

# White Paper:

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## How Self-Driving Trains May Impact the Transportation Industry

### GTG Technology Group



*GTG Technology Group, LLC builds software to manage global transportation management systems (TMS) for all sizes of intermodal brokerage, and drayage transportation companies. GTG is dedicated to providing TMS solutions designed to provide end-to-end visibility and connectivity. GTG's software is delivered as a Cloud-based Software as a Service and was engineered to help businesses in the transportation industry overcome their challenges faster, more cost effective, and more efficiently.*

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## How Self-Driving Trains May Impact the Transportation Industry

Self-driving automobiles have been in the news a great deal lately. From Google's car in California to the Chrysler 200 that can steer the car back into the correct lane, this technology is becoming more common at a rapid rate, and advances in technology don't have to stop at passenger cars.

Other means of travel may be impacted by self-driving technology as well. For instance, we could soon see self-driving technology used in the rail industry. Though there would be benefits, there would likely be concerns about safety. Though we are still grappling with questions about benefits and concerns, the technology isn't slowing down. With driverless technology developing at such a rapid pace, a self-driven train may become a reality sooner than one would expect.

Let's start with the most important question. When and how could self-driving trains impact the transportation industry? It seems it has already begun. Driverless trains have been a reality in many countries for years. From Dubai to London, countries and their rail industry are looking to capitalize on this latest technological advancement. Some have begun using self-driving trains in the transit systems, and others are beginning to use it for industrial purposes.

As new technology is developed, it's imperative all industries explore how the new could be applied to their businesses. The transport and rail industries are no exception. When one considers how much impact self-driving technology could have on the rail and other industries, it becomes clear that this technology is the future. And the sooner this can be infused into the rail industry, the better.

Driverless technology offers many potential benefits to the rail industry. Some of these include cost-savings, increased efficiency, and increased punctuality. But there are also quite a few concerns about how this could impact railway workers and passengers. Some also have safety fears, since the trains would be complete automated. This article will outline the potential benefits of self-driving trains, as well as concerns that have come to light since this technology has been implemented in other regions.

## How Self-Driving Trains Work

The simplest way to explain how self-driving trains function is by saying they are trains that are completely computerized. The train's computer is controlled from a remote control center, instead of on the train itself. Lasers are used to track movement on the rails, and this information is sent back to the control room. Everything is monitored and controlled from one location instead of from inside the train.

Let's look at an [overview<sup>1</sup>](#) of how driverless trains function to get a better idea of how it works.

- **Trackside monitoring** – A computer is installed trackside to collect all data relating to train movements. It will calculate the movement of all trains. This information allows a schedule to be created so trains can be continuously routed at shorter intervals than if the train were being operated by a human. All information collected by the trackside monitors is also transmitted back to the central controls.
- **On the train** – The train speed is completely controlled by computer, and controls all other functions that were previously performed by a human operator.
- **Failsafe** – All driverless trains are carefully monitored. In the event something happens, a protocol or system can be used to correct the issue.

All of this information is stored and evaluated. Computers run algorithms on the data to see how the trains perform. Once all of the data has been analyzed, any findings can be applied to any train to help it perform to its maximum ability. The ability to have up-to-date data that can be reviewed and used to implement changes is an invaluable tool for the rail industry.

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<sup>1</sup> <http://askascientist.co.uk/technology/driverless-trains-work/>

## Why Self-Driving Trains?

Many people are advocating for trains to become automated and driverless. One argument for implementing self-driving trains is [safety](#)<sup>2</sup>. It is believed it would help prevent speeding and accidents involving trains. With everything being controlled by a computer, there would be no possible user error.

One of the greatest benefits of self-driving trains is their punctuality and speed. For example, when South Korea began using [self-driving trains](#)<sup>3</sup>, it noticed that since the trains could operate on a 20-hour schedule, punctuality was greatly improved. Another example of driverless trains increasing punctuality is the Dubai Metro. In its first 6 months of operation, the self-driving trains had a punctuality rate of 99.69%.

Some research suggests that automated trains will help reduce [train failure](#)<sup>4</sup>, improve capacity, and make trains more predictable. Most of these improvements will be due to the computer being able to track information. This will enable rail companies to determine what changes should be made to increase efficiency and to see if there are any issues with the train so it can be addressed before a failure occurs.

One reason automated trains help improve train failure rates is that they wear-and-tear on the braking system and on the trains' propulsion system. This not only means the breaks and propulsion system last longer, which will save the railway money, but it will also work better and not be as likely to fail.

Another advantage is that driverless trains could cut operating costs. Automated trains are more efficient and can work longer hours during a day than a human could. This would mean that trains could run for longer periods of time without having to employ another person for an additional shift. Simple things like this will cut down on costs in the short and long-term.

Automated trains use less energy, which is another way for rail companies to cut down on cost. And since the train is precisely controlled, trains can run at scheduled intervals to help increase productivity and efficiency.

It's clear there are many advantages to using self-driving trains. But what are the drawbacks?

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<sup>2</sup> <http://www.wired.com/2015/05/trains-adapt-self-driving-car-tech-boost-safety/>

<sup>3</sup> <http://www.railway-technology.com/features/featurejuly-stories-driverless-trains-high-speed-rail-investment-plans/>

<sup>4</sup> <http://www.railway-news.com/uploads/files/Dubai-Metro-Driverless-Trains.pdf>

## Drawbacks of Self-Driving Trains

Several drawbacks have come to light regarding driverless trains, such as the vast infrastructure that is needed to support these sophisticated train systems. All of these must be monitored around the clock to ensure the trains are running correctly. This is done from high-tech central control rooms. But this drawback should be expected, considering the way the technology works.

Some may say one of the biggest drawbacks is that there is no human operating the system from onboard the train. This has created a fear that if something happened to the self-driving train, there would be no one onboard who could try to correct the problem.

One example of a self-driving train experiencing a problem happened in [London in 2010<sup>5</sup>](#). The London Underground lost control of a driverless train. It continued to run for an additional 4 miles before it could be stopped, and nearly collided with another train in the process. Incidents like this make it understandable why people are skeptical of self-driving trains.

It is worth noting there have been very few instances of driverless trains having problems. And yet, a computerized system is still less likely to have an error than a human. This fact alone makes the safety concerns less of a drawback. As long as the trains are monitored, there is very little possibility for a major issue.

There aren't a lot of major drawbacks when it comes to self-driving trains. As previously stated, the only major concern is that a human isn't operating the train. The only other drawback is the infrastructure, but one would expect a technology like self-driving trains to require support. Since those are the only worries when it comes to this technology, it shows how effective and efficient driverless trains can be.

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<sup>5</sup> <http://www.railway-technology.com/features/featuredriverless-train-technology/>

## Are Driverless Trains Safe?

Safety is the biggest concern relating to self-driving trains. After all, machines are not completely infallible. Many would-be passengers have expressed concerns about machine malfunctions and how they can be avoided. However, it can be argued that machines are less likely to make an error than a human. Making trains automated should help reduce user error and increase train safety.

Dubai was one of the first to implement automated driverless trains in their metro system. There were safety concerns, but Dubai has taken steps to ease passengers' concerns. For example, one of the safety features Dubai has implemented is sealed doors on platform edges. These doors will only open when a train is present in the station. The trains are also regularly serviced and cleaned by personnel. Dubai went a step further and incorporated staff safety measures at the train depots, ensuring employees can service the trains safely.

Dubai's driverless transit system is a safety success story. Having only one fault for every four million kilometers travelled has proven that self-driving trains are as reliable and safe as regular transit trains. These results are the reason Dubai's Metro is one of the leading self-driving train systems in the world at the moment.

London also seems to think that [driverless trains](#)<sup>6</sup> are safe enough to transport people. There are currently plans to implement high-tech driverless trains in the London Underground system. The city believes this is the solution to help handle the growing population of London. Since the trains can handle a greater capacity and have shorter intervals, this could be the solution London needs. Paris has already made the switch to self-driving trains for its transit system and has seen great success.

Originally, London had hoped to have the self-driving trains implemented sooner, but there were passenger and [safety concerns](#)<sup>7</sup> that required pushing the implementation deadline back further. This should allow enough time for testing to ease the public's fears. At this time, London hopes the trains will be ready for debut after 2020.

Copenhagen has also started using self-driving trains, and it's possible the country's railway passengers are safer because of it, due to the increased safety measures. One [example](#)<sup>8</sup> of this is the laser technology that has been added to trains, making it impossible for someone to be killed if they fell or jumped in front of one of the trains. This beam will send a signal to the control system in the event someone steps or falls in front of the train.

Other things that can be done to increase passenger safety are implementing CCTV so passengers can be seen onboarding and leaving the train, remote train diagnosis, platform

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<sup>6</sup> <http://www.dezeen.com/2014/10/13/driverless-vehicles-cars-trains-drone-delivery-technology/>

<sup>7</sup> <http://www.standard.co.uk/news/transport/london-underground-scrap-plans-for-driverless-trains-after-safety-concerns-8201540.html>

<sup>8</sup> <http://www.railway-technology.com/features/feature127703/>

supervision, and onboard emergency calls. All of these would help ensure passenger safety and ease fears about the use of self-driving trains.

## How Self-Driving Trains Could Affect Industry Jobs

There is a growing concern that self-driving trains could mean layoffs and fewer jobs in the industry. As more things become automated, the fear is actual employees may no longer be needed.

Australia is a prime example of why this fear need not exist. The country has already created an [automated rail network](#)<sup>9</sup> which carries iron ore long distances. Rio Tinto is the company in charge of this project known as the “Mine of the Future.” The idea behind the project is to use automated equipment to streamline the mine. The company implemented automated trains, as well as the other automated equipment, in order to deal with a skills shortage in the industry.

When questioned about whether or not this change would cause job loss or job elimination, Rio Tinto’s Greg Lilleyman stated they will not only still need employees, but could potentially need more in a few years-time. He explained that self-driving trains would make them more efficient and competitive and eventually they will need more employees to help handle the growth.

Many rail unions around the world have expressed concern in regards to job loss. However, it seems the number of jobs should not be negatively affected. If anything, the self-driving trains could create jobs in the rail industry. It has been suggested that train personnel could work on the platform or in the trains as staff. Some types of jobs may no longer be necessary, but others will be created to accommodate the needs of the automated trains.

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<sup>9</sup> <http://www.abc.net.au/news/2012-02-20/rio-tinto-driverless-train-network/3839678>

## Automation is the Future for the Rail Industry

We live in a technology-driven world. It's likely that self-driving technology will be a part of everyday life in the next decade. So incorporating this technology into trains is the next step in the evolution of automation.

Some have suggested that [driverless automobiles](#)<sup>10</sup> will make trains obsolete. But there is an opportunity here. If the railway companies begin using similar technology, it could make the industry more appealing for travel and transport.

This technology increases efficiency, and gives the trains the ability to travel at higher speeds. Those two factors alone mean driverless trains would cut down on transporting and passenger costs as well as travel and transport time. Trains are also able to transport a large load or many people at one time. All of these factors would save customers and clients money, which is attractive to everyone.

Automated trains are more efficient and productive than traditional trains. However, it is still imperative that more research is done to evaluate for safety and other concerns. Research will have to be ongoing where automated trains are concerned, but the greatest advantage technology offers is it can always be improved.

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<sup>10</sup> <http://www.dailymail.co.uk/sciencetech/article-2810758/Will-self-driving-cars-kill-train-Autonomous-vehicles-make-railways-obsolete-new-high-speed-routes-built-expert-claims.html>

## Self-Driving Trains and the Rail Industry

So will self-driving trains begin being used more in the rail industry? It seems likely. With self-driving trains being such a success in transit system trains, there is no reason that this technology couldn't be more widely used by all aspects of the rail industry.

Britain's rail industry has already begun looking into the self-driving train [option<sup>11</sup>](#) for longer transports. Considering the London Underground is working towards using driverless trains, it should come as no surprise that the British rail industry is looking into it, as well, to increase efficiency and reduce costs.

As previously stated, Australia has already begun incorporating driverless trains into its "[Mine of the Future](#)" project to increase safety, efficiency, and environmental performance while lowering costs. This railway is the first heavy haulage, long-distance, fully automated system in the world. At least 40% of this railway will become driverless in 2016.

With an example like Australia's Mine of the Future project, it seems the rail industry is embracing this new technology, and for good reason. When you think about the potential savings this technology offers coupled with the increase in efficiency, safety, and productivity, every transport company should be looking at how fast it can incorporate this technology into their rail business.

And with more countries turning to automated trains for their underground transit programs, it will become easier to find experts in the field to gain a better understanding of how this technology can be used by the rail industry at large.

Since technology is constantly changing and improving, it's imaginable that the rail industry could be using self-driving trains on a regular basis within the next 20 years. As more safety measures are created every day, jobs are more than likely not being lost, and there's an increase in efficiency of self-driving trains, this new technology should be explored. If applied correctly, self-driving trains could push the rail industry forward at a rapid pace.

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<sup>11</sup> <http://www.ft.com/cms/s/0/a444e9ce-1d79-11e4-8b03-00144feabdc0.html#axzz42bnLEeVz>

## Notes

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