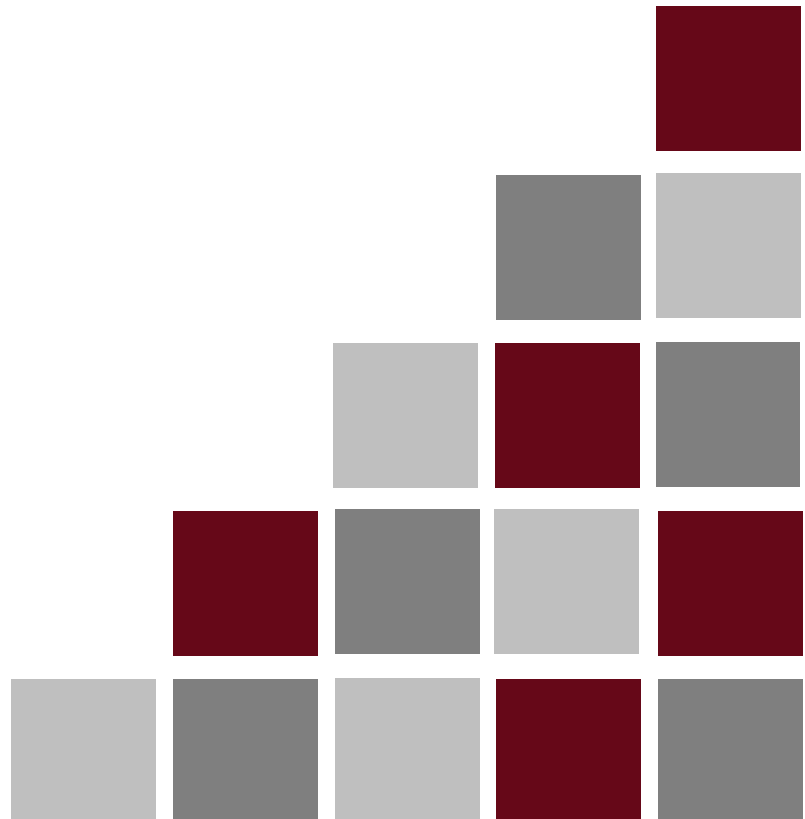


# Principles by IUCG:

*Exploring Disruptive Trends in the  
Automotive Industry*

Alex Jacobs, Heather Stratton, Haylee Whiteley

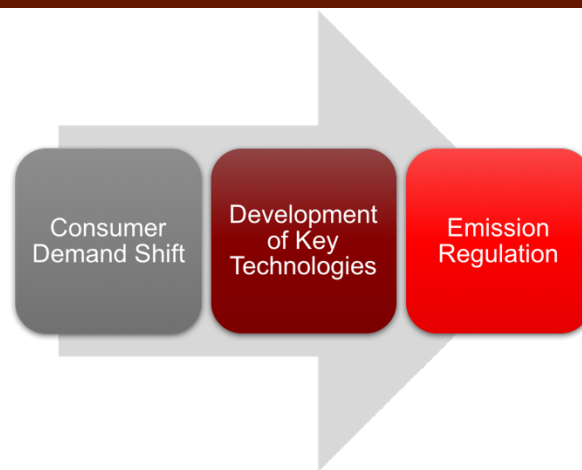


## CURRENT STATE

On the surface, the automotive industry seems to be trending in the right direction. In 2017, automotive sales reached an all-time high at 88 million, a 4.8% increase from 2016.<sup>1</sup> In addition to record sales, Original Equipment Manufacturers (OEMs) enjoyed margins at their highest rate in the last decade. Total shareholder returns (TSR) from 2013 to 2017 are lower than the market average, showing the industry is underperforming.<sup>1</sup> These figures tell two conflicting stories. One of an industry enjoying record sales and productive margins and the other of an industry that is an unattractive space for investors.

This disparity can be explained by emerging trends that are changing the landscape of the automotive industry: electrification, shared mobility, connectivity and automation. Investment in preparation for these costly changes could explain the low TSR. The automotive industry is currently at a crossroads. OEM's who are willing to adapt to these rapidly approaching changes will prosper, while those who cannot will struggle.

## ELECTRIFICATION



When considering the direction that the automotive industry is headed, it is impossible to ignore the emergence of electric vehicles (EVs). Currently, EVs account for about 1.47% of vehicles in automotive markets across the globe. However, by 2040 EVs are expected to make up as much as 50% of vehicles on the roads.<sup>2</sup> Electrification of the automotive industry will become a highly disruptive trend,

forcing automakers to adapt quickly due to a shift in consumer demand, rapid development of key technologies, and increasing regulations of automotive emissions.

### ***Consumer Demand Shifting in Favor of Electric Vehicles***

A rapid increase of EV sales in recent years shows the demand for EVs are increasing. Even though sales have increased, there is still a large market EVs have yet to penetrate. In a study done by McKinsey to gain insight on consumer relationships with EVs, 44% of consumers in the U.S would consider buying an EV.<sup>3</sup> This figure shows high levels of demand. In the U.S., 50% of consumers were familiar with EVs. This figure could increase dramatically with increased availability of information. Consumers are also becoming excited by companies like Tesla, sending EVs into the public eye. The record high pre-sales of the Tesla Model 3 show that heightened consumer excitement is translating to increased demand.

### ***Development of Key Technologies***

Some of the most prominent barriers to entry for EVs derive from the current state of technologies that are vital to successful market penetration. There are three key developments in technology that will make EVs competitive with Internal Combustion Engine (ICE) vehicles: decreasing cost of battery packs, increasing availability of charging stations, and increasing battery range.

- A. Decreasing Cost of Battery Pack:** Battery packs account for one third of the total cost of an EV. The high cost of these battery packs is the main reason EVs tend to be more expensive than ICEs.
  - a. From 2010 to 2017, the average price of a battery pack has decreased by roughly 80%.
  - b. <sup>4</sup>This trend should continue as research and development increases.
  
- B. Increasing Availability of Charging Stations:** One major competitive advantage that ICEs hold over EVs is the convenience of “filling up”.
  - a. Gas stations are currently significantly more available to consumers than EV charging stations.
  - b. Charging station availability in the U.S. has increased dramatically since 2011. This trend is projected to continue with global charging stations increasing from about 2 million in 2016 to almost 12 million in 2020.<sup>5</sup>

- C. Increasing Range:** The development of larger battery packs has allowed the range of popular EV models to increase significantly.
- a. From 2016 to 2017, the range of the Tesla Model S increased from 208 to 249 miles, the Nissan Leaf went from 84 miles to 107 miles and the Chevrolet Bolt improved from 53 miles to 238 miles<sup>6</sup>.
  - b. These increases will solve one of the most significant factors keeping consumers from purchasing an EV.

### ***Impact on Automotive Industry***

- A. Decrease in demand for ICE vehicles:** Currently, EVs account for about 1.47% of vehicles on the road globally. This figure is predicted to increase to anywhere from 10% to 50% by 2040<sup>9</sup>. This will significantly decrease demand for ICE vehicles which make up a vast majority of products that automakers currently offer.
- B. Changing product lines:** Manufacturers will be forced to respond to this shift in demand by developing a fleet of EVs. This process will require automakers to develop knowledge about a product line that is significantly different from their current offerings. For OEMs, this will mean broadening their product selection to incorporate EV specific parts. This will create a space for EV specialized OEMs to capture market share, and will produce increased competition.
- C. Rise in manufacturing costs:** Once this transition begins, automakers will be faced with a transition period in which they will be manufacturing both ICE vehicles and EVs. This will require a massive initial investment for both OEMs and automakers in the form of research and development and acquiring the appropriate resources to create new products. The average manufacturing cost to produce a vehicle has risen by about 20% in the last decade<sup>10</sup>. These costs will be highly disruptive in an industry that is already operating at fairly thin margins.

## SHARED MOBILITY

### ***Trends Driving Shared Mobility***

Shared mobility is the idea that a driver or rider can utilize a vehicle that is not theirs to get to a destination. There are two types of shared mobility: ride hailing and car sharing.

### Ride Hailing

- *Driver and rider meet up on demand using an app (like Uber)*
- *OEM creates membership program*

### Car Sharing

- *Peers find a peer to rent their car to using an app*
- *Companies have a fleet of cars members can rent on demand*

### Driving Forces

Shared Mobility is already popular in its current form as it is a \$23 billion market in the United States. Every year for the past five years, the amount of shared mobility users has increased 30%, which has led to 338 million total users worldwide<sup>11</sup>.

There is great demand for shared mobility to become more popular than it already is. The preferences of current demographics point towards the use of shared mobility. Between the year 2000 and 2015, there was a 5% decrease in license holders between age 17 and 24<sup>12</sup>. This trend shows a license is becoming less of an essential, which will increase demand for travel alternatives.

Traveling has become more diverse as the average urban dweller uses three modes of transportation to get to their destination<sup>12</sup>. While ride hailing is currently used as one of the three modes of transportations (especially for social destinations), its convenience is helping it rapidly become a more popular option. The main reason shared mobility is expected to have an effect on the automotive industry is the volume of shared mobility users. The demographic that uses shared mobility the most is young and urban with a moderate income. The largest demographic group in the world right now is young, moving to urban areas and becoming increasingly wealthy.

While cultural effects may abate the adaption of shared mobility in western countries, the population in developing countries will overtake the slow growth experienced in the western countries. Due to the match in user and world demographics, the preferences of users worldwide and the current demand, it is predicted that by 2030 one in every ten cars sold could be used for the purpose of ride hailing or car sharing<sup>13</sup>.

### ***Impacts of Shared Mobility***

It is predicted that by 2030 there will be a 24% increase in the number of miles a car travels which will affect the industry in two main ways<sup>13</sup>.

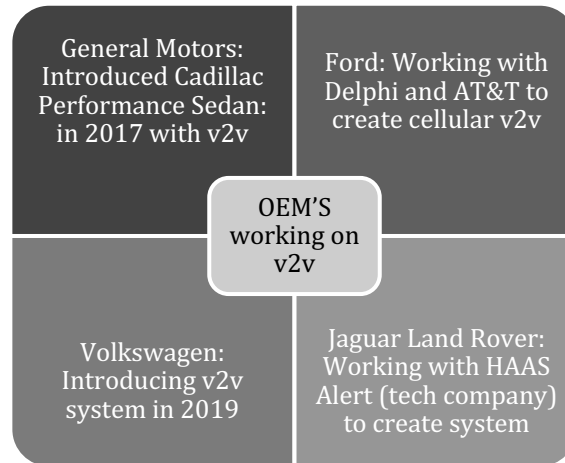
- A. Evaluation of the Industry:** A company's willingness to adjust to the disruptive trend of shared mobility will be judged by how many miles their cars travel because that will show their future likelihood of profit. If an OEM's car travels more miles, then the OEM will be more likely to sell cars in the future because the miles show the OEM is keeping up with the disruptive trend of shared mobility. Currently, the industry is evaluated based off of how many cars are sold. For an accurate picture of the industry, mileage per car must be used when evaluating sales.
  
- B. Competition in New Spaces:** As diverse mobility becomes a more popular trend, OEM's are starting to come into the shared mobility space with their own niche. BMW recently bought a carsharing and ride hailing program called *ReachNow*. With this program, BMW is now competing with technology companies such as Uber, which is non-traditional competition for an OEM. In terms of OEM to OEM competition, they will be competing for programs and implementation of shared mobility which is a new way for them to compete for making and selling cars.

## CONNECTIVITY

### ***Consumer Trends Driving Connectivity***

Connectivity lets cars on the road communicate with one another. The innovation is currently occurring with a technology called vehicle to vehicle (v2v). V2v lets cars talk to each other across 300 meters and analyze 10 messages per second from other cars about steering wheel position, brake status, speed and road conditions<sup>14</sup>. The main issue with v2v technology is that in order for it to work with a small margin of error, 100% of cars on the roads must have the technology.

The demand from consumers for connectivity to succeed due to safety concerns. In 2016 there were 37,461 fatal crashes on United States roads, which was a 5.6% increase in fatalities from 2015<sup>15</sup>.



### ***Impacts of Connectivity***

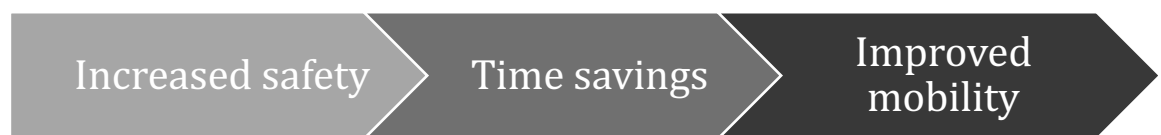
Connectivity is already starting to transform the roads and the industry. Within the next two years, it is expected that technology could account for 20% of a car's value<sup>1</sup>. This is a big change for an industry that previously only made car parts. With this change, OEM's, developers, and automobile service providers room to improve the technology in the car and add value. OEMs will have the opportunity to make the car a service and a product for the consumers in a way they never have before. The largest impact of connectivity however, is the way in which it will allow for autonomous vehicles to enter the industry.

## Autonomous Vehicles

Once a figment of the imagination, autonomous vehicles are now a real force in the automotive industry.

### ***Driving Forces for Automation***

The potential benefits of automation will be the moving factor for society's large-scale acceptance and usage of these vehicles. There is a large opportunity to improve the consumer experience through increased safety, time savings, and improved mobility.



- A. Increased Safety:** Perhaps the most important driving force for autonomous vehicles is the ability to save lives.
- a. Automotive industry accounts for 37,461 deaths per year by motor vehicle crashes in the United States alone.<sup>17</sup>
  - b. 94% of car accidents in the United States are due to human error.<sup>18</sup>
  - c. Vehicle crashes in the United States cost an estimated \$242 billion in economic activity due to loss of life, lost workplace productivity, and decreased quality of life because of injuries.<sup>19</sup>
- B. Time Savings:** The strong possibility for increased time savings will be another benefit of automation.
- a. An average commuter in the United States spends 42 hours in traffic per year.<sup>20</sup>
  - b. Self-driving cars will work to eliminate traffic and allow for smoother driving, better connection, and reduced accidents.
- C. Accessible Mobility:** Several populations in the United States have limited access to the transportation they need. Autonomous vehicles provide a new option for these people.
- a. 49.2 million Americans are over the age of 65 and an estimated 53 million Americans have some form of disability.<sup>18</sup>
  - b. Populations with low incomes and those without a driver's license must also be considered.
  - c. Autonomous vehicles provide a reasonably priced, safe and efficient option for the elderly, disabled, and younger populations to access transportation.

### ***Key Use Cases***

**Freight Trucking:** The first major use case for autonomous vehicles involves freight trucking, which provides a beneficial opportunity for increased delivery efficiency. On average, a freight truck spends less than a third of a day traveling on the road.<sup>21</sup> With the development of self-driving vehicle technology, these trucks could be on the road for increased hours per day, resulting in a more efficient transportation of goods. The freight trucks would be self-driving on the longest and most simple part of the delivery process, and then pick up a human driver at a transfer hub to complete the final miles of the trip. This would allow truck drivers to keep their jobs.



**Robo-Taxis:** A robo-taxi is a driverless taxi operating for an on-demand mobility service. Robo-taxis have the potential to be low-cost for consumers because there is no labor cost associated with use. In addition, with the large possibility that automation will go hand-in-hand with electrification, costs can potentially be even lower for riders. These self-driving taxis will have a large societal impact for current populations with limited transportation accessibility.

### ***Impact on the Industry***

**A. Increase in Vehicle Mileage:** Autonomous vehicles will see increased mileage due to the increased usage by robo-taxis and increased accessibility. Also, on-demand driving will result in frequent journeys with no passengers at all. This will occur with both ride sharing and private autonomous vehicles. Increased vehicle mileage could result in higher vehicle turnover rates, ultimately affecting costs.<sup>22</sup>

**B. Decrease in Personal Vehicle Sales:** The populations that previously had few mobility options, will now have the opportunity to use shared, self-driving vehicles, rather than owning personal vehicles. It is estimated that the various forms of mobility could lead to a possible reduction in inventory in the United States from 270 million in 2017 to 212 million in 2030. In 2030, almost 7% of the remaining inventory could be shared vehicles and 10% of the vehicle inventory could be autonomous.<sup>22</sup> Now as much as ever, the industry will need to be flexible to the customers changing needs and preferences in order to remain successful.

## RECOMMENDATIONS

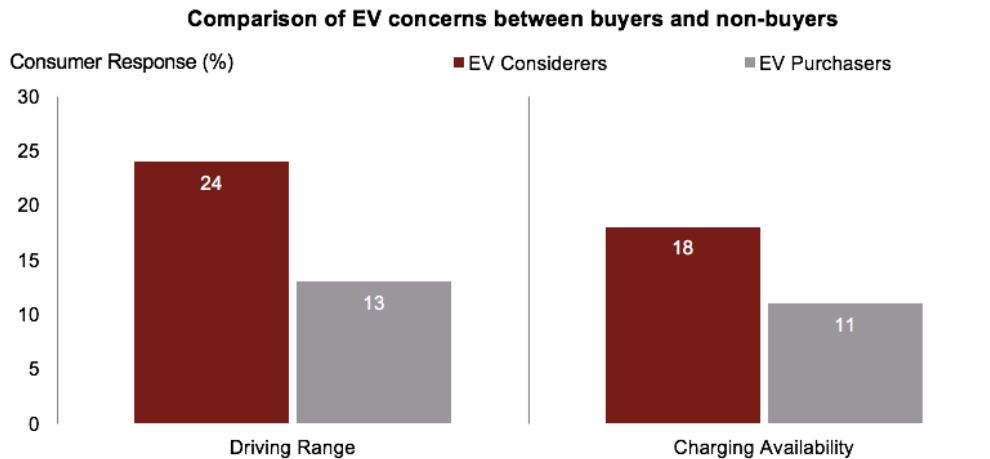
### ***Prepare for Shift to Electric Vehicles (EVs)***



## Understand EV Market

In order to successfully transition into the EV market, automakers will have to target specific markets that will be profitable while consumers begin to consider EVs. Currently, consumers that are buying EVs are predominantly either luxury consumers who can afford high prices, or lower budget consumers who are early adopters of green technology. The next group of consumers that automakers can target include urban commuters seeking a vehicle with low total cost of ownership (TCO) and high-tech consumers looking to purchase a status symbol.

Once these groups have been identified, a targeted marketing campaign will be effective to overcome some key barriers to entry. In a McKinsey consumer survey, consumers who were considering buying a vehicle were much more concerned about barriers such as range and charging availability than consumers who have already purchased a vehicle. These results mean that increasing consumer awareness will result in higher sales volume.



Source: [McKinsey&Co](#)

## Accommodate High Costs

Increasing manufacturing costs involved in a transition to EVs will force automakers to create creative strategies to get the most out of their available capital. One strategy to help save money is consolidation among OEMs. This industry has historically been extremely protective of manufacturing practices and methods due to the high rate of competition in the industry. Consolidation, while producing parts such as transmissions (which are extremely similar across many vehicle models), will help save money during the manufacturing process.

Another strategy to help accommodate high costs is targeting different markets from the classic individual car owner. Automakers can take advantage of alternative markets such as e-hailing and car sharing services. E-hailing fleet operators will prefer the lower TCO associated with EVs, and consumer excitement around EVs will make e-hailing even more popular. These alternative markets will help recover revenues lost to high manufacturing costs.

### **Launch Fleet of EVs**

Once target markets have been established and costs have been considered, automakers will have to develop and launch a fleet of EVs. In order to enter this new space, knowledge will have to be acquired concerning the necessary components and manufacturing practices that will be required to make a quality product. This information can be acquired through investment in research and development, or mergers with companies that have the necessary technologies and skills. Once vehicles have been developed, investment in charging infrastructure on both a private and public basis will help transition consumers from ICE vehicles to EVs. This investment will be returned through higher sales as a result of overcoming charging availability as a barrier to entry.

### ***Prepare for New Strategic Areas***

Preparing for new strategic areas of focus will be in every businesses' best interest. The main goal of auto manufacturers will remain the same: sell cars. However, in order to do this, they must find new ways to create demand for their cars. Customers are already changing their purchasing behavior. Most are well-educated, and in order to prepare for new strategic areas, the industry must stay relevant with market trends. Research must be done to stay up to date with everything surrounding the customer. Technology must continue to develop to cater to their needs and preferences. Also, it is important to note that customers will no longer solely be individuals. Increasingly, it has become common for other companies to buy multiple cars to add to their fleets. Now more than ever, it is imperative to truly understand the customer and develop new technologies and products based on their needs and preferences.

## REFERENCES

1. Singh, Akshay, et al. "2017 Automotive Trends." *Strategy& - the Global Strategy Consulting Team at PwC*, 1 Mar. 2017, [www.strategyand.pwc.com/trend/2017-automotive-industry-trends](http://www.strategyand.pwc.com/trend/2017-automotive-industry-trends).
2. "Why the Market Isn't Sweating the Decline in U.S. Auto Sales." *Why Do the Right Here Continually Condemn Nazis but the Left Never Condemns Antifa? - Discussionist*, [www.discussionist.com/10209367](http://www.discussionist.com/10209367).
3. Hertzke, Patrick, et al. "Dynamics in the Global Electric-Vehicle Market." *McKinsey & Company*, [www.mckinsey.com/industries/automotive-and-assembly/our-insights/dynamics-in-the-global-electric-vehicle-market](http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/dynamics-in-the-global-electric-vehicle-market).
4. "Electric Vehicle Battery: Materials, Cost, Lifespan." *Union of Concerned Scientists*, [www.ucsusa.org/clean-vehicles/electric-vehicles/electric-cars-battery-life-materials-cost](http://www.ucsusa.org/clean-vehicles/electric-vehicles/electric-cars-battery-life-materials-cost).
5. "Automotive." *British Standards Institution (BSI) Standards | IHS Markit*, [ihsmarkit.com/industry/automotive.html](http://ihsmarkit.com/industry/automotive.html).
6. Gilboy, James. "New 670-Mile Tesla Range Record Set." *The Drive*, 4 Aug. 2017, [www.thedrive.com/sheetmetal/13221/new-670-mile-tesla-range-record-set](http://www.thedrive.com/sheetmetal/13221/new-670-mile-tesla-range-record-set).
7. "Final Rule for Model Year 2012 - 2016 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards." *EPA*, Environmental Protection Agency, 10 Apr. 2018, [www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-model-year-2012-2016-light-duty-vehicle](http://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-model-year-2012-2016-light-duty-vehicle).
8. "Climate Change in the American Mind - October 2017." *Yale Program on Climate Change Communication*, [climatecommunication.yale.edu/publications/climate-change-american-mind-october-2017/](http://climatecommunication.yale.edu/publications/climate-change-american-mind-october-2017/).
9. Plumer, Brad, and Jim Tankersley. "Renewable Energy Is Surging. The G.O.P. Tax Bill Could Curtail That." *The New York Times*, The New York Times, 7 Dec. 2017, [www.nytimes.com/2017/12/07/climate/tax-overhaul-energy-wind-solar.html](http://www.nytimes.com/2017/12/07/climate/tax-overhaul-energy-wind-solar.html).
10. "The Road to 2020 and beyond: Whats Driving the Global Automotive Industry." *McKinsey & Company*, [www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-road-to-2020-and-beyond-whats-driving-the-global-automotive-industry](http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-road-to-2020-and-beyond-whats-driving-the-global-automotive-industry).
11. Fund, Collaborative. "The Future of Car Sharing." *Car Sharing, Collaborative Consumption, Zipcar, Igo Cars, Citycarshare, Social, Sustainable, Transportation, Community, Car Ownership*, [futureofcarsharing.com/](http://futureofcarsharing.com/).
12. PricewaterhouseCoopers. "Automotive." *PwC*, [www.pwc.com/gx/en/industries/automotive.html](http://www.pwc.com/gx/en/industries/automotive.html).
13. Gao, Paul, et al. "Disruptive Trends That Will Transform the Auto Industry." *McKinsey & Company*, [www.mckinsey.com/industries/automotive-and-assembly/our-insights/disruptive-trends-that-will-transform-the-auto-industry](http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/disruptive-trends-that-will-transform-the-auto-industry).

14. Knight, Will. "Networked Cars Will See Accidents Before They Happen." *MIT Technology Review*, MIT Technology Review, 8 July 2015, [www.technologyreview.com/s/534981/car-to-car-communication/](http://www.technologyreview.com/s/534981/car-to-car-communication/).
15. NHTSA. "USDOT Releases 2016 Fatal Traffic Crash Data." *NHTSA*, NHTSA, 23 Apr. 2018, [www.nhtsa.gov/press-releases/usdot-releases-2016-fatal-traffic-crash-data](http://www.nhtsa.gov/press-releases/usdot-releases-2016-fatal-traffic-crash-data).
16. Ingraham, Christopher. "The Astonishing Human Potential Wasted on Commutes." *The Washington Post*, WP Company, 25 Feb. 2016, [www.washingtonpost.com/news/wonk/wp/2016/02/25/how-much-of-your-life-youre-wasting-on-your-commute/?noredirect=on&utm\\_term=.89b0e117a95e](http://www.washingtonpost.com/news/wonk/wp/2016/02/25/how-much-of-your-life-youre-wasting-on-your-commute/?noredirect=on&utm_term=.89b0e117a95e).
17. "General Statistics." *IIHS*, [www.iihs.org/iihs/topics/t/general-statistics/fatalityfacts/overview-of-fatality-facts](http://www.iihs.org/iihs/topics/t/general-statistics/fatalityfacts/overview-of-fatality-facts).
18. "Automated Vehicles for Safety." *NHTSA*, NHTSA, 13 Apr. 2018, [www.nhtsa.gov/technology-innovation/automated-vehicles-safety](http://www.nhtsa.gov/technology-innovation/automated-vehicles-safety).
19. Frank, Jacqui. "Here's How Much Time and Money You Waste Sitting in Traffic a Year." *Business Insider*, Business Insider, 23 Feb. 2017, [www.businessinsider.com/time-money-spent-traffic-per-year-us-cities-new-york-los-angeles-san-francisco-atlanta-2017-2](http://www.businessinsider.com/time-money-spent-traffic-per-year-us-cities-new-york-los-angeles-san-francisco-atlanta-2017-2).
20. *An Analysis of the Operational Costs of Trucking: 2017 Update*. [atri-online.org/wp-content/uploads/2017/10/ATRI-Operational-Costs-of-Trucking-2017-10-2017.pdf](http://atri-online.org/wp-content/uploads/2017/10/ATRI-Operational-Costs-of-Trucking-2017-10-2017.pdf).
21. UberATG. "The Future of Trucking: - UberATG - Medium." *Medium*, Augmenting Humanity, 1 Feb. 2018, [medium.com/@UberATG/the-future-of-trucking-b3d2ea0d2db9](https://medium.com/@UberATG/the-future-of-trucking-b3d2ea0d2db9).
22. PricewaterhouseCoopers. "Five Trends Transforming the Automotive Industry." *PwC*, [www.pwc.com/gx/en/industries/automotive/publications/eascy.html](http://www.pwc.com/gx/en/industries/automotive/publications/eascy.html).