

## NTC Program Progress Performance Report (PPPR) Information Form

### For P.I.'s Use

On a semi-annual basis the NTC sponsored P.I. must report Program Progress Performance Report (PPPR) using the format specified in this PPPR Information Form. The form must be submitted electronically to the corresponding NTC Associate Director by **3/10/2015**.

**Cover Period: 10/1/2014 – 3/10/2015**

NTC Funded Project Information (Round/Year 1, 2013-2014)	
University Name	University of Maryland
Project Title	U.S. National and Inter-Regional Travel Demand Analysis: Person-Level Microsimulation Model and Application to High-Speed Rail Demand Forecasting
Principal Investigator	Lei Zhang, Associate Professor
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**The form includes the following six parts:**

- Part I – Accomplishments: What was done? What was learned?
- Part II – Products: What has the program produced?
- Part III – Participants & Collaborating Organizations: Who has been involved?
- Part IV – Impact: What is the impact of the program? How has it contributed to transportation education, research and technology transfer?
- Part V – Changes/Problems

*Supplementary documents/materials can be attached to this form with the submission.*

**Part I – Accomplishments: What was done? What was learned?**

The information provided in this section allows the OST-R grants official to assess whether satisfactory progress has been made during the reporting period.

**Reporting Period**

**10/1/2014 – 3/10/2015**

**1. What are the major goals of the program?**

The National UTC aims to promote strategic transportation policies, investment, and decisions that bring lasting and equitable economic benefits to the U.S. and its citizens. The Center is concerned with the integrated operations and planning of all modes serving the nation’s passenger and freight transportation system, including the institutional issues associated with their management and investments. A balanced multi-modal approach will be used that considers freight and passenger travel mobility, reliability, and sustainability, as well as system operations during periods of both recurring and non-recurring incidents, including response to major emergencies. The modes in this theme include highway, transit, rail, and inter-modal interfaces including ports, terminals and airports. In particular, the center focuses on research, education, and technology transfer activities that can lead to (1) Freight efficiency for domestic shipping and for our international land, air, and sea ports; (2) Highway congestion mitigation with multi-modal strategies; and (3) Smart investments in intercity passenger travel facilities such as high speed rail. Major center activities are as following:

- **Advanced & Applied Research Promoting Economic Competitiveness:**  
Our research activities are multimodal/intermodal and multidisciplinary in scope, with the aims of addressing nationally and regionally significant transportation issues pertinent to economic competitiveness and providing practice-ready solutions.
- **Education, Workforce Development, Technology Transfer, & Diversity**  
The consortium is committed to providing high-quality transportation education and workforce development programs for a broad and diverse audience. Center’s efforts will support the development of a critical transportation knowledge base and a transportation workforce that is prepared to design, deploy, operate, and maintain the complex transportation systems of the future.

<p><b>2. What was accomplished under these goals?</b></p>	<p>A prototype microsimulation-based national and inter-regional passenger travel demand model for High Speed Rail demand forecasting and other national-level travel analysis is developed.</p> <p>The model system is developed based on a rigorous behavioral framework in long distance travel planning, and takes into account the specific attributes of the long distance travel such as low frequency, long activity duration, different sets of mode alternatives, etc. The system includes three tiers: 1) the yearly long distance activity pattern level predicting the number of different activities a person will choose during one year; 2) the tour level which consists of tour destination choice, time of year choice, tour duration, and tour mode choice; 3) the stop level predicting the intermediate stop frequency, purpose and location. According to the different decision-making processes for different types of long distance activities (business, personal business, and pleasure), two tour-level model structures were developed, one for long distance business/personal business activities and the other for long distance pleasure activity.</p> <p>Furthermore, the model is implemented in our developed micro-simulation platform which simulates each individual's yearly long distance activities and travel in the U.S. Based on the simulation results (the first two tiers of the model system), the national-level passenger OD table by travel mode and time of year is obtained.</p> <p>Although the with-in-sample validation method was employed to test each model component in the model system, a cross-sample validation method will be utilized to validate each model component in order to further improve the model performance in future. Once the national passenger OD data from Federal Highway Administration is available, a systematic model calibration will be carried out. Furthermore, we will select several major corridors in the U.S including northeastern corridors and California HSR to conduct quantitative analysis and forecast the HSR demand based on our proposed and developed person-based national travel demand model.</p>
<p><b>3. How have the results been disseminated?</b></p>	<p>The research results were published in the UTC Spotlight Newsletter, November 2014.</p> <p>NTC@Maryland Supports National-Level Travel and Transportation Investment Analysis Collaborative research at UMD and ASU is investigating intercity passenger travel demand at the national level</p>

	<p>and the economic impacts of high speed rail. UMD researchers, led by NTC@Maryland Director, Lei Zhang, Ph.D., have developed quantitative models for interregional and national passenger travel demand analysis. These models are implemented in a microsimulation platform to provide decision-makers with information to strategically invest in nationally significant corridors, the national highway system, passenger rail, and airports.</p> <p><a href="http://www.rita.dot.gov/utc/sites/rita.dot.gov.utc/files/utc_spotlights/pdf/spotlight_1114.pdf">http://www.rita.dot.gov/utc/sites/rita.dot.gov.utc/files/utc_spotlights/pdf/spotlight_1114.pdf</a></p>
<p><b>4. What do you plan to do during the next reporting period to accomplish the goals? (4/1/2015 – 9/30/2015)</b></p>	<ol style="list-style-type: none"> <li>1. Cross-sample validation for model component and model improvement (10/1/2014 – 12/1/2014)</li> <li>2. National-level passenger OD table completion, integrating with the stop-level simulation results (12/1/2014-1/1/2015)</li> <li>2. High speed rail application with the developed model system (1/1/2015-3/31/2015)</li> </ol>

**Part II – Products: What has the program produced?**

Publications are the characteristic product of research projects funded by the UTC Program. OST-R may evaluate what the publications demonstrate about the excellence and significance of the research and the efficacy with which the results are being communicated to colleagues, potential users, and the public, not the number of publications. Many research projects (though not all) develop significant products other than publications. OST-R may assess and report both publications and other products to Congress, communities of interest, and the public.

<b>Reporting Period</b>	<b>10/1/2014 – 3/10/2015</b>
<b>1. Journal publications:</b>	None
<b>2. Books or other non-periodical, one-time publications</b>	None
<b>3. Other publications, conference papers and presentations</b>	<p>Lu Y., Chen X. and Zhang L.* (2015) A national travel demand model for the U.S.: A person-based microsimulation approach. The 94th Annual Meeting of Transportation Research Board, Washington DC, United States, January 11–15, 2015.</p> <p>Zhang L.* and Lu Y. (2015) U.S. National and Inter-Regional Travel Demand Analysis: Person-Level Microsimulation Model and Application to High-Speed Rail Demand Forecasting. Project Final Report, Project ID: NTC2014-SU-R-21, National Transportation Center at Maryland (NTC@Maryland).  <a href="http://ntc.umd.edu/sites/default/files/documents/Publications/NTC2014-SU-R-21%20Lei%20Zhang.pdf">http://ntc.umd.edu/sites/default/files/documents/Publications/NTC2014-SU-R-21%20Lei%20Zhang.pdf</a></p>
<b>4. Website(s) or other Internet site(s)</b>	<a href="http://ntc.umd.edu/node/35">http://ntc.umd.edu/node/35</a>
<b>5. Technologies or techniques</b>	None
<b>6. Outreach</b>	On Thursday, August 28, 2014, the A. James Clark School of Engineering

<b>activities</b>	hosted its first-ever Advanced Transportation Technologies Day event, during which nearly 40 representatives from governments, industry, academe and media attended the event. The project was introduced.
<b>7. Courses and workshops</b>	None
<b>8. Inventions, patent applications, and/or licenses</b>	None
<b>9. Other products</b>	A person-based national travel demand model is developed.

**Part III – Participants & Collaborating Organizations: Who has been involved?**

**OST-R needs to know who has worked on the project to gauge and report performance in promoting partnerships and collaborations.**

**Reporting Period**                      **10/1/2014 – 3/10/2015**

**1. What organizations have been involved as partners?**

[Describe partner organizations – academic institutions, other nonprofits, industrial or commercial firms, state or local governments, schools or school systems, or other organizations (foreign or domestic) – that have been involved with the program. Partner organizations may provide financial or in-kind support, supply facilities or equipment, collaborate in the research, exchange personnel, or otherwise contribute.]

- [Provide the following information for each partnership:  
 Organization Name:  
 Location of Organization: (if foreign location list country)  
 Partner’s contribution to the project (identify one or more)
- Financial support;
  - In-kind support (e.g., partner makes software, computers, equipment, etc., available to project staff);
  - Facilities (e.g., project staff use the partner’s facilities for project activities);
  - Collaborative research (e.g., partner’s staff work with project staff on the project); and
  - Personnel exchanges (e.g., project staff and/or partner’s staff use each other’s facilities, work at each other’s site).]

Nothing to Report.

**2. Have other collaborators or contacts been involved?**

[Some significant collaborators or contacts within the lead or partner universities may not be covered by “What people have worked on the project?” Likewise, some significant collaborators or contacts outside the UTC may not be covered under “What other organizations have been involved as partners?” For example, describe any significant:

	<ul style="list-style-type: none"><li>• Collaborations with others within the lead or partner universities; especially</li><li>• interdepartmental or interdisciplinary collaborations;</li><li>• Collaborations or contact with others outside the UTC; and</li><li>• Collaborations or contacts with others outside the United States or with an international organization.</li><li>• Country(ies) of collaborations or contacts.]</li></ul> <p>Nothing to Report.</p>
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**Part IV – Impact: What is the impact of the program? How has it contributed to transportation education, research and technology transfer?**

**DOT uses this information to assess how the research and education programs:**

- increase the body of knowledge and techniques;
- enlarge the pool of people trained to develop that knowledge and techniques or
- put it to use; and,
- improve the physical, institutional, and information resources that enable those people to get their training and perform their functions.

<b>Reporting Period</b>	<b>10/1/2014 – 3/10/2015</b>
<p><b>1. What is the impact on the development of the principal discipline(s) of the program?</b></p>	<p>[Describe how findings, results, techniques that were developed or extended, or other products from the program made an impact or are likely to make an impact on the base of knowledge, theory, and research and/or pedagogical methods in the principal disciplinary field(s) of the program. Summarize using language that an intelligent lay audience can understand (Scientific American style).]</p> <p>[How the field or discipline is defined is not as important as covering the impact the work has had on knowledge and technique. Make the best distinction possible, for example, by using a “field” or “discipline”, if appropriate, that corresponds with a single academic department (i.e., physics rather than nuclear physics). ]</p> <p>The research represents the first attempt to develop a microsimulation-based national long-distance travel demand for high speed rail and national travel analysis. All major behavioral dimensions of long-distance travel is considered, except for route choice and network loading that require significant new network data collection/coding efforts and cannot be achieved with the limited budgeted of this project. The developed model system can help researchers and decision makers in development and quantitative evaluation of national transportation policies from infrastructure investment to infrastructure operation and management.</p>
<p><b>2. What is the impact on other disciplines?</b></p>	<p>[Describe how the findings, results, or techniques developed or improved, or other products from the program made an impact or are likely to make an impact on other disciplines.]</p> <p>In addition to enabling national-level infrastructure investment and</p>

	<p>operational analysis, a long-distance passenger travel demand model can also support large-scale evacuation planning and operations due to natural disasters or targeted attacks, and enable micro-level analysis of the spread of pandemic diseases resulting from long-distance travel.</p>
<p><b>3. What is the impact on the development of transportation workforce development?</b></p>	<p>[Describe how the program made an impact or is likely to make an impact on transportation workforce development. For example, how has the program:</p> <ul style="list-style-type: none"> <li>• Provided opportunities for research and teaching in transportation and related disciplines;</li> <li>• Improved the performance, skills, or attitudes of members of underrepresented groups that will improve their access to or retention in transportation research, teaching, or other related professions;</li> <li>• Developed and disseminated new educational materials or provided scholarships; or provided exposure to transportation, science and technology for practitioners, teachers, young people, or other members of the public?]</li> </ul> <p>The developed national travel demand model provides a capable long-distance passenger travel analysis tool in the U.S. for researchers to conduct the national-level infrastructure investment and operational analysis. Besides, it can help analyze the impact of socio-demographic, economic, and transportation infrastructure changes on long-distance travel demand, the influence of energy (e.g. fuel price) and environmental factors (e.g. climate change and related regulations) on long-distance passenger travel, and Improve the long-distance passenger travel module in statewide and even some metropolitan-level travel demand model.</p>
<p><b>4. What is the impact on physical, institutional, and information resources at the university or other</b></p>	<p>[Describe ways, if any, in which the program made an impact, or is likely to make an impact, on physical, institutional, and information resources that form infrastructure, including:</p> <ul style="list-style-type: none"> <li>• Physical resources such as facilities, laboratories, or</li> </ul>

<p><b>partner institutions?</b></p>	<p>instruments;</p> <ul style="list-style-type: none"> <li>• Institutional resources (such as establishment or sustenance of societies or organizations);</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Information resources, electronic means for accessing such resources or for scientific communication, or the like.]</li> </ul> <p>Nothing to Report.</p>
<p><b>5. What is the impact on technology transfer?</b></p>	<p>[Describe ways in which the program made an impact, or is likely to make an impact, on commercial technology or public use, including:</p> <ul style="list-style-type: none"> <li>• Transfer of results to entities in government or industry;</li> <li>• Instances where the research has led to the initiation of a start-up company; or</li> <li>• Adoption of new practices.]</li> </ul> <p>The results and the methods of this project will be disseminated to the decision makers and politicians in federal or state government through the technical literature. And it can help them better understand the person’s long distance travel behavior, assist them systematically design and quantitatively evaluate the inter-regional infrastructure investment and operation and management policies.</p>
<p><b>6. What is the impact on society beyond science and technology?</b></p>	<p>[Describe how results from the program made an impact, or are likely to make an impact, beyond the bounds of science, engineering, and the academic world on areas such as:</p> <ul style="list-style-type: none"> <li>• Improving public knowledge, attitudes, skills, and abilities;</li> <li>• Changing behavior, practices, decision making, policies (including regulatory policies), or social actions; or</li> <li>• Improving social, economic, civic, or environmental conditions]</li> </ul> <p>A capable long distance travel analysis tool enable us to better understand the long-distance travel behavior and forecast the travel patterns in the future. With the analysis tool, the decision makers or</p>

	<p>politicians would make efficient and inexpensive investments or national-level or inter-regional-level transportation policies which would have an impact on people’s long distance travel.</p>
<p><b>7. Additional impacts</b></p>	<p>[NTC encourages to consider identifying program results by outcomes or impacts, as suggested by the examples below. Impacts should be linked to National goals expressed in the Secretary’s Strategic Goals.]</p> <p>[Outcomes are broader changes that are expected to result from the products, such as:</p> <ul style="list-style-type: none"> <li>• Increased understanding and awareness of transportation issues;</li> <li>• Improved body of knowledge;</li> <li>• Improved processes, techniques and skills in addressing transportation issues;</li> <li>• Enlarged pool of trained transportation professionals;</li> <li>• Greater adoption of new technology;</li> <li>• Other impacts.</li> </ul> <p>Impacts are the longer-term, fundamental changes intended as a result of your activities, such as:</p> <ul style="list-style-type: none"> <li>• Safer driver behavior;</li> <li>• Increased travel time reliability;</li> <li>• Increased intermodal transportation operations;</li> <li>• Reduction in carbon and other harmful emissions from transportation sources;</li> <li>• Other impacts. ]</li> </ul> <p>Nothing to Report.</p>

<b>Part V – Changes/Problems</b>	
<b>If not previously reported in writing to OST-R through other mechanisms, provide the following additional information or state, “Nothing to Report, if applicable:</b>	
<b>Reporting Period</b>	<b>10/1/2014 – 3/10/2015</b>
<b>1. Changes in approach and reasons for change</b>	<p>[If there is nothing significant to report during this reporting period, state “Nothing to Report.”]</p> <p>[Describe any changes in approach during the reporting period and reasons for these changes. Remember that significant changes in objectives and scope require prior approval of the OST-R grant administrator.]</p> <p>Nothing to Report.</p>
<b>2. Actual or anticipated problems or delays and actions or plans to resolve them</b>	<p>[If there is nothing significant to report during this reporting period, state “Nothing to Report.”]</p> <p>[Describe problems or delays encountered during the reporting period and actions or plans to resolve them.]</p> <p>Nothing to Report.</p>
<b>3. Changes that have a significant impact on expenditures</b>	<p>[If there is nothing significant to report during this reporting period, state “Nothing to Report.”]</p> <p>[Describe changes during the reporting period that may have a significant impact on expenditures, for example, delays in hiring staff or favorable developments that enable meeting objectives at less cost than anticipated.]</p> <p>Nothing to Report.</p>

<p><b>4. Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards</b></p>	<p>[If there is nothing significant to report during this reporting period, state "Nothing to Report."]</p> <p>[Describe significant deviations, unexpected outcomes, or changes in approved protocols for the use or care of human subjects, vertebrate animals, and/or biohazards during the reporting period. If required, were these changes approved by the applicable institution committee and reported to the agency? Also specify the applicable Institutional Review Board/Institutional Animal Care and Use Committee approval dates.]</p> <p>Nothing to Report.</p>
<p><b>5. Change of primary performance site location from that originally proposed</b></p>	<p>[If there is nothing significant to report during this reporting period, state "Nothing to Report."]</p> <p>[Identify any change to the primary performance site location identified in the proposal, as originally submitted.]</p> <p>Nothing to Report.</p>