



Program Progress Performance Report for University Transportation

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Project Title:

NEXTRANS - Integrated and Sustainable Transportation Solutions:
From Concepts to Deployment

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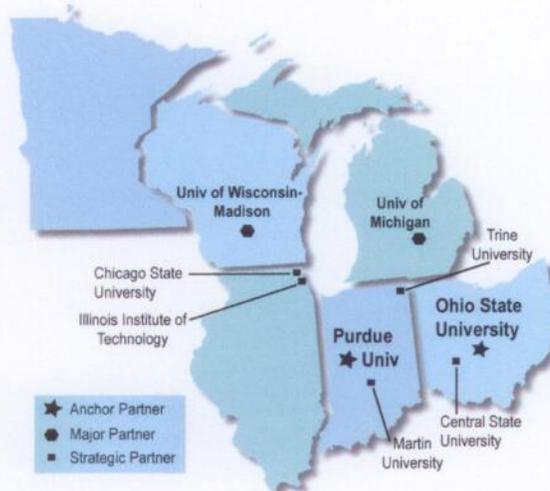
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Grant Period: January 2012 - January 31, 2014

Reporting Period End Date: June 30, 2012

Report Frequency: Semi-annual (subsequent will be quarterly)



Signed: 

Rick D. Evans, Managing Director

Major Goals

The vision of the NEXTRANS Center is to seek integrated and sustainable transportation solutions, and address them in the context of the research, education, workforce development, and technology transfer goals of the Center. Similarly, the theme of the Center is to develop these solutions ranging from concepts to deployment across multiple stakeholders in the context of policy, planning, design, implementation, maintenance, and management for transportation-related needs. In addition, a key emphasis of the Center is to provide an ability to aid policymakers in understanding the impacts of alternative solutions so that policy decisions can be more informed.

The theme of the NEXTRANS Center will be fostered through seven focused research activities in terms of (i) technology-enabled integrated and sustainable solutions; (ii) asset/project management and resource allocation; (iii) data-driven analysis and behavior modeling; (iv) transportation links to energy security, environment, and climate change; (v) policy and institutions; (vi) economic revitalization and global competitiveness; and (vii) living and quasi-living laboratories. A key characteristic of the Center's research activities is that together these seven activities illustrate the interdisciplinary and collaborative nature of the Center, and emphasize the need for interdisciplinary skills in the context of workforce development.

In terms of workforce development and education goals, a synergistic element of the consortium collaboration is the intent to create transportation education programs by strategic partners Chicago State University and Trine University arising from real-world needs, expand an incipient program on air quality and transportation at strategic partner Central State University, grow the existing transportation program at IIT, and provide exposure and experiential learning opportunities related to transportation for students at strategic partner Martin University. NEXTRANS' education-related scope and accomplishments involve formal training through the research project experience, new coursework and new modules in existing courses, essay competitions, and community-oriented transportation research activities. The workforce development-related scope spans professional development courses and training seminars, and research related to workforce development issues. These mechanisms target: (i) K-12 students; (ii) community college students; (iii) undergraduate students; (iv) graduate students; (v) research associates/staff; (vi) underrepresented groups; and (vii) transportation professionals.

The NEXTRANS theme is synergistic with technology transfer opportunities, especially through technology-enabled innovations, cross-disciplinary sustainability related solutions, and public-private partnerships. The anchor/major partners have ongoing technology transfer entities with well-documented mechanisms to transfer research results to the immediate potential users. In addition, the anchor partners have ongoing annual conferences that attract public and private sector transportation professionals. Also, the Center will provide opportunities for regional and national workforce interaction via a variety of planned activities.

Activities and Accomplishments from January 1, 2012 – June 30, 2012

From January 1, 2012 to June 30, 2012, activities of the NEXTRANS Center focused on showcase projects at anchor partners, Purdue University and The Ohio State University.

Purdue Showcase Project - Driving Simulator Lab: Interactive Experiments and Modeling of Traveler Behavior to Address Mobility and Safety Needs

1. Accomplishments

Major Activities

- Designed static and dynamic participant surveys
- Developed complete experiment design to understand the psychological and physical benefits of real-time information
- In the process of developing the structural models to understand the psychological effects associated with real-time information provision
- In the process of developing the specifications for the driving simulator, estimated arrival date is Sept. 1, 2012
- In the process of preparing the Institute Review Board (IRB) document to conduct interactive experiments with the driving simulator

Specific Objectives

- Quantify the value of real-time traveler information for users and decision-makers
- Design a static survey to capture traveler attributes, preference changes and learning behavior of travelers under information provision
- Prepare detailed experiment design for interactive experiments and sequential steps for each participant
- Write research papers for presentation in conferences and obtain feedback for experiment design, survey design, modeling, etc.
- Finalize the physical and operational characteristics of the Driving Simulator Lab

Significant Results

- Nothing to Report

Potential Impacts

- Provide guidance to decision-makers about the comprehensive benefits of real-time traveler information and enable them to make investment decisions
- Improve the quality of travel by reducing delays and increasing satisfaction with the travel experience
- Identify effective mechanisms to disseminate information to travelers

Key Outcomes or Other Achievements

- Nothing to Report

Efforts to Disseminate Results

- Nothing to Report

Plans for the Next Reporting Period (07/01/2012-9/30/2012)

- Obtain IRB approval for the interactive experiments to be conducted
- Assemble Driving Simulator Lab and test the functional characteristics of the equipment in the context of experiment design
- Initiate driving simulator based experiments
- Continue to develop the models to analyze the psychological effects of information provision

2. Products

Publications, conference papers, and presentations

- Song, D.Y., Hsu, Y-T., and Peeta, S. (2012). “Value of Travel Information: Implications for Quality of Travel Experience,” Proceedings of the 13th International Conference on Travel Behavior Research, Toronto, Canada.
- Sharma, S., Hsu, Y-T., Song, D.Y., and Peeta, S. (2012). “Development of Realistic Behavior Models for Reliable Assessments of Benefits from Real-time Traveler Information Provision,” Proceedings of the 13th International Conference on Travel Behavior Research, Toronto, Canada.

Websites or other Internet Sites

- A website will be used to conduct surveys for participants of the interactive experiments

Technologies or Techniques

- Interactive techniques will be developed to perform advanced experiments to better understand the role of behavior in traveler decision-making under information provision

Databases

- Interactive experiments will involve the collection of huge amounts of data through driving simulator-based experiments across several participants

Physical collections

- Experiment participants will provide data through surveys during the initial screening process

Audio or Video Products

- Informative videos will be developed to train participants for the interactive experiments

Models

- Several different models of traveler behavior under information will be developed

Educational aids or curricula

- The Driving Simulator Lab will be used to provide high school and undergraduate students with hands-on experience to help understand the role of behavior in traveler decision-making

Instruments

- Several systems will be integrated to generate a holistic driving experience using the simulator

Equipment

- The driving simulator, webcams, video cameras, iPads, workstations, and other accessories will be used to integrate the system to generate a broad range of behavioral data

3. Participants & Other Collaborating Organizations

Participants

- A chart of participants is located on pages 8-9 of this document

Other Collaborating Organizations

- A developing partnership with NAVTEQ is in progress

4. Impact

Impact on the development of the principal discipline(s) of the program

- The outcome of the project is a new paradigm of traveler behavior models which can be used in transportation research related to real-time traffic information and road space management strategies of the discipline.

Impact on other disciplines

- Nothing to Report

Impact on the development of transportation workforce development

- Nothing to Report

Impact on physical, institutional, and information resources at the university or other partner institutions

- The Driving Simulator Lab will represent a fundamentally new resource to study several aspects related to transportation mobility, safety, and operations. Currently, the lack of such an

interactive resource represents a limitation for better understanding traveler behavior related to decisions under new operational strategies, an ability to quantify the value of information, and to better understand the psychological effects of information on traveler behavior.

Impact on technology transfer

- Results can provide transportation agencies with the critical information needed to perform cost-benefit analysis to: (i) analyze expected impacts on demand; (ii) justify investment in new or continued deployment of real-time traveler information systems; (iii) explicitly quantify the human behavior dimension to provide a broader set of parameters to the public/private sector relative to the evolution of the travel information services market; and (iv) provide options for the USDOT's Connected Vehicle program related to the leverage of the public sector investment with private sector participation.

Impact on society beyond science and technology

- Transportation agencies will have assurance that they are allocating their limited funds for technologies that are most likely to improve the effectiveness of the utilization of the nation's highway system and deliver maximum benefits to travelers in terms of better mobility and a cleaner environment.

5. Changes/Problems

Actual or anticipated problems or delays and actions or plans to resolve them

- Procurement of the driving simulator has taken longer than anticipated; the simulator is expected to arrive in September 2012.

Ohio State Showcase Project - Campus Transit Laboratory: Infrastructure for Research, Education, and Outreach

1. Accomplishments

Major Activities

- Investigated responses to web-based surveys of community perceptions and travel patterns related to a technology-enhanced bus transit service
- Continued collection of directly observed passenger origin-destination (OD) flows
- Processed automatic vehicle location (AVL) data to investigate headways
- Developed software to capture real-time predictions of bus arrival times at stops and to match them with actual arrivals
- Continued development of a website that describes Campus Transit Lab (CTL) related activities
- Met with non-center investigators interested in the CTL

Specific Objectives

- Sustain, develop, and showcase the CTL as a living lab infrastructure supporting research, education, and outreach
- Archive and process data on passenger flows, vehicle locations, and community perceptions and travel patterns related to a technology-enhanced transit service
- Exploit CTL to develop: seed research investigations, modules for coursework, training of students in data collection, and focused studies of immediate interest to service operators
- Develop collaborations with transit agencies and other investigators based on CTL-related activities.

Significant Results and Potential Impacts

- Observed OD flow data were collected. Data will be used for outreach and to evaluate OD models.
- AVL data were transformed into bus headway distributions. Results will be used for outreach and to investigate policy, congestion, and other effects on operating performance

- Data on predicted bus arrival times were captured and matched to actual arrival times. Results will be used to investigate quality of predictions for outreach and to generate research hypotheses.
- Website content was developed. Website will be used as a means of communicating project activities.

Key Outcomes or Other Achievements

- Visits from European Union COST transit project and Xerox transit research investigators and corresponding expressed interest in the Campus Transit Lab as a unique infrastructure that could foster long-term collaborations.

Efforts to Disseminate Results

- Presentations of Campus Transit Lab activities and results were made to European Union COST transit project and Xerox transit research investigators.

Plans for the Next Reporting Period (07/01/2012-9/30/2012)

- Data collection: AVL, automatic passenger counter (APC), predicted and actual bus arrival times, OD flows, additional community perceptions and travel patterns if desirable
- Research: investigate matched predicted and actual bus arrival times, headway distributions, and other data-driven investigations to generate research hypotheses
- Education: ongoing and new uses under new semester-based curriculum
- Outreach and communication: with transit agencies, general website based dissemination, and articles and presentations

2. Products

Publications, conference papers, and presentations

- Burch, G., Chen, C., Etefagh, M., Reinhold, H., McCord, M.R., Mishalani, R.G. Campus Transit Lab (CTL): Select Activities. Presentation to OSU donor, April 23, 2012.
- McCord, M.R., Mishalani, R.G. Campus Transit Lab (CTL): Select Research Activities. Presentation to Xerox, Columbus, OH, April 20, 2012.
- Mishalani, R.G., McCord, M.R. Overview of Campus Transit Lab (CTL) at The Ohio State University. Presentation to Xerox, Columbus, OH, April 20, 2012.
- McCord, M.R., Mishalani, R.G., Goel, P.K., et al. Campus Transit Lab (CTL): Research, Education, and Outreach Activities. Presentation to EU COST project team representative, Columbus, OH, April, 10, 2012.
- Mishalani, R.G., McCord, M.R., Goel, P.K. Overview of Campus Transit Lab (CTL) at The Ohio State University. Presentation to EU COST project team representative, Columbus, OH, April, 9, 2012.

Websites or other Internet Sites

- A website will be developed that will include, among other things, activities and results from this project.

Technologies or Techniques

- We regularly download and store data from commercially provided, state-of-the practice automatic vehicle location technologies, passenger information systems, and automatic passenger counter technologies implemented on an operational bus service

Databases

- We are and will be developing databases that include bus location, position, and speed data, predicted and actual bus arrival data, bus passenger boarding and alighting data, estimated and observed bus passenger origin-destination flows, and community transit-related perceptions, attitudes, and mobility patterns.

Physical collections

- We manually collect bus passenger origin destination flows.

Software and NetWare

- We develop various software for archiving, processing, and analyzing the rich and large datasets collected through the Campus Transit Lab.

Models

- We will develop, refine, or test models to estimate bus passenger origin-destination (OD) flows from passenger boarding and alighting data and related components needed to use summary OD flow information appropriately.

Educational aids or curricula

- We will continue to use data obtained from the CTL, as well as the physical infrastructure, in a variety of transportation and civil engineering courses. We provide hands-on experience in transit data collection to graduate and undergraduate students associated with the project. We provide experience with practical transit planning and operations issues to our graduate students through the outreach activities.

Equipment

- We will continue to work with bus service operators to maintain the sensing equipment on the bus fleet.

3. Participants & Other Collaborating Organizations

Participants

- A chart of participants is located on pages 8-9 of this document

Other Collaborating Organizations

- The Campus Transit Lab is based on ongoing collaboration with the OSU Campus Area Bus Service.
- Project investigators hosted an extensive visit from a European Union COST transit project investigator and a visit from a Xerox transit research project team leader. Discussions and presentations focused heavily on the results and future uses of the Campus Transit Lab.
- The European Union COST transit project mentioned above is an international organization. The investigator who visited the Campus Transit Lab is from Edinburgh Napier University.

4. Impact

Impact on the development of the principal discipline(s) of the program

- Nothing to Report

Impact on other disciplines

- Nothing to Report

Impact on the development of transportation workforce development

- One female engineering graduate student and one female engineering undergraduate student participated in the project.
- CTL-based course material was presented in a large, required undergraduate course in transportation engineering and analysis that included fifteen (approximately 10 percent) undergraduate female engineering students and in an elective, graduate course in public transportation that included four graduate and three undergraduate female engineering students.
- Graduate and undergraduate students participating in the project were provided with the opportunity to conduct transit-related research.
- CTL material was used in a 150-student course in transportation engineering and analysis and an 18-student course in public transportation.

Impact on physical, institutional, and information resources at the university or other partner institutions

- The Ohio State University Campus Transit Lab is a unique living laboratory that has been and will continue to be used for research, education, and outreach. This project makes a major contribution toward providing the physical and human resource infrastructure required to develop, sustain, and take advantage of the laboratory.

Impact on technology transfer

- Obtained data are already leading to results of research and practical value that are communicated via presentations and publications. Ways to possibly broaden this communication will be explored.
- Among other things, this project seeks to make methods to estimate bus passenger origin-destination flows from boarding and alighting data and other derived uses of automatic passenger counter and automatic vehicle location data available to transit agencies and planning organizations.

Impact on society beyond science and technology

- Nothing to Report

5. Changes/Problems

Actual or anticipated problems or delays and actions or plans to resolve them

- Nothing to Report

Name	# Hours Worked	Contribution	Funding Support	Collaborated with Individual in Foreign Country	Countries of Foreign Collaborator	Travelled to Foreign Country	Duration of Stay
LiLi Du	520	Identify research opportunities, conduct work on showcase projects of the Center, write proposals, build non-consortium partnerships	NEXTRANS Project	No	N/A	No	N/A
Mahsa Ettefagh	130	Prepared website material, processed and investigated web based survey responses, collected origin-destination passenger flow data, prepared presentation material for visitors and presented material	NEXTRANS Project	No	N/A	No	N/A
Rick Evans	520	Provided day-to-day supervision of Center staff, oversee delivery of program deliverables and activities, responsible for reporting, liaison between Center and faculty, travel to CUTC Summer Meeting	NEXTRANS Project	No	N/A	No	N/A
Andrew Gyde	9	Archived field origin destination passenger flows; updated database of origin-destination flows	NEXTRANS Project	No	N/A	No	N/A
Yu-Ting Hsu	120	Developing models and experiment plans, helping with technical specifications for the driving simulator	NEXTRANS Project	No	N/A	No	N/A
Xiang Li	11.5	Collected origin-destination passenger flows	NEXTRANS Project	No	N/A	No	N/A
Jiaqi Liu	80	Supported data archiving and initial processing, captured predicted and bus arrival time data, prepared preliminary comparisons with actual arrival times	NEXTRANS Project and OSU cost-share	No	N/A	No	N/A
Mark McCord	13	Set agenda, supervised graduate and undergraduate student activities and contributions, prepared and presented presentations to visitors, developed and implemented CTL based material in courses	OSU cost-share	Yes	Scotland	No	N/A
Andrea McIntyre	520	Synthesize GDR and performance metrics, prepares PPPR, maintains Center website, prepares and distributes reports and media documents, responsible for maintenance of RIP & TRID databases, travel to CUTC Summer Meeting	NEXTRANS Project	No	N/A	No	N/A
Rabi Mishalani	13	Set agenda, supervised graduate and undergraduate student activities and contributions, prepared and presented presentations to visitors, developed and implemented CTL-based material in courses	OSU cost-share	Yes	Scotland	No	N/A

Srinivas Peeta	96	Planning, guidance on the interactive experiment design, purchase decisions, development of models	NEXTRANS Project	No	N/A	No	N/A
Nija Phelps	474	Facilitates day-to-day Center functions, facilitates center meetings and outreach activities	NEXTRANS Project	No	N/A	No	N/A
Chenbo Shangguan	80	Processed automatic vehicle location data and developed distributions of single route headways, prepared presentation material for visitors	NEXTRANS Project	No	N/A	No	N/A
Sushant Sharma	520	Identify research opportunities, conduct work on showcase projects of the Center, write proposals, build non-consortium partnerships, and mentor undergraduate student interns	NEXTRANS Project	No	N/A	No	N/A
Dong Yoon Song	120	Developing models and experiment plans, helping with technical specifications for the driving simulator	NEXTRANS Project	No	N/A	No	N/A
Xiao Wei	80	Processed automatic vehicle location data and developed distributions of multiple route headways, prepared presentation material for visitors	NEXTRANS Project	No	N/A	No	N/A