4 RECENT TRENDS IN TRANSIT

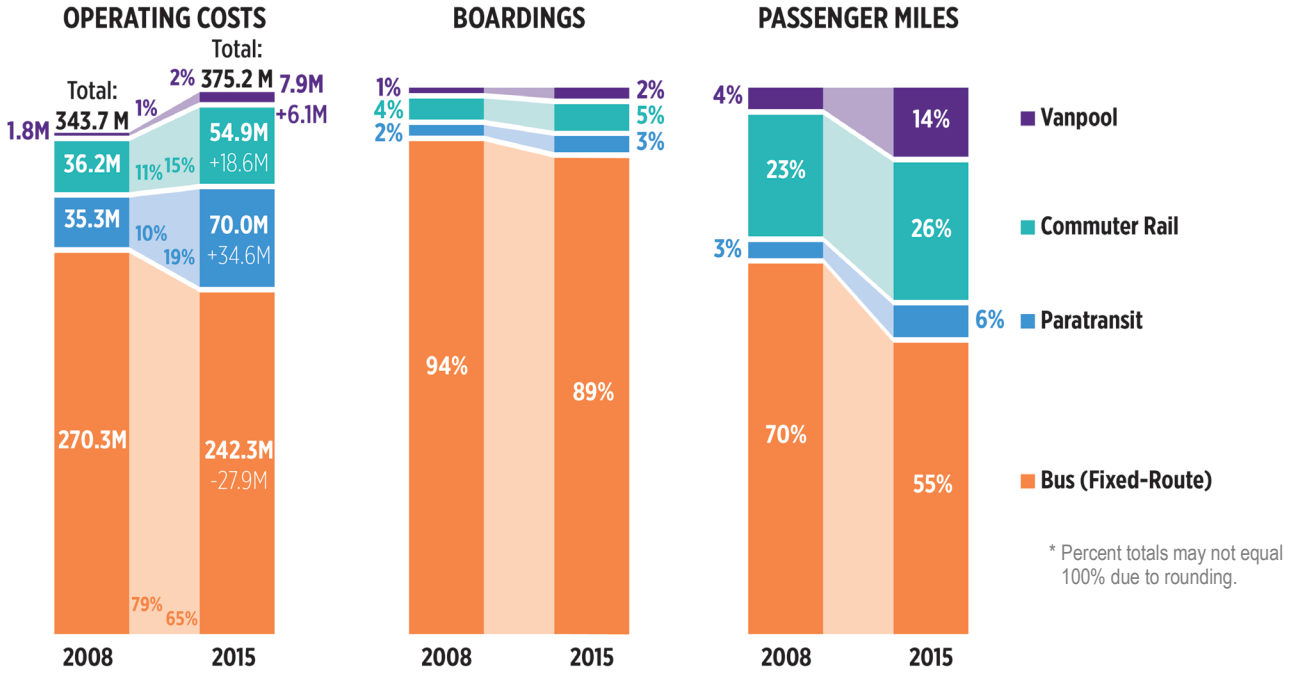
TRANSIT RIDERSHIP

The OC Transit Vision is being developed against the backdrop of a multiyear decline in transit use in Orange County. Since fiscal year 2006-2007, with a peak of more than 69 million annual boardings, ridership on OCTA buses has fallen by 37 percent, to 43.3 million annual boardings in 2015-2016.

OCTA has made a large effort in reversing this decline. The 2016 Bus Service Plan network restructuring is projected to increase transit ridership by 1.6 million boardings over three years, largely by reallocating resources to areas where they can be more cost-effective and productive. The agency has also convened a ridership task force to investigate causes of the decline and to propose creative solutions.

What OCTA has been unable to do is to invest funding in more transit service—or indeed, to reverse the deep budget cuts made during the Great Recession, which coincided with a fare increase. Since 2008, the annual number of fixed-route service hours has been reduced by 14 percent, while the adult cash fare has increased from $1.25 to $2.00 and the cost of a 30-day local pass has increased from $45 to $69. At the same time, required spending on modes other than fixed-route service has increased, from 22 percent in fiscal year 2008 to 36 percent in 2015. This includes an increase in paratransit's share of the overall agency transit budget from 10 to 19 percent (see Figure 4-1).

Figure 4-1 **Operating Costs, Boardings and Passenger Miles by Mode** *(2008 and 2015)**

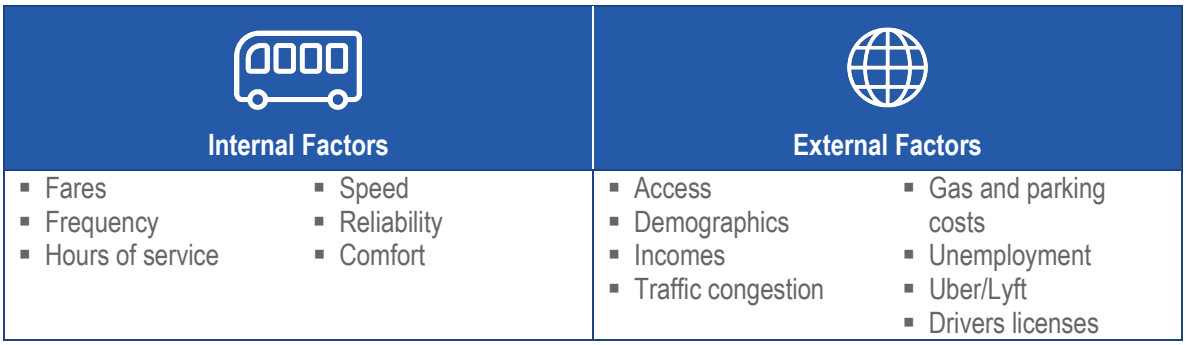


* Percent totals may not equal 100% due to rounding.

Many factors impact transit ridership, but it is useful to think of them in two categories: *internal* versus *external*, and *incentives* versus *disincentives*.

Internal factors are those a transit agency can control: fares and service levels and quality (although funding constrains an agency's ability to control its service levels and quality). A broader range of external factors impact ridership: land use, demographics, access to stops, limited incomes, congestion, and economic conditions, to name a few.

Figure 4-2 Internal and External Factors that Affect Ridership



Then there are incentives and disincentives. Clearly, low fares are an incentive to use transit, while higher fares can be a disincentive. Other factors may not be so obvious. Low gas prices and free parking can incentivize driving, while the need to cross wide streets full of high-speed traffic discourages people from walking to bus stops.

The fact remains that *better transit attracts more riders.*

Some factors are more malleable than others. Much of the research into OCTA's recent ridership decline—and similar declines elsewhere in Southern California and across the nation—has focused on internal and external factors. Recent analysis by the Southern California Association of Governments (SCAG) and others have identified a number of potential factors: rising employment (which increases the number of people commuting but also increases the number of people who can afford to purchase and maintain personal cars), lower gas prices, the rise of ride-hailing companies such as Uber and Lyft, and the new state law allowing undocumented immigrants to obtain driver's licenses. Some of these factors are cyclical in nature, while others may represent longer-term, structural changes. The recent trends in Orange County shows that while population increased 4.7 percent between 2009 and 2015, registered drivers increased by 9.9 percent and registered vehicles increased by 16.9 percent.

A recent study by researchers at the Mineta Transportation Institute in San Jose—"Investigating the Determining Factors for Transit Travel Demand by Bus Mode in US Metropolitan Statistical Areas"—found that:

> *... seven internal factors, which the transit managers and operators have control over, and only one external variable, namely gas price, (are shown) to have significant impacts on transit travel demand by bus mode.* ***Transit supply, transit fare, average headway, transit coverage, service intensity, revenue hours, and safety*** *are the contributing internal factors for transit demand by bus. This indicates that the mechanisms to increase ... transit ridership patronage are in the hands of the transit authorities, which further indicates that they do not need to depend on (the) outside world to attract more ridership but can do so by adjusting the influential internal factors that are under their control.*

CULTURAL, TECHNOLOGICAL, AND TRANSPORTATION TRENDS

Recent social, demographic, technological, and transportation trends that may significantly influence the future of transit both nationally and in Orange County are discussed below.

Cultural Trends

People driving less overall. Starting in 2008, national vehicle miles traveled (VMT) began to trend downward. While low gas prices contributed to an uptick in national VMT in 2015, per capita driving remains at pre-2000 levels. This trend suggests that people are looking for alternatives to driving, and are more open to alternative modes than before.

In particular, younger generations are driving less. Younger people are waiting longer to get driver's licenses and are showing a strong preference for alternative modes of transportation. These trends suggest that, in the future, vehicle ownership and driving may not be as valued as they were in the past.

Renewed desire to live in urban areas. Millennials (generally speaking, those born between roughly 1980 and 2000) like having the world at their fingertips. With the resurgence of urban and denser suburban neighborhoods as centers of economic energy and vitality, a majority of millennials are opting to live in more urban areas over sprawling suburbs or rural communities. Sixty-two percent indicate a preference for living in the type of mixed-use communities typically found in urban areas, where they can be close to shops, restaurants, and offices. Millennials are currently living in these areas at a higher rate than any other generation, and 40 percent say they would like to live in an urban area in the future. For the first time since the 1920s, U.S. cities are growing faster than the rest of the country. Orange County, however, is experience Millennial outmigration, due in part to high housing costs.

More single households. Younger generations are also waiting longer to marry and have children. Housing preferences and travel patterns associated with traditional nuclear-family households are not as dominant as in previous decades.

Aging population. While younger millennials are driving less, are more likely than previous generations to live in urban areas, and are forming families later, the baby boomers that came before them are reaching retirement age and driving less as well. While some empty nester couples with grown children may choose to trade their large suburban homes for smaller, easy-to-maintain apartments in more walkable areas, surveys have found that most would prefer to age in place. They will need accessible and convenient transportation options to do so

Diversifying population. Orange County and California have been at the forefront of America's racial diversification: a minority of Orange County residents are now non-Hispanic white. Many non-white residents are immigrants from countries where transit use is more prevalent, and in general, non-white Americans tend to use transit at higher rates than white Americans.

Increasing housing costs. While other demographic trends should favor transit use over the long term, one recent trend in Orange County (and in other desirable communities in coastal California) runs counter to this: rapidly increasing housing costs. Increasingly unaffordable housing is pushing low-income and even some middle-class residents, including Millennials with less job experience and earning power, out of Orange County or to areas of the county that are more difficult to serve with transit. High housing costs are also increasing commute distances as people seek lower-cost housing in less expensive areas such as Riverside County—for many of these longer trips, transit is a less viable option than driving.

Impacts of technology. Smartphone-based ride-hailing services such as Uber and Lyft (see next section) provide a new set of mobility options. These services provide a quick and relatively affordable alternative for short trips, although there are barriers to use, such as access to a credit card and smartphone.

Changes to shopping behaviors. As internet shopping soars, people are making fewer trips to stores. While this necessarily means an increase in deliveries, it also likely means a decrease in personal shopping trips. For Orange County, online shopping also has a negative impact on sales tax revenues, which support transit operations. This is because many online retailers ship to Orange County from warehouse, in neighboring counties, which receive the sales tax.

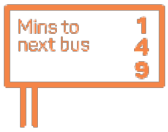
Taking another look at transportation demand management. Finally, transportation demand management (TDM) measures such as variable roadway and parking pricing and employer-based transit benefits are essential tools for transportation planning that were widely used locally in the 1990s, declined somewhat in recent years, but are now on the rise nationally. TDM turns the traditional paradigm of increasing supply and capacity to meet demand on its head, suggesting instead that it may be possible to manage travel demand cost-effectively without increasing supply.

Technological Trends

Recently implemented technologies have rapidly changed how people connect, and where and how they choose to live, work, and travel. Newly developed technologies have changed the expectations of transit riders—dynamic, flexible, and real-time information now informs travel decisions and behavior. The following section addresses mobility options that rely on smartphone apps. This section addresses the technologies themselves as well as a few technologies important to transit operators, if not necessarily the riding public.

Smartphone Applications. Smartphone apps can be used to look up wait times for buses and trains, figure out where a route goes, and even to pay fares. Multimodal mapping services such as Google Maps and Apple Maps provide information on stop locations, routes serving those stops, wait times, and travel times. Transit agencies also deploy proprietary apps to distribute system maps, schedules, and rider alerts.

Websites and Social Media. Before smartphone apps provided real-time travel information, transit agency websites offered custom trip planners, many of which were somewhat difficult to use. Websites are still around, of course, but they have evolved into multiplatform resources available on desktops as well as mobile devices. Agency websites are now also just one element of larger, multichannel information distribution strategies that exploit social media outlets such as Facebook and Twitter to widely and easily distribute service alerts, meeting notices, and other timely information.



Real-Time Arrival Information. Research has found that time spent waiting on transit may be perceived as 50 percent or even 100 percent longer than it actually is. Simply letting riders know not just when their buses or trains are scheduled to arrive, but when they will actually arrive can greatly improve the transit-riding experience. Transit agencies can make real-time information on vehicle locations and projected arrival times widely available, for use in platforms ranging from Google Maps to agency-specific smartphone apps.

Mobile Ticketing. Fare payment options have greatly expanded in the last 15 years. First, stored-value smart cards replaced tokens and eventually paper passes. Customers load cash or prepaid passes onto these cards online, at transit vending machines, and sometimes at local grocery and convenience stores. An example of this is the TAP Card in Los Angeles County. More recently, smart cards have started to give way to mobile ticketing apps (such as OCTA's OC Bus app) that allow users to pay using their smartphones rather than having to acquire and physically reload smart cards.

Vehicle Technologies. Transit operators have recently incorporated a number of new techniques and technologies into their operations, from automated passenger counters aboard vehicles to dispatch software platforms for demand-responsive services. But the most significant advancement may be new methods of vehicle propulsion, most notably the rise of battery-powered electric buses and streetcars. Battery life has been greatly extended in the last few years, and it is now reaching the point where it may be a viable, reliable option for everyday operations. Transit agencies such as King County Metro in Washington state are already putting electric buses into service on a trial basis. (It should be noted, however, that new technologies can be more expensive to operate.)

Transportation Trends

Shared Mobility

In Orange County and elsewhere, the menu of mobility options has also been evolving rapidly.

These options generally fall into the category of shared mobility services, or ways of making private vehicles more efficient by ride sharing or car sharing. Many new alternatives blur the line between private and public transportation. All of them have context-dependent applications and utility. Some will likely compete with transit, while others will prove complementary. Bike sharing and ride sharing, for example, can help traditional fixed-route transit overcome the "first-/last-mile" problem of accessing stops.

Below is a quick snapshot of both newer and older nontraditional mobility offerings. Most of these options already exist in Orange County, although some remain limited to more urban areas.

Car sharing

Round-trip (Traditional). Round-trip car-sharing services offer membership-based short-term car rentals that typically charge by the hour. Reservations are made online or via mobile app; cars are unlocked with the app or membership card. Cars are located in both on-street and off-street spaces throughout a service area and must be returned to the pickup location. The services allow people to occasionally use a car when needed during their otherwise car-free lifestyle.

One-way. One-way car-sharing services operate similarly to round-trip car-sharing, but allow members to park and leave cars at most legal parking spots in the service area. Generally designed to provide shorter trips, one-way services charge by the minute.

Peer-to-peer. This system connects car owners with potential renters via an online interface. Owners list their vehicles online and install hardware in the vehicle to allow immediate access to renters. Reservations for vehicles are made online, and vehicles are returned to the pickup location (or a nearby location) when trips are completed.

Closed network. This system is a private car-share service for a specific development. While closed network services operate similarly to traditional car-sharing services, the car is managed by a property owner and available only to tenants.

Bike sharing

Dock-based. A dock-based bike-share system allows people to check out a bike from a station using a credit card or membership card. Bicycles can be returned to other docks within the system. A standard rental is 30 minutes or less, and most systems offer a variety of memberships and passes.

Dockless. Relying on GPS locators and smartphone technology, this system allows people to reserve a nearby bicycle. Bicycles can be picked up and returned at any ordinary bike rack within a service area, which significantly expands access points and simplifies the return process.

Peer-to-peer. This system connects bicycle owners to potential renters via an online interface. Using a special lock, owners can list their bicycle as available for reservation. Bicycles can be picked up and returned at ordinary bicycle racks within a service area.

Ride hailing

Taxis and Limos. Taxis and limousines are the original private shared mobility services. Both provide for-hire vehicles staffed by professional drivers licensed to transport passengers.

Transportation Network Companies (TNCs). These companies use an online or mobile platform to connect passengers to drivers. Drivers use their personal vehicles, and do not need a special license to transport passengers. Typically more affordable than taxis except during demand surges, such services make it easier for people to leave their vehicles at home but do require a credit or debit card and smartphone. The speed and smooth user interface for many of these services make them attractive options.

Ride sharing

Carpooling. Carpooling is an arrangement between multiple people to make a trip in a single vehicle. The classic example of carpooling is coworkers who live near each other organizing to share a vehicle to work.

Vanpooling. Vanpooling services are typically fee-based operations operated by a third party. Driven by one of the commuters, the van travels on an agreed-upon schedule to pickup and drop-off locations.

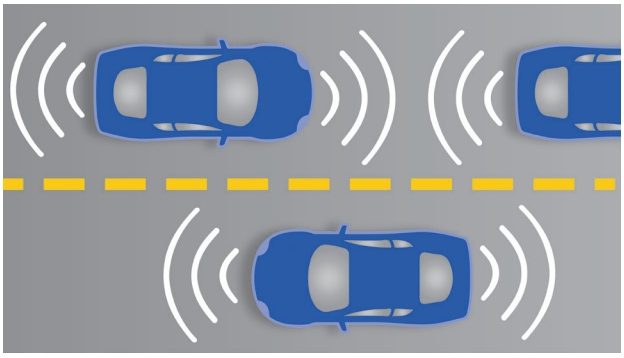
Vanpooling Subscription Services. These services require payment for each trip, providing door-to-door commuting service to people outside of traditional transit service areas or hours. Trips must be booked in advance, and subsidies may be used by lower-income passengers. This service can help to fulfill travel needs not met by transit networks.

Dynamic ride sharing

Dynamic ride sharing connects passengers and drivers through an online system, pairing individuals making a similar trip. Passengers agree upon and pay a share of the trip's cost. By providing drivers and passengers with an expanded pool of potential travel partners, dynamic ride sharing takes the traditional carpool to a new level.

Autonomous Vehicles

Curiosity about autonomous vehicles has intensified in recent years. As transportation technology continues to evolve rapidly, major benefits such as improved safety, increased mobility, and maximized efficiency may be on the horizon. However, autonomous vehicles will bring new challenges for jurisdictions as technology is slowly integrated with existing infrastructure and human drivers.



Though autonomous vehicles are expected to provide safety improvements, it will take decades for roadways to become fully automated, potentially resulting in friction between autonomous and human drivers. In addition, there are concerns that autonomous vehicles might increase VMT, congestion, and emissions levels. This can result from empty cars traveling long distances to cheaper parking, and commuters traveling longer distances as an attempt at finding cheaper housing.

Additionally, this technology has the potential to increase the capacity of existing roadways through more efficient signal timing and tighter vehicle spacing, reducing congestion concerns and encouraging people to use their own vehicles rather than public transit services. Policies to curtail increased VMT due to autonomous vehicles could play an important role in preventing such concerns from materializing. Potential policies include the following:

- Pay per mile
- Facilitating and encouraging the sharing economy
- Establish autonomous vehicles as support for transit and active modes, not a replacement
- Ensure high quality transit is available, especially along major corridors, as quality will be increasingly important to encourage ridership

Parking is also likely to be impacted as autonomous vehicles emerge. A system of shared autonomous vehicles could reduce the significant amount of land dedicated to parking (if vehicles are shared; if not, parking needs could stay the same, or even increase). This presents a tremendous opportunity to recapture highly underutilized land currently dedicated to storing cars. With technology expected to support complete autonomous capability in 2022—and 100 percent of the market expected to be autonomous by 2045—places like Orange County should begin to

plan for reduced parking in the very near term, especially given the lengthy development process and life span of parking structures[1].

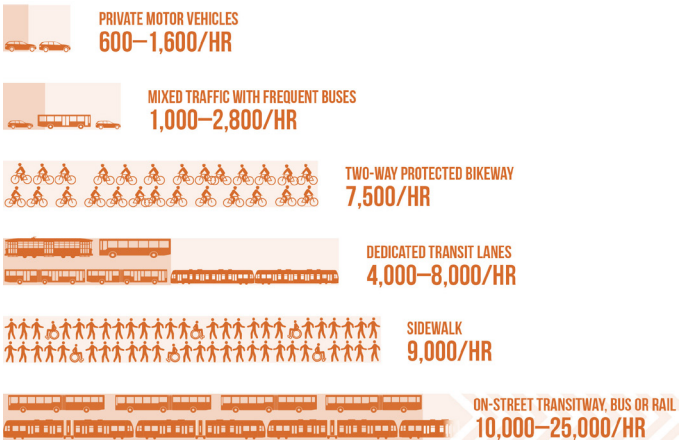
Finally, autonomous vehicles could reduce the cost of providing transit service, if driverless buses are used. However, this is unlikely to occur for some time, if ever, as transit agencies such as OCTA employ thousands of bus operators.

As autonomous technologies begin to emerge, Orange County will need to update infrastructure to maximize capacity and network safety while simultaneously looking ahead to address the potential challenges of managing new technologies.

SUMMARY

These are interesting times for both transit providers and riders. Transit operators are being pulled in multiple directions: on the one hand, cultural, technological, and larger transportation trends are pushing people onto buses and trains. At the same time, factors such as low gas prices are reducing transit ridership. Some transit operators see new transportation options, such as Uber, Lyft, and autonomous vehicles, as existential threats—but in some ways, they are proving complementary to transit. Transit riders, meanwhile, are encountering an unprecedented range of new travel tools and options.

Figure 4-3 10-Foot Lane Capacity, by Mode



The capacity of a single 10-foot lane (or equivalent width) by mode at peak conditions with normal operations.

Source: NACTO Transit Street Design Guide

Whatever the future holds in terms of transportation technology, a few simple facts remain:

- High-capacity transit is a space-efficient (and potentially cost-efficient) way to move large volumes of people in constrained corridors, freeing space for other uses.
- Transit will still have an important role to play in reducing greenhouse gas emissions. Even if electric vehicles become the norm, electricity comes from external sources that are for the most part decades away (at best) from being fully renewable. Transit's ability to use less energy on a per-capita basis matters for the foreseeable future.
- The rise of autonomous vehicles holds the potential to reduce operating costs for transit, making it more cost-effective. Tomorrow's transit network may not look like today's—it is likely to include smaller vehicles and more on-demand operations—but there will still be a transit network featuring high-capacity corridors for decades to come.

[1] Morgan Stanley. (2013). "Autonomous Cars: Self-Driving the New Auto Industry Paradigm." Retrieved from: http://orfe.princeton.edu/~alaink/SmartDrivingCars/PDFs/Nov2013MORGAN-STANLEY-BLUE-PAPER-AUTONOMOUS-CARS%EF%BC%9A-SELF-DRIVING-THE-NEW-AUTO-INDUSTRY-PARADIGM.pdf