

TCRP Frontline Employee Survey

The Effects of Vehicle Automation on the Public Transportation Workforce

With this survey, Texas A&M Transportation Institute is examining the possible effects of vehicle automation on the transit workforce. If your job involves supporting the operation, maintenance, supervision, planning, training, or management of bus transit, we want to hear from you.

Answering our questions will take less than 15 minutes. If you close your web browser without finishing the survey, your responses on submitted survey pages will be saved. You can come back and finish the survey within a week's time if you use the same computer. After a week, your responses will be recorded as is.

Participation is voluntary. You may decide not to participate or withdraw at any time. All responses are confidential. There will be no identifiers linking you to this study in any publicly available report or dataset. For more information, see the [Study information sheet](#).

If you have questions about the survey or need any assistance in completing it, please contact Dr. Ipek Sener at 512-407-1119 or i-sener@tti.tamu.edu.

If you have complaints, or concerns about the research, or for questions about your rights as a research participant, you may contact Texas A&M University Human Research Protection Program office toll free at 1-855-795-8636 or by email at irb@tamu.edu.

By clicking the Next button below, you agree to participate in the study.

What is Transit Vehicle Automation?

This section of the survey provides you with some important background information about transit vehicle automation to help you understand the rest of the survey. Just a heads up: it may require a few minutes to read.

There are many types of automation technology that may eventually occur in public transit; however, this study focuses on five specific types of transit automation or “use cases”. All the use cases have one thing in common: vehicles are equipped with sensors, cameras, communications, and other complex on-board technology that would theoretically enable the vehicles to operate without human drivers for some or all parts of the vehicles’ driving tasks.

Potential Workforce Impacts

Each use case may impact employees in the public transportation workforce—including drivers, mechanics, street or road supervisors, trainers, planners and schedulers, managers, and others. The actual impacts of each use case on different positions may be positive or negative. Workforce impacts are currently difficult to predict and depend largely on policy decisions, funding, liability and legal issues, market forces, and the specific situations and needs of individual employees.

Brief descriptions of each use case are provided below. Please read over the descriptions. (Later in the survey, we will remind you what each use case means.)

Use Case 1: Bus Automation for Maintenance and Yard Operations

Vehicle automation may enable the fully autonomous movements of buses within transit bus yards and garages, including autonomous movements of buses into maintenance bays and bus storage, parking, and fueling areas. To date, we are not aware of any examples of this use case in active deployment; however, based on some reasonable assumptions, automated yard operations might mean that: During pull out, drivers would “call” their vehicles, which would arrive at a staging area for drivers to conduct pre-trip inspections and then drive the buses into service. At pull in, drivers would park their vehicles at a staging area for post-trip inspections, and then the buses could self-park. Buses would autonomously maneuver through a bus wash or to a fueling station. Buses would be called from the yard by mechanics; buses would leave their parking locations and arrive at the desired maintenance bays.

This use case does not involve automating vehicles while they are in revenue service.

Use Case 2: Low-Speed Automated Shuttles

Low-speed automated shuttles are small, highly-automated vehicles that usually operate in less complicated environments (for example, within a business park, on a college campus, or in a dedicated lane). The shuttles usually do not exceed 25 mph and cruise around 10-15 mph. The shuttles usually can carry 4-15 passengers and some models have wheelchair ramps. Low-speed automated shuttles could be used in rural, suburban, and urban areas, but current shuttle pilots tend to serve as small circulators or services to connect riders with high-capacity transit.

The shuttles do not require a human operator, but, at this time, all shuttles have kept a human attendant on board to serve as a safety operator if needed.



Figure 1. Low-Speed Automated Shuttle

Source: Navya website.

Use Case 3: Automated Bus Rapid Transit (BRT)

Bus rapid transit (BRT) provides transit service with similar speed and efficiency as light-rail transit because BRT often operates in dedicated lanes that have permanent stations. BRT also often has off-board fare collection and traffic signal priority. Standard full-size buses are used to provide BRT services.

Automated vehicle technology is relatively easy to deploy for BRT versus other transit services, primarily because BRT often operates in its own lane. Buses would precisely align with elevated station platforms, improving accessibility for the disabled and the elderly. Automated BRT could scale up to as many vehicles as required by demand through vehicle platooning, and it may help maintain bus headways when there is congestion. Automated BRT would most likely be used in urban and suburban settings, where high-capacity transit is needed.

Use Case 4: Automated Mobility on Demand

Mobility on demand (MOD) is demand-responsive mobility that leverages many types of mobility services, such as ridehailing, transit, and shared vehicles, to provide customers with mobility when and where it is requested. Automated MOD would include small- or medium-size vehicles operating autonomously, dispatched by a centralized control system to meet customer requests for rides. Automated MOD could provide Americans with Disabilities Act (ADA) paratransit, services connecting customers to/from transit stops/stations, and on-demand shared-ride services in which multiple customers traveling along a generally similar path are grouped into the same vehicle.

Automated MOD could theoretically operate in any environment but would require fully-autonomous vehicles capable of safely driving in mixed traffic and various operating environments. Automated MOD could be operated by a public transit agency as part of

its services, or automated MOD could be operated by a private company (e.g., Waymo, Lyft, or Uber).

Use Case 5: Automated Local Bus Service

Local bus service is the regular operation of transit buses along a route stopping at fixed bus stops according to a published timetable. However, automating full-sized, full-speed buses to travel under all roadway and environment conditions will require significant technological advances.

Possible impacts from automating local bus service are related to reducing operating costs, improving safety, improving headways and time point adherence, and reducing environmental impacts if electrification accompanies the automation. To date, automated transit bus demonstrations have used predefined routes and lanes with known geometries and limited exposure to other vehicles. These environments include bus-only road shoulders, dedicated bus lanes, high-occupancy vehicle (HOV) lanes, and transit stations with boarding platforms.

Q1 What is your current job title?

If you have multiple duties in your job, please select the one that best reflects your current main responsibilities.

- Bus Operator
 - Bus mechanic / Maintenance technician
 - Bus service person / Fueler / Cleaner
 - Dispatcher / Controller
 - Road/Street supervisor or Traffic controller
 - Bus operations trainer
 - Facilities maintainer
 - Parts clerk
 - Short-range transit planner / Schedule maker
 - Police officer or Security person
 - Other _____
-

Q2 How long have you been in your current position?

- Less than 1 year
 - 1 year – 4 years
 - 5 years – 9 years
 - 10 years – 14 years
 - 15 years – 19 years
 - More than 20 years
-

Q3 Do you supervise the work of others?

- Yes
 - No
-

We will now ask you 6 questions about each of the transit automation use cases. Please read the brief use case description provided and think of the use case when you are answering the 6 questions.

Use Case # 1: Bus Automation for Maintenance and Yard Operations

Brief Description: Fully autonomous movements of buses solely within transit bus yards and garages, including autonomous movements of buses into maintenance bays, storage, vehicle parking, and fueling areas. This use case does not impact revenue service.

Q4 What benefits do you think "Bus Automation for Maintenance and Yard Operations" will have on employees in the transit workforce who work in your position?

Q5 What concerns do you have about the impact "Bus Automation for Maintenance and Yard Operations" will have on employees in the transit workforce who work in your position?

Q6 Think about your position and indicate how likely it is that you would experience the possible benefits listed below if "Bus Automation for Maintenance and Yard Operations" occurred where you work.

	Does not apply	Not at all likely	Somewhat likely	Very likely	Extremely likely
Chance to learn new skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job physical demands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increases in pay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvements in working condition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7 Any additional thoughts/comments you'd like to share about possible benefits? Please feel free to provide below.

Q8 Think about your position and indicate how concerned you are that you would experience the possible impacts listed below if "Bus Automation for Maintenance and Yard Operations" occurred where you work.

	Does not apply	Not concerned at all	Somewhat concerned	Very concerned	Extremely concerned
Needing additional training to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in job responsibilities (different duties)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction in pay (either guaranteed or premium pay)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q9 Any additional thoughts/comments you'd like to share about possible impacts? Please feel free to provide below.

Use Case # 2: Low-Speed Automated Shuttles

Brief Description: Small highly automated vehicles that can carry 4-15 passengers that operate in less complicated environments (e.g., within a business park, on a college campus, or in a dedicated lane), not exceeding 25 mph.

Q10 What benefits do you think "Low-Speed Automated Shuttles" will have on employees in the transit workforce who work in your position?

Q11 What concerns do you have about the impact "Low-Speed Automated Shuttles" will have on employees in the transit workforce who work in your position?

Q12 Think about your position and indicate how likely it is that you would experience the possible benefits listed below if "Low-Speed Automated Shuttles" occurred where you work.

	Does not apply	Not at all likely	Somewhat likely	Very likely	Extremely likely
Chance to learn new skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job physical demands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increases in pay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvements in working conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 Any additional thoughts/comments you'd like to share about possible benefits? Please feel free to provide below.

Q14 Think about your position and indicate how concerned you are that you would experience the possible impacts listed below if "Low-Speed Automated Shuttles" occurred where you work.

	Does not apply	Not concerned at all	Somewhat concerned	Very concerned	Extremely concerned
Needing additional training to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in job responsibilities (different duties)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction in pay (either guaranteed or premium pay)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 Any additional thoughts/comments you'd like to share about possible impacts? Please feel free to provide below.

Use Case # 3: Automated Bus Rapid Transit (BRT)

Brief Description: Automated BRT provides transit service with similar speed and efficiency as light-rail transit using automated full-size buses operating in dedicated lanes with permanent stations. Buses would precisely align with elevated station platforms, improving accessibility for the disabled and the elderly. Automated BRT could scale up to as many vehicles as required by demand through vehicle platooning, and it may help maintain bus headways when there is congestion. Automated BRT would most likely be used in urban and suburban settings, where high-capacity transit is needed.

Q16 What benefits do you think "Automated BRT" will have on employees in the transit workforce who work in your position?

Q17 What concerns do you have about the impact "Automated BRT" will have on employees in the transit workforce who work in your position?

Q18 Think about your position and indicate how likely it is that you would experience the possible benefits listed below if "Automated BRT" occurred where you work.

	Does not apply	Not at all likely	Somewhat likely	Very likely	Extremely likely
Chance to learn new skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job physical demands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increases in pay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvements in working conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q19 Any additional thoughts/comments you'd like to share about possible benefits? Please feel free to provide below.

Q20 Think about your position and indicate how concerned you are that you would experience the possible impacts listed below if "Automated BRT" occurred where you work.

	Does not apply	Not concerned at all	Somewhat concerned	Very concerned	Extremely concerned
Needing additional training to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in job responsibilities (different duties)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction in pay (either guaranteed or premium pay)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q21 Any additional thoughts/comments you'd like to share about possible impacts? Please feel free to provide below.

Use Case # 4: Automated Mobility on Demand (MOD)

Brief Description: Automated MOD would include small- or medium-size vehicles operating autonomously, dispatched by a centralized control system to meet customer requests for rides. Automated MOD could provide Americans with Disabilities Act (ADA) paratransit, services connecting customers to/from transit stops/stations, and on-demand shared-ride services in which multiple customers traveling along a generally similar path are grouped into the same vehicle.

Q22 What benefits do you think "Automated MOD" will have on employees in the transit workforce who work in your position?

Q23 What concerns do you have about the impact "Automated MOD" will have on employees in the transit workforce who work in your position?

Q24 Think about your position and indicate how likely it is that you would experience the possible benefits listed below if "Automated MOD" occurred where you work.

	Does not apply	Not at all likely	Somewhat likely	Very likely	Extremely likely
Chance to learn new skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job physical demands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increases in pay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvements in working conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q25 Any additional thoughts/comments you'd like to share about possible benefits? Please feel free to provide below.

Q26 Think about your position and indicate how concerned you are that you would experience the possible impacts listed below if "Automated MOD" occurred where you work.

	Does not apply	Not concerned at all	Somewhat concerned	Very concerned	Extremely concerned
Needing additional training to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in job responsibilities (different duties)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction in pay (either guaranteed or premium pay)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q27 Any additional thoughts/comments you'd like to share about possible impacts? Please feel free to provide below.

Use Case # 5: Automated Local Bus Service

Brief Description: The operation of automated, full-size transit buses along a typical, local route stopping at fixed bus stops according to a published timetable.

Q28 What benefits do you think "Automated Local Bus Service" will have on employees in the transit workforce who work in your position?

Q29 What concerns do you have about the impact "Automated Local Bus Service" will have on employees in the transit workforce who work in your position?

Q30 Think about your position and indicate how likely it is that you would experience the possible benefits listed below if "Automated Local Bus Service" occurred where you work.

	Does not apply	Not at all likely	Somewhat likely	Very likely	Extremely likely
Chance to learn new skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduced job physical demands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increases in pay	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improvements in working conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
More desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q31 Any additional thoughts/comments you'd like to share about possible benefits? Please feel free to provide below.

Q32 Think about your position and indicate how concerned you are that you would experience the possible impacts listed below if "Automated Local Bus Service" occurred where you work.

	Does not apply	Not concerned at all	Somewhat concerned	Very concerned	Extremely concerned
Needing additional training to succeed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Job loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Change in job responsibilities (different duties)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reduction in pay (either guaranteed or premium pay)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Loss of desirable working assignments (e.g., runs, shifts, or tasks)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q33 Any additional thoughts/comments you'd like to share about possible impacts? Please feel free to provide below.

Q34 Are you a member of a labor union?

- Yes
 - No
-

Q35 What type of organization is your direct employer (i.e., what type of organization funds your paycheck)?

- A stand-alone public transportation agency
 - A public transportation agency that is part of city, county, or state government
 - A non-profit or human services agency
 - A for-profit private transportation provider or transportation contractor
 - Other _____
-

Q36 What is your age?

Q37 Which one represents you the best?

- Female
 - Male
 - Non-binary
 - Prefer to self-describe _____
 - Prefer not to say
-

Q38 What is your race?

- American Indian or Alaska Native
 - Asian
 - Black or African American
 - Native Hawaiian or Pacific Islander
 - White
 - Other _____
 - Two or more races
-

Q39 Are you of Hispanic, Latino, or Spanish origin?

- Yes
 - No
-

Q40 What is your residence zip code?

Q41 What is the annual income of your household?

- Less than \$10,000
 - \$10,000 - \$19,999
 - \$20,000 - \$29,999
 - \$30,000 - \$39,999
 - \$40,000 - \$49,999
 - \$50,000 - \$59,999
 - \$60,000 - \$69,999
 - \$70,000 - \$79,999
 - \$80,000 - \$89,999
 - \$90,000 - \$99,999
 - \$100,000 - \$149,999
 - More than \$150,000
-