
- TAC Action: Test open source, web-based software tools to support ridership data standard and provide input to PI. Revisions will be incorporated by PI. Process will be repeated until satisfactory to ODOT.
- ODOT Action or Decision: Provide feedback as progress in the development of the web-based software tools is presented.

**Task # 6: *Develop documentation for the open source, web-based software tools to support ridership data standard.***

Document development process used to create the open source, web-based software tools to support ridership data standard. The audience of this document will be potential developers interested in enhancing the functionality of the open source, web-based software tools. Design and create tutorial videos to facilitate the use of the open source, web-based software tools. Tutorial videos will be made available to users via a project web site.

- Time Frame: 4 months.
- Responsible Party: Porter (OSU)
- Cost: \$18,000
- Deliverable: Tutorial videos to describe functionality of the open source, web-based software tools.
- TAC Action: Test open source, web-based software tools to support ridership data standard and provide input to PI. Revisions will be incorporated by PI. Process will be repeated until satisfactory to ODOT.
- ODOT Action or Decision: Review tutorial videos and provide feedback.

***Task # 7: Prepare draft final report and draft research note.***

Contents to include an updated abstract, acknowledgement, disclaimer, introduction, updated literature review, final research methodology, draft standard and software tool presentation, discussion of results, conclusions, and potential for future research, application, or technology transfer, and other sections as appropriate. Write a two-page research note with a template from ODOT Research Section.

Time Frame: 2 months.

Responsible Party: Porter (OSU)

Cost: \$6,000

Deliverable: Final report.

TAC Action: Review drafts of final report and research note and provide input to PI. Revisions will be incorporated by PI. Process will be repeated (as needed) until satisfactory to ODOT.

ODOT Action or Decision: Review and counsel prior to TAC meeting. Schedule TAC meeting.

***Task #8: Final report and final research note.***

Edit draft final report and draft research note to incorporate comments/feedback provided by the ODOT research Coordinator after the last TAC meeting.

Time Frame: 1 months.

Responsible Party: Porter (OSU)

Cost: \$3,000

Deliverable: Final report and research note.

TAC Action: Review final report and research note and provide input to PI. Revisions will be incorporated by PI. Process will be repeated (as needed) until satisfactory to ODOT.

ODOT Action or Decision: Review. Provide formal acceptance of final report and research note. Publish final report and research note on ODOT's research website.

## **6.0 Reporting**

All reports will be produced in the standard ODOT Research Section report format provided to the PI by the Research Coordinator (unless some other format is deemed to be more appropriate).

The PI, in consultation with the TAC and Research Coordinator, will deliver to ODOT the data produced during the project in electronic format. The PI will ensure the data is labeled and organized to facilitate future access. ODOT will warehouse the data.

## 7.0 Time Schedule

The timeline of the project is depicted in Figure 1. This timeline shows the headings of the major tasks, the monthly time blocks in which each task will be completed, and the approximate occurrence of deliverables as well as meetings with the TAC. The ODOT Research Coordinator will schedule the seven TAC meetings shown in Figure 1. The PI and Research Coordinator will prepare meeting agendas. The PI will submit TAC meeting minutes to ODOT. ODOT will review the advice provided by the TAC and, if necessary, will direct the PI to make changes to project documents.

For the purposes of this proposal, the ODOT starting date is assumed as **July 1, 2016**. However, this date is flexible and the schedule will be modified to reflect actual contract start time at some future date. The timeline shows a project kick off meeting in early July to present to the TAC the proposed work plan.

Project Tasks	Fiscal Years																	
	2017						2018											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Task #1: Perform a comprehensive review on the current state of the art and state of the practice of transit ridership data.	†			* †														
Task #2: Preliminary design and development of a public transit ridership data standard.							* †											
Task #3: Issue final draft of public transit ridership data standard with implementation recommendations.									* †									
Task #4: Develop functional and technical requirements of the open source, web-based software tools to support the public transit ridership standard.																		
Task #5: Develop and test open source, web-based software tools to support ridership data standard.													* †		* †			
Task #6: Develop documentation for the open source, web-based software tools to support ridership data standard.																		
Task #7: Prepare draft final report and draft research note.																		
Task #7: Final report and final research note.																		* †

\*Deliverables (excluding quarterly progress reports)

†TAC Meetings

Figure 1. Tentative Project Schedule

## 7.0 Budget Estimate

The itemized project budget shown below details expenditures for each task by fiscal year and in total.

<b>Task #</b>	<b>Task Description</b>	<b>FY17</b>	<b>FY18</b>	<b>Total</b>
1	Perform a comprehensive review on the current state of art and state of practice of transit ridership data.	\$18,000	--	\$18,000
2	Preliminary design and development of a public transit ridership data standard.	\$36,000	--	\$36,000
3	Issue final draft of public transit ridership data standard with implementation recommendations.	\$27,000	--	\$27,000
4	Develop functional and technical requirements of the open source, web-based software tools to support the public transit ridership standard.	\$9,000	--	\$9,000
5	Develop and test open source, web-based software tools to support ridership data standard.	\$25,200	\$37,800	\$63,000
6	Develop documentation for the open source, web-based software tools to support ridership data standard.	--	\$18,000	\$18,000
7	Prepare draft final report and draft research note.	--	\$6,000	\$6,000
8	Final report and final research note.		\$3,000	\$3,000
<b>Total for tasks (Contract amount)</b>		<b>\$115,200</b>	<b>\$64,800</b>	<b>\$180,000</b>

## 8.0 References

- [1] American Public Transportation Association. (2015). Public transportation embracing open data. Retrieved from <http://www.apta.com/resources/reportsandpublications/Documents/APTA-Embracing-Open-Data.pdf>: <https://trid.trb.org/view/1366907>.
- [2] Porter, J. D., Kim, D. S., Ghanbartehrani, S., Mohseni, A. & Barahimi, P. (2016). Transit network analysis software tool wiki. Retrieved from <https://tnasoftwaretool.engr.oregonstate.edu/TNAtoolAPI-Webapp/wiki/#!/index.md>
- [3] Federal Transit Administration. (2013). 2013 small systems waiver reporting manual. Retrieved from [https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/SSW\\_Manual.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/SSW_Manual.pdf)
- [4] Federal Transit Administration. (2013). 2013 rural reporting manual. Retrieved from [https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rural\\_Manual.pdf](https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/Rural_Manual.pdf)