A series of roundtable discussions hosted by the Humphrey School's State and Local Policy Program (SLPP) investigated the policy impacts of new transportation technologies. The roundtables—held as part of SLPP’s work under the Transportation Policy and Economic Competitiveness Program—specifically explored the impacts of the digital infrastructure and self-driving vehicles.

Discussion topics included opportunities and obstacles for improved mobility and access for people who cannot drive, possible impacts of self-driving vehicles on urban form, and broader impacts of the digital infrastructure on the physical infrastructure. Participants included U of M
Improving safety of two-lane roundabouts

While two-lane roundabouts almost always reduce fatal and severe crashes, they can also lead to a substantial increase in minor crashes. To help combat this problem, researchers with the Roadway Safety Institute are investigating solutions for reducing crashes at two-lane urban roundabouts. The research, funded by the Minnesota Department of Transportation, began in 2011 with a troublesome two-lane roundabout in Richfield, Minnesota—at the time, one of the few modern urban roundabouts in the Twin Cities. Following the roundabout’s construction, the number of property-damage crashes increased substantially at the site. Experts at the Minnesota Traffic Observatory (MTO) were brought in to make improvements and gauge their effectiveness with a before-and-after study.

“With the assistance of local and national roundabout experts, we made a number of changes in the signs and lane markings,” says MTO director John Hourdos. Changes included adding lane designation signs upstream of the approach, removing fishhook-style arrows, extending the solid lane line upstream of the roundabout, eliminating the solid-and-skip lines, lowering signs to improve visibility, and adding crosswalk signs on the islands.

The effects of these changes were documented with a 360-degree camera mounted in the center of the roundabout. Based on collected data, the researchers concluded that a number of the changes had a significant, positive long-term effect.

“After the changes, lane-change violations decreased 20 percent, turn violations dropped more than 40 percent, and lefts from the outer lane—the most severe violation—were reduced 45 percent,” Hourdos says. “One early clue that led us to believe that the changes were significant is that we immediately saw a 53 percent improvement in selecting the correct lane—which was sustained one year later.”

Following the success of this project, researchers wanted to extend the investigation to more roundabouts with different designs. In a new project, funded by the Minnesota Local Road Research Board, the research team is accomplishing this by studying four additional two-lane roundabouts in Minnesota that vary greatly in age, driving conditions, and built environment. Researchers have collected before-and-after data at all four roundabouts. Video analysis is currently under way, with results expected later this year. The project also includes the use of automated violation detection for turning violations, but we believe there is still room for improvement in yield violations,” says Joe Gustafson, Washington County’s traffic engineer. “We’re looking forward to seeing the results from this latest study to determine what additional treatments might be effective in reducing our crashes even more.”

Once this latest project is complete, researchers hope results may pave the way for a larger, multi-state study.

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CTS launches redesigned traffic control game

Gridlock Buster, an online traffic control game that teaches middle and high school students about traffic control, has a new look!

The newly redesigned game features updated, more user-friendly graphics and can now be played on tablets and mobile devices.

Gridlock Buster incorporates tools and ideas used by traffic control engineers in their daily work to teach students what it’s like to manage traffic flow. Players work their way through progressively more challenging levels, learning how to control traffic signals and ensuring that delays don’t get out of hand.

The game was originally developed with funding from the Intelligent Transportation Systems Institute at the U of M in 2009. CTS worked with Web Courseworks, the original game developer, to create the updated version.

According to Nick Schultz, project manager at Web Courseworks, the most significant changes to the game include a more vibrant aesthetic, enhanced mobile compatibility, a perspective shift that provides players with more clarity and depth, and an optional streamlined version that allows returning players to skip the introductory information and go straight to gameplay.

Overall, Schultz says, the updates have created “an environment we think players will be more excited to explore.”

In addition to being freely available online, the game is also used with related traffic engineering curriculum in educational and outreach activities.

“Gridlock Buster is an excellent hands-on tool for introducing students to transportation concepts,” says Gina Baas, CTS associate director of engagement and education. “We use the game in a variety of STEM-focused camps and activities to let students experience what it’s like to work in transportation and engineering—and hopefully spark their interest in pursuing related degrees and careers.”

The game is available at cts.umn.edu/gridlockbuster.

Roadway Safety Institute efforts highlighted in new video

Researchers at the Roadway Safety Institute (RSI) are working to reduce crashes and save lives on our nation’s roadways, and a new video provides an overview of their efforts.

The video features interviews with RSI director Max Donath and researchers from across the region who are working on projects ranging from reducing crashes at rail grade crossings to investigating roadway safety issues on tribal lands. It also highlights some of RSI’s education efforts, including the development of a museum exhibit designed to introduce preteens to safety concepts.

RSI, established as a regional University Transportation Center in 2013, is led by the U of M and housed at CTS.

The video is available on the RSI website at roadwaysafety.umn.edu.
In June, more than 40 White Earth Nation students were introduced to a variety of transportation topics in a daylong session offered by the Roadway Safety Institute (RSI).

The program was part of the White Earth Indian Reservation Summer Academy of Math and Science, a two-week day camp for reservation youth in grades 4 to 8. The camp focuses on hands-on learning and uses Indian culture and heritage as a vehicle for studying math, science, and engineering. It is offered in partnership by the White Earth Nation and the University of Minnesota Extension.

“This is a unique program that has been a great way to meet RSI’s objectives of teaching safety and building tribal partnerships,” says Colleen O’Connor Toberman, CTS/RSI program coordinator.

This year, staff led students through a variety of interactive activities to spark their interest in transportation, engineering, and safety.

In a lesson on road sign design, students learned about sign retroreflectivity, shape, and color before creating their own road signs using the Ojibwe names for local places. Another lesson introduced students to the essentials of bridge design and then allowed students to build their own bridges and test their stability and strength. Staff also tied engineering concepts to the camp’s emphasis on natural science in a lesson exploring how beavers modify their living environment with dams and bridges.

Students experienced the dangers of distraction by getting behind the wheel of pedal carts in a lesson co-taught by Minnesota Toward Zero Deaths program regional coordinator Tom Nixon. The lesson demonstrated how distractions and multitasking impair essential concentration while driving and walking. Nixon also engaged students in discussions about booster seats and seat belt use, sharing ideas to help students encourage their friends and relatives to buckle up.

“Just knowing how high the [roadway] death rate is in our reservation communities…anything we can incorporate into our curriculum to try and keep our young people safe is a very worthwhile part of the program,” says Deb Zak, regional director of the U of M Extension’s Northwest District.

Nixon hopes students will make safer driving choices in the future based on what they learned. “The great opportunity we had today was to talk to them before they become drivers,” he says. “We wanted them to learn about what their actions will lead to and the limitations of their abilities [when they’re distracted]. The more educated they are, the more aware they’ll be of what their choices will mean.”
Professor Gary Davis of the Department of Civil, Environmental, and Geo-Engineering (CEGE) has been appointed Richard P. Braun/CTS Chair in Transportation Engineering, effective July 1. The purpose of the endowed faculty chair is to foster innovation in the academic program in transportation engineering at CEGE.

CTS collaborated with the Department of Civil Engineering (now CEGE) to establish the chair in 2006. CTS initiated the position using royalties from Autoscope®, an invention in traffic detection technology developed by Professor Panos Michalopoulos and patented by the University. Braun was the founding director of CTS and a former commissioner of MnDOT. CEGE professor David Levinson was the inaugural chair.

Davis outlines his plans below.

What are your research interests?

During the past 25 years, my research has targeted four general areas: causal inference and impact assessment in traffic safety, application of accident investigation and reconstruction methods to traffic engineering questions, the use of Bayesian statistical methods in traffic and transportation engineering, and the application of optimization methods to problems in traffic engineering and transportation planning.

What will your focus be?

I expect my main focus over the next several years to be in the area of safety-related decision support. I also plan to support and advance the Minnesota Traffic Observatory data collection capabilities, with a focus on adding crash and near-crash events to our database.

What are your teaching plans?

At the undergraduate level I regularly teach CEGE’s required introduction to transportation engineering course, our required uncertainty and decision course, and a technical elective in traffic engineering. This year I’ve also returned to our technical elective in highway design. At the graduate level I regularly teach a course in data analysis methods.

Executive Committee updates

At its June meeting, the committee welcomed three new members:

- Tom Clark, Senior Vice President, Logistics, Schwan Food Company
- Bill Dossett, Executive Director, Nice Ride Minnesota
- Brian Ryks, Executive Director, Metropolitan Airports Commission

Catalyst Year in Review

During the past year, these were our most-read stories online:

#1: RESEARCH HELPS FIELD ENGINEERS MANAGE TRAFFIC AT WORK ZONES

#2: STUDENT PASS PROGRAM PROVIDES EDUCATIONAL, ECONOMIC, SOCIETAL BENEFITS

#3: SMARTPHONE APP COLLECTS DETAILED DATA ABOUT TRAVEL BEHAVIOR

#4: SELECTING THE RIGHT BUS FOR THE RIGHT ROUTE HELPS IMPROVE FUEL EFFICIENCY

#5: BIKE, PEDESTRIAN COUNTING EFFORTS ENGAGE LOCAL AGENCIES STATEWIDE

If you missed them, the stories are available online in the Catalyst archive.
transit planning, job training, and job placement services.

“Spatial mismatch is a serious problem in the Twin Cities region and it appears to have worsened since the turn of the millennium,” says Yingling Fan, associate professor in the Humphrey School of Public Affairs and the study’s principal investigator. “The biggest concentrations of unemployed workers lack frequent transit service to some of the richest concentrations of job vacancies, particularly jobs in the south and southwest metro.”

The researchers found that accessibility to job vacancies via transit varies significantly by residential location and industry sector, with vacancies in certain sectors much more easily accessible from some parts of the region than others. “While transit access is generally good in the inner city, some areas of intense disadvantage—such as North Minneapolis, Brooklyn Park, and Midway St. Paul—have relatively poor access to entry-level jobs despite being near major employment centers,” Fan says.

They also identified in-demand occupations that offer a living wage, have low educational requirements, and are found across the regional economy. Some examples include health care aides, administrative assistants, machinists, and truck and bus drivers. “These jobs are not distributed evenly throughout the metro, though, so there is a need to combine job training and transit planning,” Fan says.

The researchers also analyzed the impacts of the proposed regional transit system buildout and found it would significantly increase access to jobs for disadvantaged areas. For example, they estimate a 23 percent increase for Brooklyn Park, 18 percent for North Minneapolis, and 17 percent for the Gateway Corridor along I-94 east of St. Paul.

At the scale of the region as a whole, the mismatch between unemployed workers and job vacancies would lessen with the proposed regional transit system, but only slightly. “Transit plays a crucial role, but it could be even more effective if efforts to get workers to the jobs they need were better coordinated with efforts to give them the skills they need for those jobs,” she says.

The team’s policy recommendations center on finding “sweet spots” for coordinated transit planning and workforce development and creating a future transit system to serve the needs of disadvantaged workers (see sidebar).

Co-investigators were Andrew Guthrie and Kirti Vardhan Das, research fellows in the Humphrey School. Sponsors were Hennepin County, the Jay and Rose Phillips Family Foundation of Minnesota, and the McKnight Foundation.

“The McKnight Foundation focuses on low-income people and places that have been left out of the picture previously,” says Eric Muschler, program director with the foundation. “Dr. Fan’s research pulls these areas together so policymakers can see how policy can connect, reinforce, support, and provide benefit to the people that we care about.”

Policy recommendations include:

- Redefine “accessible jobs” based on access by transit, not geography.
- Consider the entire pipeline linking workers with jobs: individuals’ skills and interests, available training, jobs reachable by transit, and interested employers.
- Collect data on job-seekers’ skills to help select occupations for training programs, and tailor those programs to participants’ capabilities and needs.
- Identify employers who stand to benefit from engaging with workforce development and transit planning efforts. The employers may include those facing labor supply problems in inaccessible suburban locations.
- Redefine flexible transportation to take into account disadvantaged workers’ often complex lives and nontraditional schedules. Serving disadvantaged workers well with transit will mean fast, frequent, regular regional service and local connections tailored to demand.
- Pursue diverse first-mile/last-mile solutions to connect workplaces with transit lines. Engage transportation management organizations and also consider employer or district shuttles and car or bicycle sharing.
- Pursue transit-oriented economic development to direct future job growth to transit-friendly areas.
“One item that cut across all of these sessions was the potential for changing how we might define the ‘winners’ and ‘losers’ in the development of 21st century transportation,” says SLPP director Frank Douma.

Many technological developments, such as those related to self-driving vehicles, may offer benefits to currently underserved populations. People with disabilities will be able to ‘drive’ the same vehicles as others, transit will become more flexible, and many trips may become unnecessary. But, Douma says, these advantages might not come about automatically—or easily.

“A clear example of this is the realization that just because a self-driving vehicle can transport a person that is physically unable to drive, it does not mean that the person will be able to easily enter and exit the vehicle, or easily interact with it, unless the vehicle has been specifically designed to meet the needs of these users,” Douma says.

Other equity-related discussion themes included:

- **Economic impacts.** The expansion of private ridesharing organizations such as Uber and Lyft has implications for taxi drivers and other transportation providers—and for lower-income neighborhoods. There may be a need to ensure continued transportation service to residents excluded from ridesharing services that require access to a smartphone and credit card.

- **Technology and job class.** New technologies can help individuals not only to improve their transportation options but also to do their jobs remotely. However, employees in the service sector and other positions that require a physical presence will benefit less from telework opportunities.

- **Rural communities.** Residents in rural areas may benefit less from new technologies than those in urban areas. Ridesharing and carsharing depend on higher-density neighborhoods to turn a profit, making lower-density rural communities less attractive markets. In addition, more limited broadband connectivity in rural areas means that residents have less access to telework, teleshopping, and telemedicine.

In spite of these questions and concerns, the roundtable discussions also highlighted the many ways new technologies could help improve mobility for individuals with disabilities. For example, they could allow aging rural residents to live in their homes longer, provide access to new economic opportunities for residents of low-income neighborhoods, and remove barriers for people with disabilities.

“However, without due attention from public officials, advocates, and this wide and varied group of stakeholders themselves, these benefits may not be realized,” Douma says. “[Although] self-driving vehicles and other developments of the digital economy are already legal…it is becoming increasingly clear that there is a role for public policy to ensure that the benefits are enjoyed as widely as possible.”
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Linking the unemployed to jobs: transit planning and workforce development.

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TRAFFIC CONTROL GAME GRIDLOCK BUSTER has a new look.

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Photo: Metro Transit