UTC-Semi-Annual Progress Report

Portland State University

Submitted to:	U.S. Department of Transportation Office of the Secretary-Research
Grant Number:	69A3551747112
Project Title:	National University Transportation Center National Institute for Transportation and Communities (NITC) *Consortium members: Portland State University (PSU), Oregon Institute of Technology (OR Tech), University of Arizona (UA), University of Oregon (UO), University of Texas at Arlington (UTA), University of Utah (UU)*
Center Director:	Jennifer Dill, Ph.D. Professor, Portland State University Director, National Institute for Transportation and Communities (NITC) jdill@pdx.edu 503-725-2855
Submitting Official:	same as above
Submission Date:	April 30, 2020
DUNS:	05-222-6800
Recipient Organization:	Portland State University PO Box 751 Portland, OR 97207-0751
Grant Period:	November 30, 2016 – September 30, 2022
Reporting Period End Date:	March 31, 2020
Report Term:	Semi-annual
Signature:	

Table of Contents

1 ACCOMPLISHMENTS: What was done? What was learned?

1.1 What are the major goals of the program?

The major goals for NITC as described in our application fall into six categories:

Research

- **Build and extend existing research through Year 1 projects**. The first year of funding will support projects that extend some of our existing work, supplemented by a competitive peer-review process to select additional projects proposed by researchers of our consortium.
- **Competitive, peer-review project selection process in Years 2 through 5.** Our projects in Years 2 through 5 will be selected through a competitive request for proposal (RFP) process. These funds will be available for projects consistent with our theme.
- **Pooled Fund Research.** We will continue the Pooled Fund Research program which offers a process by which cities, counties, MPOs and other regional or local agencies can pool relatively small pots of research dollars to then leverage NITC matched funds for a single, collaborative project.

Leadership

- **High Standing within National and International Arenas of Transportation.** NITC faculty will continue to demonstrate leadership by disseminating their research within and outside of academia. NITC faculty help address national transportation problems through volunteer leadership on TRB committees and in other positions. By serving on these committees, faculty help set national research agendas and connect with agency leaders and practitioners on pressing research issues. To continue and reinforce this practice, NITC will mentor our new, tenure-track faculty to apply for committee and panel membership and recognize the activities of all faculty members.
- **Solving Regional and National Transportation Problems.** NITC's director and staff will serve as points of contact for agency leaders and policymakers regionally, statewide and nationally. When we identify needs that match the expertise of our researchers, we will make a connection. We will work with key staff at the DOT modal administrations, both in Washington, D.C. and within our regions, to determine the most effective way for our researchers to learn from and inform agency activities.
- **Future Leaders**. We recognize the investment we must make in our young faculty and students by prioritizing research projects that include them. We will also support students traveling to conferences to present their work, a key activity in developing the next generation of leaders.
- **Development and Delivery of Programs.** We demonstrate our leadership in innovating transportation education, workforce development, deployment of research results and conducting research.

Education and Workforce Development

- **Offer Degrees and Courses in Multiple Disciplines.** NITC university partners will continue to offer a rich array of degrees that serve the transportation profession.
- **Provide Experiential Learning.** Our campuses will continue to provide experiential learning opportunities, and NITC will seek ways to expand them.
- **Develop Innovative New Curriculum and Learning Opportunities.** We will develop new, innovative curriculum that can be tested and shared among NITC and other universities.
- **Educate Professionals.** NITC will maintain a vibrant program of seminars, workshops, professional courses and other training opportunities that provide practitioners with the latest tools and techniques.
- **Attract and Support Undergraduate Students.** NITC will support projects and initiatives that expose middle and high school students to transportation concepts and careers. The efforts aim

to attract and retain new undergraduate students to our degree programs, involve undergraduates in our research, increase the number of women and students of color in these programs, and expand the diversity and capacity of the transportation workforce.

- **Attract and Support Graduate Students.** NITC will support graduate students directly through research assistantships working on projects. We will provide dissertation fellowships for students to research surface transportation topics that fit under the NITC theme. This will be a competitive process open to Ph.D. students at NITC universities multiple times throughout the year.

Technology Transfer

- **Move Research into Practice.** We aim to bridge research and practice by interpreting results, and identifying how and by whom they can be best applied in practice. Our Technology Transfer Plan systemizes the integration of research into practice. As part of this plan, projects are given a ranking based on their technology readiness level and an implementation plan is developed for all projects showing implementation potential based on this ranking. This process will ensure research results have a greater chance of being used in practice.
- **Use Innovative Approaches to Communicate Research Results**. NITC will embark on an ambitious program of sharing information through traditional and new media.

Collaboration

- **Collaborate within our consortium.** Our governance structure is cooperative and leadership is distributed. The Executive Committee includes one faculty member from each campus, and it provides overall direction for the Center, makes project funding decisions, and selects NITC award recipients, including student of the year. They will meet in person at least once a year, rotating the location between campuses, and hold regular conference calls. Each Executive Committee member will be responsible for representing and supporting their respective campus.
- **Collaborate externally.** In addition to the partnerships that occur through individual projects and the pooled-fund program, NITC will foster collaboration with a range of "end-users" of our work through an External Advisory Board. As the national UTC for improving the mobility of people and goods, NITC will work with OST-R staff to foster collaboration between all the UTCs focusing on this DOT priority. Primary aims will be to avoid duplication of efforts and identify opportunities for collaboration.

Diversity

- **Attract underrepresented students to transportation careers**. We aim to attract underrepresented students to transportation through programs that target middle, high school, or elementary school students. We do this by providing extra funds to researchers who engage underrepresented students in their projects, collaborating with WTS, STEM and education experts, and expanding our National Summer Transportation Institute (NSTI) Program to partner campuses.
- **Priority funding to research with an equity focus.** We give priority to funding research projects that have an equity focus by awarding them additional points in the RFP process.

1.2 What was accomplished under these goals?

1.2.1 Research

NITC has funded 51 research projects through General Research, Small Starts and Pooled-Fund grants. The General Research grant program supports 36 larger-scale projects. The Small Starts grant program funds researchers who have not yet had the opportunity to undertake significant transportation research. All projects have to be consistent with NITC's theme, are peer reviewed, and are selected by

the NITC Executive Committee via consensus. During this reporting period, there were 40 active projects, of which 7 were completed.

Build and extend existing research through Year 1 projects.

- The 10 Initial Research Projects funded by NITC (close to $2 million) engage 22 researchers. Seven projects involved more than one partner university, demonstrating our commitment to collaboration. The 10 projects are, on average, 90% complete. (Appendix, Table 1). Six projects are complete, and their final reports are available online.

Competitive, peer-review project selection process in Years 2-5.

- **General Research:** For the 2020 round, we have received 60 abstracts. The full proposals are due May 29, with funding decisions made after a review by academics and practitioners. In June 2019, ten proposals were selected out of 37 total proposals for funding through the third General Research RFP (Appendix, Table 4). The selection process included prioritization for projects relating to multimodal transportation data and transportation-land use-housing interactions. The awards ranged from $53,702 to $145,650 for a total of $1,035,794 in grant funding. The funding request of all proposals was $3,803,378.
  In June 2018, eleven proposals were selected for funding through the second General Research RFP (Appendix, Table 3). These projects ranged from $38,049 to $149,973 for a total of $925,578. Projects are, on average, 85% complete.
  The first RFP for General Research was issued in spring 2017. Six projects were selected, ranging from $39,932 to $99,764, for a total of $437,762 (Appendix, Table 2). These projects are fully complete. Recently, OIT's Matthew Sleep (PI) completed a project to use sustainable cementitious material from the Mt. Mazama volcano in southern Oregon to make ADA wheelchair accessible trail surfaces.
- **Small Starts:** For the third round, five proposals were selected for total funding of $99,916 in November 2019. In 2018, three Small Starts projects were awarded $60,000 in funding (Appendix, Table 3). They are 85% complete. In 2017, six Small Starts projects were funded. Project budgets were approximately $20,000, for a total of $119,924 (Appendix, Table 2). Five projects are complete, and one is 85% complete.

Transportation for Livable Communities Pooled Fund Research.

- NITC's Pooled Fund program offers a process by which cities, counties, MPOs and other regional or local agencies can pool relatively small pots of research dollars to then leverage NITC matched funds for a single, collaborative project. In January 2019, two Pooled Fund Projects were awarded $350,000 in funding from NITC and partners. The "Applying an Equity Lens to Automated Payment Solutions for Public Transportation" project will be completed this summer.

1.2.2 Leadership

High Standing within National and International Arenas of Transportation.

Many of the consortium's faculty members and students serve on national committees and panels and other volunteer positions.

- Faculty and staff served on 54 TRB volunteer committees, task forces or panels (42 committees/sections and 12 panels/task forces/workgroups). Three served in leadership positions as committee chair, and 3 as committee coordinators.
- Director Jennifer Dill was appointed to the Eno Center for Transportation Board of Regents. Eno's Board of Regents supports the educational and professional development programs, including selecting the Future Leaders Development Conference Fellows, offering advice and guidance on program development, and providing leadership for the Eno Alumni Association.

Dill was also appointed as a Handling Editor for the Editorial Board of *Transportation Research Record*.

- APA Foundation's 2019 Year in Review devoted one page to Chris Nelson (UA), "Making A Difference: Leaving a Legacy" about his work and support of the next generation of planners.
- Nico Larco (UO) was a keynote at the Walk21Rotterdam event in the Netherlands, on Oct. 8, 2019.
- Amy Lubitow (PSU) was awarded a fellowship by the Active Travel Academy at the University of Westminster in London. She will conduct a research study and lead workshops for graduate students, post-doctoral candidates and researchers for three weeks in London.

Solving Regional and National Transportation Problems

During this reporting period, NITC research has been instrumental in informing regional and national issues. Activities and progress in this goal area include:

- In January, Jennifer Dill and Representative Earl Blumenauer discussed how research & education can create more equitable and sustainable transportation and communities.
- Reid Ewing (UU) shared recent model enhancements (an outcome of a NITC project) with the Oregon Modeling Improvement Program on March 3.
- Jennifer Dill, Joe Broach, Nathan McNeil, and John MacArthur (PSU) won "Highest Score for Presentation" award from the TRB Bike Committee for Bicycling and Bike Share for Women of Color.
- A PSU graduate student, supervised by Jennifer Dill, is providing background research to help Portland Metro in developing their new Regional Mobility Policy. The policy will result in new mobility standards (instead of volume/capacity level of service) for transportation planning decisions at multiple levels (project through regional planning).
- PSU (PI: Dill) was selected to lead a new NCHRP project to develop a Research Roadmap for the AASHTO Council on Active Transportation (link).

Future Leaders.

NITC support plays a critical role in developing students and faculty as leaders in their discipline.

- Samuel Jensen (UA) is the 2019 NITC Student of the Year. He presented on "An Inventory of Bus Stop Amenities Guidelines at U.S. Transit Agencies" at TRB in the Bus Transit Research and Practices poster session. He also serves as the president of Graduate Planning Society, UA's planning student group, and as vice-chair of the city of Tucson's Pedestrian Advisory Committee.
- Julian Griffee (UA) was honored as the 2020 TRB Minority Student Scholar. This is the second year in a row this honor has gone to a NITC-supported student and is consistent with UA's federal designation as a Hispanic Serving Institution.
- The Dwight Eisenhower Transportation Fellowships were awarded to 9 PSU students, including Gabby Abou-Zeid who was awarded their Top Ranked Masters Fellowship Fellow. Abou-Zeid was also selected to be an Eno Transportation Fellow.
- Travel funds were provided for 74 students to attend conferences (47 received support for TRB).

Development and Delivery of Programs.

Our communications team leads the way in promoting NITC, UTC, and other transportation agencies' research outcomes and transportation events to the public via newsletters and social media. Our projects' final reports and other products are published and freely available for download from NITC's research website. During this period, final reports were downloaded 3,238 times; practitioners were responsible for 36% of downloaded reports. During this reporting period, 183 surveys were completed by people who downloaded reports (76 practitioners, 35 faculty/researchers, 32 students, 3 media/communications staff, and 31 other stakeholders). They heard about the research/reports from: NITC newsletter 35%, TRB website/TRID search 20%, web searches 19%, colleagues 6%, YouTube 8%,

and other sources 13%. Eighty-one percent of them rated the reports as very or somewhat useful, with 76% saying the reports met their needs, and 88% rated the clarity of reports as excellent or good.

1.2.3 Education and Workforce Development

Offer Degrees and Courses in Multiple Disciplines.

The six-university consortium offers a total of 2 certificates, 13 bachelor, 26 graduate and 9 PhD programs in transportation and closely related fields, including several dual degree options. A new PhD program in Planning and Public Affairs starts Fall 2020 in UO's School of Planning, Public Policy & Management; the program will include students focusing on transportation and sustainable cities. Two of the degree programs offered by the University of Utah and seven of the programs offered by the University of Texas at Arlington also receive support from other U.S. DOT-funded UTC programs.

Provide Experiential Learning.

Our campuses continue to incorporate access to community partners and employment opportunities in a number of ways. This includes the support for student groups on each of our partner campuses. Under the guidance of the Executive Committee member, each group is able to set its own agenda and priority to cater to its unique student body, goals, and interests. These groups coordinated or participated in 40 webinars, activities and events that attracted 844 participants (Appendix, Table 5). The students in UO's Live Move volunteered 992 hours in 2019 and hosted 12 community events, including an Intersection Improvement Pilot Study in Fall 2019. In November 2019, Portland State's Students in Transportation and Engineering (STEP) won 1st place at the 2019 Bill Kloos ITE Traffic Bowl.

NITC organized a special lunch and learn with the National Park Service (NPS) on Jan 15, 2020 for 10 students representing the following institutions: UA, UU, OIT, PSU, and UC Berkeley. The presentation by NPS transportation staff included information on applications to the Public Lands Transportation Fellows program.

Develop Innovative New Curriculum and Learning Opportunities.

Last summer, S.T.E.A.M. TRAINing: Engaging High School Girls in Transportation Issues through GIS developed and delivered a one-week summer transportation GIS workshop for 9 middle and high school girls. NITC is processing this education project's final report and curriculum for a 1-2 week lab course in transportation-focused mapping and GIS for middle and high school girls. The curriculum is designed as a survey and introduction to mapping and GIS. Students apply their learning to solving real world transportation issues.

Educate Professionals.

During the reporting period, NITC supported 20 events that were attended by 1,910 professionals: 6 webinars attended by 693 individuals (primarily practitioners); 12 Friday Transportation Seminars attended in person or streamed live by 1,056 people (mostly practitioners). The webinars and seminars are open to the public, webcasted to enable professionals and individuals across the country to participate, and recordings are posted on NITC/TREC websites (https://nitc.trec.pdx.edu/events). Nearly all of the events are eligible for AICP professional development credits. Viewers streamed our events from 49 states, Washington D.C., Puerto Rico, 11 Canadian provinces, and several countries. Practitioners are able to receive AICP credits. APA awarded practitioners 2,432 AICP credits for these events. Since 2016, practitioners rate TREC's APA events 4.2 out of 5 stars; they also provide feedback that is useful for future events.

On October 15, PSU's Initiative for Bicycle and Pedestrian Innovation (IBPI) held its annual Ann Niles Active Transportation Lecture with a presentation, "The Pedestrian Safety Crisis in America," by Angie Schmitt to 120 attendees, including practitioners, researchers, students, and advocates.

On Friday, February 28, Amy Lubitow (PSU) gave a brown bag lecture "Reading Hard To Count Populations: Improving Transportation Survey Research" for PSU's Sociology department on her NITC-funded research.

On March 18, Amy Parker (PSU) and Martin Swobodzinski (PSU) presented on their NITC Project: A Comprehensive Examination of Electronic Wayfinding Technology for Visually Impaired Travelers in an Urban Environment, at the Mobility Matters interdisciplinary summit, which was held at PSU and focused on accessible design.

Attract and Support Undergraduate Students.

NITC recognizes that transportation workforce development does not always take place at the university level. Students' interest in transportation can start much earlier, which is why NITC aims to attract and retain new undergraduate students to transportation-related degree programs and increase the number of underrepresented students in these programs. As a result, we continually work on supporting current undergraduate students while also expanding NITC's reach into the K-12 classroom. NITC PIs are encouraged to submit Diversity project proposals to support undergraduate research assistantships for underrepresented students.

The Oregon Tech ITE Student Chapter stays engaged with their local K-12 community through volunteering, most recently at STEM Night at Henley Elementary, as well as volunteering for traffic safety control on Halloween night in Klamath Falls.

Through the Transportation Research and Education Center (TREC), PSU connects planning and engineering students with community advocates through a local partnership Better Block PDX. This curriculum pathway program, known as Better Block PSU, has provided opportunities for students to tackle real transportation and placemaking challenges in the community. It offers a practicum experience for students, increases capacity for community organizations, and has been successful at influencing policy and leading to permanent changes in Portland's streetscape — most notably the Better Naito project. A total of fifteen projects have been shepherded through PSU since 2015, including four that will be built in the first phase of the City of Portland's Central City in Motion plan that kicked off in Summer 2019. In February 2020 PSU managed the call for proposals and selected four new projects:

- Safe Routes to School: N Willis / Portsmouth Intersection Improvement
- St. John's Food Truck Pop-Up
- Streets Alive in Hood River, OR
- Safe Routes to School: SW 35th Walkway

Attract and Support Graduate Students.

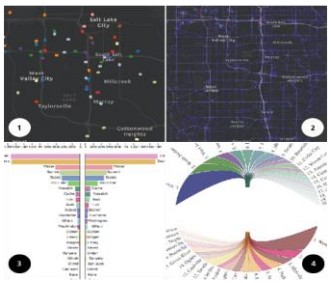
NITC offers dissertation fellowships to Ph.D. students who have advanced to candidacy. This reporting period, dissertation fellowships were awarded to two students: Shiloh Deitz, UO, "Free Movement: Enhancing Open Data to Facilitate Independent Travel for Persons with Disabilities;" and December Maxwell, UTA, "Maternal Mental Health and Keetoowah Women: Past, Present, and Future." In addition, there is an ongoing dissertation fellowship for Joey Iuliano, UA, "Pedal the Old Pueblo: A Naturalistic Study on Bicycling in Tucson, AZ," and we are soliciting proposals for future fellowships.

1.2.4 Technology Transfer

Move Research into Practice.

Developed and offered annually by PSU, the Initiative for Bicycle and Pedestrian Innovation Training Course was included as an answer choice for engineers and planners on a League of American Bicyclists survey to public agencies for their biannual Bicycling and Walking in the United States Benchmarking report. The question was on how they learn to accommodate bicyclists according to the most current AASHTO or NACTO standards.

In December 2019, NITC published the final report on "Key Enhancements to the WFRC/MAG Four-Step Travel Demand Model" by Reid Ewing (UU). The primary users of the new models will be the two MPOs, Wasatch Front Regional Council and Mountainlands Association of Governments, that collaborated on this research project. The models will be incorporated into their four-step model and will provide planners better predictive accuracy of travel forecasts by allowing for greater sensitivity to new variables that affect travel behavior. The models were also made available to MPOs across the nation, the vast majority of whom use four-step models.



Using NITC Small Starts funding, Nikola Markovic and his team (UU) developed visual analysis tools to demonstrate how GPS trajectory data can help accurately model and analyze mobility trends. Transportation agencies must understand the cost-benefits before they decide to invest in data acquisition and analysis tools. This project collaborated with the Utah DOT, and used one month of Utah trajectory data (about 2.5 million trips). At left are four visualizations that are displayed on project websites (listed in section 3.2).

Use Innovative Approaches to Communicate Research Results.

Updated daily, the NITC website saw 10,973 site visitors during this reporting period, an 11.5% increase from the last period which indicates we continue to steadily grow our online audience and reach. The NITC website continues to attract an international audience with 19.4% non-U.S. visitors; our most notable international reach this past period is with Canada, India, United Kingdom, Germany, and Australia.

We published twenty-four NITC stories on research results, newly funded projects, the impact of events, and NITC Student Spotlights. The Spotlights showcase the outstanding students supported by NITC funding, including student group leaders, NITC Dissertation Fellows, and research assistants on NITC-funded projects. All of these stories are shared in our monthly NITC newsletter (6,568 subscribers - 3.9% increase; with an average 30% open rate; 6.9% click rate) dedicated to communicating NITC research and events.

We continue to incorporate best practices in targeted communication, and in March launched our new CRM (customer relationship management) database and marketing platform through HubSpot. When our newsletters are integrated with a robust CRM, it enables NITC staff to more effectively track and manage relationships with partners, researchers, students, alumni, and practitioners.

1.2.5 Collaboration

Collaborating within our consortium.

NITC's governance structure is collaborative, and encourages multiple perspectives on decision-making from Executive Committee and Advisory Board members. Members of the Advisory Board reviewed Small Starts proposals, Student of the Year candidates, and scholarship applications. The Executive Committee holds quarterly teleconferences to discuss funding of projects, and address issues. NITC also

encourages our consortium faculty to collaborate on research projects. Of the 50 research projects funded to date, 50% (25) involve more than one consortium partner.

Collaborating with other UTCs.

Jennifer Dill and TREC Communications Director Cait McCusker presented in a TRB 2020 panel on Effective Communication of Research alongside Hilary Nixon, Deputy Executive Director of Mineta Transportation Institute on Monday, January 13, 2020. NITC continues to share best practices in tech transfer and research dissemination.

Susan Handy (NCST director) and Yinhai Wang (PacTrans director) serve on the NITC Advisory Board. We support research dissemination of other UTCs through our social media on a weekly basis. Many of the peer reviewers of NITC final reports are faculty working with other UTCs.

External collaboration.

John MacArthur and Nathan McNeil received a NITC tech transfer grant to take key findings from a national assessment of equity bike share programs funded by Better Bike Share Partnership and create outreach material to inform bike share system operators of best practices and lessons learned related to integrating equity. Findings from the assessment will be supplemented with examples of programs, measures, and planned improvements from members of a technical advisory committee (TAC). Ten 2-page briefs on program elements will be developed and disseminated through project partners in June 2020. Since data collection and measurement of outcomes is an area that we have observed to be needed (both through survey responses and through interviews with bike share operators and cities), strategies and suggested protocols for measuring each of the program elements will be developed, in consultation with the TAC, and included in the briefs.

1.2.6 Diversity

Attract underrepresented students to transportation careers.

NITC uses several approaches aimed at attracting women and people of color into the transportation field. This includes offering programs and fostering partnerships with partners that achieve this goal.

- UO's Live Move students delivered a tactical urbanism project for underrepresented high school students looking to attend UO for college.
- During this reporting period, one Diversity project was completed at PSU, and another was awarded at UU. Diversity projects support undergraduate research assistantships for underrepresented students.
- PSU is planning to host two high-school transportation summer camps that will serve students from underrepresented communities. One camp will serve female-identified students. With the Covid-19 pandemic, we are currently examining how to shift these camps to a virtual format.

Priority funding to research with an equity focus.

Many of our research projects address equity (see **Appendix, Tables 1-4**) by:

- examining barriers to access, including the connections between transportation, land use, and housing;
- developing clear sets of strategies or interventions that will generate more inclusive measures of transportation behaviors;
- examining electronic wayfinding technology for visually impaired travelers;
- evaluating the impact of ADA on transit ridership and equity implications for people excluded or greatly inconvenienced by paying for transit through non-cash based collection technologies; and
- optimizing housing and service locations to provide mobility to meet the mandated obligations for former offenders to improve community health and safety.

1.3 How have the results been disseminated?

Research results are disseminated through various venues that include presentations at conferences, monthly webinars and through papers and reports. The NITC communication team delivers a monthly newsletter on NITC research, tech transfer opportunities, and researcher accomplishments to 6,568 subscribers, as well as social media channels on Twitter, Facebook, YouTube, and LinkedIn. These efforts are described in more detail in sections 1.2.4, 3.1 and 3.2.

1.4 What do you plan to do during the next reporting period to accomplish the goals?

Expected highlights for the next reporting period include:

- Reporting on progress of funded research
- Selection of General Research projects
- Support for undergraduate and graduate students (activities have been limited due to Covid-19)
- Updates on tech transfer and workforce development events (online)
- Recap high school summer transportation camps and bikeway design training for professionals

2 PARTICIPANTS & COLLABORATING ORGANIZATIONS: Who has been involved?

2.1 What organizations have been involved as partners?

Each NITC research project must be supported by matching funds. Overall, NITC projects have 56 different partners from outside of the consortium providing matching funds, or contributions in other ways (Appendix, Table 7). This includes partners from local governments, non-profits, regional government agencies, state DOTs, transit agencies, and industry partners. During this reporting period, there were 45 active partnerships.

2.2 Have other collaborators or contacts been involved?

Twenty-five of the funded research projects (50%) involved investigators from more than one university. Thirty-two of the research projects (64%) included investigators from more than one discipline.

3 OUTPUTS: What new research, technology or process has the program produced?

Technology transfer performance measures are summarized in Table 8.

3.1 Publications, conference papers, presentations, and events

At this year's TRB Conference, 130 NITC faculty, researchers, and students presented their research through 57 posters, 30 lectures, 2 workshops, and 1 committee presentation. So far, 19 papers based on research from this FAST Act grant have been published in peer-reviewed journals, including 6 during this reporting period. They have been cited 35 times. Past research projects, supported by NITC National and Tier 1 grants, continue to result in publications. Research is also published in conference proceedings (**Appendix, Table 6**). NITC has published 18 final reports, with one-page project briefs for each final report.

3.2 Websites or other Internet sites

We leverage our strong online and social media presence to promote our research findings, expand the reach of our education, and elevate our faculty and student researchers. We also raise awareness of important transportation issues nationwide and findings that advance our center's theme.

- **NITC website:** Updated daily, the website provides comprehensive information about our center and complete research portfolio. This includes stories about our research, press coverage, tech transfer resources, professional development events, and opportunities for students.
- **Twitter (TREC: 3,571 followers, +243):** We promote NITC-sponsored research, publications, and events while also uplifting the activities of fellow UTCs. We share news and achievements from NITC-funded students, faculty, and ongoing projects. Launched in 2019, our new NITC_UTC twitter (336 followers, +87) offers more effective framing of the consortium partnership.
- **Facebook (944 followers, +35):** In addition to sharing research, this platform shares photos of our events and offers connection with other organizations, researchers, and practitioners.
- **YouTube (740 subscribers, +85):** Where we publish freely accessible video recordings of weekly seminars at PSU, monthly NITC webinars, special lectures, and more.
- **LinkedIn (355 followers, +106):** We target transportation professionals to share tools, practical information, and our latest studies.
- **Flickr:** An archive of photo collections from events we hosted or attended, most notably used to showcase the presence of NITC researchers and students at the annual meeting of TRB.
- **Instagram (412 followers, +58):** This platform introduces the people behind the research and puts a face to the center. Instagram has provided a high level of engagement, which we expect to help both our technology transfer and student recruitment efforts.

A NITC Small Starts project, Visual Exploration of Utah Trajectory Data and their Applications in Transportation by Nikola Markovic (UU), produced four websites of their visualizations of trajectory data.

- Trips between counties: Chord diagram; https://markoviclab.civil.utah.edu/vis-circos/
- Trips entering and exiting Salt Lake City: Visualization; https://markoviclab.civil.utah.edu/vis-enterexit/
- Utah variable traffic density: Heatmap; https://markoviclab.civil.utah.edu/vis-trafficdensity/
- Vehicles Traveling; https://markoviclab.civil.utah.edu/vis-travel/

3.3 Events to support technology transfer

In addition to NITC supporting 20 events that were attended by 1,910 professionals, and research presented at TRB, PIs have presented their research to stakeholders and potential users. During this reporting period, Nikola Markovic and Rebecca Steckler completed NITC research projects. Nikola presented about statewide GPS trajectories for 250 people at the INFORMS Annual meeting in Seattle, WA, and UDOT's Annual Conference in Salt Lake City, UT. Rebecca presented to 50 people on Emerging Technologies and Cities in Eugene, OR. NITC's data program manager, Tammy Lee, and Kristin Tufte (PSU) presented to 80 stakeholders of the Oregon Simulation and Capacity Analysis User Group via an ITE-hosted webinar. They demonstrated data analysis using "the Portals," PSU's multimodal transportation data archive.

3.4 Technologies or techniques

A NITC Small Start project by Nikola Markovic (UU) with Utah DOT completed a computationally-intense map matching, which increased data size from 12 to 90 GB. The data were fused with road network information as well as 100 GB of UDOT radar data to enable its evaluation. A number of interactive visualizations were developed and shared with UDOT to help them understand the data and their potential applications.

Stephen Fickas and Marc Schlossberg (UO) created a smartphone app to bring the benefits of V2I (vehicle-to-infrastructure communication) to bicycling. The app receives updates from traffic signals and cues the bicyclist to increase or decrease their speed to catch a green wave.

3.5 Inventions, patent applications, and/or licenses

Nothing to report.

3.6 Other products

NITC #1087 project: The Qualitative Pedestrian Environments Data (QPED) Toolkit was developed at the University of Arizona in collaboration with Living Streets Alliance and with support from the CDC's Physical Activity Policy Research Network (PAPRN+) and the National Institute for Transportation and Communities (NITC). Arlie Adkins, PI, presented a workshop session at the Active Living Research 2020 Conference on February 2. It will help communities and decision makers better understand neighborhood walkability from the perspective of a different kind of expert: the people out walking in their communities. The Toolkit includes On-Street Interview Guide (English and Spanish), Data Collection Manual, Training Materials, and Data Entry Template.

Jennifer Dill was a guest co-editor of a special issue of the Journal of Transport and Health on travel and well-being.

4 OUTCOMES: What outcomes has the program produced?

Research Outcomes

NITC uses two measures to track research outcomes:

1. Number of stakeholders who collaborated on implementing research outcome: 11.
   During this period, NITC worked with 1 state DOT (Utah), 6 regional associations/councils, and 4 local government stakeholders.

2. Number of projects that reach deployment and adoption (measured by the number of projects that reach TRL scale 4 or 5): 6.
   Additionally, we have identified eight projects that we believe will reach TRL scale of 4 or 5, including four of the 2019 General Research awards.

Attracting and retaining undergraduate and graduate students outcomes

UA has significantly grown both the number of students and reach of their scholarship program: 21 students from eight degree programs including planning, civil & mechanical engineering, optical engineering, public health, sustainable built environments, architecture and geography have been awarded NITC Student Scholar Awards. UTA's ITE Student Chapter at UTA hosted a six-lecture series, supported students for attending six conferences including TRB, and has increased its membership to 109 students.

Baxter Shandobil, PSU Master's student, with Kelly Clifton, PSU faculty, won Best in Session at TRB's Annual Meeting from the Public Transportation Planning and Development Committee (AP025).

PSU alum Tara Goddard won the 2019 ANB10 Best Paper Award on whether news coverage affects perceived blame. PSU alum Patrick Singleton's research on which transport users would prefer teleportation was featured in a Forbes article. While at PSU, both students worked on NITC research projects, received awards, and were published.

5 *IMPACTS: What is the impact of the program? How has it contributed to improve the transportation system: safety, reliability, durability, etc.; transportation education; and the workforce?*

The impacts of the NITC program are achieved through interdisciplinary collaboration, our strong and intentional partner relationships, and the active participation of professionals that informs our educational offerings. Technology transfer performance measures are summarized in Table 8. 18 projects have been completed to date and we are working with stakeholders to assess the impact of the work. Impact takes time to track and assess, and many projects have not been completed long enough to measure. This section provides some of the impacts that we are now seeing from projects funded through the current and previous NITC grants (MAP-21 funds).

- Number of stakeholders reporting impact from surveys: 21
- Number of stakeholders who have adopted, implemented or deployed research findings or technologies: 10

5.1 What is the impact on the effectiveness of the transportation system?

Examples of impact from survey respondents

- A practitioner, working at a small-medium sized, Midwest MPO that is trying to improve the way they collect and incorporate public input, stated that the "Developing Data, Models, and Tools to Enhance Transportation Equity" report by Amy Lubitow (PSU) is helping them "develop some of our own outreach and data analysis practices related to underrepresented populations.
- A professor says the "Rethinking Streets for Bikes" report by Marc Schlossberg (UO) has made an impact in their classroom as "in Oklahoma there are far fewer examples to point to on better design for bicycling as a regular activity."
- A member of a local bicycle and pedestrian board used "Rethinking Streets for Bikes" to push for safety measures.
- A practitioner involved in a Bus Rapid Transit project, with a bus-bike right turn lane as an alternative, used the "Evaluation of Bus-Bicycle and Bus/Right-Turn Traffic Delays and Conflicts" report by Miguel Figliozzi to better understand general conflict between modes.

5.2 What is the impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company?

The promotion of e-bikes by Raleigh Bicycles and Bosch eBike to customers in March 2020 was informed by the NITC report "A North American Survey of Electric Bicycle Owners" by John MacArthur (PSU) and Christopher Cherry (UTn). It is clear to these businesses that potential customers need more information. The report, which addresses motivations and barriers to riding an ebike, is included in resources promoted by these companies.

5.3 What is the impact on the body of scientific knowledge?

A recent publication in the Journal of Transport & Health cites, shows similar patterns, and adds nuance to a past NITC National publication "Racial bias in driver yielding behavior at crosswalks" by Tara Goddard, Kimberly Kahn, and Arlie Adkins.

Arlie Adkins and Jennifer Dill's Unpacking Walkability: Testing the Influence of Urban Design Features on Perceptions of Walking Environment Attractiveness is on the list of the 10 most cited papers in the Journal of Urban Design over the last three years.

Nicole Ngo (UO) had an article related to her NITC project published in the Journal of Environmental Economics and Management on the effects of smart-parking policies on public transit, traffic flow, and air pollution.

UO's Urbanism Next Center launched its Nexus clearinghouse comprising hundreds of resources related to new mobility, e-commerce, and the sharing economy as they relate to the form and function of cities.

5.4 What is the impact on transportation workforce development?

The skills and knowledge of the current transportation workforce needs to keep pace with the changing technology, policy, and best practices. NITC has made significant impacts training the current transportation workforce in several areas:

- **Bicycle design and planning.**
  The Penticton & Area Cycling Association's urban bike advocacy efforts have adopted research by Kelly Clifton (PSU) on cyclists' economic impacts to promote a lake-to-lake bike route in Penticton, British Columbia, Canada.

  In November, the National Transportation Safety Board published the "Bicyclist Safety on U.S. Roadways: Crash Risks and Countermeasures" which cited "Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S." by Christopher Monsere, Jennifer Dill, Kelly Clifton, and Nathan McNeil (PSU). That research was funded by the NITC Tier 1 UTC grant.

- **Interdisciplinary collaboration.**
  Stephen Mattingly, NITC Executive Committee member, is leading the "Enhance Leadership in Transportation" initiative for the UTA's strategic plan. The team includes civil engineering, planning and social work and uses an interdisciplinary approach to transportation.

  Dr. Roger Lindgren (Civil Engineering - OIT) collaborated with Marc Schlossberg (City and Regional Planning - UO) and John Rowell (Architecture - UO) on Rethinking Streets for Bikes project. The NITC report has been downloaded 3,818 times.

- **Next generation of researchers.**
  As co-author, Sirisha Kothuri won the AHB50 2019 Best Paper Award with a younger member for "Evaluation of Driver Comprehension of FYA Permissive Right Turns" with Hisham Jashami (Oregon State PhD student).

  As mentioned in the Future Leaders section, Gabby Abou-Zeid was awarded Top Ranked Masters Fellowship Fellow. As an undergraduate studying sustainable built environments at UA, she worked on NITC research projects. She participated in PSU's Transportation Undergraduate Research Fellowship (TURF) summer program. Now she is a civil engineering graduate student at PSU working with Dr. Kelly Clifton's SUPERLab. On February 14, Gabby presented her freight demand research for the Portland Bureau of Transportation at a Friday Transportation Seminar.

- **Next generation of faculty.**
  UO's Rebecca Lewis received tenure, co-taught a study abroad course on "Designing Cities for People on Bike," and won a national award from the Chamber of Commerce for her work on innovative transportation finance strategies.

  In November, Vivian Miller, UTA alum, former NITC Dissertation Fellow, and new faculty at Bowling Green State University, delivered a presentation based on her NITC Dissertation project "Transportation, Social Support by Family Visitation, and Depression of Older Adult Nursing

Home Residents" to 85 people at the Gerontological Society of America's annual meeting in Austin, TX.

Kelly Clifton was appointed PSU's Interim Associate Vice President for Research. Her transportation research has been supported several times by past UTC grants.

6 CHANGES/PROBLEMS

6.1 Changes in approach and reasons for change

As of March 2020, all in-person activities were suspended due to the coronavirus pandemic. This affects research timelines. Some organizations partnering on research projects have temporarily closed or reduced their operations. We anticipate many projects, particularly those requiring data collection, will request no-cost extensions to accommodate delays in data collection. Some projects that involved in-person qualitative data collection (e.g. focus groups, interviews) may be able to use online approaches. Some projects may require more significant changes, such as in cases where the transportation system or behavior does not return to pre-Covid conditions.

Researchers and students are not presenting their work at many conferences that have been cancelled.

6.2 Changes that have a significant impact on expenditures

Nothing to report.

6.3 Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards

As noted in 6.1. Social distancing will negatively affect research projects.

6.4 Change of primary performance site location from that originally proposed

NITC staff and researchers are working from home. University campuses are closed to in-person meetings through Spring term.

7 SPECIAL REPORTING REQUIREMENTS

Not applicable.

Appendix

Table 1: Initial research projects funded (2016-2017)

Grant	Project Title	Investigators	Univ.	Status
Initial Projects	Access to Opportunities: Redefining Planning Methods and Measures for Disadvantaged Populations*	Arlie Adkins Stephen Mattingly	UA, UTA	Active
	Bringing Bikes into the V2X Smart City Conversation	Stephen Fickas Marc Schlossberg	UO	Complete
	Economic and Business Impacts of Non-Motorized Bike/Pedestrian Infrastructure	Jenny Liu Jennifer Dill	PSU	Complete
	Evaluating Improved Transit Connections for Ladders of Opportunity	Stephen Mattingly Yi-Chang Chiu	UTA UA	Active
	From Knowledge to Practice: Rethinking Streets for People on Bikes	Marc Schlossberg Roger Lindgren	UO OIT	Complete
	Improving Integration of Transit Operations and Bicycle Infrastructure at the Stop Level*	Miguel Figliozzi Chris Monsere	PSU	Complete
	Key Enhancements to Four-Step Travel Demand Models	Reid Ewing	UU	Complete
	Network Effects of Disruptive Traffic Events	Juan Medina Cathy Liu	UU	Active
	Social-Transportation Analytic Toolbox (STAT) for Transit Networks*	Cathy Liu Ran Wei Aaron Golub Liming Wang	UU PSU	Complete
	Foundational Smart Cities Platform for NITC	Kristin Tufte John MacArthur Larry Head	PSU PSU UA	Active

*Research projects that address equity related to mobility

Table 2: Research Projects funded by NITC in 2017

Grant	Project Title	Investigators	Univ.	Status
General Research (Round 1)	Updating and Expanding LRT/BRT/SCT/CRT Data and Analysis*	Arthur Chris Nelson	UA	Complete
	Life-Space Mobility and Aging in Place*	Ivis Garcia Zambrana Keith Dias Moore Alan DeLaTorre	UU PSU	Complete
	Understanding Factors Affecting Arterial Reliability Performance Metrics	Avinash Unnikrishnan Sirisha Kothuri	PSU	Complete
	Planning in Gateway and Amenity Communities: Understanding Unique Challenges Associated with Transportation, Mobility, and Access to Opportunity*	Danya Rumore Philip Stoker	UU UA	Complete
	Developing Data, Models, and Tools to Enhance Transportation Equity*	Amy Lubitow Julius McGee Raoul Lievanos	PSU UO	Complete
	Universally Accessible Trail Improvement with Naturally Occurring, Sustainable Materials*	Matthew Sleep	OIT	Complete
Small Starts (Round 1)	A Decentralized Network Consensus Control Approach for Urban Traffic Signal Optimization	Gerardo Lafferriere	PSU	Complete
	Is There a "Buy Local" Case for Lower Travel Speeds? Testing Differences in Driver Recognition of Local versus National Retail at Different Travel Speeds	Jonathan Bean Arlie Adkins	UA	Active
	How Will Autonomous Vehicles Change Local Government Budgeting and Finance? A Case Study of Solid Waste, Drop-off/Pick-up Zones, and Parking.	Benjamin Clark	UO	Complete
	Vehicle Sensor Data (VSD) Based Traffic Control in Connected Automated Vehicle (CAV) Environment	Xianfeng Yang	UU	Complete
	How Can Interdisciplinary Teams Leverage Emerging Technologies to Respond to Transportation Infrastructure Needs? A Mixed-Methods Evaluation of Civil Engineers, Urban Planning, and Social Workers' Perspectives.	Noelle Fields Courtney Cronley Kate Hyun Stephen Mattingly	UTA	Complete
	A Comprehensive Examination of Electronic Wayfinding Technology for Visually Impaired Travelers in an Urban Environment*	Martin Swobodzinski Amy Parker	PSU	Complete

*Research projects that address equity related to mobility

Table 3: Research Projects funded by NITC in 2018

Grant	Project Title	Investigators (Univ.)	Uni	Status
General Research (Round 2)	The Connection between Investments in Bus Stops, Ridership, and ADA Accessibility*	Keith Bartholomew Arlie Adkins	UU UA	Active
	Investigating Effects of TNCs on Parking Demand and Revenues	Benjamin Clark Anne Brown	UO	Active
	Matching the Speed of Technology with the Speed of Local Government: Developing Flexible Codes and Policies Related to the Possible Impacts of Autonomous Vehicles on Cities	Marc Schlossberg Heather Brinton	UO	Processing Final Report
	Reducing VMT, Encouraging Walk Trips, and Facilitating Efficient Trip Chains through Polycentric Development	Reid Ewing Yehua Dennis Wei Shima Hamidi	UU, UTA	Processing Final Report
	An Electric Bus Deployment Framework for Improved Air Quality and Transit Operational Efficiency	Xiaoyue Liu Aaron Golub Ran Wei	UU PSU UCR	Active
	Connected Vehicle System Design for Signalized Arterials	Xianfeng Yang Mingyue Ji	UU	Complete
	Revisiting TODs: How Subsequent Development Affects the Travel Behavior of Residents in Existing Transit-Oriented Developments	Nathan McNeil Jennifer Dill	PSU	Processing Final Report
	Optimizing Housing and Service Locations to Provide Mobility to Meet the Mandated Obligations for Former Offenders to Improve Community Health and Safety*	Anne Nordberg Jaya Davis Stephen Mattingly	UTA	Active
	Land Use and Transportation Policies for a Sustainable Future with Autonomous Vehicles: Scenario Analysis with Simulations	Liming Wang Yao-Jan Wu	PSU UA	Active
	Emerging Technologies and Cities: Assessing the impacts of new mobility on cities	Becky Steckler Rebecca Lewis	UO	Complete
	LRT/BRT/SCT/CRT Development Outcomes FINAL PHASE	Arthur C. Nelson Kristina Currans Nicole Iroz Elardo	UA	Active
Small Starts (Round 2)	Urban Transportation System Flood Vulnerability Assessment with Special Reference to Low Income and Minority Neighborhoods*	Courtney Crosson	UA	Active
	Promoting Environmental Justice Populations Access to Opportunities within Suburban Boomtowns: An Interdisciplinary, Mixed-Methods Approach to Addressing Infrastructure Needs*	Jandel Crutchfield	UTA	Complete
	Visual Exploration of Utah Trajectory Data and their Applications in Transportation	Nikola Markovich (UU)	UU	Complete
Pooled Fund	Applying an Equity Lens to Automated Payment Solutions for Public Transportation*	Aaron Golub Jenny Liu John MacArthur Anne Brown Candace Brakewood	PSU, UO, UTK	Active
	Exploring Data Fusion Techniques to Derive Bicycle Volumes on a Network	Sirisha Kothuri Joseph Broach Nathan McNeil Kate Hyun	PSU UTA	Active

Grant	Project Title	Investigators (Univ.)	Uni	Status
		Stephen Mattingly Krista Nordback	UNC	

*Research projects that address equity related to mobility

Table 4: Research Projects funded by NITC in 2019

Grant	Project Title	Investigators	Univ.	Status
General Research (Round 3)	Is Transit-Oriented Development Affordable for Low and Moderate Income Households (in terms of H+T)?*	Reid Ewing Arlie Adkins Nicole Iroz-Elardo	UU UA	Active
	Seamless Wayfinding by Individuals with Functional Disability in Indoor and Outdoor Spaces: An Investigation into Lived Experiences, Data Needs, and Technology Requirements*	Martin Swobodzinski Amy Parker	PSU	Active
	New Mobility For All: Can Targeted Information And Incentives Help Underserved Communities Realize The Potential Of Emerging Mobility Options?*	Nathan McNeil John MacArthur Jennifer Dill	PSU	Active
	Developing Strategies To Enhance Mobility And Accessibility For Community-Dwelling Older Adults*	Kate Hyun Caroline Krejci Kathy Lee	UTA	Active
	Using Social Network Analysis To Optimize Access To Culturally Responsive And Affordable Transportation For Older (Im)Migrants*	Rebecca Mauldin Stephen Mattingly Rupal Parekh	UTA UConn	Active
	Green Waves, Machine Learning, and Predictive Analytics: Making Streets Better for People on Bike & Scooter	Marc Schlossberg Stephen Fickas	UO	Active
	Data-Driven Mobility Strategies for Multi-Modal Transportation	Yao-Jan Wu Sirisha Kothuri Xianfeng Yang	UA PSU UU	Active
	Development Of Low-Cost Radar-Based Sensor For Multi-Modal Traffic Monitoring	Siyang Cao Yao-Jan Wu	UA	Active
	Evaluation of Portland Shared E-Scooter Pilot Program Goals and Outcomes	John MacArthur Jennifer Dill	PSU	Active
	Scooting to a New Era in Active Transportation: Examining the Use and Safety of E-Scooters	Kristina Currans Reid Ewing Nicole Iroz-Elardo	UA UU UA	Active
Small Starts (Round 3)	Evaluating Mobility Impacts Of Construction Workzones On Utah Transportation System Using Machine Learning Techniques	Abbas Rashidi	UU	Active
	Developing and Testing Transportation Barriers Scale and Its Impact on Mental Health Among At-risk/Homeless Youth and Emerging Adults	Philip Baiden Godfred Boateng Stephen Mattingly	UTA	Active
	Do Travel Costs Matter?: Using Psychological And Social Equity Perspectives To Evaluate The Effects Of A Low-income Transit Fare Program On Low-income Riders	Liu-Qin Yang Aaron Golub Liming Wang	PSU	Active
	E-Scooters and Public Health: Understanding the Implications of E-Scooters on Chronic Disease	Nicole Iroz-Elardo	UA	Active
	The Impact of Ride Hail Services on the Accessibility of Nonprofit Services	Dyana Mason	UO	Active

*Research projects that address equity related to mobility

Table 5. Student group activities during this reporting period

Student group	Activity	Date	# of participants
STEP (PSU)	Student and Faculty Mixer	10/4/2019	39
	METRANS International Urban Freight Conference	10/16-18/2019	2
	Traffic Bowl Qualifiers	11/7/2019	6
	Bike Infrastructure Tour	11/8/2019	5
	Lunch-and-Learn: Fehr & Peers	11/14/2019	15
	Bill Kloos Traffic Bowl	11/21/2019	6
	TRB Aftershock	2/5/2020	35
	Game Night	3/4/2020	10
ITE (Oregon Tech)	Visiting Speaker: Robert Bachus	10/7/19	43
	Webinar Berkeley ITS Webinar: Insights into Why & How Cities are Planning for AV	10/18/19	9
	Webinar Datafication of Cycling: Effects and Opportunities at the Intersection of Industry & Policy	10/29/19	7
	Webinar Webcast: Career Opportunities at Kittelson & Associates	10/29/19	21
	Safe Roads for Trick or Treating - Klamath Falls	10/31/19	18
	Kittelson meet and greet	11/5/19	23
	Webinar An Introduction to Safe Systems in the US, a Road to Zero Coalition	11/7/19	8
	Engineering Club Mixer	11/7/19	125
	Traffic Bowl Team practice with Kittelson	11/20/19	7
	Wilsonville roadway and sewer project site tour	11/21/19	6
	Oregon ITE Traffic Bowl	11/21/19	13
	PDX Airport Concourse E construction tour	11/22/2019	12
	Oregon Tech Etiquette Dinner	1/23/2020	6
	Webinar New Travel Demand Modeling for our Evolving Mobility Landscape	2/11/2020	7
	Oregon Asphalt Pavement Conference (Eugene OR)	2/19/2020	5
	Webinar Environmental (in)Justice from Recommendations to Regulations	2/19/2020	7
	Webinar: Greenroads Sustainable Road Construction Rating System	2/28/2020	7
	Webinar: The Southwest Corridor Light Rail Project	2/28/2020	7
	Visiting Speaker: Andrew Sullivan	3/6/2020	29
Live Move (UO)	Visiting Speaker: M. Keller	10/2019	30
	Visiting Speaker: Maria Sipin	1/2020	25
	Visiting Speaker: Jenna Berman	2/2020	40
	Visiting Speaker: Aaron Brown	3/2020	40
	LTD Listening Session	3/2020	15
ITE (UTA)	"TSM&O – What it is, Why it's important and How you can get involved"-ITE Guest Speaker	11/20/19	25
	Joint ITE and ASCE Resume Workshop	2/15/2020	70
Point B (UU)	Jarrett Walker Workshop on Transit Planning - Canceled	4/1/2020	0
UA	NITC/TRI Lecture Series: Peter Koonce (City of Portland)	11/8/19	60
	Workshop: Emerging Engineering Techniques for Multi-Modal Facilities	11/9/19	25
	Active Living Research Conference	02/02/2020	25
	Portland Field Trip and Tour of Transportation Infrastructure	03/01/2020	9

Table 6. List of publications resulting from work funded by NITC.

Publication type	Citation	Status
Peer - reviewed Journals (scientific, technical, or professional)	Nelson, Arthur C. et al. 2017. *Transit-Oriented Developments Make a Difference in Job Location*, Fordham Urban Law Journal, Vol 44 (4), 1079-1102	Published
	Nelson, Arthur C. 2017. *Transit and Real Estate Rents*, Transportation Research Record: Journal of the Transportation Research Board, Vol 2651(5), 22-30	Published
	Hinners, S. J., Nelson, A. C., & Buchert, M. (2018). Streetcars and Economic Development: Do Streetcars Stimulate Employment Growth?. Transportation Research Record.	Published
	Nelson, A. C., Stoker, P., & Hibberd, R. (2018). Light rail transit and economic recovery: A case of resilience or transformation?. Research in Transportation Economics.	Published
	Haghighi, Nima, Xiaoyue Liu, Ran Wei, Wenwen Li, Hu Shao. Using Twitter Data for Transit Performance Assessment: A Framework for Evaluating Transit Riders' Opinions about Quality of Service. Public Transport. Vol 10, Issue 2, pp 363-377. 2018	Published
	Chen, Z., Liu, X. C., & Wei, R. (2019). Agent-based approach to analyzing the effects of dynamic ridesharing in a multimodal network. Computers Environment and Urban Systems, 74, 126-135	Published
	Yang, X. F., Chang, G. L., Zhang, Z., & Li, P. F. (2019). Smart Signal Control System for Accident Prevention and Arterial Speed Harmonization under Connected Vehicle Environment. Transportation Research Record, 2673(5), 61-71.	Published
	Keeling, K. L., Glick, T. B., Crumley, M., & Figliozzi, M. A. (2019). Evaluation of Bus-Bicycle and Bus/Right-Turn Traffic Delays and Conflicts. Transportation Research Record, 2673(7), 443-453.	Published
	Dai, Z., Liu, X. C., Chen, Z., Guo, R. Y., & Ma, X. L. (2019). A predictive headway-based bus-holding strategy with dynamic control point selection: A cooperative game theory approach. Transportation Research Part B-Methodological, 125, 29-51.	Published
	Lievanos, R. S., Lubitow, A., & McGee, J. A. (2019). Misrecognition in a Sustainability Capital: Race, Representation, and Transportation Survey Response Rates in the Portland Metropolitan Area. Sustainability, 11(16).	Published
	Miller, V. J. (2019). Investigating Barriers to Family Visitation of Nursing Home Residents: A Systematic Review. Journal of Gerontological Social Work, 62(3), 261-278.	Published
	Adkins, A., Barillas-Longoria, G., Martinez, D. N., & Ingram, M. (2019). Differences in social and physical dimensions of perceived walkability in Mexican American and non-hispanic white walking environments in Tucson, Arizona. Journal of Transport & Health, 14.	Published
	Wei, Y. D., Xiao, W. Y., Medina, R., & Tian, G. Effects of neighborhood environment, safety, and urban amenities on origins and destinations of walking behavior. Urban Geography.	Published
	Lubitow, A., Tompkins, K., & Feldman, M. (2019). Sustainable Cycling For All? Race and Gender-Based Bicycling Inequalities in Portland, Oregon. City & Community, 18(4), 1181-1202.	Published
	Gehrke, S. R., & Wang, L. M. (2020). Operationalizing the neighborhood effects of the built environment on travel behavior. Journal of Transport Geography, 82.	Published
	Clark, B. Y. (2020). THE IMPACTS OF AUTONOMOUS VEHICLES ON LOCAL GOVERNMENT BUDGETING AND FINANCE: CASE OF SOLID WASTE COLLECTION. National Tax Journal, 73(1), 259-281.	Published
	Wu, Y. Y., Wei, Y. H. D., & Li, H. (2020). Analyzing Spatial Heterogeneity of Housing Prices Using Large Datasets. Applied Spatial Analysis and Policy, 13(1), 223-256.	Published

Publication type	Citation	Status
	Park, K., Ewing, R., Sabouri, S., Choi, D. A., Hamidi, S., & Tian, G. Guidelines for a Polycentric Region to Reduce Vehicle Use and Increase Walking and Transit Use. Journal of the American Planning Association, 14.	Published
Peer - reviewed Published proceedings of conferences & meetings	Sleep, MD and Masley, M, (2019) Innovative and Sustainable Uses of Volcanic Ash as a Natural Pozzolan for Dust Abatement and Unpaved Roadway Improvement, Eighth International Conference on Case Histories in Geotechnical Engineering, March 24–27, 2019, Philadelphia, Pennsylvania	Published
	Nelson, Arthur C. and Keuntae Kim. 2018. Bus Rapid Transit and Economic Development: A Quasi-Experimental Treatment and Control Analysis. Meeting Compendium of Papers. Transportation Research Board.	Published
	Nelson, Arthur C. and Robert Hibberd. 2018. Analysis of the Variation in Apartment and Office Market Rents with Respect to Commuter Rail Transit Station Distance in Metropolitan San Diego and Salt Lake City. Meeting Compendium of Papers. Transportation Research Board.	Published
	Nelson Arthur C. et al. 2018. *Commuter Rail Transit and Economic Development*. Meeting Compendium of Papers. Transportation Research Board.	Published
	Nelson, Arthur C. 2018. Express Busways and Economic Development: Case Study of the Miami-Dade South Express Busway. Meeting Compendium of Papers. Transportation Research Board.	Published
	Hinners, Sarah Jack, Arthur C. Nelson, Martin Buchert. 2018. Streetcars and Equity: Case Studies of Four Streetcar Systems Assessing Change in Jobs, People and Gentrification. Annual Meeting Compendium of Papers. Transportation Research Board.	Published
	Hibberd, Robert and A.C. Nelson. 2018. *Longitudinal Cluster Analysis of Jobs-Housing Balance in Transit Neighborhoods*. Meeting Compendium of Papers. Transportation Research Board.	Published
	Nelson, Arthur C. and Robert Hibberd. 2018. Using the Real Estate Market to Establish Streetcar Catchment Areas: Case Study of Multifamily Residential Rental Property in Tucson, Arizona. Meeting Compendium of Papers. Transportation Research Board.	Published
	Nelson, Arthur C. 2018. Bus Rapid Transit and Office Rents. Annual Meeting Compendium of Papers. Transportation Research Board.	Published

Table 7: Organizations partnering with NITC projects.

Organization		Contribution Type			
Name	Location	Financial support	In-kind	Data	Other
Alliance for Walking and Biking	Washington, DC				x[1]
American Printing House for the Blind	Louisville, KY		x		
Arlington Adult Day Health Care	Arlington, TX		x		
Assoc. of Pedestrian Bicycle Prof.	Lexington, KY	x			x[1]
Catholic Charities of Fort Worth	Fort Worth, TX		x		
Central Lane MPO	Eugene, OR	x			
City of Eugene	Oregon	x			x[1]
City of Gresham	Oregon	x			
City of Orem	Orem, Utah	x			
City of Portland	Oregon		x		x[1]
City of Seattle	Washington		x		
City of Springfield	Oregon				x[1]
City of Tucson	Arizona	x			
Clevor Consulting Group	Portland, OR	x			
Colorado DOT	Denver, CO	x			
Concord Engineering	Utah	x			
District of Columbia DOT	Washington, DC	x			
ECONorthwest	Portland, OR	x			
Gayle Wells Foundation	Houston, TX		x		
Institute for Sustainable Solutions	Portland, OR	x			
Lane Transit District	Eugene, OR	x			
League of American Cyclists	Washington, DC				x[1]
Metro	Portland, OR	x	x		
Metropia	Tucson, AZ		x	x	
Mid-American Regional Council	Kansas City, MI	x			
Mountainland Assoc. of Gov't	Orem, UT			x	
moovel NA	Portland, OR	x			x[1]
Oregon DOT	Salem, OR	x	x		x[1]
OPAL Environmental Justice	Portland, OR				x[1]
PeopleforBikes	Boulder, CO	x			
Pima County DOT	Arizona	x			
Portland Metro	Portland, OR	x	x		x[1,4]
Project 7B	Utah	x	x	x	
Puget Sound Regional Council	Washington				x[1]
Regional Transportation Commission of Southern NV	Nevada	x			
Regional Transportation District	Denver, CO	x			x[1]
Rowell Brokaw Architects	Eugene, OR	x	x		
Resource Systems Group (RSG)	Salt Lake City, UT			x	
Rowell Brokaw Architects	Eugene, OR	x	x		x[2]
Salt Lake City Corporation	Salt Lake City, UT	x	x		
Salt Lake County Planning & Transp.	Salt Lake City, UT	x			

Organization		Contribution Type			
Name	Location	Financial support	In-kind	Data	Other
Sixty and Better	Fort Worth, TX		x		
Smart Growth America	Washington, DC				x[1]
St. George Area Convention and Tourism	Washington County, UT	x	x	x	
The Senior Source	Dallas, TX		x		
Town of Springdale	Utah	x	x	x	
TriMet	Portland, OR			x	x[1,2]
Tucson Water	Tucson, AZ		x		
Unlimited Choices	Portland, OR				x[3]
Unlocking Doors	Dallas, TX		x		
USTAR - Utah Office of Economic Development	Salt Lake City, UT	x			
Utah Office of Tourism	Utah	x	x	x	
Utah DOT	Salt Lake City, UT	x		x	x[1]
Utah Transit Authority	Salt Lake City, UT	x		x	
Virginia DOT	Richmond, VA	x			
Wasatch Front Regional Council	Salt Lake City, UT	x		x	x[1]
Washington County Engineering & Construction Services	Hillsboro, OR			x	

[1]Resource partner (provides input into research at various stages of project), [2]Assistance with data collection and/or processing, [3]Recruitment of survey participants, [4]Facilitates communication with stakeholders.

Table 8. Technology Transfer Performance Metrics

Tracking Parameter	Performance Metric	Performance Goals & Key Performance Indicators (KPI)
Outputs	Number of final reports **18 total**	Produce final report that clearly articulate research results and meet NITC standards (KPI: 1 final report/project) **On track**
	Number of publications in trade/professional publications **19**	Meet or exceed the number of publications (KPI: 1 publication/project) **On track**
	Number of presentations at national/ international and professional/trade conferences **37** presentations (out of 40 current projects).	Meet or exceed the number of presentations (KPI: 1 presentation/project) **On track**
	Number of events and event participants for technology transfer **20 events/last six months** **96 attendees/event**	Meet or exceed number of events, professional development hours and number of attendees (KPI: 25 number of events/year with average of 50 attendees/event) **On track**
	Number of dissemination tools and products for the 7 recently completed research projects **7 briefs** **6 webinars**	Meet or exceed the number of dissemination tools or products per project (KPI: 1 brief/project) **On track**
	Number of downloads for electronic tools (databases, scripts, algorithms, etc.) **TBD**	Meet or exceed the downloads per electronic tool (KPI: 20 downloads/tool) **In progress**
	Number of media stories covering NITC faculty, researchers and projects **19 in the last six months**	Meet or exceed the number of media stories (KPI: 30/year) **On track**
	Percentage increase of online engagement with stakeholders: NITC Newsletter (subscribers) - **3.9%** NITC Newsletter (open rate) - **30%** NITC Newsletter (click rate) - **6.9%** NITC Website (visitors, compared to previous 6-month period)) - **11.5%** Twitter - **7%** Facebook - **4%** YouTube - **13%** LinkedIn - **43%** Instagram - **16%**	Meet or exceed our currently high averages for online engagement metrics (KPI: NITC Newsletter (subscribers) - 9% NITC Newsletter (open rate) - 31% NITC Newsletter (click rate) - 8.5% **On track**

Tracking Parameter	Performance Metric	Performance Goals & Key Performance Indicators (KPI)
Outcomes	Number of stakeholders who collaborated on implementing research outcomes **11 stakeholders**	Meet or exceed the number of stakeholders involved (KPI: TBD) **In progress. Two is the baseline.**
	Number of projects that reach deployment and adoption. **6 projects**	Meet or exceed number of projects that reach TRL scale 4-5 (KPI: TBD) **In progress. Six is the baseline.**
Impacts	Number of stakeholders reporting impact from surveys **11 Practitioners** **4 Faculty/Researchers** **10 Other stakeholders**	Meet or exceed response rate of stakeholders. (KPI: TBD) **In progress**
	Number of stakeholders who have adopted, implemented or deployed research findings or technologies: **12**	Meet or exceed number of adoptions, implementations and deployments (KPI: TBD) **In progress**