Chapter 5
Self-Driving Cars:
Radical Innovation in the Transportation Industry

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ABSTRACT
The United Kingdom passed a series of acts to control the use of mechanically propelled vehicles on public highways. The Locomotive Act 1865 (Red Flag Act) limited the speed of self-propelled vehicles to six (6) km/hr in the country and three (3) km/hr in towns while requiring a crew of three. Since then, much progress has been made to adopt these mechanically propelled vehicles and build our lives and societies around them. Personal vehicles have become the dominant mode for transportation in many developed and developing countries. However, this fact begs the question of what the next evolution for the transportation industry is, and the answer is currently before us. Some may refer to it as self-driving, automated, autonomous, or even driverless cars that are capable of driving themselves from point A to point B with minimal or no human intervention. While admittedly the technology is not currently advanced adequately to safely and reliably accomplish the aforementioned task, this chapter aims to provide context and familiarize the reader with some of the necessary background information and then examine the challenges and possibilities that will be provided by this technology in a not so distant future.

DOI: 10.4018/978-1-4666-4749-7.ch005
PRELUDE

The United Kingdom passed a series of acts to control the use of mechanically propelled vehicles (i.e., cars - as we call them today) on public highways. Most noteworthy, The Locomotive Act 1865 (Red Flag Act) limited the speed of self propelled vehicles to six (6) kilometers per hour in the country and three (3) kilometers per hour in towns while requiring a crew of three: Driver, Stoker, and Flag Man who was required to carry a flag and walk at least 55 meter ahead of each vehicle. The following Highways and Locomotives (amendments) Act of 1878 made the use of red flag optional and reduced the required distance from 55 meters to 18 meters. Subsequently, many of the restrictions were removed in the Locomotives on Highways Act of 1896. Many influential figures and organizations campaigned for such incremental changes. For example, Harry J. Lawson who had purchased the British Daimler engine patent in 1985 and later formed the Daimler Motor Company played a major role in repelling the Highways and Locomotives Act.

In retrospect, the Red Flag Act portrays how a society reacted to an innovation that changed the way of life. Transitioning from horse drawn carriages to self-propelled vehicles was handled slowly through incremental changes towards full adoption and utilization of the technology which ultimately led to rendering the legacy technology (i.e., horses and carriages) obsolete. Automobiles and other technologies such as piped water have made us live our lives differently. While we have underestimated the disruptive nature of such changes brought to us by these technologies, we have also underestimated our own capacity to adopt and change.

It is worth mentioning that in 1968 the United Nations introduced an international treaty known as the Vienna Convention on Road Traffic which was designed to facilitate international road traffic and to increase road safety by establishing standard traffic rules among the contracting parties. In this treaty, under article 8, there are two interesting statements that are as follow (United Nations, 1968):

Every moving vehicle or combination of vehicles shall have a driver.

Every driver shall at all times be able to control his vehicle or to guide his animals

However, Article 8 did not thwart some of the visionary car manufacturers (i.e., GM and Mercedes Benz) to turn a blind eye and start working with the idea of self-driving vehicles. Yet, there is compelling body of evidence which suggests they did not succeed and the human driver is still needed to operate an automobile.

BACKGROUND

For many years mankind has dreamt of a modern transportation system that would require marginal or no human oversight. This can be traced back to 1939 where at the Futurama Exhibit at New York’s World Fair – designed by Norman Bel Geddes and sponsored by GM Corporation -- portrayed the future in 1960 (Wired Magazine, 2007). GM’s ride presented a utopia of transportation systems with sophisticated highways and cars that could drive themselves and keep a safe distance from each other automatically. The second World Fair in 1964 exhibited an even more audacious future vision in which cars were much larger in size and driven by tiny human puppets (Wired Magazine, 2007). However, this vision which was postulated at the first Futurama did not materialize until 1977 where the Tsukuba Mechanical Engineering Lab in Japan operated the first “autonomous” vehicle on a dedicated, clearly marked course and achieved speeds of up to 30 kilometers per hour by tracking white street markings (wikicars, 2013). To date, many projects have been undertaken in Europe, Asia, and USA to create a fully autonomous
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