

Major Innovations in Transportation: Evolution of Automobiles

Jackson Nyamwange

Graduate Student

Department of Secondary and Middle School Education

Dr. Monica Nyamwange

Department of Geography and Urban Studies

William Paterson University

Wayne, New Jersey

Abstract

The automobile is perhaps the most significant invention the world has ever witnessed. With it, people and cargo are able to be transported across large journeys at rapid speeds. The purpose of this research paper is to describe the developments of the first automobile and the periodical advancements over the decades to contemporary vehicle as we know it today. Cars were and still are such a vital component in today's world. In modern times, cars do much more than transport people from one place to the next but can represent ones wealth, profession, and in some cases even personality. The mission of this research is to piece together the original car from its inventive state and link various advancements that such cars experience and the effect socially and economically these advancements had. Personally, I consider cars to have a personal stake in moving forward and I hope to discover today's agenda to continue to accelerate.

Introduction

The history of the automobile reflects a development that took place worldwide over a long period of time. By definition, an automobile or car is a wheeled vehicle that carries its own motor and transports passengers, goods etc. The creation of automobiles has changed the stratification, ecological and professional outline of developing a society during the twentieth century. Although it's virtually impractical to recognize a single individual who could be ordained the rights to being the inventor of the automobile, it required the efforts of thousands of people to create the car as we know it. There were actually some inventions which hold the most responsibility for introducing automobiles into our daily lives. The history of automobile production is marked by technological innovation, an invention that has been applied and adapted throughout the manufacturing and service sectors of the world economy.

The First Steam Car/Gas Automobiles

Depending on which research you look at; the idea of the automobile originates in Europe not America. In the eighteenth century various inventors began testing automobiles out of engines that would travel by steam. "Tests with steam engines actually date back to 1769, when Nicolas Cugnot of France designed, constructed and operated a tractor which was powered by a steam engine. Steam engines powered cars by burning fuel that heated water in a boiler, producing steam that pushed pistons that turned the crankshaft, which then operated the wheels. His efforts were far from a complete success, but the vehicle would slow down between stops to gather up steam."¹When Cugnot got into the first automobile accident in 1771, this marked a series of misfortune for the French inventor. With one of Cugnot's supporter deceased and the other exiled, the funding for Cugnot's road vehicle trials would presumably ended. "During the early accounts of these self-operated vehicles; both road and railroad vehicles were being developed with steam engines."² Steam engines added so much weight to a vehicle which already had to deal with the poor structure of roads; nonetheless, steam engines were considered to be very productive to the overall creation of automobiles. For those who accept these early steam-powered road vehicles as automobiles, agree that Nicolas Cugnot was the inventor of the first automobile. This would be the on-start to a series of developments which would lead us to the conventional car.

¹Rae, John. *The American Automobile Industry: The First Forty Years*.6

²Ibid. Rae, 7

By the early 1800s, many Englishmen tried to develop the prior steam vehicles. Richard Trevithick of England actually crafted and operated a steam-powered carriage. This led to various English engineers who constructed, and commercially operated, steam vehicles, which carried passengers and cargo. However, their efforts were severely hindered by the conventional countrymen who limited their use on public roads. They were forced to turn their attention to conducting trains or carriages on private rails; leading to the innovation of railroads. About the same time, Robert Anderson of neighboring Scotland drove the first electric carriage.

In 1860, a French engineer named Etienne Lenoir invented an internal combustion engine that used illuminating gas for fuel and an electric spark for ignition. It was used to drive machinery and became the first commercial gas engine. In 1866, Otto and Langen of Germany improved upon the gas engine by developing the four-stroke cycle which is still used today. In 1885, Daimler, another German, used the Otto cycle in a gas vapor engine which he manufactured in large quantities. The following year he applied his petrol engine to a motor car. Daimler's engine was used in France by Emile Levassor who designed a vehicle which set the basic mechanical pattern for modern automobiles."³

Automobiles in America

The idea of an automobile in the United States started with an engineer named Oliver Evans. Evans was responsible for the first steam-powered vehicle in Philadelphia in 1805. "Evan's automobile was much too unstable to be usable on land, and there was no serious experimentation with such technology until later in the century."⁴ There were a series of innovations but nothing ever led to serious production until the Duryea brothers (Charles and Frank) produced their first gasoline driven "horseless-carriage" in 1893. Originally, the Duryea's were bicycle mechanics with an infatuation for advancement. These brothers crafted their first automobile in a workshop located in Springfield, Massachusetts and it was completed for testing by September, 1893. "It ran with one-cylinder, a gasoline engine and a three-speed transmission placed on a horse carriage. At the automobile's top speed it can reach a maximum speed of 8 miles per hour."⁵

By the twentieth century, these automobiles were regarded as technically realistic, if susceptible to significant improvements, but at the same time other conditions had combined to make the commercial production of automobiles feasible— if risky. Some of those other conditions dealt with the development of the highway system appropriate for the operation of motor vehicles and the growth of industries capable of providing the resources of capital and technical skill which is vital to make automobiles. The first automobile to be mass produced in America (Curved Dash Oldsmobile) was developed and built by the American car manufacturer Ransom Olds in 1901.⁶ This was considered the beginning of the assembly line where cars were built piece by piece and used interchangeable parts and this started the Detroit area automobile industry. There were approximately 400 cars made in 1901, 2,500 in 1902, and nearly 19,000 overall.

Henry Ford

By the start of the twentieth century, the automobile was a mere toy for the wealthy and a dream for the less fortunate. The majority of models were complex machinery that often required a chauffeur with the mechanical capability to operate it. Henry Ford felt it was necessary to create a basic, dependable and reasonably priced car; in which the average American employee could afford to have and maintain. Out of his dedication and creativity came the Model T and the assembly line - two innovations that ultimately transform the landscape of American society and shape the way we operate in today's world. While brainstorming, "Ford compared various industries and their inefficiencies formed four vital principles that would expedite his vision: continuous flow, interchangeable parts, a division of labor, and attempting to reduce wasted effort."⁷ The true definition of an assembly line is the production of goods in significant quantities, usually using specific designs. "These assembly lines often require an explicit set of skills in which the labor force or specialized machines are arranged in the most efficient way possible."⁸ Ford would implement these philosophies into his company steadily and in 1913; they came together in creating one of the most efficient moving assembly lines ever used on a large-scale production bases and within five years he was producing cars at a record-breaking rate.

³Ibid. Rae,6

⁴"History of the Automobile". GM Home. 4

⁵Ibid.GM Home,4

⁶Ibid. GM Home, 6

⁷Collier, Peter. *The Fords: An American Epic*.36-37

⁸Womack, James et.al. *The Machine That Changed the World*.28

“During the Model T's nineteen years of production, the price would dip as low as \$280. It would sell nearly 15,500,000 vehicles in the United States alone.”⁹ The Model T would ignite the beginning of the automobile era; where the car evolved from an elite necessity for the rich community to essential transportation for the common person. By 1914, Fords manufacturing plant in Highland Park, Michigan were doing things which were unheard of at the time using innovative manufacturing tactics. “Ford’s plant could complete a finished chassis every 93 minutes. This was an astonishing development as far as production with the average production time was 728 minutes.”¹⁰ Using a consistently-progressing assembly line, subdivision of labor, and cautious management of operations, Ford realized what success he can have with the demand for automobiles growing. Although he would greatly increase productivity, this resulted in a monthly work turnover of 40 to 60 percent in his factory. This mostly occurred due to the horrid tedium of assembly-line work and frequent raises in the production quotas allocated to workers based of demand. “Ford tackled this issue by doubling the daily earnings and standards in the industry, increasing wages from \$2.50 to \$5.”¹¹

This would increase structure and loyalty in his labor force and a considerable decrease in operating costs. These factors, joined with an enormous increase in output made possible by new other technological methods, created a boost in company revenue from \$40 million in 1914 to \$70 million by 1916.¹² Between the years of World War I, Ford motors experienced what Ford called it “hectic” growth. By 1917, Ford’s company started to mass produce trucks and tractors. In 1919, a clash with stockholders over the money to be exhausted building the massive manufacturing complex in Dearborn, Michigan caused the corporation to become completely owned by Henry Ford and his son (Edsel) who would eventually surpass his father as president. Ford Motor Company began its journey with one man who foreshadowed products being able to impact all types of people and meet there needs, but in the process Ford would create a legacy of developing products that serve the ever-changing needs of people throughout the world. As solitary owner of this Company he became one of the wealthiest and well known people in the world. With this wealth opened up the door to charitable work. Ford and his family spent a good deal of time and money setting up a historical museum in Greenfield Village, Michigan, but are mostly recognized for setting up the Ford Foundation, which gives grants for research, education, and development. When Henry Ford envisioned model T or the assembly line, he probably did not fathom the affect he would have on the industry. His success did not only revolutionize the automobile industry—but he would change the world.

Influence of Automobiles in World War II

Throughout WWI, the manufacturing of the automobiles originally displayed military value. Vehicles were used exclusively for transporting and supplying armies. Also, automotive plants were converted into headquarters for producing military equipment (tanks and aircraft). By WWII, there were more resources to prepare automobiles for military effort. In Britain, the British government created factories neighboring automotive plants for the sole purpose of military manufacturing (especially aircraft) when war came, using blueprints from such automotive industries. This type of preparation was attempted by countries like France, but was considered tardily and inefficiently. In Germany, industry was not entirely converted for military production until about 1943 in later efforts. The United States did not intertwine war industrialization and the automobile industry until after the attack on Pearl Harbor in December 1941. But America’s effect in warfare from an automotive stand point still attracted attention from a productive capability. Once its resources had been committed to the war effort, its involvement was huge.

“Between the years of 1940 and 1945, such automobile companies made almost \$29 billion worth of military materials, a fifth of the country’s entire output. The list included 2,600,000 military trucks and 660,000 jeeps, but production extended well beyond motor vehicles. Automotive firms provided one-half of the machine guns and carbines made in the United States during the war, 60 percent of the tanks, all the armored cars, and 85 percent of the military helmets and aerial bombs.”¹³

⁹Brinkley, Douglas. *Wheels for the World*.111-112

¹⁰Ibid.Brinkley,32

¹¹Ibid. Collier,37

¹²Ibid. Womack, 35

¹³Heitmann, John Alfred. *The Automobile and American Life*. Jefferson, N.C.: McFarland & Co., 2009. 121

Governments initially thought that automotive facilities could be readily converted for aircraft production, but this proved more complicated than expected. Automobile assembly plants could not accommodate such huge airframes, nor could an automobile engine factory be transformed without major modifications. These issues were eventually resolved, and automobile companies contributed significantly to aircraft production. Britain was actually more suitable to use their automotive resources, at that time the world's second major producer of automobiles. "There adjacent military headquarters to the automobile factories would become operative, and manufactures like Austin, Morris, Standard, Daimler, Ford, and Rootes participated in filling the wartime demand for aircraft and aircraft engines."¹⁴ Leyland Motors and Vauxhall built tanks. Lord Nuffield made noteworthy contributions to the war production effort by creating a system for repairing aircraft, employing the sales and service organizations of Morris Motors, and it was eventually extended a larger pool of small contractors. The automotive production of the other opposition was much smaller in scale, and their factories for weaponry were significantly larger than America or Great Britain. In effect, the automotive industries in these countries were troubled chiefly with meeting the avid request for automobiles. The several Ford companies that came under German control (also Volkswagen) created the German equivalent of the jeep, while Renault (a tank manufacturer since World War I) built tanks for France and later for Germany.

The 60s/70s

During the 1960s/70s, the automobile industry saw major changes in the market. By this time, there had been a heavy influence by the European manufacturers. Those foreign manufactures started incorporating better technology that resulted in innovative models.

"European innovations in the 1960s and 1970s included front wheel drive, break disks, fuel injection, unitized bodies, five-speed transmissions, and engines with high power-to-weight ratios."¹⁵

Meanwhile, Japan also started successfully manufacturing automobiles in a major way, starting with its Keicar. Also during this time period, that utilization of Monocoques was extensively used by the European automobile industry. The newer models also tested with various other materials suitable for the body of a car (ex. *fiberglass*). "During the fall of 1962, the introduction of the Elan by Lotus, which had a fiberglass exterior panel which was tailored with a central bearing hollow element made of steel. This was considered the Backbone skeleton; this sustained the engine and the suspension and also contained the transmission."¹⁶ America would also adopt this frame structure for cars that were produced. During the 60s, there was also an emergence of pony and muscle cars in America where the performance of a car concerned people the most. The Ford Mustang would gain major popular car of this period and enjoyed a great deal of fanfare till Chevrolet introduced its Camaro in 1967 to contend with the mustang.

As for the 1970s, those times proved to be a decade of chaotic transformation for automobile industries with the biggest hits landing in the United States. In the early parts of the 70s, there was serious economic disorder in the form of elevated interest rates, unstable inflation, and price management. To make matters worse the energy crises of 1973-1974 and 1979 brought a serious of problems to automobile industry which had a direct correlation to the changes brought upon the U.S. economy. With the domestic economic situation, U.S. automakers also faced a developed global market, with more competition from foreign manufacturers.

"In spite of the economic woes of the economy, the foreign automobile market sold about 100,000 more automobiles than America during 1970s than they had in 1969. The imported market value rose from 11% to 14 %, in which nearly all of the increase was due to the increased popularity of compact, inexpensive cars such as the Toyota Corolla and the Volkswagen Beetle."¹⁷

America's Domestic producers answered with their own small-car models (Ford Pinto, AMC Gremlin, Chevrolet Vega).

¹⁴Hillstrom, Kevin, and Laurie Collier Hillstrom. "14." In *the Industrial Revolution in America: Automobiles*. Oxford: ABC-Clio, 2006. 120

¹⁵Ibid,Heitmann, 120-121

¹⁶Ibid. Womack, 23

¹⁷Ibid,Heitmann,164-70

The 70s resulted in a dramatic change in every aspect of the automobile industry in the America. It officially lost its competitive edge over a world that it once dominated; Japanese now acquired that title. The car itself became less of a status symbol than a mode of transportation. Consumers were looking for more economical and fuel efficient cars. After the 1970s, the Detroit car-makers were subjected to a decade of rebuilding lines of cars, restoring their status for excellence, and mend a recovering domestic market.

Asian Invasion: 80s

The largest percentage of the growth in the global auto industry was during the 1980s. The high demand for vehicles, combined with the low waged skilled workers in Asia, led to circumstances where manufacturers in those countries would manufacture cars for less of the cost of American unionized employees. Automakers would then export these less costly automobiles to powerful countries across the world. By 1981, Japanese automobile producers entered into a so-called Voluntary restraint agreement, which limiting the number of cars that could be imported to the U.S. to about 2 million per year. To counter this agreement, Japanese car companies started developing luxury cars that had elevated profit margins (Toyota's Lexus, Honda's Acura, and Nissan's Infiniti etc.). Also, Japanese car manufactures started producing auto production plants within the U.S., with the three largest successful Japanese auto manufacturers all opening production facilities by mid 80s. These plants were opened mainly in the southern U.S., (in states that were not union gracious).¹⁸

Despite the economical and marketing instability during the 1970s and 1980s, these decades would lead many technological improvements with widespread use various improvements such as disc brakes, fuel injection, electronic engine control units, and electric ignitions. By the mid-1980s, oil prices had fallen stridently, helping lead to the recovery of the American automobile industry. Under the management of Lee Iacocca, Chrysler mounted resurgence after its fear of Japanese invasion in the late 1970s. Chrysler introduced "The Minivan" in 1984 with the Plymouth Voyager and Dodge Caravan (this deemed to be quite popular). These automobiles were built on a passenger-car chassis and could seat up to seven people as well as being able to hold heavier passengers. Chrysler would also bring in their "K-cars" which came with front-wheel drive and fuel-efficient engines. By 1987, Chrysler would purchase American Motors which manufactured the Jeep. This proved to be brilliant timing to benefit from the Sport utility vehicle boom which was going on. Ford would attempt to make a response after losses of nearly \$3 billion dollars in the early 1980s.¹⁹

The 90s/2000s

The 90s, too many are seen as a light at the end of the tunnel for many people globally. Conditions in the automobile industries started on the down fall with the decade starting with a global recession, which resulted in weak auto sales and operating losses for all companies. Also, the infiltration of Kuwait by Iraq led to an increase in oil costs. However, the automakers recovered rather quickly. By middle of the 90s, truck sales (SUVs, Minivans, and Pickup trucks) began to become popular worldwide. The low gas prices allowed customers to buy gas-guzzling vehicles without economic worries. The American automakers experienced the benefit of existing designs for truck-based vehicles, which the foreign carmakers did have the same success allowing domestic cars to dominate the market and gain huge profits. There was also a tax on imported trucks causing the foreign auto producers to start producing vehicles in American plants.

The 2000s, started with similar economic issues as the 90s (recessions) but things would amplify with the terroristic attacks on September 11, 2001. This considerably influenced the automobile market's production and profits. The stock market decline during this period also attacked the pension funds of the automakers, needing huge aid to fund the automakers (with GM investing these contributions by adding debt). In 2005, oil prices would begin rising and hit a huge peak in 2008. With an American auto industry population heavily depended on the gas-guzzling light truck sales for their profits, their sales dramatically decreased. Also during the 2000s, the finance departments of the Big Three started increasing the importance of their general productivity (and their potential collapse). By 2008, the Big Three were in serious financial breakdown and the brink of a financial recession and the economic crisis would result in the auto industry turning to federal government for assistance. Ford was in the best position, as they had graciously raised nearly \$23 billion in cash in 2006 by mortgaging majority of their assets.²⁰ Chrysler would eventually be purchased in 2007, by an equity firm.

¹⁸Johnson, Richard. *Six Men Who Built the Modern Auto Industry.*, 45

¹⁹Ibid. Womack, 24

²⁰Ibid. GM Home, 12

They probably suffered the most with their major dependency on truck sales, and had few new products being manufactured. General Motors had similar issues as Chrysler (with their dependency in light truck sales) and burdened by high health care costs.

Conclusion

Automobiles have and always will be a vital component to our society. Tracking the development of the automobile from its fundamental stage to its current level of luxury raises some questions, such as: What will the future hold for these cars? What will be the capabilities of these cars with its various technologies? Will vehicles in the future be able to operate on their own? Could they possibly have the ability to levitate? Having such advanced technology, what type of fuel will these vehicles use? At this time, all people can do is speculate on what will be the next development. American history gives testament to the importance such technology as to how it has served in helping America adjust through its rough times.

References

- Brinkley, Douglas. *Wheels for the World*. New York: Viking, 2003.
- Collier, Peter. *The Fords: An American Epic*. San Francisco: Encounter Books, 2002.
- Foster, Mark. *Nation on Wheels*. Southbank: Thomson, Wadsworth, 2003.
- Heitmann, John Alfred. *The Automobile and American Life*. Jefferson, N.C.: McFarland & Co., 2009.
- Hillstrom, Kevin, and Laurie Collier Hillstrom. In *The Industrial Revolution in America: Automobiles*. Oxford: ABC-CLIO, 2006.
- Johnson, Richard. *Six Men Who Built the Modern Auto Industry*. Osceola: Motorbooks, 2005.
- Rae, John. *The American Automobile Industry: The First Forty Years*. Boston: Twayne Publishers, 1985.
- Womack, James et.al. *The Machine That Changed the World*. New York: Free Press, 2007.
- History of the Automobile. "GM Home".
http://www.gm.ca/inm/gmcanada/english/about/OverviewHist/hist_auto.html (accessed May 2, 2011)