

Program Progress Performance Report

To US DOT/OST-R, University Transportation Centers

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1. Accomplishments

What are the major goals and objectives of the program?

Through a strategically focused program that is synergistic with U.S. DOT priorities and MAP-21 goals, the Midwest Transportation Center (MTC) addresses regional issues related to its theme of *Data Driven Performance Measures for Enhanced Infrastructure Condition, Safety, and Project Delivery*, focusing on the overall goal of **State of Good Repair**. Under this theme, the MTC's objectives are to

- Serve as a focal point within the region and nationally for research that develops data performance measures for infrastructure condition, safety, and project delivery.
- Ensure efficient use of funds by building on existing programs, avoiding duplication, leveraging existing resources, and developing creative cooperative activities with industry.
- Develop products that are useful and relevant to stakeholders including national, state, regional, and local transportation agencies as well as industry and other researchers.
- Provide leadership in the next generation of technology transfer, beginning with the research itself—involving the user, innovative outreach, and new communications technology.
- Develop the next generation of transportation professionals and provide opportunities for current professionals.
- Provide leadership opportunities for students and young professionals.
- Recruit and retain a diverse workforce.

What was accomplished under these goals?

The MTC accomplishes these goals by focusing on the following five activities:

- A. Research (goals 1, 2, 3)
- B. Outreach/technology transfer (goals 3, 4)
- C. Education (goals 6, 7)
- D. Workforce development (goals 5, 6)
- E. Center management (all goals)

The following sections summarize MTC accomplishments under each of these activities during the reporting period.

Highlights include the following:

- MTC & IHRB combine funds for innovative research projects (page 6)
- 2017 Mid-Continent Transportation Research Symposium (page 6)
- UHPC for Bridge Applications Workshop and Pooled Fund Study (page 6)
- 2017 Iowa Tribal Summit (page 7)
- Study Abroad to Great Britain (page 7)
- Ready, Set, Build!: Bridge Building Challenge (page 12)

A. Research

The MTC's lead organization Iowa State University (ISU) is working with partners Wichita State University and Creighton University to help them develop transportation-focused research programs; partner organizations University of Missouri–Columbia (UMC) and the University of Missouri–St. Louis (UMSL) are working with partner Harris-Stowe State University.

The total number of projects funded under this grant to date is 118. All MTC-funded research projects, completed and in-progress, are listed at intrans.iastate.edu/mtc/index.cfm/research.

Completed Research

During this reporting period, 6 final reports and 3 technology transfer documents were submitted for research projects funded under this UTC grant (see “Products” on page 13).

Current Projects

Following are highlights of a few projects representing the work of all the partner institutions during this reporting period:

Risk-Based Bridge Management: A Methodology to Assess and Incorporate Risk in Decision-Making

PIs: Basak Aldemir Bektas and Omar Smadi, Iowa State University

In recent years, risk-based management of infrastructure assets has gained precedence in infrastructure asset management. The Moving Ahead for Progress in the 21st Century Act (MAP-21) aligned with this progress, requiring state transportation agencies to incorporate risk-based management in planning systematic preventive maintenance, replacement, or rehabilitation decisions for their bridge networks. However, the legislation does not provide guidance on a methodology; states are flexible in what type of methodology they choose or how they define risk. At present, state agencies are challenged by identifying and quantifying these risks and developing procedures to address these risks at the network level. The research team tackled these issues focusing on regional risks while working with state transportation officials in the region. The team identified risks, modeled and quantified them, and ultimately developed a methodology to incorporate all risks into decision making at the network level. While the research focused on regional risks and expertise, the resulting methodology was exemplary for all state transportation agencies.

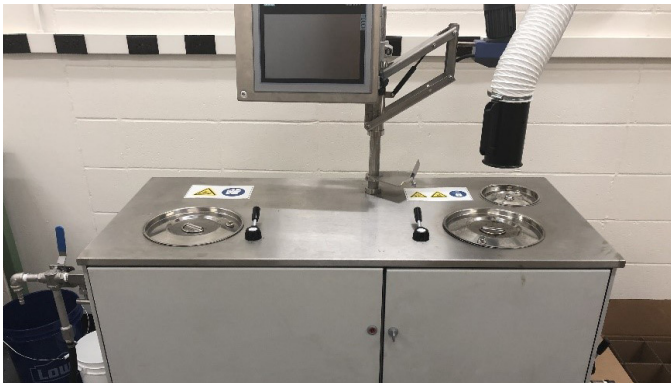
Enhancing the Fundamental Knowledge and Use of Asphalt Emulsions Using Systematic Scientific and Engineering Approaches

PI: Ashley Buss, Iowa State University (IHRB and MTC Joint Funding for Innovative Research)

Asphalt emulsion research has remained almost exclusively

in industry leaving knowledge gaps in the scientific and engineering communities. Asphalt emulsions have a growing market share due to their large role in pavement preservation activities and cold-in place recycling. This project focused on asphalt emulsion formulation and how formulation influences asphalt emulsion properties.

The research documented how viscosity change influences the ability to process and formulate an emulsion. A polymer-modified emulsion was tested using viscosity and rheological testing tracked over time. The test results of the polymer-modified asphalt emulsion was compared with a non-modified asphalt emulsion to develop recommendations for formulation and processing based on a scientific investigation.



Mill for making emulsions

An Investigation of the Link Between Macroscopic Traffic Flow Characteristics and Individual Vehicle Fuel Consumption

PI: Jing Dong, Iowa State University (IHRB and MTC Joint Funding for Innovative Research)

Ambient temperature, congestion, traffic signal progression, and driving style affect vehicle emissions and fuel economy. The objective of this project was to study the impact of traffic and environmental conditions on the emissions and fuel consumption of individual vehicles.

A fleet of university rental vehicles, with a variety of vehicle sizes, models, and years, were monitored over a one-year period. Vehicle speed, location, ambient temperature, emissions, and fuel consumption were recorded using an on-board diagnostics II (OBD-II) logger. The data collected from the vehicles' controller area network (CAN) bus was linked with the macroscopic traffic measurements, such as flow rate, fleet mix, space, mean speed and its variations, and travel time. The influence of traffic stream characteristics, signal coordination, and ambient temperature on vehicle fuel consumption was analyzed.

High Friction Surface Treatment for High Crash Locations

PI: Zach Hans, Iowa State University

The Iowa Department of Transportation's (DOT's) Office of Traffic and Safety is currently participating in a Federal Highway Administration (FHWA) Every Day Counts initiative

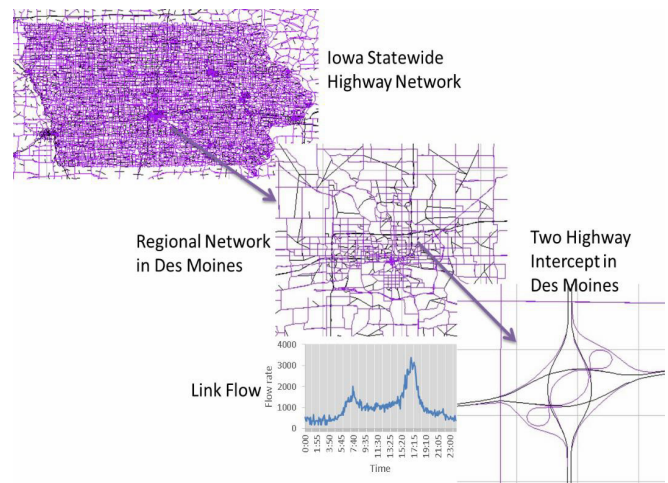
to advance the rapid deployment of High Friction Surface Treatments (HFSTs). They have allocated \$1,000,000 to HFST installation as a crash mitigation strategy on selected two-lane primary and paved secondary horizontal curves throughout the State of Iowa. The Center for Transportation Research and Education (CTRE) at Iowa State has been responsible for the development of site selection criteria and identification of candidate sites. Out of more than 6,000 horizontal curves, nine curves were chosen for implementation based on various factors such as crash experience (evaluated from several different perspectives), traffic volume, roadway and roadside characteristics, pavement condition, as well as more detailed site review and Iowa DOT district and county engineers feedback. HFST placement began August 22 and was completed September 14, 2017.

Data Driven Highway Infrastructure Resilience Assessment

PI: Guiping Hu, Iowa State University

The objective was to design a novel resilience measure for highway infrastructure, which is data driven and based on cutting edge multi-level optimization modeling and solution techniques. This resilience measure can be used to not only identify potential vulnerability to natural and man-made threats but also suggest effective and cost-efficient investment decisions to enhance the resilience of highway infrastructure.

The resilience measurements revealed insightful information about (1) the most vulnerable components of the transportation system that require special monitoring, maintenance, and enhancement; (2) quantitative, intuitive, and visual assessment of the system resilience; and (3) assessment of resilience improvement contributed by new construction to the existing infrastructure. A multi-scale realistic regional highway network in Iowa was studied in this project.



Multi-scale realistic regional highway network in Iowa

Development of an Eco-Friendly, Cost-Effective BiogROUT for Concrete Crack Repair

PI: Kejin Wang, Iowa State University (IHRB and MTC Joint Funding for Innovative Research)

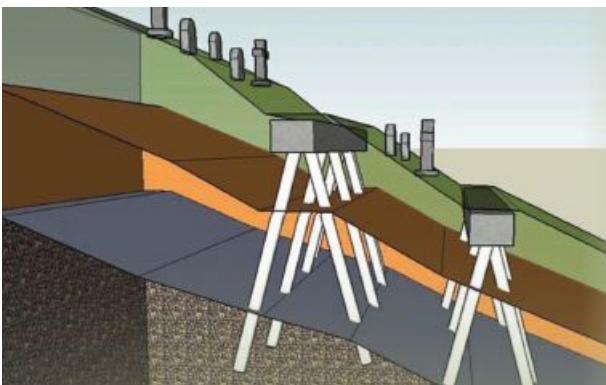
The research team explored both the feasibility and challenges of using a hybrid, semi-flexible, semi-ridge concrete for highway pavements, bridge decks, and overlays. The hybrid concrete was made with asphalt pervious concrete filled with a self-consolidating Portland cement mortar called casting cement asphalt mixture (CCAM), and it was expected to possess the advantages of both asphalt (flexible) and Portland cement (rigid) concrete, thus advancing performance and longevity of transportation infrastructures. In the study, experiments were conducted to achieve optimal CCAM mixes. The basic engineering properties such as strength, shrinkage, and freeze-thaw durability of the CCAMs were evaluated.

Improved Design Practices for A-Walls for Slope Stabilization

PI: Andrew Boeckmann, University of Missouri–Columbia

A-Walls have successfully been used for slope stabilization. University of Missouri–Columbia researchers J. Erik Loehr and Henry Brown previously created a method for predicting the resisting forces in A-walls for slope stabilization based on results of full-scale field installations and experimental results involving scaled micropile elements installed in large-scale physical models. Although the method satisfies compatibility, it does so with uncoupled (i.e., separate) lateral and axial analyses, without consideration of interaction between upslope and downslope micropiles (that are connected through a capping beam).

To evaluate the effect of coupling, the research team analyzed slopes stabilized with A-walls using a finite element model with coupled upslope and downslope piles rather than an uncoupled lateral (p-y method through LPILE) and axial (t-z method) analyses. Load-transfer parameters for the analyses were calibrated to data from field installations of A-walls to demonstrate viability of the revised methodology. The research team then compared results of the coupled analyses to results from the uncoupled approach to evaluate the effect of interaction between upslope and downslope micropiles.



Micropiles used for stabilization of Oak Hill Cemetery in Washington, DC

Evaluation of Work Zone Split Traffic Symbol Sign

PI: Praveen Edara, University of Missouri–Columbia

Effective signage that is easy to understand facilitates safe driving through a work zone. While the guidance for work zone signage in the Manual on Uniform Traffic Control Devices (MUTCD) is suitable for many conditions, there may be instances where alternative signage may be more effective at enhancing safety. This project evaluated the use of alternative signage for closure of a middle lane in a freeway work zone on a bridge rehabilitation project on I-170 in St. Louis, Missouri.



Horizontal alignment warning signs from MUTCD Section 6F

The alternative signage displays the lane arrangement in a single sign while the MUTCD signage shows the movements to the left and the right sides of the work area on separate signs. The evaluation of the alternative signage included stakeholder and driver surveys, operational and safety analyses, and the collection and analysis of field videos to assess driver behavior. The analysis of field videos showed that drivers may have adapted to the alternative signs as the rate of lane changes decreased between the early and late periods of construction.

Autonomous and Connected Vehicle Technology: Effects on the Motor Carrier Industry with Implications on Freight Policy

PI: Ray Mundy, University of Missouri–St. Louis

This study sought to evaluate the broad impacts that autonomous and connected vehicle technologies can have on both the motor carrier and rail industries. Since the development and adoption of these technologies are likely to be gradual, three phases were posited and analyzed. Depending on the degree of autonomy that is available, the motor carrier industry could achieve up to a 42.1% reduction in average cost per mile of long distance truckload freight in the next two decades. If fully autonomous technology is available for use in the motor carrier industry, it is estimated that the American rail freight industry could see a 19 to 45 percent drop in demand for competitive truckload freight.

The initial phase of motor carrier autonomous vehicles started with truck platooning, which the research team expected to see introduced and spread widely within the next five years. This phase alone provided significant cost reduction in long distance truck load freight, which would make it difficult for rail carriers to effectively compete unless significant efficiency and effectiveness measures were taken.



Peloton test vehicles on a highway

An Exploration of Machine Learning Approaches to Predict Pavement Performance

PI: Ravi Nath, Creighton University

Machine learning (ML) techniques are used to model and predict Pavement Condition Index (PCI) for various pavement types using a variety of input variables. The primary objective of this research was to develop and assess PCI predictive models for the years 2014 and 2015 based upon the 2013 PCI values and other road characteristics during the calendar year 2013. Clearly, if a road segment was resurfaced during 2014 or 2015, then this information will profoundly affect the PCI for 2015. Data collected by the Iowa DOT regarding road conditions across Iowa were used to model the PCI. Watson Analytics was utilized as a ML tool to perform the analysis. The analysis showed that ML is a viable approach to modeling PCI for various pavement types and also it is possible to predict future PCI from past PCI values, thus eliminating the need to measure PCI for road segments on a yearly basis. This approach also has the advantage over multiple linear regression models in that it automatically accounts for nonlinear relationships.

Other Research-Related Activities

Innovative Research Projects with Joint Funding: MTC and Iowa Highway Research Board

The Iowa Highway Research Board (IHRB) is an advisory group to the Iowa DOT and is responsible for assisting in the development and continuation of an effective research program for Iowa highway transportation. One of its goals is to encourage transportation innovation and long-range technological advances.

The Region VII MTC is one of 10 regional University Transportation Centers sponsored by the U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology and is led by Iowa State University's Institute for Transportation. The research focus area for the MTC is "State of Good Repair," a key program under the 2012 Moving Ahead for Progress in the 21st Century Act (MAP-21).

To support innovation and advances, the IHRB and MTC provided seed funding for four projects that are innovative

or explore long-range advances in highway transportation. These projects may be "high-risk, high-reward" in nature, or they may be basic research that can lead to new fundamental insights that, in due course, will result in substantive advances in the design, construction, instrumentation and monitoring, modeling, or management of highway-related projects. These projects are not necessarily expected to lead to results that are of immediate use in highway transportation, but produce results that hold promise for further useful development. A few of these projects are highlighted in the research section, and we will continue to report on these innovative research projects.

B. Outreach/Technology Transfer

Research symposium participants hear about Smart City Challenge winner,

August 16–17, Ames, Iowa

More than 260 transportation professionals participated in the 2017 Mid-Continent Transportation Research Symposium. The every-other-year event brings together state and federal transportation staff, researchers, graduate students, and experts from business and industry. The event featured 81 research presentations, including 26 poster presentations. Keynote speaker Ben Pierce, Transportation Technology Program Lead at HDR, talked about the Smart City Challenge and the winning Columbus, Ohio, application. Symposium registrants came from 14 states, the District of Columbia, and the United Kingdom.

Symposium sponsors are the Iowa DOT, Institute for Transportation at ISU, and the MTC.



Keynote Ben Pierce, right, visits with UMSL's Ray Mundy

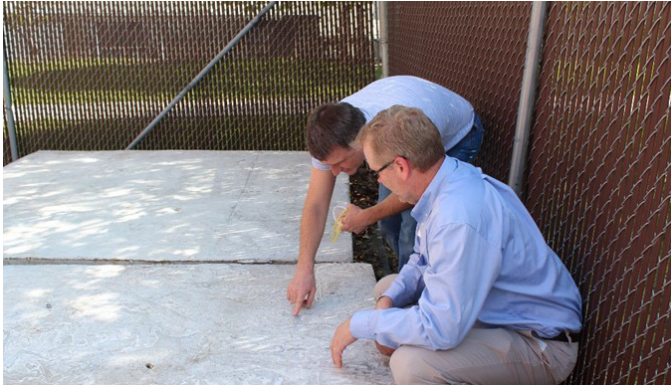
MTC support helps lead to pooled fund to develop UHPC guidelines,

May 4, 2017, Ames, Iowa

A spring 2017 workshop supported in part by the Midwest Transportation Center has helped create a new pooled fund to develop guidelines for using Ultra-High Performance Concrete (UHPC). The Iowa DOT, FHWA, Institute for Transportation's Local Technical Assistance Program, and the MTC sponsored a May 4, 2017, workshop on UHPC bridge applications. More than 50 city and county engineers, contractors, and researchers—including five participants from

Switzerland—attended the workshop held in Ames, Iowa.

The workshop helped lead to the pooled fund study TPF-5(366) “Development of Structural Design Guide for Ultra High Performance Concrete.” The Iowa DOT is the lead state agency. Other states in the pooled fund thus far are Connecticut, Georgia, New York, and Washington. The pooled-fund study will facilitate advancement in the state-of-the-practice for UHPC in the US highway sector, which includes development of a design and construction guide specification.



Workshop participants inspect a UHPC sample during the laboratory visit

Development of new MTC website under way

The MTC will have a new website in 2018. The MTC and the other centers and programs at the Institute for Transportation will benefit from a new user-friendly and state-of-the-art web environment that will work on desktop, tablet, and smartphone platforms. The new websites are under development now and will be ADA compliant, with improved databases and other systems. The sites also will have an easy-to-use CMS (content management system), allowing staff to easily change and update their sites.

Project consultation key goal of 2017 Iowa Tribal Summit

The three-day event was held from May 31 to June 2 in Tama, Iowa, attracting a total of 81 participants, comprising of 17 Tribes/Nations and 12 agencies. Topics of discussion included relationship building, conflict resolution, cultural properties, and changing laws related to consultation under the National Historic Preservation Act (NHPA).

During the Summit, the Iowa DOT’s Brennan Dolan discussed some of the more challenging project types in Iowa’s environmentally rich areas, including emergency-related, cultural, and historic projects, along with corridor studies. He explained that these types of projects deal with a lot of agricultural, state, and environmental issues.

Dolan’s presentation sparked further discussion on how consultation can better take place between Tribes and agencies in an effort to preserve the land, together. After all, under the NHPA: “Consult is built upon the exchange of ideas, not simply providing information.”



2017 Iowa Tribal Summit attendees pose together at the end of the meeting

Third MTC Research Brief, Summer Webinar helps Research Implementation

The MTC is again helping get new knowledge into the hands of transportation professionals. A research brief on a new bridge structural health monitoring system has been posted on the MTC website and a webinar on the topic was held on July 19, 2017. The brief, titled “Bridge Structural Health Monitoring System Can Provide Immediate and Accessible Data,” is the third in a series of MTC one-page documents that highlight research results. The previous two briefs were “Safety Benefits of Safety Edge” and “Evaluation of Low-Cost Traffic Calming.” The webinar explained how the system works and how it is being implemented in Iowa.

C. Education

Study Abroad Students Return from Great Britain

How could a medieval castle hold up to a siege? Or, how does London, one of the busiest cities in the world, keep their roadways running smoothly? These questions and more were asked over the course of the two-week study abroad in May 2017. Students had the opportunity to even tour London’s traffic operations center. This was the MTC’s third study abroad trip, held in collaboration with Iowa State University’s Department of Civil, Construction, and Environmental Engineering. A total of 25 students took the trip.



A few students pose on a bridge in St. Andrews, Scotland



Students in front of Roman Baths in Bath, England

Study Abroad Students to Visit Italy, May 7–18, 2018

Civil engineering is an increasingly global profession. Through this course, students will begin to gain an international understanding of the impact of different historical, cultural, social, environmental, and political factors for transportation and infrastructure projects. In addition, this course will help students prepare for future careers in both the public and private sector.

The MTC will conduct its fourth study abroad program in May 2018, taking students to various sites across Italy for the two-week course Global Perspectives in Transportation. These students, led by MTC-affiliated faculty, will gain a holistic, global perspective of transportation systems and how they vary from the US.

AASHTO Bridge Competition Teams

As part of a pilot program, the MTC partnered with the Iowa DOT to fund three Iowa State University graduate students to work with teachers and mentor students in order to encourage participation in this transportation opportunity. The AASHTO National Bridge and Structure Competition is held annually for students from participating TRAC™ & RIDES states. Guidelines for the competition are posted on the TRAC™ website in October, entries are submitted in February, and teams selected to participate in the final competition are notified in March. Five groups from this new program completed the required digital design, model, and proposal for submission. Of the 18 teams chosen to compete, one of ISU’s Science Bound teams was selected as a finalist for the competition held in Portland, Maine, during the Annual AASHTO Meeting from May 23–24, 2017.



ISU Science Bound team with their completed bridge

MTC Transportation Scholars Program Enhances Student Experience

The MTC continues to sponsor and manage the Transportation Scholars program at Iowa State University, the University of Missouri–Columbia, and University of Missouri–St. Louis. The program requires students to demonstrate excellence in coursework, research, leadership, and community outreach.

Seminar in Transportation

Led by MTC Director Shauna Hallmark, the “Tom Maze Transportation Seminar” presents weekly during the spring semester and features nationally and internationally recognized speakers who present on timely transportation-related topics and interact with the students. The seminar is broadcast online in real-time to students at MTC partner institutions; the broadcast location rotates among Iowa State University, University of Missouri–Columbia, and University of Missouri–St. Louis. Presentations are recorded and made available via the MTC website. During this reporting period, 4 presentations were made, and each presentation had an average of 61 participants. Presenters participating were from the Washington State Department of Transportation, Consultancy/Demographia, University of Missouri-Columbia, and Iowa State University.

Fall Transportation Graduate Student Research Seminar

The 2017 fall semester began the third year of ISU’s weekly Transportation Graduate Student Research Seminar. This series, which is led by ISU’s Peter Savolainen, was developed by the transportation division of the Department of Civil, Construction, and Environmental Engineering. Graduate students in transportation, including MTC Transportation Scholars, present their research results, allowing them to develop their presentation skills and receive feedback from other students and faculty on their research. Each transportation student must participate in this seminar at least once during their degree program. Nine student presentations were made during the current reporting period with an average of 40 attendees.

Hongtao Dang receives Trinect Fellowship Award

Each year Trinect recruits 10 Iowa State University graduate students (Fellows) associated with the College of Engineering to work collaboratively with a selected elementary school teacher and an ISU pre-service teacher to leverage the Fellow’s expertise in science and mathematics. For fall 2017 through spring 2018, Institute for Transportation graduate student Hongtao Dang has been selected to participate in this exciting program. Together, they will develop innovative and engaging STEM activities for elementary school students. The Fellows will spend one full day every week throughout the public school year in an elementary classroom in Des Moines, Iowa, performing the duties of a “resident engineer” as they interact with their partner teachers and students.

Two projects funded through MTC Undergraduate Research Program

Seed funding for Undergraduate Research Program at Iowa State University is allocated to faculty who engage undergraduate students in research projects under the thematic focus of the MTC. Faculty provide matching funds and this project is oriented toward facilitating broader opportunities for undergraduate research and encouraging students to consider graduate school opportunities. This term, the following two projects were funded:

Dr. Michael A. Perez, “Temperature influence on sediment basin efficiency and turbidity”

Scope – The aim of this study was to conduct small scale experiments to determine the influence of temperature on a soil particles settling velocity and quality (i.e., turbidity). This information will be useful in designing sediment basins based on regional and seasonal temperature conditions. The hypothesis was that colder regions, including the Midwestern US, may need to consider longer detention or larger sediment basins to achieve desired capture efficiencies.

Dr. Cristina Poleacovschi, “Evaluate the effect of infrastructure planning and design on the social capital of refugees in the context of Europe”

Scope – The goal of this research was twofold. First, this research sought to conduct a comparative analysis of the design of housing in Germany and Sweden. Then, the research identified the effects of these designs on the psychological recovery of refugees (e.g., trauma reduction). Second, this research identified if the spatial planning of housing affected the level of human, economic, and social capital.

2017 ITE Midwest/Great Lakes District Student Leadership Summit

The ISU Transportation Student Association (TSA) attended the Institute of Transportation Engineers (ITE) Midwest/Great Lakes District Student Leadership Summit (SLS) at Purdue University in September 2017. This was the second annual SLS (the first was held in 2016 at ISU), which is planned and executed entirely by students. The purpose of the Summit is to prepare students to make an impact in the transportation industry, develop professional and leadership skills, and promote networking between future and current transportation professionals.

TSA Success Stories

The Transportation Student Association is the student-operated Iowa State chapter of the Institute of Transportation Engineers and the Intelligent Transportation Systems of America (ITS|A). The organization cultivates the advancement of transportation ideas through interactions with members of academia, industry, and the public through meetings, sponsored conferences, and outreach initiatives. TSA co-founded the Midwestern and Great Lakes ITE President’s Council and initiated a set of events for its members, including software

training sessions, a career panel forum, technical writing and poster design seminars, safety educational workshops for high school students, and a roadside clean up event.



TSA students after cleaning up Iowa roadside

MTC Students Win Awards, Gain Valuable Experience

MTC students are actively participating in competitions and presenting their research. During the current reporting period, MTC students had several major accomplishments:

- TSA hosted a booth activity at the Cyclone Fly on April 8.
- Twenty-three InTrans students attended the 2017 Mid-Continent Transportation Research Symposium and seven presented posters.
- Six University of Missouri–Columbia students traveled to attend the 2017 Mid-Continent Transportation Research Symposium.



Ray Mundy of the University of Missouri–St. Louis reviews student posters at 2017 Mid-Continent Transportation Research Symposium

- TSA students picked up eight large bags of trash along a Story County road near Kelley, south of Ames, Iowa, on September 30.
- PhD student and TSA member Tingting Huang won top student paper in ITE Midwest District competition.

- Ahmed AlBughdad won best activity award in the ITE Midwest District competition.
- Georges Bou-Saab won best poster in the ITE Midwest District competition.
- Niloo Parvin received an ITE scholarship.
- In mid-May, TSA was awarded the Best Student Chapter award from the Missouri Valley Section (MOVITE) of ITE, which allowed the group to advance to the Midwestern District Competition.
- On May 30, the chapter was awarded Best Student Chapter in the Midwestern ITE District for their excellent programs and membership growth during the 2016–2017 school year.
- Amrita Goswamy attended the Transportation Research Board's first Roadside Safety Conference in San Francisco, California, in June.
- Georges Bou-Saab attended the sustainability metrics and practices session at the Air and Waste Management Association's 110th Annual Conference.
- Georges Bou-Saab became a member of the 2017 Lifesavers Traffic Safety Scholars program.
- Students from the University of Missouri–Columbia presented the results of the project entitled “Implementation Evaluation of Rustic Road Geosynthetic Reinforced Soil Integrated Bridge System” to the Missouri legislature through the University’s “Undergraduate Research Day at the Capitol” on Tuesday, April 4, 2017, as well as at the state’s TEAM (Transportation Engineers Association of Missouri) Conference, where their poster took third place in the student competition March 22–24, 2017.

D. Workforce Development

Nicole Oneyear serving on Safety Discipline Working Group for National Transportation Career Pathways Initiative

As part of the working group, ISU's Nicole Oneyear is helping to determine transportation safety occupations as well as core competencies for these occupations. She is also helping to identify any gaps in the existing education or training that is needed to help train the next generation of transportation safety workers.

The Missouri Bridge Conference

Held May 17, 2017, in Columbia, Missouri, the conference was hosted by the University of Missouri with funding from the Missouri Department of Transportation, with some match budgeted from the MTC technology transfer project. About 250 people were in attendance. The conference was excellent and there were several presentations on research work conducted on MTC-funded projects. Dr. Washer, Mr. Boeckmann, and Mr. Stone (a MoDOT research engineer) all discussed their MTC research projects. All PowerPoint presentations have been posted on the conference website, which greatly facilitates tech transfer and implementation.

ASCE Engineering Day for Kids

The University of Missouri student chapter of the American Society of Civil Engineers (ASCE), with support from the MTC, held its spring Engineering Day for Kids on April 8, 2017. There were over 60 3rd- to 5th-grade participants. ASCE student members assisted the students as they learned about what civil engineers actually do. They built bridges and structures out of toothpicks and gumdrops, setup and ran cars on a simulated highway, built retaining walls with sand and paper, and measured and calculated material properties.



Students and volunteers at Engineering Day for Kids

MTC Teams with Program for Women in Science and Engineering

The MTC teamed with Iowa State University's Women in Science and Engineering (WiSE) to offer the Ready, Set, Build!: Bridge-Building Challenge. The event was held on April 27, 2016, at ISU during the WiSE-sponsored Taking the Road Less Traveled (TRLT) Career Conference, which hosted 350 9th and 10th graders, 48 of whom participated in the bridge challenge. WiSE collaborates with other groups to increase the participation of women in STEM fields.



Students collaborate during the bridge-building process

One of the goals of the conference (held multiple times in spring and fall) is to expand awareness of STEM careers. This was the third time the Institute for Transportation conducted this activity as part of the TRLT Career Conference.

High Schoolers Do Research in Young Engineers and Scientists Program

The MTC and Iowa State University's Center for Biorenewable Chemicals collaborated during summer 2017 on the YES (Young Engineers and Scientists) program. In this partnership with Iowa high schools, the program offers six-week research internships to participating students who can work up to 40 hours a week under the supervision of a mentor. At the session's end, each student presents a poster outlining his or her research. 2016 YES program participant Logan Peters continued to work at InTrans as a student employee during the 2016–2017 school year and participated in the program with InTrans again during summer 2017. He is the second program participant who has asked to stay on with InTrans following the completion of the YES program.



Logan Peters presents his poster during YES reception

Three STEM Educators in Research Experience for Teachers Program

For the fourth year, the MTC participated in the Research Experience for Teachers program offered in summer 2017 by Iowa State University's Center for Biorenewable Chemicals and funded by the National Science Foundation. Three Iowa public high school math and science teachers worked on active research projects while building their science and engineering knowledge base for use in their classrooms. MTC Director Shauna Hallmark, MTC affiliate researcher Basak Aldemir-Bektas, and Bridge Engineering Center Director Brent Phares hosted the teachers for six weeks at ISU's Institute for Transportation. Two of the three teachers requested placement with InTrans for their second year of participation in the program.

Teaching in the Fast Lane: Summer Workshop for Elementary School Teachers

Twenty-four elementary teachers were selected to participate in the MTC-sponsored Teaching in the Fast Lane: Summer Workshop for Elementary School Teachers from July 10–14, 2017. Now in the workshops' third year, the program introduced teachers to engineering concepts and engineering professions with the goal of equipping them to enrich their classrooms and raise awareness and enthusiasm among young students about engineering.



Iowa DOT engineers met with teachers to discuss bridge testing and monitoring

Hands-on activities come from the AASHTO Roadways in Developing Elementary Students (AASHTO RIDES) kit. Each participant received a modified version of the AASHTO RIDES kit, which included ready-to-use supplies for implementation of newly learned activities. Each kit included items such as a set of engineering process flash cards, Hot Wheels cars, spring scales, stopwatches, and other fun and educational items.

GO! Further: Workshop for High School Students Develops Leadership Skills

The MTC offered two weeklong GO! Further workshop sessions at Iowa State University during summer 2017 in partnership with ISU's Office of Precollegiate Program for Talented and Gifted (OPPTAG). Each session provided a leadership and learning experience for high school students. Students learned about the world of engineering and took part in hands-on activities to develop leadership and teamwork skills. To ensure diversity, the MTC collaborated with ISU's Science Bound program, which partners with schools to increase the number of ethnically diverse Iowa students pursuing STEM careers and with ISU's Program for Women in Science and Engineering to appeal to young women across Iowa. A total of 22 students attended the sessions.



GO! Further students work with InTrans researcher Bob Steffes

The 68th Annual Missouri Traffic Safety and Blueprint Conference

Hosted by the Transportation Infrastructure Center at the University of Missouri, in cooperation with the Midwest Transportation Center, Missouri Department of Transportation, Federal Highway Administration, National Highway Traffic Safety Administration, and the Missouri State Highway Patrol, the Missouri Traffic, Safety and Blueprint Conference was held September 27–29 in Columbia, Missouri. Over 425 people attended with a total of 48 speakers coming from as far as Seattle, Washington and Washington, DC. Having MTC support was significant in assuring a successful conference.

Ready, Set, Build!: Bridge-Building Challenge to Be Held November 2017

Expanded in 2016 to a two-day event, the Ready, Set, Build!: Bridge-Building Challenge will continue as a two-day event in 2017 following much success last fall. The event is scheduled for November 3–4 at the Science Center of Iowa (SCI) in Des Moines, Iowa. On November 3, school groups from across Iowa (currently maxed out registration with a total of 28 teams totaling 112 participants) will participate in a stand-alone session. Then, on November 4, families and after-school groups will participate in their own session. Participants will be divided into multiple age categories and family groups. Each team will have three hours to build a bridge out of provided materials (e.g., Popsicle sticks, wooden dowels, masking tape, hot glue, string, wire, and poster board).

Participants will have the opportunity to interact with engineering professionals from the Iowa Department of Transportation and Institute for Transportation and learn more about bridges and other transportation-related topics. Iowa State University engineering graduate students also volunteer for the events to assist the young designers/builders during the process.

Through hands-on learning booths at the main entrance, the Iowa DOT, InTrans, ISU's Transportation Student Association, and WiSE, we anticipate over 1,200 SCI attendees to share learning opportunities about transportation and bridges.

This event is sponsored in part by the Iowa DOT and supported by ISU 4U Promise, which helps prepare students from communities with historically lower attendance or academic success in higher education for college.

GO! Online Magazine

GO! online magazine has become the MTC's premier tool for informing young people about careers in transportation. Through articles, activities, and resources, GO! provides information about a variety of transportation-related careers and academic programs. GO! is financially and academically supported by the MTC, initiative partners at MTC consortium universities, ISU's Department of World Languages and Cultures, the Iowa DOT, and representatives from Online-Master-Programs.org, AffordableCollegeFoundation.org, College-affordabilityguide.org., and OnlineColleges.net. GO! also partners with the accelerated bridge construction-themed University Transportation Center at Florida International University, which provides one ABC-related article every quarter.

During this reporting period,

- At least two new articles were published, disseminated, and marketed to potential users monthly.
- GO! reached 1,382 teachers and transportation professionals monthly.
- On social media, the GO! Facebook page has 303 followers and the Twitter page has tweeted 1,330 times and has 356 followers.
- The GO! website was accessed by 1,950 unique users who viewed 4,573 pages.

E. Center Management

Quarterly Partner Meetings

MTC leadership at Iowa State University and its partner institutions have frequent communication. The goal is to identify commonalities among institutions, leverage funding for similar activities, and identify opportunities to collaborate. These conversations have been productive.

How were results disseminated?

In general, information about the MTC and its activities, particularly for the purposes of enhancing public understanding, increasing interest in transportation careers, and advancing technology transfer, was disseminated via the following channels:

- GO! magazine for teens
- MTC /InTrans En Route e-newsletter
- Website
- Research reports
- Most of the activities described under Outreach/Technology Transfer (beginning on page 6) and Workforce Development (beginning on page 10)

Detailed, itemized information about many of the above activities is provided in the annual performance metrics report to OST-R, U.S. DOT.

April	
Articles	Green infrastructure: The PlasticRoad Green infrastructure: 3D constructed bridges Green infrastructure: One 'step' at a time
ABC-UTC article	Can't stop the traffic!
May	
Articles	Transportation & me: A traffic planner Transportation & me: A forensics expert Transportation & me: An automotive stylist
Interview	Transportation & me: Interview with a bridge engineer
June	
Articles	Transportation Feats of the World: Journey on the Trans-Siberian Transportation Feats of the World: Journey across the Akashi Kaikyo Transportation Feats of the World: Journey to the International Space Station Transportation Feats of the World: Journey on the London Underground
Interview	Transporting a town: Redesigning the CyRide bus system
July	
Articles	Transportation Feats of the World: Journeys from the Kansai Airport Transportation Feats of the World: Journey across the Golden Gate Transportation Feats of the World: Journey along the Great Wall
August	
Articles	Autonomy meets the automobile The not-so-distant future of car safety
September	
Articles	Personalized by AI Everyday convenience for you



A panel from *GO!*'s web comic

What activities are planned for the next reporting period?

The following activities are planned for the next reporting period:

Center Management

- Continue showcasing MTC products/activities

Research

- Continue to monitor progress of the research program

Education

- Hold the summer 2018 Study Abroad program to Italy (May 2018)
- Track Transportation Scholar participation in required and recommended activities

Workforce Development/Diversity

- Continue producing content for *GO!* magazine
- Hold fall 2017 workforce development activities like the Ready, Set, Build!: Bridge Building Challenge

Outreach

- Develop brochures to highlight the impact of research projects
- Plan Innovations in Transportation Conference (August 2018)

2. Products

In addition to products and activities discussed in the previous section, the MTC has generated and/or funded the following products:

Presentations (in chronological order)

- Wang – “Hybrid Concrete for Advancing Pavement Performance,” Meeting of the Iowa Highway Research Board, Ames, Iowa, April 28, 2017
- Goswamy – “Safety Evaluation of Safety Edge Treatment in Iowa” Transportation Research Board First International Roadside Safety Conference: Safer Roads, Saving Lives, Saving Money, San Francisco, California, June 12–15, 2017
- Dong – “Estimating Energy Efficiency of Connected and Autonomous Vehicles in A Mixed Fleet,” Automated Vehicles Symposium, San Francisco, California, July 11, 2017
- Jeong – “Guide to Life-cycle Data and Information Sharing Workflow for Transportation Assets,” International Conference Maintenance and Rehabilitation of Constructed Infrastructure Facilities, Seoul, South Korea, July 21, 2017
- Dissanayake – “Crash Modification Factors for Lane Departure Countermeasures in Kansas,” International Conference

- on Advances in Highway Engineering & Transportation Systems, Negombo, Sri Lanka, July 21–22, 2017
- Hu – “An Ensemble Learning-based Prognostic Approach with Degradation-Dependent Weights for Remaining Useful Life Prediction” ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE), Cleveland, Ohio, August 6–9, 2017
 - Hu – “An Ensemble Bias-Correction Method with Adaptive Weights for Dynamic Modeling of Lithium-Ion Batteries,” ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE), Cleveland, Ohio, Aug 6–9, 2017
 - Hans – “Operational Data to Assess Mobility and Crash Experience During Winter Conditions,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Hu – “A Trilevel Optimization Model for Resilient Transportation Network Design,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Dissanayake – “Safety Evaluation of Raised Speed Limits on Kansas Freeways using EB Method,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Savolainen – “Effectiveness of Median Cable Barriers and Rumble Strips,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Mundy – “Truck Platooning, Autonomous Trucking vs. Intermodal Rail Service – Implications for National Transporting Freight Policy,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Alhasan – “Impact of Spacial Pavement Friction on Crash Risk Assessment,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Hallmark – “Evaluating Driver Braking and Stopping Behavior at Rural Intersections using SHRP 2 Naturalistic Driving Study Data,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Smadi – “Multiple Changepoint Detection on Speed Profile in Work Zones Using SHRP 2 Naturalistic Driving Study Data,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Dong – “A Trilevel Optimization Model for Resilient Transportation Network Design,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Basmajian – “Keeping the Bottom Line: Accesibility and Essential Services in Rural Iowa,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Zhu – “Integrating Spacial-Temporal Traffic Data on an Urban Network for Change Detection,” 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Boeckmann and Loehr – “Improved Design Practices for A-Walls for Slope Stabilization,” Annual Deep Foundations Institute (DFI) SSI Conference, Washington DC, August 29–30, 2017
- ## Articles and Papers
- Hu – “On-Board Prediction of Remaining Useful Life of Lithium-Ion Battery,” paper accepted for presentation at 2017 IEEE Transportation Electrification Conference and Expo (ITEC), August 27–30, 2017
 - Fletcher, Rasheed, and Najjar – “FE-ANN based modeling of 3D simple reinforced concrete girders for objective structural health evaluation,” paper accepted for publication in Structural Health Monitoring
 - Jeong – “Guide to Life-cycle Data and Information Sharing Workflow for Transportation Assets,” paper accepted for presentation at Conference on Maintenance and Rehabilitation of Constructed Infrastructure Facilities, Seoul, South Korea, July 21, 2017
 - Dissanayake – “Crash Modification Factors for Lane Departure Countermeasures in Kansas,” paper accepted for presentation at International Conference on Advances in Highway Engineering & Transportation Systems, Negombo, Sri Lanka, July 21–22, 2017
 - Hans – “High Friction Surface Treatment for High Crash Locations: Site Selection Process” submitted to Accident Analysis & Prevention
 - Hallmark – “Development of Crash Modification Factors for Lane Departure Countermeasures,” developed three technical briefs this quarter
- ## Other
- Goswamy – “Speed Prediction Model in Work Zones on 4-lane Divided Highways Using the SHRP 2 Naturalistic Driving Study Data,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Arabzadeh – “Effect of Deicing Chemicals on the Performance of Nano-Technology Based Super Water-Repellent Concrete,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Huang – “Implementing Data Quality Assurance with Visualization Tools,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Shi – “Investigating Fly Ash-based Geopolymer in Pervious Concrete for Removal of Heavy Metals in Urban Stormwater Runoff,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
 - Chang – “Traffic Impact Assessment Tool for Work Zones Using Real Time Travel Data,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017

- Bharadwaj – “Understanding the Impacts of Work Zone Activities on Traffic Flow Characteristics,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
- Le – “Data Integration Across Geospatial Data Life Cycle of Transportation Assets,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
- Gholamialam – “Spatial Analysis of Crash Frequency: A Statewide Study,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
- Goswamy – “Crash Modification for the Safety Edge in Iowa,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
- Jeong – “Guide to Life-cycle Data and Information Sharing Workflow for Transportation Assets,” included in poster session for 2017 Mid-Continent Transportation Research Symposium, Ames, Iowa, August 16–17, 2017
- Dong – Developed a database of individual vehicles’ fuel consumption, GPS location and speeds and created fuel consumption models for gasoline and electric vehicles
- Hans – Developed a methodological approach to integrate and summarize snow plow AVL data on selected roadways as well as integrated crash and snow plow data
- Hu – With his team designed an interactive software for demonstration for “Data Driven Highway Infrastructure Resilience Assessment,” which can be accessed at <https://charliexu.github.io/ReleaseWebpage4IDot/>
- Jeong – “Guide to Life-cycle Data and Information Sharing Workflow for Transportation Assets,” data exchange narratives, process maps, exchange requirement matrices, and ideal process maps for signs, guardrails, and culverts were developed
- Jeong – “Guide to Life-cycle Data and Information Sharing Workflow for Transportation Assets,” An FME based framework was proposed to assist asset management professionals in extracting geospatial asset information from as-designed MicroStation drawings

3. Participants and Collaborating Organizations

The Midwest Transportation Center utilizes many colleges, departments, and centers at Iowa State University as internal partners: Civil, Construction, and Environmental Engineering; National Concrete Pavement Technology Center; Center for Transportation Research and Education; Bridge Engineering Center; National Center for Wood Transportation Structures; Center for Earthworks Engineering Research; Engineering Research Institute; Aerospace Engineering; Center for Weather Impacts on Mobility and Safety; Electrical and Computer Engineering; Statistics; Industrial and Manufacturing Systems Engineering; Chemical and Biological Engineering; Center for Biorenewable Chemicals; Food Science and Human Nutrition; Supply Chain and Information Systems; Landscape Design; Agricultural and Biosystems Engineering; Transportation Services; and the Virtual Reality Application Center.

Other collaborative efforts with external entities (other than collaborations among MTC partner universities) are summarized in the following table:

Summary of Collaborative Activities

External Partners/ Collaborators	Partner Type	State/Country	Financial Support	In-Kind Contributor	Research Collabo- rator	Facilities	Personnel Exchange	Materials	Data
Ann L. Schneider & Associates, LLC	Industry	Missouri			X				
Argo Genesis, a subsidiary of Seneca Petroleum Company	Industry	USA	X						
Arizona State University	University	Arizona			X				
Asphalt Paving Association of Iowa	Industry	Iowa			X				
BASF	Industry	Iowa						X	
Caterpillar	Industry	USA	X						
City of Belton	Government	Missouri			X				
City of Chesterfield	Government	Missouri			X				
City of Columbia	Government	Missouri	X		X				
City of Grandview	Government	Missouri			X				
City of Jefferson City	Government	Missouri			X				
Collins Engineering	Industry	Missouri			X				
Consulting Engineers Association	Industry	Missouri			X			X	
Costello & Associates, Inc.	Industry	Missouri			X				
Creative Visions Human Development Institute	University	Iowa			X				
Embry-Riddle Aeronautical University	University	Florida			X				
Federal Highway Administration	Government	USA			X				
HDR Consultants	Industry	Missouri			X				
HR Green	Industry	Iowa			X				
Illinois Department of Transportation	Government	Illinois			X				
Illinois State Highway Patrol	Government	Illinois			X				X
Indiana Department of Transportation	Government	Indiana			X				X
International Association of Transportation Regulators	Non Profit	Canada			X				
Iowa Department of Transportation	Government	Iowa	X					X	X
Iowa Counties (Various)	Government	Iowa			X				
Iowa Highway Research Board	Government	Iowa	X		X				
Jensen Engineering	Industry	New York			X				
Jiangsu Research Institute of Building Science Company	Industry	China			X				

External Partners/ Collaborators	Partner Type	State/Country	Financial Support	In-Kind Contributor	Research Collabo- rator	Facilities	Personnel Exchange	Materials	Data
Kansas Department of Transportation	Government	Kansas			X				X
Kansas State Highway Patrol	Government	Kansas							X
Lambert Airport	Industry	Missouri		X			X		X
Liberal High School	School	Missouri					X		
Metropolitan Taxi Commission	Industry	Missouri	X	X					
Michigan Department of Transportation	Government	Michigan			X				X
Mid-American Air Museum Foundation	Non Profit	Kansas				X			
Midwest Transportation Workforce Center (UTC)	University	Wisconsin			X				
Missouri Counties (Various)	Government	Missouri			X				
Missouri Department of Transportation	Government	Missouri	X						X
Missouri State Highway Patrol	Government	Missouri			X				X
NASA Ames Research Center	Government	California			X				
National Advanced Driving Simulator	University	Iowa			X				
National Academies	Government	District of Columbia			X				
National Ilan University	University	Taiwan			X				
Nebraska Department of Transportation	Government	Nebraska							X
Nebraska State Patrol	Government	Nebraska							X
Norwich University	University	Vermont			X				
Purdue University	University	Indiana			X				X
Road Industry Safety Consensus	Committee	Iowa			X				
Science Center of Iowa	Non Profit	Iowa			X				
Shrive Hattery	Industry	Iowa			X				
Skyline Steel	Industry	Missouri			X			X	
St. Louis Board of Aldermen	Government	Missouri					X		
St. Louis Street Department	Government	Missouri			X				
Syracuse University	University	New York			X				
Terminal Railway Association of St. Louis	Industry	Missouri	X	X					

External Partners/ Collaborators	Partner Type	State/Country	Financial Support	In-Kind Contributor	Research Collabo- rator	Facilities	Personnel Exchange	Materials	Data
The Airport Ground Transportation Association	Industry	Missouri			X				
The Taxi, Limousine, and Paratransit Association	Industry	Missouri			X				
Tianjin Chengjijian University	University	China			X				
Transdev On Demand, Inc	Industry	Missouri			X				
Trinity Products	Industry	Missouri						X	
U.S. Army Corps of Engineers	Government	USA			X				
Union Pacific Railroad	Industry	Missouri			X				
University of Missouri Extension	University	Missouri			X				
University of Iowa	University	Iowa			X				
University of Maryland	University	Maryland			X				
University of Technology, Sydney	University	Australia			X				
University of Wisconsin	University	Wisconsin			X				

4. Impacts

What is the impact on the development of the principal discipline(s) of the program?

The results of MTC-sponsored research conducted by faculty in transportation-related disciplines at all partner institutions fundamentally affect the understanding, teaching, and ultimately the state of the practice related to enhancing infrastructure condition, safety, and project delivery. As a consequence, the state of transportation infrastructure and operations is enhanced.

What is the impact on other disciplines?

As stated in Section 3, Collaborating Organizations, the Midwest Transportation Center regularly partners with faculty in other disciplines and related organizations, such as Electrical and Computer Engineering; Business and Finance; Statistics; Industrial and Manufacturing Systems Engineering; Chemical and Biological Engineering; Center for Biorenewable Chemicals; Food Science and Human Nutrition; Supply Chain and Information Systems; Landscape Design; Agricultural and Biosystems Engineering; and the Virtual Reality Application Center.

These partnering activities in research and beyond serve to broaden the understanding of these disciplines to include transportation-related issues, enhancing a multidisciplinary approach to transportation-related problem solving.

What is the impact on transportation workforce development?

Although long-term impacts of the Midwest Transportation Center's workforce development activities is difficult to quantify, a direct result of these activities is that hundreds of public school students are now being exposed to information about transportation-related careers and encouraged to pursue studies in disciplines that will help them succeed in such careers. In addition, university students pursuing transportation-related programs of study are being reinforced and challenged to higher achievements in such pursuits. For example, students who will be participating in the Study Abroad in Italy in summer 2018 will broaden their understanding of the complexities of transportation infrastructure construction and operations outside the US to an extent that wouldn't have been possible without the MTC sponsorship.

Some of the specific numbers include the following:

- Over 1,000 K–12 teachers were passively reached through *GO!*
- 154 K–12 students actively participated in targeted activities
- The MTC is working with the regional transportation workforce center to coordinate workforce development activities
- 47 students are participating in the MTC Transportation Scholars Program
- 61 students participated in each of 4 spring semester seminar activities/presentations
- 42 students participated in each of 6 fall semester seminar presentations
- 25 students attended the Study Abroad in Great Britain
- MTC supports various activities for transportation student organizations

What is the impact on physical, institutional, and information resources at the partner institutions?

See the lists in Section 2, Products.

What is the impact on technology transfer?

Through direct Midwest Transportation Center sponsorship and management of workshops and other events, approximately 550 people received face-to-face training during the reporting period. See the complete discussion of Outreach/Technology Transfer (page 6) in Section 1, Accomplishments, and the lists in Section 2, Products (page 13). The MTC is helping support the 2018 Innovations in Transportation Conference, to be held October 17–18 in Central Iowa and sponsored by Iowa State University’s Institute for Transportation and the Iowa Department of Transportation.

A research brief on a new bridge structural health monitoring system has been posted on the MTC website and a webinar on the topic was held on July 19, 2017. The brief, titled “Bridge Structural Health Monitoring System Can Provide Immediate and Accessible Data,” is the third in a series of MTC one-page documents that highlight research results. The previous two briefs are “Safety Benefits of Safety Edge” and “Evaluation of Low-Cost Traffic Calming.” The webinar presentation provided an overview of the project and discussed details of the fully automated structural health monitoring system, which was first tested on a U.S. Highway 30 bridge near Ames, Iowa. This project is a joint venture between the Bridge Engineering Center at Iowa State University’s Institute for Transportation and the Iowa DOT. There were 79 participants from more than 7 states and various agencies. This included the FHWA, Iowa DOT, IHRB, and project partners University of Kansas and KSDOT. The material was presented first from a researcher’s perspective and then followed by a practitioner’s perspective. This demonstrated how the research had been implemented.

A spring 2017 workshop supported in part by the Midwest Transportation Center has helped create a new pooled fund to develop guidelines for using Ultra-High Performance Concrete (UHPC). The Iowa DOT, FHWA, Institute for Transportation’s Local Technical Assistance Program, and the MTC sponsored a May 4, 2017, workshop on UHPC bridge applications. More than 50 city and county engineers, contractors, and researchers—including five participants from Switzerland—attended the workshop held in Ames, Iowa. The workshop helped lead to the pooled fund study TPF-5(366) “Development of Structural Design Guide for Ultra High Performance Concrete,” with the Iowa DOT as the lead state agency.

What is the impact on society beyond science and technology?

MTC research has led to information that agencies utilize to improve traffic safety, reduce impact of construction, and reduce costs for agencies. Currently we are working on developing information that will allow us to quantify these impacts.

5. Changes/Problems

Nothing to report.

6. Special Reporting Requirements

Nothing to report.