# The Auto-mobile: Speed, Roads and Curious Socio-Technological Dynamics

**James P. Boyle Jr.**

**University of Missouri**

When one thinks of the development of a technology, it is often hard to see the social influences that helped to shape and reshape the technology. However, these social factors have influenced every technology, from making things faster, slower, safer, or cheaper and easier to produce. The technologies themselves have also worked back upon social dynamics, changing the way individuals and groups act within their social world. It is these complex dynamics that have guided the evolution of even the most taken for granted technologies that we use every day, such as the automobile and the very roads we travel on. Without the speedometer for example, we would not be able to properly gauge our speed and obey the speed limits, the rules that have evolved to keep the roads safe and effective modes of transportation for those that travel on them. As one can see, the direct interaction of technological dynamics and social dynamics have served to create the speedometer and regulated road systems we know today, exposing a complex web of socio-technological interaction.

Before analyzing the system of personal transportation we are familiar with, we must take into context the social and technological circumstances that enabled cars, roads, and regulations to arise. First, we must look at the development of the auto-mobile, smoother and more well connected roads, and the resulting traffic that traversed them. The auto-mobile itself had a confused and fragmented beginning. The earliest constructed auto-mobiles were steam powered, and largely impractical for personal use. The first four wheeled, internal combustion engine-powered auto-mobile was developed by Daimler and Maybach;

> "The 1885 Daimler-Maybach engine… [it] was small, lightweight, fast, used a gasoline-injected carburetor, and had a vertical cylinder. The size, speed, and efficiency of the engine allowed for a revolution in car design. On March 8, 1886, Daimler took a stagecoach and adapted it to hold his engine, thereby designing the world's *first four-wheeled automobile***.** Daimler is considered the first inventor to have invented a practical internal-combustion engine."[1]

Thirteen years later, Daimler and Maybach created the first "V-slanted two cylinder, four-stroke engine with mushroom-shaped valves. Just like Otto's 1876 engine, Daimler's new engine set the basis for all car engines going forward." This new engine, along with a new four speed transmission, enabled their automobile to reach speeds of up to 10 miles an hour, revolutionary for the time. However still there was no need for regulation of roads, and no need for speed limits to be implemented on auto-mobiles; the social need had not yet come to pass, as auto-mobiles were just a rarity among carriages and horses.

As the internal combustion engines started to evolve both in achievable speed and overall design, they began to overtake other modes such as steam power as a reasonable and reliable power source for auto-mobiles. A market was being constructed. They begun to be produced on an assembly line when Random Eli Olds, the "designer of the three-horsepower, curved-dash Oldsmobile, the first commercially successful American-made automobile and the first to use a progressive assembly system… foreshadowed modern mass-production methods."[2]

The mass production system set up by Eli Olds paved the way for the well-known Ford Auto Company started by Henry Ford in Detroit, Michigan to create his own fine tuned assembly line, which in building the Model T in such a manner, "made its debut in 1908 with a purchase

price of $825.00."[3] This cheap price and ease of construction enabled the average American access to a product that had been "a plaything for the rich." This new car, affordable to the average American and built for the rough, unpaved roads that were common of the time, made the average person able to cross greater distances, commute to work, or even to modify the car to run farm machinery. The first year of production Ford had managed to sell "over ten thousand... establishing a new record. Four years later the price dropped to $575.00 and sales soared. By 1914, Ford could claim a 48% share of the auto-mobile market." The car's versatility, durability, and cheap cost opened up a previously untapped market, which in turn created infrastructural needs that had not been previously considered. The flood of new auto-mobiles created needs for safety, both in roads and the cars, and for both their regulations. It was in 1901 that the first speed limit law was passed for auto-mobiles, in Connecticut, which dictated 12 miles an hour in city limits and 15 miles an hour outside city limits.[4] Though it was seven years earlier than Ford's Model T's begun rolling off the assembly line, the minority of auto-mobiles on the roads had already become necessary to regulate, as they shared road with carriages, potentially spooking their horses and causing dangerous incidents. This regulation of auto-mobiles and roadways would become only more specific and thorough as the increase in possible speeds achievable and permitted on roads grew, as use of horses and carriages faded out. A large aspect of this regulation focused on the speedometer, and its ability to gauge one's speed and keep it within dictated limits.

The speedometer originally was expensive to build, and due to a lack of other cars on the road there was no need for the implementation of it, nor much of a need for the regulation of the drivers speed (the speed limits were largely left up to the individual states as they saw fit); however as more and more cars were continually produced and driven (both by Ford and other

new auto companies), "automobile manufacturers… included speedometers as standard equipment in 1910 as the need to limit drivers' speeds started to become an issue in society."[5] Not only the need for speed regulation, but the need for safer roads was also becoming a large public concern due to the heightened traffic. "It's [the Model T's] widespread popularity created pressure for the federal government to become more directly involved in road development,"[6] as more and more car owners were dealing with the dire conditions of unpaved, unregulated roads that previously had not been a problem for walkers, bikes, and carriages. Due to the societal pressure, "Congress passed the Federal- Aid Road Act of 1916," in an attempt to allocate funds to road improvement, however before it could be implemented, WWI begun, stalling any road developments.

After the war, there was a new interest in road development, and "things took off again in the Roaring 20s when the Bureau of Public Roads (BPR), as ORI was then called, was authorized by the Federal Highway Act of 1921 to provide funding to help state highway agencies construct a paved system of two-lane interstate highways." Throughout the 20's and 30's the roads were continually improved, often from depression era public works projects. However the improvements were to be short-lived, as "when America entered World War II in 1941, the focus turned toward providing roads that the military needed. After the war, the nation's roads were in disrepair, and congestion had become a problem in major cities." The continual manufacture of auto-mobiles at reasonable prices and the post-war boom in both consumption and production, created a system that was desperate for some kind of comprehensive maintenance and regulation for the auto-mobile users. After the roads had come back into the public consciousness as an issue of both safety and efficacy, the government was again incited to take action, and

> "In 1944, President Franklin D. Roosevelt had signed legislation authorizing a network of rural and urban express highways called the 'National System of Interstate Highways.' Unfortunately, the legislation lacked funding. It was only after President Dwight D. Eisenhower signed the Federal-Aid Highway Act of 1956 that the Interstate program got under way."

This government program was to become one of the largest in American history, one that we use even today. Although it took about 35 years to complete the majority of the system, and there was no comprehensive regulation of speed limits; the newer, safer, and more effective highways left the speed regulation to the states, who would set their own speed limits.[7]

With local regulation of speed limits, and better road quality, travel had become far less problematic. However, the illusionary perfection of these technologies was to be short lived. Social demands were to again cause major changes in the American Interstate Highway System, affecting those who used them, as well as the development and reforming of the existing technologies.

The problem on the horizon was the 1970's fuel crisis, and the public needed to find a way to lessen its fuel consumption drastically, and thus "the American government was forced to do something to reduce the country's massive fuel consumption."[8] This question of how to lower fuel consumption was pressing, and

> "the answer they came up with was to enforce a maximum speed limit across the US of 55mph. However, federal legislation is not actually able to impose such a limit, so instead the government made this maximum limit a condition for their continued funding of their highways programme. In other words, states had to impose the 55mph limit or the federal contribution to their road programme would dry up."

The governmental pressure to reduce speed limits in order to curb car's wasteful consumption of gas due to fast driving was met with some mild opposition, but overall it helped to reduce gas consumption as well as highway fatalities. This new regulation of speed limits in itself was a great fix for the time, however to implement this law there needed to be an accurate way to gauge a vehicles speed outside the car in order to enforce this new law. This method of gauging a vehicles speed was to be embodied by what we know as the radar gun.

Radar was a necessity to enforce these laws, and the "radar has been used to monitor vehicle speed since the end of World War II. During the mid-1950s, radar became widely used with the building of the Interstate Highway system."[9] The ability to enforce the new regulation is what made it ultimately a feasible method of reducing fuel consumption. The opposition to this new law and its enforcement however was not to go completely unnoticed as "it was maddening to drive down a wide super highway, but limit your speed to 55mph," a complaint that resounded with many of the daily drivers on those highways as they had to contend constantly with the low speed limits; but it wasn't until the fuel crisis ended that the cries to raise the speed limits became an overall acceptable idea and

> " In 1987, Congress authorized states to reset speed limits within their borders, but proponents of the national maximum speed limit law claimed it lowered automobile-related fatalities, prompting Congress to keep it on the books until finally repealing it on November 28, 1995."[10]

Once the mandated 55mph speed limit law was repealed, states adopted speed limits similar to what they were before the federal law, as the speed limits we know today. The problem, or what was once defined as the problem (the overconsumption of gasoline), depended not on necessarily slowing the consumption of gasoline, but on "whether the relevant social

groups see the problem as being solved,"[11] and once the gas crisis was over, the "solution" to the gas crisis was no longer needed; it was now not a solution but a hindrance to effective, speedy travel and use of auto-mobiles that did not need to conserve their gasoline. The social element of auto-travel had turned back on itself, as a solution was now a problem. It then influenced governmental change, which altered the regulations of the technologies used by those very people that comprise the "social," changing their interactions with those technologies and thus changing the nature of their social world. As Latour so simply puts it in his *Mixing Humans and Non-Humans Together: The Sociology of a Door Closer*, he sees "only actors- some human, some non-human, some skilled, some unskilled- that exchange their properties,"[12] (pg. 303), meaning that the exchanges going on between an individual, an organization, and a piece of technology should not be seen as simply one changing another, but a far more complex *exchange* of actions; an exchange of work and procedures among actors, all of whom are players in a game of constant actions between and on one another.

To look at one piece of technology for example, the speedometer, which tells us our speed, and enables us to use roads safely, changing the way auto-mobile users would otherwise travel. It, being created by individuals, in turn works back on individuals by allowing them to accurately gauge their speed and adjust accordingly within the social space of the road; as Latour clarifies, "it means what defines our social relations is, for the most part, prescribed back to us by non-humans," (pg. 310). These non-human actors do not just influence the social, they redefine it. They enable different kinds of interactions as actors delegated by people, reconstructing the very nature of relations within the complex web of actors comprised of both humans and non-humans.

As one can see, it was not just technological advance or social demands alone that formed the conditions of the time, but a synthesis of both working together in an inseparable, interwoven network. Within this system are many actors, like the speedometer, a small yet invaluable part of the auto-mobile, without which the speed regulation laws could not have been enforced, which would have created large fatality rates as cars became faster and roads smoother. The speedometer itself, although initially a feature of little importance, quickly grew into a necessary actor for safe and effective travel.

The speedometer, a simple mechanism that gauged the speed based on the rotation of a small magnet on the driveshaft from the engine to the wheels, had changed little from its conception in the early 1900's in the first production auto-mobiles. These speedometers were Eddy-current, a design that gauged the revolutions of the driveshaft through the magnetic current created as the driveshaft turned as described above. The magnet on the driveshaft, as it spins, is measured by a small cable with copper wiring that picks up the rotating magnetic field created by the spinning magnet, and carries the current to the dashboard, where the wire terminates and pulls the needle with the power of electric current from the magnet on the driveshaft, thus displaying the vehicles speed.[13] Overall a simple mechanism made up of a few more, smaller actors. So effective was this actor within the larger actor network of auto-mobile and driver that it was not changed much over its implementation and use, except for very recent introduction of more sophisticated display techniques such as the electronic speedometer, which works on the same principal except "Circuit electronics in the car are designed to display the speed either on a digital screen or on a typical analog system with a needle and dial," instead of the traditional direct current-to-dial technique.

The mechanics of the instrument and the instrument itself, while being fairly simple, do not in themselves suggest much of its complexly embedded history within the actor network of everyday life to

those ordinary users of the speedometer. However, the very fact that the speedometer as an actor had not changed much in mechanical design over the course of auto-mobile development and use paradoxically also suggests its extreme utility within the larger actor network of people and mechanisms. From the first mass production of auto-mobiles that opened up a new market thus changing the social world, to the newly overcrowded roads that demanded social regulation and technological change, the history of the speedometer, road regulation, and the auto-mobile, suggests a far more complex view of socio-technological relationships than an independent "technology" and "society."

Clearly, a technology is more than just an insular, separable thing from the social world that gave rise to it; an instrument viewed within the socio-technological context opens up a new way entirely of thinking, of conceptualizing a tool as an actor;  it is a part of a system in which society and technology interact intimately and play upon one another so much so that one would be at a total loss to conceptually divide the two in a comprehensive biographical analysis of a seemingly distinct "technology."

1) http://inventors.about.com/library/weekly/aacarsassemblya.htm

2) http://www.britannica.com/EBchecked/topic/427416/Ransom-Eli-Olds Encyclopedia Britannica

3) http://www.eyewitnesstohistory.com/ford.htm

4) http://www.wired.com/science/discoveries/news/2008/05/dayintech_0521

5) http://www.tech-faq.com/speedometer-calibration.html

6) http://inventors.about.com/library/inventors/blcar3.htm

7) http://www.fhwa.dot.gov/interstate/faq.htm#question11

8) http://www.miketodd.net/encyc/speedlimits1.htm

9) http://www.1stradardetectors.com/support/technology-101/Radar_Gun_History_.html

10) http://www.history.com/this-day-in-history/nixon-signs-national-speed-limit-into-law

11) Pinch and Bijker pg 16 Pinch, T. & W.E. Bijker. 1987. "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit From Each Other," in W.E. Bijker et al (ed.) The Social Construction of Technological Systems (Cambridge: MIT Press) pp. 17-50.

12) Y Johnson, J. (Bruno Latour). 1988. "Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer," Social Problems 35 (3): 298-310.

13) http://auto.howstuffworks.com/car-driving-safety/safety-regulatory-devices/speedometer5.htm