

Innovations Effects on the Automobile Industry

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Innovation has served as the stepping stone for many inventions and products people have today. Companies heavily rely on the advancement of technology to accelerate, modify, and improve overall product production. Research and development in innovation are pivotal for product advancement and influencing the company's market influence. Innovation impacts key areas such as market dynamics, the job market, policy development, and economic performance. Consequently, many companies prioritize advancing innovation to influence these crucial areas. The automobile industry stands out as a major beneficiary of innovation, with its progression tied to innovative developments since the creation of automobiles. Cars have evolved from steam engines to combustion engines and now run on pure electricity, showcasing the continuous innovation in the automobile industry. Advancements in safety and technology, including self-driving features and automatic parking, have made automobiles more sophisticated. Currently, there is a significant emphasis on developing cleaner and more energy-efficient cars in response to societal demands for eco-friendly transportation. This initiative is expected to have a profound impact on technology, market dynamics, policy, job creation, and economic performance.

What is Innovation

Innovation, which dates back to the invention of the wheel, is challenging to define, create, and measure. It often emerges from new ideas or methods, usually building upon existing inventions. According to Taylor (2016, p. 26), innovation is associated with scientific progress or technological change, occurring when the evolution of an existing method takes place. Taylor (2016, p. 29) further defines it as "the discovery, introduction, or development of new technology." Innovation is prevalent in technology-based industries, constantly being driven. It encompasses commercial ideas, development, product realization, and market adoption or rejection. Diverse backgrounds enhance the success of innovative ideas, fostering open discussions and creativity.

While the creation and definition of innovation are crucial, measuring it poses challenges, especially as the private sector predominantly drives innovation. Various indicators, such as science and technology input measures, can gauge innovation by quantifying resources invested in S&T (Taylor 2016, p. 36). However, gathering accurate data to

measure innovation remains time-consuming. An alternative approach involves assessing outputs, like patents and publications, from research and development, offering a potentially more accurate quantification of innovation. This method benefits from readily available information and a lower risk of misleading figures, given that the data is approved and represents tangible outputs. In conclusion, innovation manifests in diverse forms, and while challenging to define and measure, its impact is evident across various sectors.

Technological Innovations Influence on the Economy

Innovations' influence on technology profoundly impacts the economy. It serves as a significant influencing factor in diverse areas that contribute to economic dynamics. According to Taylor (2016), technological innovation brings about increasing returns and growth, proving to be a pivotal driver of competitiveness and economic progress. This is likely because technology, with its ever-changing nature, affects various sectors of the economy. New technological advancements can alter how companies produce or distribute products, thereby influencing the overall economy. Additionally, technological progress facilitates easier communication and idea-sharing among nations, streamlining the innovation process. In conclusion, technological innovation plays a crucial and impactful role in shaping not only technological output but also other factors contributing to the overall economy.

Automobile History

Throughout history, innovation and technological advancements have both positively and negatively impacted many companies. Despite the general assumption that people always strive towards technological progress, this is not universally true. This was evident during the introduction of automobiles. While transportation was a necessity, it wasn't a top priority when automobiles were first introduced. The initial introduction of automobiles in the U.S. had the potential to bring about significant changes in transportation and create new economic opportunities. However, various interest groups, including stagecoach operators and railroad companies, opposed this innovation. These groups saw automobiles as potential threats to their established businesses and spread fear to hinder their adoption.

Additionally, the fear of job loss posed another hurdle for automobile innovation. Many held the belief that the introduction of automobiles would result in unemployment in the stage-coaching and railroad industries. The railroad industry, in particular, presented the most significant challenge for automobiles, as they depicted steam-powered vehicles as dangerous, expensive, and a threat to horses. This portrayal influenced public opinion and persuaded politicians to impose heavy taxes and strict regulations on automobiles. Consequently, these obstacles led to automobiles becoming an obsolete innovation for several more years (Taylor, Chap. 7, pg. 184).

Cleaner Automobiles

While automobiles initially faced opposition at the beginning of their conception, they swiftly evolved into a valuable part of life. Following the setback of steam-powered cars, automobiles transitioned to combustion engines, marking their debut as a viable and positive influence on transportation. More people embraced the idea of innovation for automobiles as they offered an easier and faster means of travel, resonating well with consumers. Over time, the demand for further innovations in automobiles grew, leading to features like pre-installed GPS, self-parking capabilities, and in-car computer systems. The automobile industry has come a long way from its steam-powered origins.

In the present day, people seek progressive ways of getting around without harming the environment. This shift in demand has given rise to electric-powered cars. With the recent push for environmentally friendly and sustainable living standards, there emerged a niche for change. Cleaner transportation became a valued commodity for consumers, prompting automakers to produce electric cars in response to the growing demand.

However, a budding fear surrounds the new idea of creating electric-powered cars. Automobile industries are growing concerned about the expensive nature of developing energy-efficient vehicles. There is also apprehension regarding the challenge of establishing a lasting battery life expectancy. In addition, the influence of oil and gas industry owners impact the creation of electric cars. Individuals see no incentive to buy a new car when they have a perfectly functioning one, especially if gas prices remain affordable, dissuading consumers from making the switch. Faced with these challenges, automobile

companies must compete on prices to attract consumer attention. Additionally, they need to position electric cars as a commodity that consumers cannot do without. The electric-powered car represents the next innovation of the future, and it will have a significant impact on technology, market dynamics, policy, job creation, and economic performance.

Innovations of Cleaner Automobiles Unavoidable

The innovation of cleaner automobiles became unavoidable as society and markets advocated for a cleaner mode of travel, compelling automakers to pioneer a new wave of vehicles. As Warsh (2006) asserts, new ideas are virtually inevitable in the presence of innovation. This is evident in the continuous innovation cycle of automobiles, with a focus on environmentally friendlier travel options. Even without the societal push toward environmentally sustainable travel, innovators would likely have eventually explored the idea of electric-powered cars.

Not only is innovation unavoidable once started, but competition also accelerates the process. Warsh (2006) presents innovative discoveries that happen in competition. Automobile companies are continually in competition with each other. Since the inception of different car "makes and models" competition for the next best thing has been ongoing. Each new car on the market features innovations that show the advancements in the automobile industry. In the end, with today's technology, having an electric-powered car is both inevitable and feasible.

Technological Advancements

Additionally, technological advancements are essential for creating an efficient electric-powered car. Achieving a functional and efficient electric vehicle relies solely on innovation. Innovation has empowered companies to transform nearly any existing product into something superior. The astonishing progress in battery-powered cars showcases the significant strides made in technology over the years, illustrating the timeline of innovation's progression.

The impact of innovation on technological development is frequently observed. There was a time when having a battery in a remote control lasting more than 24 hours would have been considered astonishing. Batteries can now power entire cars for hundreds of miles, showcasing the remarkable evolution of battery technology. The concept of plug-in capable electric car

batteries, enabling convenient home charging, was once thought unachievable but has become a reality. While challenges like charge time and charging stations remain, further research and development can propel electric cars into a competitive market item, marking a potential shift towards widespread adoption.

Research and Development

The most reliable way to develop these ideas is to use research and development (R&D) to progress innovations. R&D relies on the knowledge of various people and studies, often developing new ideas from existing ones and combining them to create something new (McArdle 2010). The approach to R&D is continuously building on old ideas to generate new ones. Investing in R&D is crucial for ensuring a steady flow of new ideas. However, innovation is expensive, requiring trial and error and enduring failures to succeed (Taylor 2016 p.82). Securing steady funding is best achieved through government subsidies, as states can invest in R&D more effectively and formulate policies to support innovation. Government support also provides credibility and stability compared to relying solely on private funding.

Concerning the innovation of cleaner cars, Sperling (1996 p.58) notes that the auto industry spends over \$5 billion annually in the U.S. alone on advertising and even more on research and development. With such substantial funding, the automobile industry should have no obstacles in coming up with innovations for electric cars. The interest of both automobile companies and the U.S. government in investing in alternative options is encouraging. The government's support provides additional benefits to the automobile companies, including tax breaks, policy initiatives, and extra funding, facilitating the goal of sustainable, powered automobiles.

Policy

While research and development have aided automobile companies enacting specific policies can support the push toward evolution and foster a culture that encourages it, even considering the natural losses that may result from innovation (Atkinson 2014). In many cases, policies are designed to build and offer incentives for addressing the issue, facilitating its integration on a larger scale. When many people follow the policy and strive to address the issue, progress is achieved

more rapidly. Policies can also stimulate competition, providing a broader range of specializations on the issue.

Policies currently in place to push automobile companies toward a cleaner future have proven to be positive for the initiative. Lee (2011) explains that government assistance in supporting research and demonstrating new battery technology, along with additional costs imposed by Congress for oil imports and air pollutants, would help accelerate progress. If the government were to implement a policy making it more expensive to import oil to the US, companies might shift their focus from obtaining oil to improving battery technology. Similarly, imposing taxes on air pollutants could incentivize companies to adopt better environmental options. In theory, placing more stipulations on the oil industry and pollutants could significantly promote a shift toward cleaner energy. Creating policies to reduce oil consumption will necessitate a complete shift toward alternative power for the transportation system (Lee 2011).

It has been the focus of many states to try and implement policies that would help maximize innovation in cleaner transportation. For instance, Dijk (2010) even states that in "2000, we find that sustaining efforts of California's Air Resources Board and Toyota were triggering the creation of an innovation path of hybrid-electric engines." California took the initiative to push businesses to find cleaner ways of travel, and these initiatives have proven to be successful. For California, it is a very ambitious progression towards cleaner energy. They have implemented deadlines, goals towards zero-emission vehicles, and penalties for not complying with the guidelines (Calef 2007).

Economic Performance of Automakers

As a result of policy, businesses will do anything for peak economic performance. This is often why companies follow policies and initiatives—to stay ahead. The need for companies to stay economically ahead can compel them to do almost anything to maintain their position at the top. For example, technology selling and trading serve as a voluntary means to pursue opportunities for profit (Baumol 2002). The trading of technology can help spread innovations and contribute to market growth. Companies may even acquire another company's innovation to incorporate it into their products to maintain a competitive

edge. Every innovation and technology created paves the way for the next newer innovation, creating a domino effect.

As for the innovations involved with cleaner transportation, many companies are trying to find clever ways to ensure their companies come out on top. The production of electric vehicles was inevitable, so now the focus is on finding the best strategy for inexpensive production (Sperling 1996). The only way automobile companies will not feel like they took an economic hit from the production of energy-efficient transportation is by innovating ways to make them more affordable. Companies, such as Tesla, are striving to offer a range of vehicles with varying price points, providing both affordable and luxury options. By utilizing innovations to advance electric cars and offering affordable options, companies can stand to receive fair profits. Taking advantage of the policies in place for cleaner cars and incorporating innovations developed or acquired through research and development will keep companies competitive in the market.

Market Dynamics

Additionally, the economic standings of the companies will not be the only thing affected by the innovation of the automobile companies; market dynamics will also see a shift. To fully grasp the effects on the market, one must observe how automobile companies shifting towards cleaner energy will affect price, demand, and supply. Analyzing the overall effects will help automobile companies understand what is needed to successfully influence market dynamics with innovative cars.

The first market effect that needs to be observed is the price. The price of any vehicle varies depending on the features, year, make, and model. The same standards will be held for electric cars. Electric cars can only be competitive with conventional cars if they have similar costs in terms of price, maintenance, and range (Lee 2011). If electric cars can stay competitive, if not more cost-efficient than current automobiles, they could have a greater effect on market dynamics.

The second market effect that needs to be observed is demand. While there has been slow demand for electric cars, there is still a certain demographic more likely to buy them. Glerum (2014) lists the target customers as those who use public

transport, households with several cars, high-income owners, and younger consumers. With the demand of these target consumers, electric cars would be seen more prominently. The demand for electric cars would also help drive the stock of automobile companies, leading to more stock partners and funding to supply the demand.

Lastly, the third market effect as mentioned in the section on economic performance, the supply of electric cars is one of the current biggest issues. This could be due in part to the demand for electric cars being high. However, firms are driven by the market to find the most economical methods to produce and supply the products most suited to consumer demands (Baumol 2002). With the demand for electric cars, the supply would also inversely increase. Automobile companies are fully aware of the innovations needed to supply large amounts of electric cars, and they would be willing to do so if the market demands the product.

Not only will supply, demand, and price play a major role in the market demands of electric cars, but policy as well. With a policy change, a greater demand for electric vehicles could be seen. It is safe to conclude that as policies are put in place to reduce emission rates, there will be a correlated increase in demand for electric cars. If consumers need a new way of transportation to comply with policy rules, they will demand a product. This also means that the price could vary as long as it is competitive with gas-powered cars and the penalties put in place by the policy. Overall, the market dynamic for the automobile industry would be on the rise.

Job Market

Not only does the demand for cleaner automobiles change the dynamics of the market, but it also can influence job markets. While many people fear that a move to cleaner transportation can cause job loss, that is not necessarily the case. The fear of job loss has been lessened, if not disproved, by many studies on the impact innovations have on job markets. In many cases, innovation creates new jobs in the wake of eliminating others (Atkinson 2017). Not only does innovation help build new jobs, but it also makes them more efficient. Although there can be slight job loss from innovation, a new job will come up as a result. There will always be a job that automation cannot do. Job loss is also not something that can happen overnight.

Businesses are impacted by the pace and direction of new products, which could still play a part in the new jobs entering the job market (Sutaria 2004). It is very unlikely that a business will drop its whole market because of innovation; if anything, it will try to modify and adapt to the new demand.

As for the discussion of job loss due to automobile industries trying to find innovative ways of being cleaner, studies have shown that the number of workers laid off primarily due to environmental regulations has been quite small (Goodstein 1996). Studies of environmental measures impacting job growth show positive influences. Environmental measures could help jobs through increased labor, cost-effective substitution of imports, and job sharing (Goodstein 1996). In the end, innovations open up the job market to new jobs and technologies that could increase job growth.

Resistance of Innovation

While the introduction of innovation and cleaner automobiles has many positive effects, there are also a few negatives that should be taken into account to have a well-rounded understanding of innovation. Some of the biggest challenges faced in the automobile industry may cause some companies to face losses. Companies may not necessarily want to be seen as losing, but any innovation or science/technology development can make losing a possibility. With the creation of any new product, there can be an adverse effect of product displacement.

In terms of economic losers in the automobile industry, they stand to lose larger assets with failure. Economic losers hold most of the stake and value of automobile companies, so losing would cause them great losses. It would also prove to be a loss for the company overall because they would be missing out on the economic opportunities that could have happened with successful innovation. Another effect of economic losers would be the labor force (Taylor 2016). If there is not an economic drive or demand for a company's product, then the labor force supplying the product would no longer have a job. Facing an economic loss that affects labor hurts not only the workers but also the economy of the country as a whole.

The second loss that can be faced due to failure is in society. While this conclusion seems a little less important, it can be detrimental to companies. If social groups are facing loss because of innovation failure or success, they will do anything to gain control again. Oftentimes, social groups will be more politically driven to discuss their dislike of the situation. Social groups can also claim cultural implications that can be caused by innovation, gaining support from cultural groups that believe could be affected.

Finally, the chorus of all the resistance plays an even greater effect on innovation. With the overall support of all resisters to innovation, it can have a major impact on progression. The agreement of all losers allows them to hold power over what innovation and technological advancements will happen. The alliance of losers to delay innovation in automobile companies can prove to be a big problem for progress. Without the support of innovation, automobile companies will struggle to properly create new technology. The resistance to new technology in automobile companies could be due to the costs of moving from old technology to new technology. Overall, the resistance of losing groups could stump the development of new technologies that could help automobile companies.

Barriers

Not only does innovation face the resistance of losing groups, but it can also encounter barriers imposed by the federal government. There are numerous stalemates that the federal government can impose on innovation to limit progress. The biggest barriers are the federal budget and "regulatory and administrative policies and processes that discourage investments (Blakey 2011)." Discouraging policies make investors less likely to invest in innovation when there could be policies hindering its development.

The barriers that innovation faces in the federal government also help explain why companies find it hard to invest in innovation. For companies, having the support of the federal government makes them more willing to participate. The same can be concluded for the automobile industry and why some have yet to start the shift towards innovations for energy-efficient cars. If automobile companies do not feel they have the full support of the federal government, then starting innovation might not be worth it. However, it is not too

far-fetched to see the shift of automobile companies as the federal government begins pushing for innovative ways of cleaner travel.

Conclusion

Over time, innovation has been a product and a development of many varying factors. This paper covers some of the more pressing impacts innovation has had on automobile companies. Focusing on the impact advancement of innovation has on technology, market dynamics, policy, job creation, and economic performance. The effects of these factors have been studied in depth to help analyze the greater impact innovation can have and face in a company's pursuit of new technology. The paper also covers innovation limitations, as discussed in the form of different groups' resistance to innovation and barriers in place by the federal government. Looking over each factor will help readers understand the overarching effects of innovation on the world.

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