

# How to manage bus services effectively in an unpredictable world

Best practices for deploying technology in bus management



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**W**ith tighter budgets, shrinking workforces and rapidly evolving technology, transit operators are already under pressure to adapt their services.

But the drive to sustainable transit is perhaps the most difficult challenge and the one requiring public buy-in if operators are to succeed in delivering low and zero-emission transportation.

A [recent report](#) commissioned by the Mayor of London found that a 27 percent reduction in the city's car traffic was required by 2030 to meet net-zero ambitions.

In the US, Washington D.C. [has set](#) a goal of reducing the number of commuter car trips by 25 percent by 2032, and Seattle is aiming to reduce single occupancy vehicle trips by 25 percent by 2025 from a 2012 baseline.

While some of these journeys will be replaced by active travel, such as walking and cycling, public transport will be expected to use or develop capacity to accept these journeys.

Operators need to be ready to meet increased demand and have the capacity to adapt services to people's individual needs such as getting to work.

This whitepaper explores these challenges from a bus operator's perspective and highlights best practice to help operators to adapt and improve their services in a cost-effective way.

In particular, we focus on:

- Improving passenger confidence through better information
- A case study on how to apply technology to on-street bus management
- Making effective use of data to plan services
- How to maximise the opportunities from investment
- The importance of staff training



# Keeping the passenger informed

**F**or years, cities around the world have been urging residents to get out of their cars and on to public transport. This not only helps ease congestion – it also contributes to improved air quality and a better standard of living.

Low-emission zones have been shown to reduce nitrogen dioxide concentrations in a wide range of conditions.

A report from the London Mayor’s Office in July 2022 found that roadside pollution levels in the city centre were 44 percent lower than if the Ultra Low Emissions Zone (ULEZ) had not been introduced, while in inner London – outside the congestion charging zone – they were 20 percent lower.

It is estimated that extending the ULEZ to the whole of Greater London could reduce nitrogen oxide emissions from cars and vans by between 285 and 330 tonnes, cut carbon dioxide emissions in outer London by between 135,000 and 150,000 tonnes, and reduce the most polluting cars on the roads by as many as 40,000 a day.



*“The ability to predict the arrival of your next bus has been huge in terms of giving people confidence in the system – but when it doesn’t work, that confidence disappears.”*

The pandemic set back many cities’ ambitions to pivot away from the car, however.

COVID-19 upended commuter patterns, and many cities are still evaluating what the ‘new normal’ looks like.

In 2022, some 66 percent of commuters in the Washington, D.C. metro region were working from home at least some of the time, an increase from 35 percent in 2019, [according to](#) the 2022 State of the Commute Survey Report by the Metropolitan Washington Council of Governments (COG).

Furthermore, for those workers commuting into jobs, a larger share of them have been driving rather than taking public transit.

In fact, 78.4 percent of those trips were taken alone in a personal car or ride-hail vehicle in 2022, up 13.8 percent from 2019, according to the survey research.

Other shifts have also been observed.

San Francisco, for example, has experienced an overall drop in ridership in recent years, but some routes in the city have seen an increase in users of up to 150 percent in certain areas.

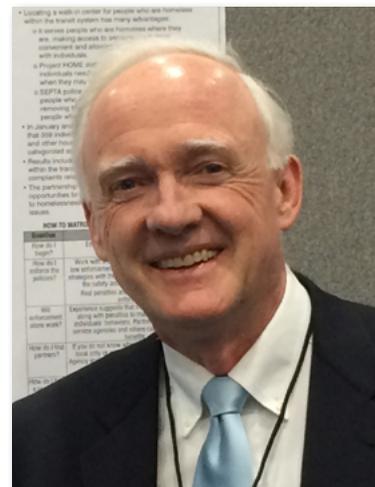
Routes that served the downtown core struggled most while those that connect to neighbourhood commercial corridors saw the biggest uptick in riders, driven by people visiting local retailers and grocery stores or going out to eat.

The total number of people commuting to work in the city has decreased by nearly 100,000, and only 11 percent of San Franciscans used public transportation to commute to work in 2021, compared to 36 percent in 2019.

One way to tackle such drops in ridership is to improve the information on scheduling so that users have a better and more convenient service.

If used well, technology can gain passenger trust by keeping riders informed on the arrival and departure times of services using real-time passenger information displays.

Daniel Boyle, the author of a [recent study](#) from the US Transit Cooperative Research Program on transit service evaluation, says: “I think that the ability to predict the arrival of your next bus has been huge in terms of giving people confidence in the system – but when it doesn’t work, that confidence disappears.”



**Daniel Boyle**

President at Dan Boyle & Associates

For example, there have been reported instances where incorrect real-time information on apps has left passengers waiting for buses that never show up or which suddenly disappear from their screen.

In some cases, 'live bus' information on apps turned out to actually be a 'legacy prediction' of when the timetable says a bus is supposed to be arriving - rather than an actual live GPS feed.

As Boyle notes, this can damage passenger trust. He stresses that the key to implementing good passenger information systems is not only to choose proven solutions but also to make sure that staff understand and can support the technology.

"This also comes down to the importance of training staff and getting them used to the technology," says Boyle. "You have the ability to indicate if a bus is not running on a system, but you have to know how to do that and you have to get used to doing that every day."

### Takeaways:

- While delivering accurate and timely information through RTI is key, equally as important is a bus service which is reliable and punctual.
- Poor service erodes public trust in the transport system and jeopardises government goals to increase public transport usage.



# Improving on-street management

**R**eal-time information and GPS-tracking of buses is part of a wider move to use technology to assist with on-street management of buses.

The street management of bus operations attempts to maximise reliability for the benefit of passengers and operating efficiency.

Key elements include how agencies monitor schedules and performance, how this data is used to inform central control and street supervisors of emerging problems, and how corrective measures are then communicated to bus operators.

It also includes proactive coordination practices to avoid foreseeable problems.

Recently, many bus transit operators in the US have implemented sophisticated run-cutting and scheduling practices and real-time automatic vehicle location (AVL) systems.

Street operations supervisory practices, however, have not significantly changed on many transit systems, with Boyle suggesting a review of current operations management practices is needed for small, medium, and large transit systems.



“The strategies identified to improve reliability (modifying speed, holding early buses, adding a reserve vehicle, turning back buses, skipping stops, and passing delayed buses) have not changed over the past few decades,” said Boyle.

“We may have more information today to help us select the ‘best’ strategy in a given situation, but our choices have not expanded.”

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# On-street management case study: Concord Kannapolis Area Transit (Rider): Concord, NC

In the US, Concord Kannapolis Area Transit (Rider) provides public transportation in the communities of Concord and Kannapolis, North Carolina.

Known locally as ‘Rider’, the transit system oversees the operation of fixed route bus and paratransit services, covering a service area population of 113,639 and an annual bus ridership of 314,041 in 2021.

In looking at on-street bus management, the most recent major technology-related change deployed by the operator was the ability for supervisors and dispatchers to work from the field with a tablet device thanks to cloud-based software.

This promised a big change in what supervisors could do but in practice there was a gap between technology and its utilisation, with the extent of tablet usage not close to what was expected.

Again as Boyle observes, staff training and getting teams comfortable with the tech is essential.

“People have hated paperwork since it was invented and moving it digitally doesn’t seem to have made it more palatable,” says L.J. Weslowski, Transit Director, Concord Kannapolis Area Transit.

Further to this, the operator did not get digital copies of

accident/incident reports, and training was delivered virtually rather than in-person.

The most successful new technology the agency has incorporated over the past decade has been the launch of mobile apps to the public, which has resulted in 50 percent fewer calls to customer services than 10 years ago.

The operator says if it could change one aspect when incorporating new technologies regarding on-street bus operations management, it would be the ability to obtain more useful data from the back-end.

“Right now our front-end real-time information is working accurately for the public,” says Weslowski, “But what we don’t understand is why the back-end isn’t, when we look at it for operational data reports.”

For instance, one of the things that Weslowski wanted was to be able to get stop-level data, in terms of on-time performance.

“So on a macro scale, if you’re seeing that buses are running 95-98 percent on time, in general, that’s great – but since coming out of the pandemic ridership has changed,” comments Weslowski.

“It [ridership] may have gone down somewhere or may even have gone up, and we want to be able to use that stop-level



**L.J. Weslowski**

Transit Director, Concord Kannapolis Area Transit.

scheduled data to be able to say ‘At this particular stop we are always having to wait because we’re running ahead of schedule because there’s less people riding this route than before and now the bus is just sitting there,’ or the driver leaves early and that’s equally as bad.

“So we need to adjust that digital schedule so that it reflects what’s happening in real-time, and for some reason the data just isn’t working on the back-end for us.

“When technology works as it’s intended and designed, it’s terrific. But looking at the big picture, as we get reliant on a technology and then it fails, what happens?

“It almost creates this irrational stress function because we’re just so used to having those things available and working.”



## Susan Walnut

Product Director  
UK & Ireland, Vix  
Technology

“On a day-by-day basis, random occurrences happen all the time when you’re running a bus operation – whether that’s a problem with the vehicle itself, a problem with the driver or on the vehicle, or problems that happen completely externally to the vehicle,” says Susan Walnut, Product Director UK & Ireland, Vix Technology.

“These all need to be dealt with in real time using tools that help the operation staff understand what’s happening and understand the context in which it’s happening.”

With over 20 years’ experience at National Express, one of the UK’s largest bus operators, Walnut has been at the heart of some of the biggest transformations in transport technology.

“Typically, your operation staff will be people who know the areas buses are running in. There is an awful lot of talk at the moment about AI and recommending new routes and new deployments for vehicles, but we have to remember that actually 95 percent of the time the people who are working in the dispatch and traffic offices are people that know the region like the back of their hand, they know exactly where buses can and can’t go.

“So we shouldn’t forget that the people who are doing this are skilled professionals – what they’re looking for is an AI tool to help make the decisions rather than a tool that will make the decisions for them.”

Linking different technologies together – rather than creating them in siloes – can also help create more seamless communication with staff and puts the passenger first.

“The other key factor is proper communications with the driver – they need to be able to know what they’re supposed to do when they find their way is blocked or if they know they’re going to be blocked somewhere else,” adds Walnut.

“So that key prompt conversation with the driver is incredibly important.

“Getting the driver a visual aid that will help them know if they’re being diverted and where they’re being diverted to is crucial.

“There’s a tendency at the moment to talk about rescheduling on the fly, which sometimes forgets the passenger, and their expectations of reliability and punctuality.

“Anything that you do in terms of changing services or adapting to change on a daily basis has to consider what the passengers are expecting.”

### Takeaways:

- The supply of RTI without in-person troubleshooting and training ahead of going live could lead to a situation where the stress involved in implementation overrides the simplicity it is designed to create.
- Ongoing support from vendors can help ease potential complications – when the technology works, it is an indispensable tool for operators.

# How data can help with service planning

**I**n looking towards the next five years, Walnut says data will become increasingly important for making transit services more personalised.

“As a technology provider, and also during my career within bus operations, there is a lot of pressure to show where buses are on maps through apps, and that is really based around the experience of people using things like Uber.

“In my opinion, I think that will decrease in usefulness over time, because actually seeing a picture of where your bus is on the map means that you still have to work a lot of things out.

“It won’t be long before people realise ‘that’s nice, but it’s not actually giving me the information that I need.’”

Instead, Walnut believes there will be an increased level of focus on the personalisation of services, which could be delivered through demand-responsive vehicles.

“I think there’ll be a greater linking of the traveller to that vehicle in a particular way.

“In fact, I could even see there being some level of demand-responsive pricing for buses, and some seats may even be bookable.

“In order to get people out of cars, they’re going to want some surety around the bus in the same way they have with a coach or a train.”

Walnut also foresees data playing an important role in service management by enabling operators to model what will be required depending on the circumstances.

“Looking at the medium term, you can look at data and plan ahead. For example, being able to predict transport patterns around a large event like a concert is absolutely something which can be modelled in advance.

“But there are other variables, like strikes for instance, where there’s more unpredictability.

“If you only have 10 percent of buses running, how do you decide which ones should run and how do you make that timetable – this is where data and the ability to model is incredibly important.”

## Takeaways:

- Personalisation of services, such as through demand-responsive vehicles and pricing structures could be transformative.
- Reliability will dictate whether passengers will feel confident enough to give up their cars for public transport options.
- Data is key for making decisions related to unpredictable events.

# Why operators need to capitalise on investment

**D**espite financial challenges in some areas, cities and operators can't afford to let their transit systems become out of date in the face of growing challenges and customer expectations.

Smart investment and vendor management are key to ensuring successful outcomes and efficient use of limited resources.

According to a [study](#) by the American Public Transportation Association (APTA), a failure to invest in public transportation infrastructure modernisation could result in a loss of US\$340 billion in cumulative business sales from 2017-2023.

The study, which looked at the impact of transport modernisation on the entire US economy, revealed some significant observations.

It found that a series of extreme winter weather events in 2015 led to a near collapse in Boston's MBTA's ability to perform on-time or to recover its performance in any predictable period of time.

During a 30-day period of the most intense winter conditions, the MBTA experienced an unprecedented system-wide shutdown of all operations on three occasions, leaving large sections of the metropolitan area immobilised.



City officials found that on a normal workday, 1.3 million of the 3.3 million people living in the Boston metro area used the MBTA to carry out their normal daily activities.

Out of these 1.3 million, 25 percent did not have access to a vehicle for personal transportation and rely solely on MBTA for transit needs.

Health care services were also impaired largely due to transport limitations that prevented medical personnel, support staff and the patients themselves from reaching provider locations.

These problems are estimated to have cost Boston's regional economy \$40 million, and spurred the city to re-examine its public transit modernisation efforts.

While Boyle notes there are no easy fixes to these problems, the need for vendors to stay with a project after its initial implementation is crucial.

“When you look at operators who have had good or bad things to say about their vendors, it's the guys that came back six months later to do a refresher to see what's working and what's not are obviously more highly valued than those who just install it and leave.”

As with the experience of Concord, Boyle says it's important to properly train staff on new technological change.

***“Technology can improve day-to-day operations, but technology alone is not a panacea.”***

“Technology can improve day-to-day operations, but technology alone is not a panacea.

“The high cost and rapid pace of change in new technologies can create a situation in which the replacement cycle is getting shorter and shorter while agency budgets are limited.

“Technology improvements do have high potential impact for operational improvements, but the challenge is to design an ideal replacement cycle that will meet agency needs and fit within agency budgets.”

“But I think these problems can be fixed, and the question goes back to how good your vendor is. They should be supporting you when you have a problem, and help you figure out where it is and how to fix it.”

#### **Takeaways:**

- Environmental disasters/ major incidents are by nature unpredictable, but at the same time inevitable. Agencies need to have proper processes in place to plan for the unexpected and adapt.
- Having advanced management and modelling systems in place can allow for better planning from authorities.

# Training teams to adapt to tech

**T**he need to train staff on technological change and work with a reliable vendor who will offer continuous support is crucial, as Boyle elaborates - “train, then train some more”.

He explains: “Effective and positive training can make a world of difference. Never become complacent and comfortable with new technologies because they are ever evolving and will easily become new again the next day.”

Investment in proper training, particularly for those in supervisory roles, can save time, money and ease the transition towards technological change.

“Do not settle for minimum training when the agency has spent millions on a new system,” Boyle adds.

“As new staff members join the agency, do not assume they have familiarity with the agency’s technology.

“Training, early on and often, is key to a successful launch of new or upgraded technology.”

Besides taking the time to explain how the technology works, Boyle says it’s also important for staff to understand the ‘why’.

“Street supervisors and dispatchers care about their jobs and the quality of service they provide and want to use technology to provide the best service possible to customers.

“The lesson here is not to be afraid to introduce them to new technology. If the agency can show them how customers benefit, they will embrace it.”



## Takeaways:

- Technology is always evolving – agencies need to work with vendors who are attentive to this.
- Training staff isn’t just about showing them how it works, but explaining why the change is being made.

# Strategies for success

**D**espite the challenges they face, there are many steps cities and operators can take today using existing resources and cost-effective solutions to keep fleets running smoothly.

- **Partnerships:** The private sector has an important role to play in helping operators keep their fleets running effectively so partnership is crucial.

A successful collaboration requires transparency between the transit agency and vendors.

- **People:** It is important to realise that while technology can help operators with transit planning and management, people are still at the back end of operations.

Transit professionals want tools to help make the decisions rather than a tool that will make the decisions for them.

- **Communication:** Linking different technologies together, rather than creating them in siloes, can also help create more seamless communication with staff and puts the passenger first.

It is important to keep in mind that the driver is at the front-end of the organisation and is often juggling multiple tasks in their duties. Offering clear and concise information is key.

- **Transparency:** Vendors need to be upfront about what they can deliver.

In looking at which suppliers to choose, agencies need to ensure a full picture of the implementation process is set out, and any follow up training is clearly outlined.



## About Vix Technology

Vix is a global leader in automatic fare collection, transit information and transit analytics solutions. The company has been driving change in fare collection for over 35 years.

To learn more visit  
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