Implementing a successful Toward Zero Deaths (TZD) program takes many partners and stakeholders, but the path to developing these important partnerships can be challenging. Now, highway safety practitioners have a new tool to help get key partners on board and keep them engaged in TZD efforts. In a recent webinar, the U of M expert behind the development of the new tool—a stakeholder engagement and communication self-assessment—outlined its use and benefits.

**Self-assessment tool can help strengthen highway safety partnerships**

Identifying the best turfgrass varieties for Minnesota roadsides

Minnesota roadsides account for more than 245,000 acres of established vegetation. This vegetation, often in the form of turfgrass, helps prevent erosion and keeps contaminants from reaching ground and surface waters, but harsh conditions can make it difficult for turfgrass to thrive.

For nearly a decade, University of Minnesota researchers have been working to improve the

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Distracted driving caused by smartphone use remains a serious safety concern, and one solution is disabling certain phone features such as texting while the user is driving. However, detecting whether it’s the driver or a passenger using the phone has been problematic. Now, U of M researchers are addressing this challenge with a new method for automatically identifying the position of a smartphone inside a moving vehicle.

“Determining whether a phone is inside a moving vehicle is simple using GPS speed data, but determining the phone location inside the vehicle is much more challenging,” says Rajesh Rajamani, a professor in the Department of Mechanical Engineering.

Previous systems have required external hardware, wireless communication with the vehicle, or access to the phone’s camera, Rajamani explains. The goal of this research was to develop a method that uses only the non-camera sensors already available on the phone.

Researchers began by developing a method to determine, in real time, how the phone is positioned in relation to the vehicle, since the phone could be carried in a purse or pocket, on a display stand, or in the user’s hands. Next, researchers conducted simulations and experiments to determine how a vehicle pitches and rolls from front-to-back and side-to-side as it moves and turns, and how those movements correlate to the phone’s position within a vehicle. Finally, those roll-and-pitch dynamics were used to create a new algorithm, which was then tested through simulations and experiments.

“Our research shows that the system we developed can accurately determine if the phone is being carried by the driver or passenger of a vehicle, provided the terrain is flat and the phone’s orientation does not keep changing rapidly,” Rajamani says. “This technology could be a very valuable tool for correctly disabling texting features for the driver only.”

The research was supported in part by a research grant from the National Science Foundation and was published in the journal *Vehicle System Dynamics*. Graduate student Gregory Johnson is the lead author of the article.
On average, commuters in the United States spend more than 25 minutes commuting to work. Add in construction season or a missed bus, and a commute can become particularly unpleasant.

Below, Betty Zhou, an assistant professor in the Carlson School of Management who conducted research on stressful commutes, answers questions about how they can impact workers and employers.

What are some of the common stressors commuters face on a daily basis?

According to U.S. Census Bureau data, some commuters in the U.S. face the reality of an extremely long commute. Similar concerns were raised in other countries like China. Along with the length of commuting time, some of the common stressors faced by our research participants—who took the bus to work on a regular basis in China—included overcrowded buses, traffic jams and construction on the way to work, missing their bus, and other commuters riding bicycles or driving cars in the bus lane.

How does a stressful commute impact workers?

Research suggests that when going through two consecutive activities—such as commuting and then working—people's experiences in the first activity, particularly stress reactions, can carry over to affect their performance in the next activity. Therefore, workers can be negatively affected by a stressful commute because their mental resources were spent on regulating the negative emotions and thoughts triggered by the bad commute. They are then left with fewer resources to devote to their work in the hours immediately following their commute to work.

In this way, a stressful commute can make it more difficult for workers to regulate proper workplace behaviors (e.g., proper interactions with customers), focus their energy on work tasks, and accomplish work goals.

What can workers do to alleviate the impact of commuting?

Workers should try to find a reliable and safe way to get to work. If they cannot change the transportation means (e.g., they cannot afford a car or driving their own vehicle is too expensive in terms of parking cost), they can proactively manage their commute by collecting information about the schedule or current status of their usual rides, being aware of the weather and road conditions, and so on.

Technologies can help commuters better manage this type of information. For example, if available, commuters can use smartphone apps to check the status of the buses or light-rail trains.

How can employers and other organizations help reduce commuting stress and improve job performance?

Employers should be aware of the impact commuting has on employees. There is ample evidence that commuting can affect workers' job performance and well-being. It is an integral part of the work experience.

By raising employers' awareness of the negative impact of commuting on employees' performance, which directly affects the company's bottom line, they may be more willing to support flexible work schedules, telecommuting, or other alternative arrangements. Public transportation services can provide more timely updates on their vehicles via texts, emails, or mobile apps. This way, commuters have better control over their schedule.

What's next for your research?

My collaborators and I feel it is important to develop and evaluate interventions that can help commuters improve their commuting experiences and cope with commuting stress so it has a smaller negative impact on work and family.

A few potential areas for devising and implementing interventions include activities workers can do immediately after arriving at work and during work days that are low-cost to employers. These could be mini-recovery exercises that allow temporal detachment from work, as well as free services crowdsourced among commuters sharing similar commutes (e.g., chat groups for ride sharing, informational support, and emotional support).

(Adapted from an article in the May 15, 2019, issue of U of M Brief.)
health and performance of roadside turfgrasses in Minnesota, focusing mainly on salt tolerance and watering needs for select turfgrass species. In their latest project, funded by the Minnesota Department of Transportation (MnDOT) and the Minnesota Local Road Research Board, researchers focused on identifying grasses that can perform best in the face of three significant stressors: salt, heat, and ice.

Led by Eric Watkins, a professor in the Department of Horticultural Science, the research team aimed to create recommendations for species that perform best under these multiple, combined stressors. Ultimately, the most successful cultivars could be included in mixtures of multiple species to optimize performance under all conditions.

“We need to use the best genetics along the roadside as possible,” Watkins says. “Using the right variety of turfgrasses improves the chances of success and can save a lot of money for public agencies.”

The researchers began by conducting a literature search to identify promising turfgrass species for harsh environments; then, they contacted seed companies for further recommendations before requesting seeds for multiple cultivars.

In total, Watkins and his team tested varieties from 15 turfgrass species in salt, heat, and ice stress protocols. Based on the results, the team developed a variety of recommendations for MnDOT guidelines on salt- and heat-resistant turfgrasses; tests related to ice-resistant cultivars were inconclusive.

Overall, study findings suggest that a mixture of turfgrass varieties and species will likely be the best solution for year-round use in Minnesota, since no single cultivar performed well in every trial. With this in mind, the researchers recommended a mixture of cultivars for field studies, which began last year as part of a second phase of this research.

“We identified a selection of new cultivars that are suitable for use on harsh roadsides,” says Dwayne Stenlund, senior natural resource program coordinator at MnDOT’s Office of Environmental Stewardship. “We are trying to build a mixture diverse enough to outlast all stressors, and this study identified the cultivars we should try.”

In phase two, researchers are using a mixture of six species selected from this study: Kentucky bluegrass, slender creeping red fescue, hard fescue, buffalograss, alkaligrass, and tall fescue. Mixtures are being planted in different combinations on roadsides across the state for evaluation. In the meantime, MnDOT is adjusting its current seed mixture recommendations based on the results of this and other studies.

As part of phase two, field testing is already under way in several locations across the state, including Grand Rapids.
New online course focuses on managing roadside turfgrass

A new online course offered by the University of Minnesota aims to help practitioners successfully install and manage roadside turfgrass. The course provides a series of lessons on salt-tolerant turfgrasses and low-input turfgrass management for contractors, maintenance operators, and engineers. The course, offered through the U of M’s College of Continuing and Professional Studies, costs $30. It also counts as one credit in the Minnesota Local Technical Assistance Program (LTAP) Roads Scholar Program.

The course was developed by Extension Turfgrass Science at the University of Minnesota with funding from the Minnesota Department of Transportation (MnDOT) and the Minnesota Local Road Research Board (LRRB). The course incorporates findings from research funded by MnDOT and the LRRB in recent years.

Learn more or register for the course at z.umn.edu/turfgrasscourse.

U research on tribal transportation safety showcased in DC

The U of M’s work promoting transportation safety on tribal lands was showcased at the USDOT’s University Transportation Centers (UTC) Spotlight conference on May 14 in Washington, DC. The research poster was among 23 selected to exhibit at this one-day conference highlighting UTC program-supported transportation research activities.

The tribal safety research was conducted by Professor Greg Lindsey and Associate Professor Kathy Quick, both CTS Research Scholars with the Humphrey School of Public Affairs, and Guillermo Narváez with Proxemic Insights.

During the afternoon poster session held in the U.S. House, Quick and CTS director Laurie McGinnis shared information about the research with Congressional staff and other guests.

This research aimed to better understand and identify potential solutions for reducing the disparately high motor vehicle crash fatality rate for American Indians. In one project, Quick and Narváez collaborated with four tribal governments in Minnesota on case studies and conducted a national survey of tribes to identify key transportation safety risks in reservations. They found that pedestrian safety is a critical, under-recognized issue on many reservations, that improving road engineering and maintenance is tribes’ top road safety priority nationwide, and that tribes and other jurisdictions need to improve their coordination to enhance safety.

In other work, Lindsey assessed pedestrian safety at 10 locations on 4 reservations in Minnesota, monitoring pedestrian traffic and developing recommendations for countermeasures. Data from this project have been used by Mille Lacs tribal representatives to secure state funding for a new crosswalk and pedestrian-activated signal.

Another of Quick’s projects addressed tribes’ request to explore emergency medical service (EMS) response to motor vehicle crashes in reservations. Researchers conducted a national survey and analyzed factors including dispatch, remoteness of crash sites for ambulance and trauma care centers, training and equipment of first responders, and inter-jurisdictional coordination. Findings revealed that dispatch issues are critical, particularly cell phone coverage and pinpointing crash locations, since effective EMS response hinges on successfully placing a call for help.

The conference was co-hosted by the USDOT’s Council of University Transportation Centers and the Research, Education, and Training Reauthorization Coalition.
Research offers new ways to monitor bridge health with smart sensors

U of M researchers have developed a new method for estimating one of the key measures of bridge health—vertical displacement—using sensors installed on the I-35W St. Anthony Falls Bridge, expanding industry knowledge of how to use smart sensors.

“We need to learn more about sensors because they’re a newer technology that we don’t have a lot of experience with,” says Benjamin Jilk, complex analysis and modeling design leader with the Minnesota Department of Transportation (MnDOT) Bridge Office. “This study gave us valuable information about accelerometers and the information they provide.”

Sensors help designers and bridge managers learn more about how bridges shift and flex over time. Accelerometers measure structural vibrations triggered by traffic under varying environmental conditions.

In the MnDOT-funded study, investigators used the sensor systems on the Minneapolis bridge to design and analyze a procedure for measuring and monitoring vertical displacement on bridges under traffic forces and environmental variability. Since September 2008, the St. Anthony Falls Bridge has carried traffic over the Mississippi River while funneling sensor data from more than 500 smart sensors to researchers and MnDOT bridge engineers. The detailed data from these sensors could serve as an alternative to time-consuming inspections, and researchers wanted to know if accelerometers could be used to measure vertical displacements and help monitor bridge health.

Researchers began by developing models to estimate bridge loads and displacements using vibration frequency data gathered by the bridge’s accelerometers. In the laboratory, investigators evaluated the impact of bridge loading on displacement and vibration frequencies and then compared the laboratory findings to the effectiveness of their model. Finally, they tuned the modeling approach to the St. Anthony Falls Bridge data to determine how well the procedure could estimate vertical displacement and assess its potential for evaluating other MnDOT bridges.

Ultimately, researchers discovered that the new method was able to measure vertical displacement on bridges, but that the approach is not effective for this particular bridge because its extreme stiffness does not allow for the generation of meaningful displacements under reasonable traffic speeds.

“This technique is pretty innovative,” says Lauren Linderman, an assistant professor in the Department of Civil, Environmental, and Geo-Engineering. “The procedure development was successful, but the application to this structure was less successful. Some of the metrics identified in this technique could be useful in other monitoring approaches.”

As smart bridge technology and its uses develop, investigators will consult the methods and findings in this study and may adopt some of its procedures in future research work.

Researchers tested vibrations with sensors on a steel test beam in the laboratory.
“Stakeholder involvement is so important in addressing a problem as complex as TZD,” said Kathy Quick, an associate professor in the Humphrey School of Public Affairs. She told webinar participants that the tool was developed for their use. “It’s not a tool for scoring whether your agency is or is not performing well enough—it’s an interactive tool that helps you assess where you are and then imagine what the next step would be.”

The self-assessment tool is part of a comprehensive suite, dubbed A Road Map for Implementing the Toward Zero Deaths (TZD) National Strategy on Highway Safety, available for free on the National TZD website. Developed by a multidisciplinary team led by CTS, this new guidance highlights what is necessary for a successful TZD program while accounting for unique jurisdictional characteristics.

The online self-assessment tool walks users through a series of six aspects of stakeholder involvement: quality of stakeholder partnerships, engagement strategy, agency capacity for engagement, level of engagement, shared metrics, and benefits of engagement.

“Breaking stakeholder involvement down into these six dimensions is helpful because it can get very complicated to understand how all the aspects of stakeholder relationships work together as a whole,” Quick said. “Therefore, we use a matrix to help users assess the strength of their commitment to stakeholder relationships and the resulting benefits.”

Using the example of stakeholder partnership quality, Quick demonstrated how the tool works. As users move through an assessment, they are asked whether they know who their stakeholders are and if they have identified gaps and set priorities for strengthening relationships. They are also asked if they know the key stakeholders’ priorities and desires for partnership, if there is mutual trust and respect, and if stakeholder relationships provide an advantage to both their agency and their partners. When users have a question about an area, such as the importance of mutual trust, they are guided to resources that outline the importance of trust and a simple tool for improving trust in stakeholder relationships.

“This assessment is not meant to help you just admire the problem of stakeholder involvement, but to provide some very specific ideas, tools, and examples to help you move forward,” Quick said. “It takes a developmental approach that guides users to better understand what progress would look like, then provides resources to identify how improvements could be made and gives tools and examples for improvement.”

After completing the self-assessment, users receive a printable report highlighting their responses and gauging the current level of their organization’s practices that support stakeholder and partner engagement with TZD efforts.

This work was sponsored by AASHTO in cooperation with the Federal Highway Administration and was conducted under the NCHRP, which is administered by the Transportation Research Board of the National Academies of Sciences, Engineering and Medicine.
Identifying the best turfgrass varieties for Minnesota roadsides.

Researchers develop new methods for measuring BRIDGE HEALTH.

Self-assessment tool CAN HELP STRENGTHEN HIGHWAY SAFETY partnerships.

SYSTEM PINPOINTS SMARTPHONE LOCATION in vehicles to help reduce distracted driving.