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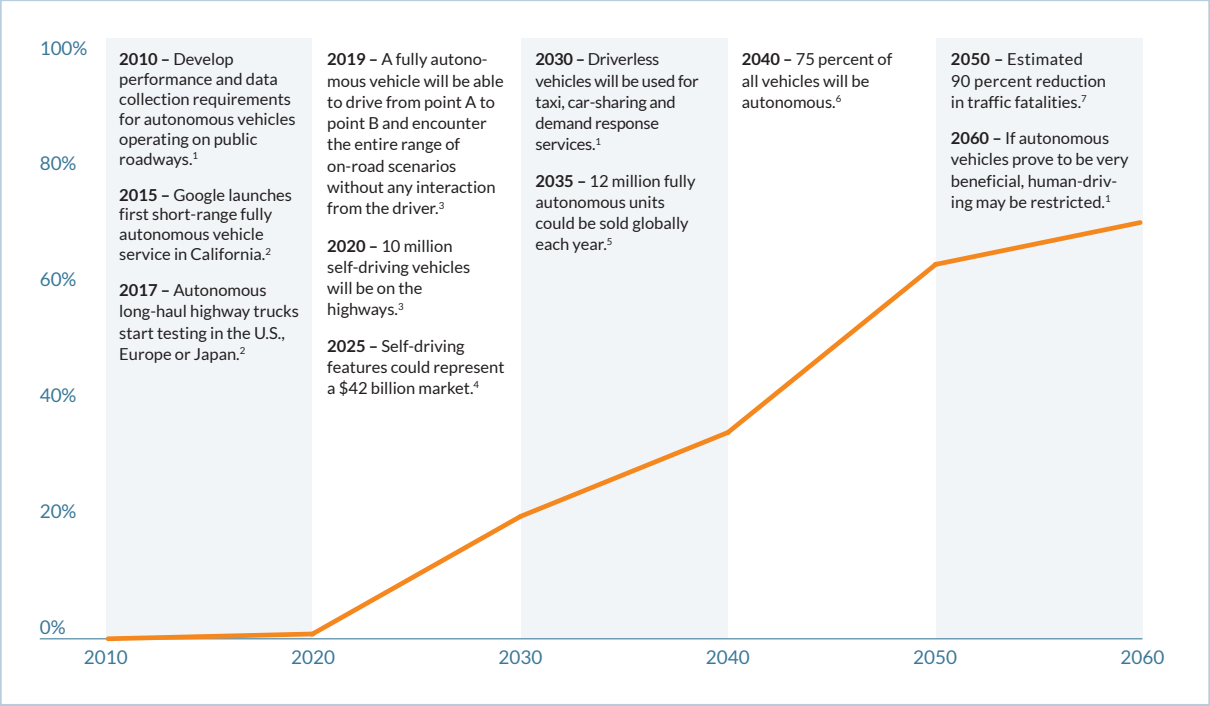
The Evolution of Autonomous Vehicles

***Emerging Risk Categories**: Technological, Economic & Societal*
***Key Industries Impacted:** Consumer Products & Services; Auto Manufacturing; Government; Financial Services; Technology, Media & Communications*

Research today predicts that by 2050 owning a smart autonomous vehicle will become the norm for consumers. The first big leap in introducing autonomous vehicles to the consumer market is expected in 2017 from Google, whose self-driving technology now costs a tenth of its original $80,000 price tag. Every major automotive manufacturer will likely follow by the early 2020s. Many of the key pieces of technology necessary for the manufacturing of autonomous vehicles are continuing to decrease in cost as the technology is perfected. And while the price of a self-driving car is still outside the price range of most consumers, investor interest continues to increase.

According to a University of Texas report, if 90 percent of the cars on roads in the United States were replaced by autonomous vehicles, the savings across various industries, such as automakers, insurers and the government, could reach as high as $450 billion. This would be a huge incentive for policymakers to clear the way for self-driving cars in the future. The full adoption of autonomous vehicles will likely take decades, but the anticipated safety, economy and convenience will no doubt help speed up the process.

Estimated Percentage of Autonomous Vehicle Adoption, and Key Milestones



Adoption curve source: *Autonomous Vehicle Implementation Predictions*, Victoria Transport Policy Institute, December 2015: www.vtpi.org/avip.pdf.

Milestones sources:

1 www.vtpi.org/avip.pdf

2 www.driverless-future.com/?p=678

3 www.businessinsider.com/report-10-million-self-driving-cars-will-be-on-the-road-by-2020-2015-5-6

4 www.marketwired.com/press-release/self-driving-vehicle-features-could-represent-a-42-billion-market-by-2025-1981515.htm

5 www.bcg.com/expertise/industries/automotive/autonomous-vehicle-adoption-study.aspx

6 www.carinsurancequotes.net/ieee-predict-that-75-of-cars-will-be-autonomous-by-2040/

7 www.fool.com/investing/general/2016/04/19/sorry-your-next-car-will-probably-be-smarter-than.aspx

Key Considerations and Implications

Widespread use of autonomous vehicles will affect a number of established sectors and industries. Below, we outline key sectors and the changes they are likely to experience.

INDUSTRY	IMPACT
 AUTOMOBILE MANUFACTURING & TECHNOLOGY	• Automated vehicles will cause an initial surge in new and used car sales, estimated at $600 billion a year globally, but sales could drop significantly once it becomes possible for unmanned cars to be summoned via an app and shared by multiple people. Parallel with this, there will be a market for technology designed to retrofit vehicles with self-driving abilities. A startup company called Otto is developing a self-driving kit for trucks, which sells for $30,000. • Security is always a risk with newly introduced technology. Car manufacturers will need to ensure cybersecurity vulnerabilities in the technology used to build out autonomous vehicles is properly addressed and assessed once adoption becomes widespread. As more and more cars connect to the internet, the attack surface for hackers will increase, providing them with a greater incentive to invest in car-hacking skills and with a greater return on their efforts. • Currently, automakers are limited in testing their vehicles in real-life conditions, due to a legal proposition which states that a human must be "in control" of a vehicle. U.S. regulators are making some progress toward guidelines for testing self-driving vehicles on roads shared with human drivers, such as allowing automakers to apply for exemptions to the rules in order to advance progress. Google recently received guidance clarifying that its software used to control the self-driving vehicle can be considered a "driver." However, progress remains slow, partly because states make their own road laws.
 INSURANCE	• As cars become automated, accidents are expected to decrease, and car owners are expected to incur less insurance costs, leading to less coverage over time. A study by the Eno Centre for Transportation estimates that if 90 percent of the cars on American roads were autonomous, the number of accidents would fall from 5.5 million a year to 1.3 million, and road deaths from 32,400 to 11,300. Customer premiums could drop as much as 60 percent in 15 years as adoption increases. • The auto insurance industry will not disappear altogether, as cars will still face risks such as flooding, damage or theft; however, the underwriting process will change. The traditional underwriting criteria, such as miles one expects to drive, will still apply, but the model, make and style of the car will assume greater importance. In the short term, insurer premiums will remain the same until insurers actually see declines in accident frequency. Over the long run, insurance companies will need to adjust their business strategies to reflect the reality of fewer accidents. Those that can't will likely exit the market.
 LAW ENFORCEMENT	• Autonomous vehicles have the potential to cut police forces in half. According to the Bureau of Justice Statistics most recent survey, more than 85 percent of the 31 million people who were involuntarily stopped by the police in 2011 were stopped for traffic-related reasons. The need for these activities could decrease significantly with the adoption of autonomous vehicles since they will be programmed to obey all traffic rules. • Reducing the number of officers can have a negative impact on safety and crime, however. About 4 percent of all drivers stopped for traffic violations each day are also searched by the police, often resulting in the discovery of more serious crimes. This crime-fighting opportunity may be reduced with driverless cars.
 GOVERNMENT	• Once self-driving vehicles become available, ordinary cars will gradually be banned, starting with city centers, business parks and campuses. Car-sharing services will increase, causing the number of cars on the road to drop. Initially, government revenues may decrease due to the elimination of licensing fees, taxes and tolls, and a reduction in fines from traffic violations. • With fewer cars on the road, the existing roadway infrastructure would be used more efficiently and the need for new roadways may decrease. Even though road repair will still be necessary, the federal and state governments may be able to reallocate a good portion of the roughly $30 billion spent annually on new roads and highways. • For local governments, active police forces comprise 5 percent of their spending. A reduction in law enforcement staff, as explained above, would mean more money in local and state budgets. The potential savings that autonomous vehicles present is the main reason the government has proposed almost $4 billion for automated vehicle research over the next decade, even with the initial decline of revenue.

Spotlight: Autonomous Semi-Trailer Trucks

The adoption of autonomous semi-trailer trucks, aka "big rigs" in the U.S., has progressed much faster than the adoption of autonomous cars. The main benefits that self-driving trucks present are safety, reduced labor demand and fuel efficiency.

- Autonomous trucks have the potential to save thousands of lives by eliminating driver fatigue — the key factor in the 4,000 deaths caused by truck accidents each year. The U.S. Congress is already pushing for stricter trucking regulation in 2016 that will limit operating times for truckers — an unpopular idea for trucking companies already short on drivers. The safety issues presented by fatigued drivers can be solved by utilizing autonomous trucks instead.
- Autonomous trucks can significantly alleviate driver shortage, or eliminate the need for drivers altogether. Truck driver shortage is estimated at more than 50,000 drivers currently, and could exceed 100,000 drivers in a few years. Self-driving trucks are not expected to eliminate drivers in the short term, but within the next 5-10 years it is expected by some that long-haul drivers will be 100 percent replaced.
- Self-driving trucks will increase fuel and driver efficiency. Because trucks will be able to communicate with one another and with other autonomous vehicles, they will navigate traffic more quickly, increasing fuel efficiency as a result.
- For truck drivers, adopting autonomous trucks represents the elimination of their jobs. Already there are a number of groups campaigning against autonomous trucks, including the International Brotherhood of Teamsters labor union. Businesses that rely on truck drivers for income, such as restaurants and motels along highways, may also be negatively impacted.

Spotlight: Spotlight: Unmanned Vehicles via App

With the adoption of autonomous vehicles, it will be possible for unmanned cars to be summoned, via app, to a given location. This will not only reduce road congestion and accidents, but impact the lives of people of all ages. Various industries may be altered or may diminish in importance due to the new ease of transportation.

- Self-driving cars can significantly change the lives of people who are blind, disabled or too young to drive by giving them independence, social interaction and access to essential services. Drunk-driving fatalities will decrease significantly due to the ease of hailing transportation. This will not only save the lives of drivers, but create safer surroundings for cyclists, pedestrians and bystanders.
- People will benefit from hands-free driving by gaining time to be more productive while in transit, as they do not need to be making actual decisions behind the wheel. Commute time will be shortened due to fewer accidents and more efficient routes.
- Ride-sharing services have already upset the taxi industry, and the need for taxi drivers will continue to decrease with the encroachment of self-driving cars. Companies such as Uber would benefit greatly from the ability to summon vehicles where needed without having to pay drivers; however, they would still need to upfront the costs of owning their fleets. Uber will be deploying a test vehicle in the near future to advance its driverless car goals. It is unclear yet what legal implications Uber could face in shifting toward an autonomous vehicle fleet. What is clear, however, is that a future Uber that no longer needs drivers will affect those individuals currently relying on income as Uber drivers.
- The demand for expanded public transportation could decrease as autonomous vehicles would be able to service out-of-the-way locations that currently lack public transportation services. Domestic and short-haul flights will face competition from on-demand cars, as many people may choose the convenience of being picked up and driven by an autonomous car the entire way.
- The real estate industry could undergo changes as the ease of transportation may shift the demand for property back to the suburbs. In addition, the need for parking will decrease as driverless car fleets will be moving continuously between places, rather than taking up parking spots.

Where to Learn More

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