

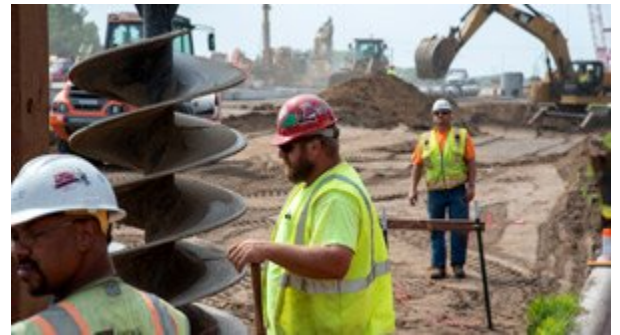
# Catalyst

  
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UNIVERSITY OF MINNESOTA

July 2021

## What's behind the transportation workforce shortage—and what should public agencies do about it?

The transportation industry is facing a growing workforce shortage—especially within the public sector. Without a reliable pipeline of dedicated staff, these agencies could experience disruptions in the important work they do. A U of M study identified causes of the shortage and strategies public agencies can implement to attract and retain staff.



## Research provides recommendations for Minnesota cities and employers to better manage vehicle traffic

How can Minnesota municipalities attract people to visit, work, and live while limiting the impacts of vehicle traffic? One answer is for local governments to work with employers in an approach known as transportation demand management (TDM). TDM strategies, such as carpool-matching services, reduce travel or spread it over more time and space. In a new white paper, a U research team explores TDM best practices and makes recommendations for Minnesota cities and employers.



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## U researchers and Edina snowplow drivers team up to reduce salt in Minnesota's waters

U of M researchers collaborated with the City of Edina on a research project that aimed to gather data and create tools for reducing road salt contamination in Minnesota's urban waters. The researchers developed scenario models to



evaluate chloride movement throughout watersheds. They also created an Active Management Toolkit with a training guide and spreadsheet tools.



Photo: City of Roseville

## Saif Benjaafar awarded prestigious professorship

Saif Benjaafar has been named a McKnight Presidential Professor, one of the highest honors at the University. Benjaafar, a CTS Scholar, heads the Department of Industrial and Systems Engineering and directs the Institute on the Sharing Economy. The endowment will allow Benjaafar's research team to tackle higher-risk and longer-term projects, leveraging existing activities supported by CTS.



Photo: Rebecca Slater

## Braun/CTS Chair: Research, teaching for a more automated future

Professor Gary Davis of the Department of Civil, Environmental, and Geo- Engineering has been reappointed Richard P. Braun/CTS Chair in Transportation Engineering, effective July 1. He plans to use his endowment for research and coursework related to automated vehicles and other topics.



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*Transport Topics*, July 15, 2021

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# What's behind the transportation workforce shortage—and what should public agencies do about it?

July 20, 2021



The transportation industry is facing a growing workforce shortage—especially within the public sector. Without a reliable pipeline of dedicated staff, these agencies could experience disruptions in the important work they do. A U of M study identified causes of the shortage and strategies public agencies can implement to attract and retain staff.



The study was sponsored by the Minnesota Local Road Research Board. “Like employers everywhere, Minnesota’s transportation agencies need to evolve in order to attract and keep a top-notch workforce,” says Lyndon Robjent, director of public works for Carver County and the project’s technical liaison.

Professor Kenneth Bartlett from the U’s Department of Organizational Leadership, Policy, and Development led the project. The work began with a literature review to better understand the changing labor market as well as current trends and best practices in human resources strategies.

The researchers next surveyed an anonymous sample of 149 workers currently employed in the public and private sectors of Minnesota’s transportation industry to gauge their perceptions on topics such as workplace satisfaction, loyalty, and career support. They then conducted one-on-one follow-up interviews with 14 employees to explore these issues in more depth.

According to the study, shifting demographics are a major reason for the workforce shortage. The US labor force is aging rapidly and baby boomers are retiring—spurring a steady decline in the labor force participation rate, Bartlett says.

The labor force is also becoming more diverse in a number of ways, including gender and ethnicity, and immigration remains a key driver of population growth. Historically, however, public transportation organizations have struggled to achieve a diverse workforce and have traditionally been viewed as white and male-dominated, Bartlett says.

**Top 3 reasons** transportation workers leave jobs:

- More pay: **47%**
- Advancement potential: **22%**
- Greater freedom in choosing work schedule and tasks: **17%**

—Study survey (Sept. 2019 – May 2020)

In addition, younger generations are bringing different values to the job, with many concerned more about career advancement and less about long-term commitment. “The shift in worker values makes it extremely important for organizations to focus on career mobility and paths for advancement,” Bartlett says. However, some public agencies—especially smaller ones—may see this as infeasible, and larger agencies may also find it challenging. The result is that fewer engineers and other highly skilled professionals are entering the field through work for public agencies, and retaining those who do is becoming increasingly difficult.

With fewer workers available, “employers in both the public and private sectors are constantly competing to fill vacancies,” Bartlett says. Jobs in rural areas—which have older and less diverse populations—tend to be harder to fill than those in urban areas.

The survey and interviews allowed the research team to dig deeper into the views of current workers in Minnesota. Researchers found that transportation jobs in the public sector offer several advantages over their private counterparts, including more competitive benefits, a perception of greater stability during economic downturns, greater work-life balance, and variety of work. Private-sector jobs are thought to offer higher salaries, more advancement opportunities, better-defined expectations, and less bureaucratic red tape.

Noting that challenges will differ across the state, the team developed recommendations



for public transportation agencies:

- **Accentuate the positives.** Make sure that hiring managers know the benefits of working in public agencies so they can relay them to applicants.
- **Describe jobs realistically.** If long days and overtime are part of the job, say so upfront so employees know what they're agreeing to.
- **Cut red tape.** When possible, make exceptions for hiring, promotion, and compensation.
- **Offer mentorships.** Provide opportunities for employees to learn from each other, with the expectation that these could lead to job promotion.
- **Plan for succession.** Fill vacancies quickly and don't rely on existing staff to absorb more work.
- **Document workplace practices.** Invest in knowledge management systems so that key information doesn't leave when employees retire.
- **Increase awareness.** Create a marketing strategy that exposes younger people to the transportation industry and helps them visualize a career path.

The changes stemming from the pandemic could make the existing workforce challenges even more critical, Bartlett says, and advises agencies to take a "strategic and flexible approach" to planning for recruitment, retention, and development of employees.

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[Home](#) > [News](#) >

Research provides recommendations for Minnesota cities and employers to better manage vehicle traffic

## Research provides recommendations for Minnesota cities and employers to better manage vehicle traffic

July 7, 2021



Most Minnesota cities want to attract more people to visit, work, and live in them—and contribute to their local economies. However, many of these cities also experience congestion, pollution, and other traffic-related problems. So, how can Minnesota municipalities welcome people while limiting the impacts of vehicle traffic?



Photo: Shutterstock

One answer is for local governments to manage transportation demand with the help of employers, using strategies and policies designed to reduce travel demand or spread it over more time and space. This approach is known as transportation demand management (TDM).

In a recent white paper, a research team led by Humphrey School professor Jerry Zhao, director of the Institute for Urban and Regional Infrastructure Finance, explores TDM best practices and makes recommendations for Minnesota cities and employers to better manage transportation demand. The paper was published by the Twin Cities Shared Mobility Collaborative (TCSMC).

“No one likes traffic or pollution, and TDM is a proven way to reduce both,” says William Schroer, executive director of East Metro Strong and TCSMC steering committee member.

“Just as important, when people use less parking, we free up a lot of room for more homes and businesses.”

TDM is particularly important given the increase in new work arrangements and subsequent changes in commuting patterns due to the COVID-19 pandemic, the researchers say. Data indicates overall traffic volumes have stayed relatively stable, and there is growing concern that vehicle-miles traveled could rise even beyond pre-pandemic levels.

“While some kinds of trips are down, overall, cities are experiencing a real rebound in vehicle traffic. The need to reduce that traffic is just as urgent,” Schroeer says. “Many people wonder if COVID has changed the need for TDM. This is in fact an excellent time to add transportation options. People reconsider their transportation choices at times of change, and this is a time of great change.”

To help cities and employers reduce traffic and emissions, Zhao and his team focus on TDM strategies such as parking management, commuter benefits, commute-trip reduction programs, and TDM plans for new or expanding private developments.

“Cities can require employers to implement these TDM programs and also implement them as employers themselves,” Zhao says.

To ensure TDM program success, the researchers recommend that cities:

- Set municipal-level TDM goals and targets that are measurable, specify a timeline, and outline applicability to employers and developers.
- Create or enhance ordinances that require or incentivize employers to implement commute-reduction measures.
- Monitor and report TDM goal achievement on a regular basis.
- Establish or improve enforcement mechanisms.
- Strengthen TDM education, outreach, and program promotion, including efforts to encourage the use of alternative transportation options.
- Collaborate with public and private agencies to offer assistance programs to building managers, developers, and employers.
- Encourage the creation of collaborative networks, such as partnerships between municipalities and transit agencies.

For employers implementing TDM programs, a critical best practice is offering a

combination of incentives and disincentives to employees. For example, employers may charge a daily parking fee while also offering a flexible range of programs to make other commute options more attractive. Example programs include telework, transit pass benefits, a guaranteed ride home option, carpool- and vanpool-matching services, and options like shuttles and bikes with related amenities such as secure storage, lockers, and showers.

“Providing a variety of commute options has been critical to supporting employees’ ability to choose and the overall success of TDM programs,” Zhao says.

In addition, the researchers recommend that employers understand employee commuting behaviors and needs, define TDM targets, regularly monitor goal achievement, and take advantage of technology to integrate TDM strategies with their current systems.

Overall, employers adopt TDM initiatives to benefit their business. But regulatory requirements often are important in giving an initial push to employers and in creating minimum standards, the researchers say. Ultimately, these requirements may also help transform the corporate culture.

“Offering real choices is doable and popular,” Schroeer says. “As employers and municipalities work to become more inclusive, this is a great time for them to make sure that they aren’t advantaging people who can afford cars over those who can’t. Employers that do so see all kinds of benefits—financial, social, and environmental.”

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## U researchers and Edina snowplow drivers team up to reduce salt in Minnesota's waters

July 13, 2021



U of M researchers recently collaborated with the City of Edina on a research project that aimed to gather data and create tools for reducing road salt contamination in Minnesota's urban waters.

"When operators have the right tools to do their jobs, they can maintain a high level of service and use less salt," says Jessica Wilson, Edina's water resources coordinator.



Photo: City of Roseville

Chloride is necessary for winter road safety but also a potential hazard to human and environmental health. According to the Minnesota Pollution Control Agency (MPCA), chloride can be toxic for people and aquatic life if it leaches into watersheds in high enough concentrations. And once it's in our waters, there's no feasible way to remove it.

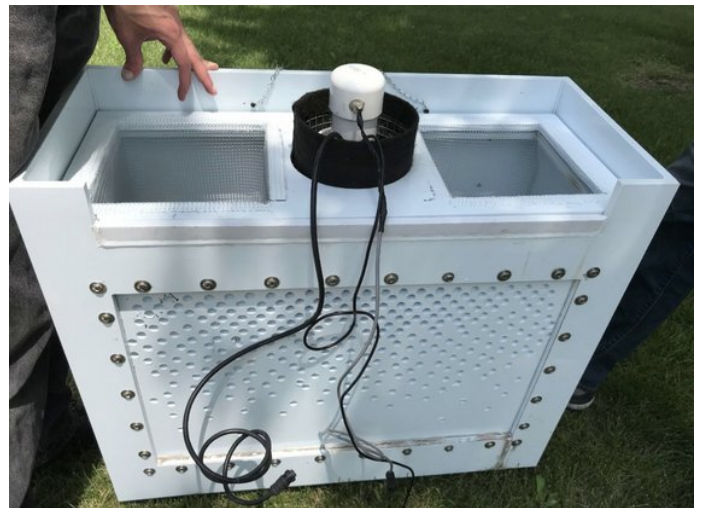
Chloride also eats into infrastructure and budgets—both public and private. A 2015 MPCA study estimated that in the Twin Cities metropolitan area alone, the total costs of chloride use for roads—including salt, labor, and equipment; damage to trees; and corrosion to bridges, pavement, and vehicles—come to \$0.4 to \$1.2 billion per year.

Many transportation agencies are working to reduce their salt use. The first step in this project was to gain a better understanding of how chloride moves from roads to

watersheds—an understudied dynamic, says Larry Baker, the principal investigator and a professor in the Department of Bioproducts and Biosystems Engineering.

To gather the necessary data, the researchers designed a new type of meltwater sampler and fitted it below Edina stormwater grates to measure variables including flow, temperature, and chloride concentrations. They deployed the sampler during two winters (2017–18 and 2018–19) and also took core samples from roadside snow piles for chloride testing. The team also compiled extensive data on salt use and application rate from Edina’s fleet of automated trucks.

One noteworthy finding from the team’s analysis is that chloride movement doesn’t tend to be gradual—rather, it comes in short bursts during a handful of events spread across the year. During both winters, the researchers found that around 90 percent of the yearly chloride loading moved off the roads in under eight non-consecutive days.



*Researchers designed a meltwater sampler.*

“It occurs when you have these large melt events,” Baker says. “Particularly these ‘winter mix’ events, where you might have snow falling that accumulates, melts, and then freezes.” A contributing factor in this pattern may be roadside snow piles, which were shown to accumulate large amounts of chloride.

Using data from the Edina study and from a previous study conducted by the U’s St. Anthony Falls Laboratory, the researchers then developed scenario models to evaluate chloride movement throughout larger watersheds. They also created an Active Management Toolkit with a training guide and spreadsheet tools. One spreadsheet, for example, allows users to forecast chloride concentrations in groundwater depending on the percentage of impervious surfaces. This active management approach—checking the effects of actions and making adjustments—is one way that local agencies may be able to reduce salt use while maintaining winter traffic mobility, Baker says.

The U team also coordinated workshops with Edina public works staff at the end of each winter of the study. The workshops brought together the researchers and plow operators and their supervisors to share data and knowledge for improving operations.

According to the project final report, the workshops had the intended effect, stimulating creative thinking and generating a suite of solutions to reduce salt use. For example, operators in the first workshop proposed the purchase of carbide blades to improve ice removal, which led the city to purchase and install five carbide blades in 2018. The carbide blades seemed to improve ice removal and had the side benefit of being far less noisy than steel blades, Baker says.

The research was funded by the Minnesota Local Road Research Board. The final report, toolkit, and two videos are available on MnDOT's research project web page.

*Writer: Sophie Koch*

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## Saif Benjaafar awarded prestigious professorship

July 15, 2021



Saif Benjaafar, Distinguished McKnight University Professor and head of the Department of Industrial and Systems Engineering, has been named a McKnight Presidential Professor.



Photo: Rebecca Slater

The McKnight Presidential Endowed Professorship is among the highest honors for faculty at the University of Minnesota. Recipients are recommended

by their college dean and chosen at the

discretion of the president based, in part, on their academic and research accomplishments and their contributions to advancing the University among its peers.

"I am humbled by this incredible honor," Benjaafar says. "I am grateful to the University leadership and the leadership in the College of Science and Engineering for their support. This is a recognition of the contributions of many colleagues and many students over many years."

The endowment funding, Benjaafar says, "will allow us to expand the research footprint of our group and to undertake higher-risk and longer-term projects that may otherwise be difficult to pursue. In particular, I am excited about exploring innovative ways transportation services could be delivered to improve access. This work will leverage existing activities that have been generously supported by the Center for Transportation Studies over many years."

Benjaafar, a CTS Scholar, has been engaged with CTS on a variety of projects and activities for more than two decades. He is the director of the Initiative on the Sharing Economy, an effort established by CTS in partnership with Benjaafar and other faculty members across the University and administered by CTS.

The McKnight award recognizes the critical importance of the University's most distinguished faculty across all disciplines, as well as the importance of strengthening U faculty for the future. Only four other College of Science and Engineering faculty members currently hold this honor.

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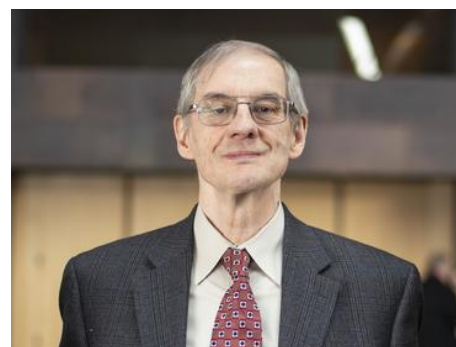


## Braun/CTS Chair: Research, teaching for a more automated future

July 26, 2021



Professor Gary Davis of the Department of Civil, Environmental, and Geo- Engineering (CEGE) has been reappointed Richard P. Braun/CTS Chair in Transportation Engineering, effective July 1. His initial appointment was in July 2016.



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.

The purpose of the endowed faculty chair is to foster innovation in the academic program in transportation engineering at CEGE. Below, Davis shares highlights of recent work and his plans for the next five years.

### What are some highlights from your first appointment?

Braun Chair funds have played an important role in several research studies. One addressed some impending challenges related to the introduction of automated vehicles into our traffic streams. These challenges arise because safety-based highway design and operation require predicting the safety consequences of design and operational decisions, but the primary tools for making these predictions are empirical models. The models give reasonable representations of the conditions in place when they were constructed, but extrapolating the models to new conditions is problematic.

In particular, our current tools are functions of the conditions present during the last 20 or so years, which are likely to change—possibly drastically—as partially or fully automated vehicles and new mobility modes see wider deployment.



*Photo: Shutterstock*

During the last five years we have made significant progress on this front. The current *Highway Safety Manual* uses empirical crash modification factors to predict the changes in crash frequencies resulting from design decisions. With one of my students, I developed a theoretical framework for recalibrating crash modification factors that have been estimated in one set of conditions to other, possibly different, conditions. This work was published in the 2019 proceedings of the Transportation Research Board (TRB) and has been presented at meetings of the TRB and the American Statistical Association.

Other topics I have studied with my students and other researchers include a model relating vehicle impact speed to pedestrian injury severity; a mechanism for studying freeway rear-ending crashes, including how the model could be extended to a population of vehicles equipped with intelligent cruise control and automatic brake assistance; and models describing how crash elements (e.g., initial positions and speeds, reaction times, braking rates) can be estimated by using data from vehicles' event data recorders to reconstruct crashes.

## **What's your focus for the next five years?**

My primary research goal for the next five years is to develop our theoretical insights regarding the transferability and external validity of crash modification factors into an operational methodology. This requires, first and foremost, being able to provide defensible, quantitative explanations of how crash modifications achieve their effects.

Also, over the years we have developed a number of specialized techniques for applying Bayesian inference to crash reconstruction. These results are scattered in a number of papers and published in different journals. I would like to assemble this material, along with suitable background and tutorials, into a book.

## What are your teaching plans?

I have regularly taught our required undergraduate courses as well as a graduate course in data analysis methods. Over the next several years I want to design and test a new four-credit technical elective, Highway Design and Traffic Operations, which could replace two existing courses. One reason to explore this is to open up some space in our curriculum for new courses. The practice of transportation engineering will continue to change as automated vehicles, micro-mobility, and shared mobility all become more prevalent. Future generations of transportation engineers will need competence in such areas as cyber-physical systems and data analytics. We need to plan those courses now.

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