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Tyrrell Keim

Artificial Intelligence and the Trucking Industry: How Many Jobs Are At Stake?

Abstract

As of 2018, the Trucking industry in America employed over 3 million drivers and brought in almost \$800 billion dollars. A third of these costs to the industry are in labor, with the average driver making about \$22 an hour. How much of this cost could be minimized with the use of artificial intelligence in order to make the industry more profitable? Andrew Yang, an early candidate for the Democratic nomination for the U.S. Presidency (since dropped out), was the first political candidate in recent memory to speak of the potential pitfalls and job loss that automation could potentially bring to an industry, specifically for truckers. Could automation truly put a lot of workers in this industry out of a job? If so, when can we expect these changes to occur and at what rate? In this paper, I'll discuss the potential overall impact that artificial intelligence could have on the trucking industry and it's employees in the near to intermediate future.

Artificial Intelligence Background

Artificial Intelligence, abbreviated AI, revolves around the idea of building smart machines that can perform jobs that typically need human intelligence to carry out. This area of computer science began with Alan Turing, a mathematician, after World War II. In 1950, Turing released a paper titled "Computing Machinery and Intelligence" in which he asked the question: "Can Machines Think?" (Selmer and Govindarajulu). This began the fundamental thinking behind artificial intelligence, which has only evolved since the mid-20th century.

In 1995, Stuart J. Russell and Peter Norvig defined AI as "the study of agents that receive precepts from the environment and perform actions" in their textbook *Artificial Intelligence: A Modern Approach*. According to Russell and Norvig, four approaches define the science of AI: Thinking humanly, thinking rationally, acting humanly, and acting rationally (Norvig and Russell). Now, after the field has been explored and evolved, artificial intelligence has been incorporated into the daily lives of those in modern society.

Examples of AI in everyday life include the likes of smartphone assistants "Siri" and "Alexa" (from Apple and Amazon, respectively), drones, email spam folders, and customized ads on social media. By taking in information, processing it, and producing a result, AI has proven itself to be extremely useful in everyday life. However, the extent of AI's usefulness continues to expand as time moves on. Smartphone assistants were revolutionary when their debut came in 2010 with "Siri" for Apple's iOS operating system, but that technology pales in comparison to the self-driving cars rolled out and tested by the likes of Toyota, Mercedes, and later, Tesla. These autonomous cars "rely on sensors, actuators, complex algorithms, machine learning systems, and powerful processors to execute software" which enables them to properly execute driving on public roads ("Everyday Examples of Artificial Intelligence and Machine Learning"). Sensors on the vehicle spot everything, like road signs, stop lights and defined lines on the road, taking in all this information in order to safely transport those inside. Artificial Intelligence perfectly represents the evolving world of technology that continues to progress.

The Current State of Trucking

The trucking industry is an extremely vital part of commerce in America, and could definitely lay claim to being the backbone of the American economy. Everything from electronics to milk and produce are delivered nationwide by truckers, with thousands of shipments being made each day. With over 3 million truck drivers in the United States, each averaging driving 105,000 miles a year, "trucking makes up the largest portion of the American transportation industry - about 27 percent" ("Incredible Facts About Trucking").

2018 was a great year for the industry, partly because of the on-going trade war between the United States and China. In 2017, the trade war threatened a 25% increased tariff rate on about \$200 billion worth of goods from China ("Trucking Market Update and 2020 Q1 Freight Outlook"). As a result, vendors and suppliers alike took the initiative to import goods ahead of the implementation of the tariff. This resulted in an influx in demand for freight services, yielding historic highs. However, just a year removed, 2019 painted a very different picture. Because companies have built up their supply chains ahead of this tariff increase, the increase itself greatly lessened shipping volumes to combat the fall in demand. According to an article from *Business Insider*, "Loads on the spot market, in which retailers and manufacturers buy trucking capacity as they need it, rather than through a contract, have fallen by a chilling 62.6% (in 2019)" ("Trucking Market Update and 2020 Q1 Freight Outlook"). Through just the first six months of 2019, about 640 trucking companies were forced to close their doors following bankruptcies. This closure figure in just half of a year eclipsed the full-year marks of 2018. The outlook for the rest of 2020 is cloudy, with both the upcoming 2020 United States Presidential election and the worldwide COVID-19 pandemic taking hold. The U.S. is operating at about 82% of normal transportation capacity due to current events, with this dropping to as low as 63%

in areas like New York and New Jersey (“The impact of COVID-19 on commercial transportation and trade activity”). With no sure-fire end to the coronavirus fears in sight, it seems as if commercial transportation will continue to take a hit and have subsequent job losses throughout the remainder of the year.

AI and the Trucking Industry

As artificial intelligence continues to spread throughout corporations as a tool to reduce the costs of labor, the market for commercial transportation doesn't seem to be an exception. Doom and gloom surrounding the integration of AI in the trucking industry has been present for years, with politicians beginning to prepare for what seems to be an eventual mass-layoff of drivers. The clearest example of this would be Andrew Yang, who participated in the 2020 democratic primaries, in which he sounded the alarm for the future of truckers. Yang fears autonomous trucks will put a mass amount of workers in the industry out of a job, echoing widespread fears of massive layoffs. In an article submitted to *Economics*, Yang details how the autonomous driving revolution could be upon us sooner than we think. “Trucks that drive themselves are already rolling out around the world. Self-driving trucks successfully made deliveries in Nevada and Colorado in 2017. Rio Tinto has 73 autonomous mining trucks hauling iron ore 24 hours a day in Australia. Europe saw its first convoys of self-driving trucks cross the continent in 2016. In 2016 Uber bought the self-driving truck company Otto for \$680 million and now employs 500 engineers to perfect the technology. Google spun off its self-driving car

company Waymo, which is working on self-driving trucks with the big truck manufacturers Daimler and Volvo” (“Self-Driving Vehicles: What Will Happen to Truck Drivers?”).

Examples of progress within automation and trucking, on top of the overview provided by Yang, aren’t hard to come by. In December of 2019, a self-driving truck completed the first ever cross-country commercial freight run. Plus.ai, an automated trucking company, announced that one of its trucks was able to travel 2,800 miles, completely on its own, all the way from California to Pennsylvania loaded with Land O’ Lakes butter. The truck was equipped with deep learning visual algorithms, multimodal sensors, and simultaneous location and mapping technologies. Both an engineer and a safety driver were on board for the trip. In driving on numerous interstates through various weather circumstances, Plus.ai believes this shows “the system’s ability to safely handle a wide range of weather and road conditions” (“Autonomous Truck Makes Coast-to-Coast Run for Land O’Lakes”). Trucking technology company Locomotion has also been rolling out self-driving trucks between Oregon and Idaho. They use a two-truck convoy system, where one truck containing a driver leads another automated truck along the highway. This two-truck system is in place to help the following automated truck to stay within highway lines, avoid other vehicles, and properly change lanes. Founder of Locomotion, Cetin Mericli, said “the point is the autonomous truck is smart enough to keep everyone safe... whatever a human driver can do, our system can do (“No driver needed: Self-driving trucks are starting to move cargo on the nation’s highways”). A Swedish autonomous trucking startup, Einride, has been experimenting with remote truck operators taking control of multiple trucks at once. Einride plans to hire about 20 operators in the next year and a half, with the hope that they will be able to handle up to 10 trucks per operator at once. Operators

would work inside remote stations with screens and a steering wheel, and monitor vehicles while they are in autonomous mode. However, if a complex situation would arise in which the truck would need to be taken over, such as in the event of an obstacle, complex parking, or urban area driving, the operator would be able to take full control (Sawers).

Outlook on Job Security

A small amount of research would yield a lot of negativity regarding the prospects of future employment in commercial transportation. The technological advances and trials with autonomous vehicles have led experts to assume the worst, leading to hundreds of thousands, even millions, projected to be out of work in the coming decades.

In a report by Goldman Sachs Economic Research, they believe that U.S. drivers “could see job losses at a rate of 25,000 a month, or 300,000 a year”. This number is so high due to the fact that the report estimates that sales of autonomous and semi autonomous vehicles will share about 20 percent of total vehicle sales between the middle and end of this decade. This comes on the back of plenty of evidence showing car companies are increasingly looking towards the future in terms of their business plan. The former CEO of Ford, Mark Fields, was replaced in 2017 by board member and self-driving car expert Jim Hackett in an attempt to “transform Ford for the future” (Balakrishnan).

An article written by Tim Dickinson, titled “Death of the American Trucker”, paints a similarly bleak picture. From the decade between 2000 and 2010, the total output produced by American factories soared upwards, while subsequently cutting over five and a half million jobs.

It is determined that automation and tech advances caused about 88 percent of these layoffs. Furthermore, it appears as if the Trump administration is encouraging this crowding-out of non-automated vehicles. “Trump’s short-lived business advisory council was stocked with CEOs pushing the envelope of robotic trucking, including Uber and Tesla. Trump’s tax plan offers big breaks for investment in automation” (Dickinson).

Not only does Dickinson believe that the Trump administration’s policies are aiding the future of autonomous vehicles, but he believes outside economic forces are also at play. As the United States races to develop the technology of the future, so too does the rest of the world. TuSimple, a startup company based in China, is on pace to implement self-driving semi-trucks sometime during 2020 (Korosec). Rio Tinto, a mining company with operations all over the world, began deploying autonomous trucks to move ore in 2016. Volvo is also taking advantage of autonomous trucks to navigate deep, tricky mines in Sweden. This worldwide technological race is great for the United States as a whole, as this will push innovation and GDP to grow. Author of the Obama White House study on automation and Duke economist Victor Bennett agrees, saying “at an economy level, we’d like automation to happen as quickly as possible... but that’s really difficult for people whose jobs are in trucking” (Dickinson).

No matter the source, studies consistently report that a large amount of trucking jobs are destined to be lost. The International Transport Forum (ITF) released a study with a similar tone, predicting a loss of 50-70% of the demand for drivers in the U.S. and Europe as of 2030. With this in mind, they project anywhere from 4.4 million to 6.4 million professional driver jobs to become obsolete between the two countries. The ITF is an intergovernmental organisation, currently containing members from 57 different countries. The organization acts like a think tank

for future policy regarding transport ministers. In the event of such circumstances, the ITF recommends four items to prioritize going forward: “establish a transition advisory board to advise on labour issues, consider a temporary permit system to manage the speed of adoption, set international standards, road rules and vehicle regulations for self-driving trucks, continue pilot projects with driverless trucks to test vehicles, network technology and communications protocols” (“Managing the Transition to Driverless Road Freight Transport”).

A Silver Lining

Though many studies would suggest the worst in terms of job loss due to autonomous trucks, some would suggest reports are being blown out of proportion. In an article titled “Truck-Driving Jobs: Are They Headed For Rapid Elimination?” Maury Gittleman and Kristen Monaco contend that the projected number of trucker job losses are far overstated. A few key reasons drive this differing opinion. First, the actual core number of truck drivers that automation has the potential to impact are a lot smaller than being reported. Second, truck drivers also perform many key tasks that will still be in demand after the implementation of autonomous vehicles. Third, certain parts of trucking will be much harder to implement than others. An example of this would be long-haul segment trucking, or trucking which will force the driver to stay overnight. This sort of trucking will be the most practical to implement automation, yet only makes up a small amount of overall trucking assignments. Many short-trip assignments will still likely require the use of a human trucker. Keeping this in mind, it is suggested that only about

300,000-400,000 jobs, at the most, would be at the mercy of automation (Gittleman & Monaco, p. 22).

Conclusion

With the various viewpoints surrounding something as complex as emerging markets and the timeline of new technology implementation, the overall view point on just how many truck driver jobs are at stake is unclear. While AI is a great tool that assuredly aids the progression of efficiency and human progression, its overall reach in the commercial transportation industry could be lower than many assume. With estimates ranging from as high as 3 million American workers being laid off to as low as 300,000, the true impact most likely will not be seen until the end of the decade. While there are definitely concerns that a mass wave of unskilled workers could be out of a job, there are reasons to be cautiously optimistic about the severity of the impact of AI.

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