How the Shift to Electrification is Affecting the Car Industry and the People

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Lecturer – Robert MacDonald
Module - Capstone Preparation
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Research Question

Has the switch to electric cars caused uncertainty in the industry? Should manufactures concentrate on electric vehicles?

Hypothesis

The car industry and the people are not prepared for the shift to electrification

Submission of Thesis and Dissertation

National College of Ireland

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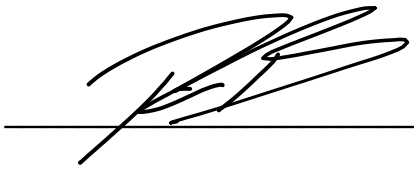
Signature of research student: 

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Abstract

This study tackles the shift to electrification in the car industry, examining how it will affect the people, car companies and even the governments too. With so much conflicting opinions and data online, it can be difficult for the non-car enthusiasts to understand the electric car world and the realities behind it. With the use of a survey, and responses from randomly targeted people, this study aims to breakdown the negatives and positives of the shift to electrification in a simplistic manner. With governments across the world planning on implementing electric cars in family homes, it is an important matter to have knowledge about, as cars are generally a big purchase for people. The danger of shifting an industry so big like the car industry, is that people are so used to combustion engine vehicles, change will be hard to accomplish, which will cause uneasiness and uncertainty among the people, The paper will go into detail about the result of electrification and what affect it will have on other industries as well. If it is a certainty that electric vehicles are the way forward as the government seem to think, the hypothesis of the study questions whether the people are actually ready to switch to electric cars now.

Introduction

This research looks to investigate the major switch within the car industry, examining the impact on the world with the introduction of electric cars. Over recent years and to this day, the automotive industry has gone through significant change, as governments look to push towards electric cars, people will be forced to move to electrifying their cars. This research aims to examine the reality of shifting an industry and the changes companies encounter during this process, especially considering their marketing. Acknowledging a new industry is difficult to promote, Car companies have to invest large amounts on marketing for their new electric cars. But why would they concentrate so much on electric cars? This is an intriguing space as a new industry is created, car manufacturers have shifted their interest to electric vehicles instead of combustion engines. The question is raised if the population are ready for the shift to electric cars now. We are seeing a massive shift from internal combustion engines in the sector already to electric cars but is it too soon?

Over the past ten years, electric cars have increased in terms of consumer demand, although it may be government pushed. Pioneers such as Tesla have driven the way forward since the early 2010s and they have propelled the marketing of sustainable cars. With restrictions and crackdowns on internal combustion engines incoming earlier than expected by governments around the world, there is a perception of panic in the automotive industry in general. Car manufacturers are inclined to invest lots of money in research and development on alternative fuel sources while also concentrating on infrastructure to power their cars. However, car manufacturers cannot fully make the charging infrastructure sustainable themselves, there will have to be lots of charge points installed So buyers can actually use their electric car. But beyond car manufacturers, are electric cars really the future? With various reports an article slating electric cars, if there was no government incentive, why would people switch to electrification? Climate change maybe a factor to consider but, are people willing to switch to electric to help save the planet? This paper aims to breakdown the current reality of the switch in the industry which is aiming to make combustion engines obsolete.

Literature Review

Why the Switch to Electrification?

Climate Action Policies set by the European Union

Climate change had and will have a major effect how the world functions. Boosted more so within the last 10 years, there has been a global realization that sustaining our current projections, there will be major implications for our planet's ecosystem. Perhaps the threatening fact is that if we continue the way we are, there will be irreversible effects which will hamper the future generations of the planet. Naturally, there is panic around the world regarding climate change as it is becoming the number one priority because if it isn't, everything else in the world will become obsolete. Rising temperatures, longer frosty months, rising sea levels and shrinking glaciers are just some of the effects we are currently experiencing (Jackson, 2021). Currently, we are on track to further enhance these results, so governments and global corporations are desperately trying to find solutions to improve climate change.

One way to help with greenhouse emissions, is to concentrate on abolishing air combustion engine cars that we use on a daily basis. "Passenger cars and vans ('light commercial vehicles') are respectively responsible for around 12% and 2.5% of total EU emissions of carbon dioxide (CO_2), which is the main greenhouse gas." (Climate Action, 2020). This percentage alone is not threatening climate change in a major way, however, as it is down to each individual. Theoretically, it is easy to achieve much lower CO2 emissions for cars and vans, as we can all switch to electric vehicles. In theory for governments around the world, this may seem achievable, however in practice, we will learn it is quite the opposite, which will be discussed later.

Electric cars will provide better simple ownership

Contrary to what most people believe now, electric cars are designed along with helping the environment to be a better vehicle ownership experience. Ever since the launch of combustion engine cars, they have improved and become more reliable over the years as

technology has vastly developed. Now, engines are at the peak of development, new technologies are always arising, and electric cars is the new wave.

In comparison to combustion engine cars, there are lots of positives and improvements that electric cars provide. With a combustion engine car, you are aware of all the movable components that are needed to run the car. Along with that, engines need to be cared for. Regular oil changes and service intervals are just some things owners have to consider with combustion engines. Furthermore, when owning a petrol or diesel powered car, you have to be wary of temperatures, fluid levels and what fuel you are putting into the car. For the everyday user cars, they do not want to be thinking about those factors. The regular person instead likes to get into the car and drive from A to B. Electric cars eliminate these factors as they are totally opposite to combustion cars. With an electric car, you have fewer movable components "so they come with less ongoing maintenance costs. In fact, there are about 20 moving parts in an electric engine, compared to nearly 2,000 in an ICEV!" (Drive Electric, 2022)

There is also no need to warm up an engine before driving as it is just an electric motor that powers the car. Apart from washer fluid there are no coolant fluids, fuel or oil to worry about. This is a major selling point of electric cars as their advantages are the disadvantages of combustion engine vehicles.

Furthermore, another reason why there is a push to electrification is because of the safety of electric cars in comparison to combustion engine cars. There have been various reports previously outlining that electric cars are not safe as they contain lithium ion batteries. They are combustible if they are damaged, but they have much less risk in comparison to internal combustion engine vehicles with as gasoline is highly flammable (Kia Singapore, 2018). Electric cars are getting safer and safer, and now they are being produced surrounded by protective cooling shields to prevent circuit shortages. This is all done in order to make electric cars the safest option instead of combustion vehicles.

Money & Power

A massive driver for change within someone's life or a company is if they are wealthy or struggling for money. It is what makes the world function properly and everyone uses it daily. When a new industry is being explored there are various ways of making large amounts of money and becoming the dominant figure within the market. Regarding the car industry, it is crucial for manufacturers to strive to be number one to gain the most market share possible as it is such a competitive industry.

It is no secret that electric cars are highly expensive to purchase and produce currently as of 2022. It is a new area of development so costs are known to be higher, but VW expect a reduction in fixed costs of 5% by 2023. With further development ongoing constantly, and the prospects of electric cars taking over, it is worth the initial investment now for a greater return in years to come (The Irish Times, 2020). With mass adoption incoming in a few years, car manufacturers can produce more vehicles and economies of scale will occur therefore, meaning car manufacturers can produce more cars at a lower cost. Currently, prices of electric cars are more expensive than their petrol equivalent. There is not much of an incentive to buy one considering the costs but, with pressure from governments across different regions of the world, people are being highly persuaded to purchase an electric car (Briscoe, 2020).

With prices of electric cars being thousands more than petrol, it is a lucrative way for car manufacturers to make money. Also, In Ireland there are grants for electric cars up to 5000 euro and lower tax rates currently (Sustainable Energy Authority of Ireland, 2020). Although it may not be a lot, this type of cash incentive balances out the high cost of electric cars and will make people shift to the electric. Car industry manufacturers will want to avail of new customers whilst the industry is changing because the industry is highly competitive, relevancy is highly important to gain the most power in the industry. Also, with governments planning on getting rid of grants for electric cars, it is important for car companies to act quickly.

Traditional successful car companies such as BMW, Mercedes and Audi are dipping into the electric car market and with the current governments pushing for EV’s, they may be forced to

switch to an electrified lineup due to the pressure from new startup companies. Rivian automotive, which is a ground up electric car company, have stormed the industry creating lots of interest in their company by displaying impressive innovation developing electric cars. With impressive performance, charging capabilities, range and build quality, they have quickly caught up to the traditional car companies and with prospects of outperforming them soon. Money will always be the attraction for any company in the world and when they see competitors doing well, they become envious of them.

With the IPO of Rivian automotive, (which is backed by Amazon), the company set the price of the stock at $78 which gave it a valuation of 70 billion. This is a high valuation for a car company considering Ford's market cap is around 60 billion (@YahooFinance, 2022). Ford being one of the major car brands in the world, Rivian's valuation may be insulting in comparison considering the history of Ford, however, investors and the public were keen and during the first day of trading, Rivian's valuation surged above 90 billion making them far more valuable than Ford and General Motors (Heilweil, 2021).

The amount of money within the electric car vehicle industry cannot go unnoticed, hence the switch to electrification (Gordon, 2021). The world moves on quickly and technology is advancing constantly, if traditional car makers stay out of electric cars then they may not survive and become irrelevant in the future due to disruptive innovation. GM (General Motors) responded to the craze and sent their own stock price soaring when announcing 30 new EVs by 2025 (Team, 2022). After being one of the biggest brands in the car industry for years, they have to adapt to the market to stay relevant in this changing industry.

Marketing for the car industry as a result of Electrification

Car companies concentrating on electric vehicle marketing

Manufactures mainly rely on marketing to sell their cars and out perform their key rivals. It is crucial for them to get their marketing right as it is one of the biggest investments for people to buy a car.

Marketing has seen a significant shift from traditional practices to digital practices which is bringing in new ideas how to advertise. Ever since the beginning of marketing, traditional methods such as television, radio, magazines, newspapers and flyers were seen as the best way to advertise products. It is only until recent years that there is a shift from traditional marketing methods to more innovative and superior digital methods. In 1990, there were around 63 million circulating papers per day (Adgate, 2021). Comparatively in 2005, newspapers generated a massive $49.4 billion in revenue (Adgate, 2021) but since then, the numbers have dwindled. In 2019, the ad revenue generated from newspapers was $12.9 billion. The influence of the digital age has heavily dampened the dominance that newspapers once had. This is important for car manufactures to change how they advertise their electric cars as traditional methods of adverting like newspapers have an audience that are not the target market for electric cars.

It's not just newspapers that are now considered a traditional way of marketing, television as we know it, is next to face the attack of the digital age. Year-on-year there is an average decline in viewership of 7%. This decline is even more prominent when it comes to younger adults. From ages 15-34, television viewership has fallen to a diminishing 12% per annum (Slattery, 2021), with people slowly fading television out of their lives shifting to online media such as Netflix, YouTube and other social media. This is evident as not nearly *"Ninety-five percent of vehicle buyers use digital as a source of information"* (Schueller, 2017).

Video Marketing

Considering the impact of the digital age, car companies use different types of marketing strategies to lure customers into their brand. One way this is done is through video marketing.

The impact of the pandemic has fast-forwarded the move to video marketing with major motor shows such as Geneva being cancelled. Car manufacturers had to adapt and now, they regularly present their new cars to the world through video marketing. Although cars may not be tangible through a screen, video presentation grants a better reality in comparison to pictures traditional methods of marketing such as newspapers and radio gave us.

Taking Tesla as an example, in March of 2019, Tesla revealed the new model Y to the world showcasing it on YouTube reaching 6.3 million as of December 2021 (Tesla, 2019). Even if a certain percentage of people watching were to go and buy a new car because of this video, it would be a success. But also, they are engaging with potential customers creating a community with live audience and comments interaction. Not only are people becoming accustomed to the brand and the products, but Tesla are also creating positive word of mouth to promote passive advertisement. This style of advertisement outperforms traditional methods of marketing and is an example of how the car industry

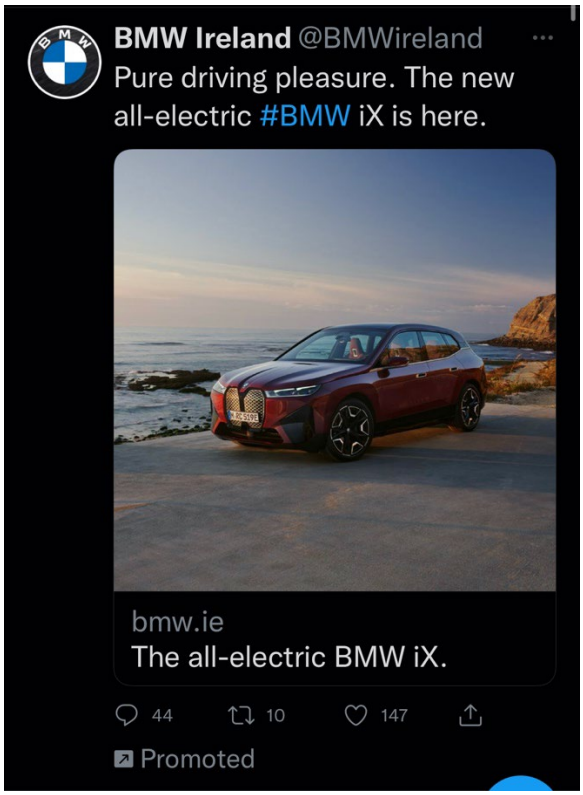
Targeted Ads

We all know and have experienced personalized advertisements through devices that we use every day. Influenced by our searches, location and personal data, targeted ads are tailored individually for people. Perhaps a mischievous way of advertising as 17% of people believe that it is ethically wrong to track people's data (Koetsier, 2019) but, it is extremely effective. When we accept terms and conditions that we usually don't read, this allows companies and data centers to collect information about you and either sell it or use it to their advantage.

Regarding the car industry, this is a great way for companies to advertise their products to people. Especially since the car industry's marketing must be tailored to certain people, targeted ads outline what car you will want and to your desired specification as well. For example, if you are young, with a family, a well paying job with disposable income and live near suburbs, because of data collection, a personalized advertisement would be aimed towards you. The car brand doesn't need to do any primary research as your data is all online so they can personalize ads that suit peoples wants. In that example, you are in the market for a new car and search for SUVs online. From there on, you will see a lot of personalized ads that will appeal to and suit you. With Electric cars bursting onto the scene at an alarming rate, targeted ads have never been more important for car companies. As it is a relatively new

sector for brands, they must rely on targeted ads to reach the right customers for electric cars which they do by judging algorithms. Petrol heads despise the idea of electric cars as they do not give the same engagement a combustion engine car does so advertising for them would be a waste of resources.

People will have split opinions about targeted advertising however, it is becoming an increasingly popular method of research for companies. "*In 2020 mobile advertising spending reached a record 223 billion U.S. dollars worldwide*". Although it may be a drastic increase of 17% on the previous year boosted by the pandemic, it shows that it is a popular way of data collection as there was 190 billion spent in 2019 (Statista, 2020). It is interesting to note that various articles and authors may agree that this way of advertising is mischievous however, the mentioned articles realize the potential and the inevitability of digital advertising, and this is backed by the heavy investment into the sector.



- Targeted ads are a worldwide method of advertising and even in Ireland as seen above, BMW Ireland is using targeted ads based on search history.

The Negatives of Shifting to Electrification

Poor charging infrastructure

The main negative association around electric cars is the infrastructure that surrounds them. It is the core weakness that has controlled the transition to EV's. As of January 2022, there are about 1000 public chargers in the Republic of Ireland (Energia, 2022), many of which do not support super-fast charging. Usually with a combustion engine car, when the fuel tank was empty you would go to a petrol station and refill the tank and pay in the shop within 3 minutes. There are no queues, petrol pumps reliably work and there are petrol stations widely available across Ireland and the world. With 1500 stations alone spread out in Ireland (Hutton, 2019), each having multiple pumps, the infrastructure is developed for combustion cars. With the introduction of electric cars, there will eventually have to be a changeover of these stations as currently, the charging infrastructure is poor in Ireland.

Although there are chargers being implemented around the country, the investment into the quality of chargers is especially weak. According to Fianna Fáil Senator Timmy Dooley, the ESB has shown a lack of ambition in building our national infrastructure to allow electric vehicles (EVs) to be recharged at stations located around the country. As a very wealthy firm, Dooley states ESB should have acted sooner and made dependable charging outlets widely available by now, especially given the Irish Government's objective of having one million EVs on Irish roads by 2030 (O'Sullivan, 2021).

With only 80 million being spent since 2010, that figure should be 10 times greater to keep up with expected demand. With 50 kilowatt (kW) "supposedly fast" chargers being available at public ESB chargers, people can plug their car in to charge their car. People are used to refilling their car within a few minutes, so, naturally the wait time for charging an electric car will be a problem. A typical Nissan leaf with a battery capacity of 62kW will charge from 20 to 80% in around 90 minutes. Limited by the speed of the chargers, cars are being developed now to withhold a lot more charging capacity.

Also, with a maximum range of 385 kilometers in the Nissan Leaf (Nissan, 2019), people will be regularly charging their cars more than combustion rivals. This results in less chargers

being available and under high demand, they do not perform at the optimum level providing full capacity. This is the weakness with the charging infrastructure in Ireland as it is a problem for the everyday driver of electric cars as people do not have time to be waiting around for a car to charge.

EV's aren't as clean as hoped

It is perceived that electric cars are clean for the environment lowering the emissions harming and impacting the world hence the reason for the switch to electrification. it can be agreed that electric cars will be cleaner than combustion engine vehicles in the future however, as they are in the growth stage after development, currently electric vehicles are not as clean as they are perceived to be. Through various articles and reports in recent years, from testing and driving an electric car, the emissions produced are zero compared to combustion engine cars. However, it is one thing to drive the car, but manufacturing and creating the car arises the problems for electric cars with regards to emissions produced.

The idea of electric cars not being so clean has been tossed around by many people, but the car company Volvo released a report comparing their new electric car emissions against their combustion engine equivalent. Mentioned in the report that there a desire to only sell electric cars by 2030 however, interestingly, the report is not fully in favor of the switch to electrification so soon. In comparison to the combustion engine car, and the electric car has to drive 110,000 kilometers before it breaks even with regards to emissions produced (Carbon footprint report, 2021). Lithium ion battery modules currently have high carbon footprints accounting for 30% of emissions produced by components in an electric car which should be considered as battery technology is what is supposed to save the future.

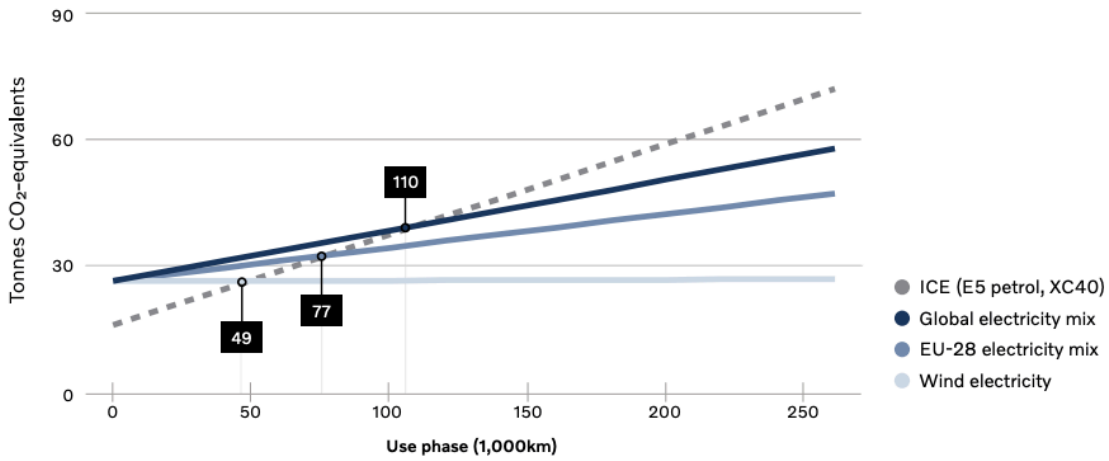


Figure iii. Break-even diagram: *Total amount of GHG emissions, depending on total kilometres driven, from XC40 ICE (dashed line) and C40 Recharge (with different electricity mixes in the use phase). Where the lines cross, break-even between the two vehicles occurs. All life cycle phases except use phase are summarized and set as the starting point for each line at zero distance.*

**Image taken from the Volvo report*

Mining raw materials, are currently needed for the production of batteries for electric cars. The mining of cobalt and lithium it is extremely energy intensive and mining these is one of the biggest carbon emitters for electric vehicles today. Creating electric cars produces substantially more pollution than producing combustion ones. This amounts to between 30% and 40% more in manufacturing emissions, the majority of which come from battery production (Saheli Roy Choudhury, 2021). At the current rate it is not sustainable to produce electric cars considering the emissions to make them. Although they do run on supposedly clean energy, the source of that energy can also be questioned as not all electricity is produced in a clean way. With wind, solar and other renewable ways of producing electricity emerging in recent years, this is promising for the electric car industry as renewable energy is a hope for the future.

However, there is another issue the electric cars create and that is the recycling of the batteries once the lifespan is complete. Battery recycling has never been easy to do, with components soldered together, raw materials being used and the durability of the battery modules being extremely difficult to breakdown, batteries are one of the hardest units to recycle. Not all batteries are able to be recycled either with many of them going into landfills damaging the environment. If a battery ends up in a landfill, its cells can emit harmful

pollutants and heavy metals. Also, recycling the batteries may be a dangerous process; if you cut too deeply into a cell or in the incorrect area, it can short-circuit, explode, and exude poisonous fumes. In Australia the recycling rate for lithium ion batteries are only 2% meaning the other 98% cannot be recycled fully therefore creating a waste of precious materials (Jacoby, 2020). This issue creates a stigma around electric cars that cannot be overshadowed and ignored as it is as damaging if not more to the environment as combustion engine vehicles are. Governments across the world have noticed this and China enacted new regulations in 2018 to encourage the reuse of EV battery components. Although this may be a start, the technology is not there to produce fully sustainable batteries.

With the phasing out of combustion engine vehicles coming within a few years, this will mean there will be a lot more electric vehicles on our roads, with a predicted 145 million electric vehicles by 2030 will be on the road (Morse, 2021). Although that may seem like a long time away, advancing the technology to be fully sustainable will be a challenge. Batteries diverse greatly in chemistry and structure as there are so many different variations and combinations, making efficient recycling systems challenging to design. And the cells are frequently bonded together with strong glues that make them difficult to separate which will cause frustration when recycling (Morse, 2021). T

his is perhaps the biggest problem for electric vehicles that hampered the growth of them. There will need to be serious investment and research to accelerate the sustainability target that car manufacturers have for electric vehicles. If it cannot be done, the shift to electrification will be wasteful and companies will look to source a new sustainable method for producing cars. The pressure is on for electric cars to become fully sustainable and efficient in the future.

Rising Electricity Prices & The Grid

There are multiple problems with electric cars ranging from the charging infrastructure to the range you get from them, but the fuel that drives the car which is electricity is and will be a problem in the foreseeable future. As this piece is written, the world is in a crisis with the global pandemic and wars causing spikes for the cost of living for the people. Although these spikes may be uncontrollable for the people, it affects them in a major way especially when it comes to transportation and their cars. There are already chip shortages for producing cars but other shortages such as petrol diesel fuel crisis has affected everyone who owns a car. The price of fuel has fluctuated massively over the past two years which has never been seen before. But it's not just the price of fuel that is on the rise, electricity is affected majorly as well.

Inflation has risen to extreme lengths people now cannot afford to pay their bills. However, add this to the already increasing prices of electricity pre-covid pandemic and war between Russia and Ukraine, the price of electricity is only going up. If you are lucky enough to have a home charge point for your car, the current electricity prices make it feasible to own an electric car however prices to charge at a fast charger have massively increased compared to what they were previously were. Ionity, a well-known charge point network increased electric charging prices by 500% at the end of January 2020. From a fixed rate of €8 to a pay per kilowatt system of €0.79 per kilowatt (Benoit, 2020). With some basic maths, using the Nissan leaf example from earlier with a 62 kilowatt battery, this would result in a cost of a hypothetical empty battery of €48.98. This is a dramatic increase that would match an already high petrol cost to run the car.

Electric cars were designed for the electricity to be cheap to run them as they are so expensive to purchase. Without government grants it is not always feasible for a person to buy and run an electric car even though it should be cheaper theoretically. Unless you can charge from home, it makes it very difficult to run an electric car cheaply added on to the fact that the infrastructure is poor already. But, with Electric Ireland announcing they are raising residential electricity prices by 23.4%, this will wipe out any savings made by charging at home unless people avail of solar powered energy (ESB Corporate, 2022).

The electric grid can't handle it

What is also increasing is the use of electricity on the grid due to people charging electric cars. For years we have been used to petrol and diesel fueling our cars and we were very reliant on those fuel sources. Now with electric cars arriving onto the scene, electricity is being used more and more to power these cars. With big batteries on board, there is huge demand for electricity when charging electric cars. Even a typical midsize car like the Nissan Leaf with the 62kw battery uses a lot of electricity to charge it up. With a high usage of electricity in a home of 5400 kwh a year (Switcher.ie, 2021), this may seem a high number, however, divide that by the number of days in a year (365) and the daily usage is around 14.795 kwh. For every 100 kilometers driven in an electric car, 15kwh on average are consumed (Epower.ie, 2020).

Again, with some simple maths, to get a rough guide on the amount of kwh an electric car uses, we divide 20,000 by 100 and multiple by 15. The outcome is 3000 kwh per year which is calculated hypothetically if you charged at home constantly and did that amount of milage a year. Although that would result in a saving in costs for fuel, which is a huge demand for the electric network. That is just the total for one electric car in a house over a year. Most houses have two cars and by 2030 the Irish government wants to have over 900,000 electric vehicles on the road (Will, 2019). This will create a huge demand on the electric infrastructure and the grid currently cannot sustain the hyper increase of electricity. Furthermore, grid overload is another issue as a result of electric cars.

As there is such a demand on the electric grid when cars are plugged in, this will be a problem at peak electricity usage times, as it would overload the grid if everyone began charging their cars at home at the same time. A real life example of this would be if everyone got home from work by 5:00 PM and plugged in whilst families cook dinner and using intensive electrical appliances, there will be huge pressure on the electric grid. This is not sustainable, and the government has set out strategies to help the electric grid cope with the influx of electric cars (Monaghan, 2022). Within these strategies such as special night tariffs, vehicle to grid systems and other management systems, the government has to dedicate time and investment into ensuring the electric grid can cope with electric cars.

Research Question and Hypothesis

This research is aimed to examine the impact of the shift to electrification in the automotive industry. Electric vehicles are a significant transition that is now taking place, and car manufacturers must change their marketing and business approaches in comparison to previous methods. But is it worth it currently to push for electric cars considering the negative views around them? Meanwhile car purchasers must assess whether switching electric is worthwhile for them and their own situation with electric cars on the horizon to become the norm for people, car manufacturers are racing to outperform their key rivals for producing and marketing their electric cars. Although the cars themselves have a massive influence on people's decisions, marketing has an overall effect on people's choices of whether they should buy a product. However, as it is a relatively new concept, it may be too soon to concentrate fully on electric cars. So, this paper aims to debrief if car manufactures, and Ireland are ready for shift to electric vehicles. By examining the hypothesis that the population are not ready for the shift to electrification, the the switch in the automotive industry has caused nervousness.

Methodology

Philosophical assumptions

The purpose of this study is to examine in detail the switch to electrification in the automotive industry. We know the process of the shift will not be overnight but, it is important to examine if the electric car infrastructure can sustain an influx of people and improve accordingly to keep up with future demand. For car manufacturers, it is difficult to judge whether or not they should invest their future into electric cars now and concentrate on marketing their EV's. From past investments into combustion engine vehicles and with them likely staying on for the foreseeable future, it is difficult to find the balance of direction for car makers. The switch to electrification has caused uncertainty in the market, so, the hypothesis is if Ireland will be ready for the shift to electrification. With combustion cars still having the market share, their lifespan is far from over, so it is a difficult balance for car

manufactures. However, with government legislation being implemented to make people purchase electric cars, along with the supposed climate benefits, it is only a matter of time before the electric car infrastructure is sufficient for everyone. Again, this is the difficult balance for car manufacturers as they don't know whether to fully concentrate marketing their electric cars.

The already successfully developed combustion engine vehicles are highly efficient, which is causing the direction of the car industry to be within a confused state currently. To help with that, as technology advances, there is lots to talk about in the car industry regarding synthetic fuels. Efuel is being developed currently, which is proposed to run current combustion engine vehicles as they usually would on petrol or diesel but, synthetic fuel produces no emissions to hamper the environment. As the synthetic fuel is being developed under normal combustion engines, this will mean that the fuel will be able to run older previous combustion engine vehicles, which, will essentially isolate the ambition for fully electric vehicles in the industry. With Porsche investing $75 million into the development of synthetic fuels, the reality of Efuel succeeding is high, as they are one of the most renowned companies in the car industry (Potts, 2022). This study will further debunk the switch to electrification to see if it is the right move or not for the future of cars, and whether or not electric car companies should be marketing their car towards electrification now.

Research Design

To assist the hypothesis, a survey has been conducted of 51 people to discover if they would be prepared to shift over in the industry, and importantly, if they have noticed the movement already happening. They main theme of the survey is the to see if people are ready for the shift to electrification. Questions in the survey include the marketing behind EV's and if people are aware of the shift in the industry. By implementing these questions, it is easier to grasp the knowledge that some people have about electric cars in the future. If electric cars are the future, why aren't people buying them now? This is another theme that survey sets out to understand, as it is important to comprehend why people are not yet switching to electric cars instead of combustion. Furthermore, what is the reason for the shift to electrification? Do people know about it, and even more importantly, do they care about what they drive?

The questions asked are designed to obtain a general opinion around electric cars on whether or not people to see what the normal person thinks of EV's.

Goals such switching people to electric cars quickly are great ambitions, but as shown in the survey, not everyone is ready for the switch as there are different opinions from everyone. This type of research is crucial to see from the perspective of the people, if they feel it is not the right decision to move electric and why. Along with the public opinion, statistics from credible articles can outline if Ireland and the world are ready for electric vehicles, using primary research that most people do not have access to. The opinions of people are a great addition to any topic, as they add depth and different viewpoints but, using statistics to back up points verifies the statement. A sense of certification is displayed when statistics are used to back a point up and boost confidence around the topic. An example being, if Irelands electricity grid can handle a hyper increase in electric cars, it is valuable to have statistics to back up the point instead of someone's opinion that cannot be verified.

A quantitative approach such as examining these statistics, can be used to define some core problems regarding the future of electric cars. With the charging infrastructure lacking in Ireland, and only a few fast chargers available to the public, it is a major problem that restricts the switch to electrification. Furthermore, with limited range in comparison to combustion cars at reasonable prices, the population are not drawn to the electric car movement. An example of a Nissan Leaf is discussed in this study as the car has a limited range in comparison to a combustion engine vehicle. For the shift in the industry to work, statistics will constantly have to be measured and reviewed to see if it is viable moving forward for the future.

Objectivity and statistical viewing are not the only important paradigm to assess. Statistics are important and they can explain many things however, when it comes to a major shift in the industry, it is down to the qualitative approach of people to accept, in this case, the shift to electrification. The opinion of the public will play a huge role in deciding the future of electric cars. People's epistemology and beliefs can swing how the world evolves.

Previously, in the early 2010's in Ireland, the government planned to introduce water charges and rates for peoples regular use of water at home. The idea of this new tax did not go down well with the Irish people, and they retaliated against the proposal, with protests outside government buildings to prevent the new tax from emerging. The people won this argument and the government cut their plans to introduce the tax on water. Moving on a few years, a new discussion of introducing the water tax was played around by the OEDC however, because how the Irish people previously objected and stood their ground, the Irish government were opposed to introducing a charge (Blaney, 2021).

An example of this in the car industry regarding the shift to electrification, is if everyone decided against buying electric cars. Maybe they are too expensive? Considering the current charging infrastructure, it can be expected that many people will turn down buying an electric car. There would be no sales of EV's, and the production would quickly halt, showing the power that the people have.

Sampling

A survey will be used regarding this study as it gives an overview and perspective from multiple people that this topic will affect them sometime in the future. Therefore, as it is of genuine interest regarding people's future. The feedback received will be in depth, and the survey should spark conversation within family homes for the future of their cars. The survey was distributed to 51 people, of different age groups, to give unbiased and realistic views to the topic of electrification in the car industry. There is no specific target market regarding the survey, in order to achieve the optimum level of authenticity. However, the survey was conducted by mostly 18 to 25 year old aged people, with 66.7% of people who took the survey being within that age group. The survey began asking a question if you or your family drive an electric car, with 13.7% of people saying yes and 25.5% of them saying their family drive a hybrid. That leaves 60.8% of people not driving an electric car who took the survey. The specific age group is actually relevant for the shift to electrification as they will be of age when they were purchasing an electric car in the future, so, the results are a realistic viewpoint from future buyers.

Data analysis

The results from the survey will be analyzed by proving if the most answered questions apply to the hypothesis which is, that the population are not ready for the shift to electrification. With the lacking charging infrastructure, the cost of electric vehicles, the negative connotations around charging and the current average kilometer range of an electric car, it can be expected, that the survey will result in proving the hypothesis true, that the car industry and people are not yet ready for the shift to electrification.

With the use of pie charts in the appendix section and within the discussion section of this study, the data will be analyzed to see if the hypothesis is true or not at this current moment in time (2022). This data is interesting to compare in the future, when electric vehicles do develop along with the infrastructure, to prove in the future, whether or not the shift to electrification was the right move for the car industry. The outcome of this survey proved how the population are subjective in nature, creating an interpretive paradigm. Differing opinions on electric cars results in confusion within the sector and the clarity of whether or not they are the future is up in the air. The data collected in the survey is qualitive, as there is no definite answer if the shift to electrification is the future. Attached in the appendix section of this study our pie charts relating to each question of the survey. This was included to give a visual overview for some of the questions how they differ etc.

Limitations

As this study has been produced within a few months, there are a few limitations that occurred throughout the writing phase. The technical limitations of this design include a limited timeframe of 2 months regarding colleting data for the survey and a reasonable small sample of 51 people may have played a factor for non-differentiated opinions.

The car industry is a highly competitive, highly observed and highly criticized sector, Therefore, material online can be conflicting in comparison to other content about the same topic. For example, I, an electric car endorser and fan may praise everything about electric cars, showing their benefits more than the negatives associated with electric cars. Then,

centered around the same topic, a petrol head will have opposing views to the EV fan and produce an opposing piece to show to the world.

In an article by (Rowlatt, 2021) from the BBC, it stated that electric cars will take over sooner than we think, bashing the combustion engine cycle that we are currently in. Manipulating graphs showing the rise of electric cars currently, and future projections will convince the reader that they should buy an electric car, as it will be the future. Contrary to that article, according to (Ghayad, 2022) from Enginerine, the piece states that, electric cars will not be the future. As outlined within the article, there are climate concerns regarding the battery and infrastructure production. There are also alternatives coming to the industry that could replace electric cars such as Efuels, and the battery technology is hard to advance for greater range and efficiency.

It can become very confusing for non-car enthusiasts to read differentiated articles like these as they do not know what to believe. Therefore, it is a limitation to write a piece regarding the topic that has approved articles may still be biased. This study has been carefully written with lots of research examined before referenced. It would be a very difficult study to conduct if it was not publicized by a car enthusiast as there is so much conflicting data online. The subject matter of the switch to electrification is qualitative in nature and although statistics may be of benefit, showing the previous history of EV's, no one knows the real future outcome of the sector and how it will improve.

Furthermore, leading on from the previous comment, another limitation regarding this study, was the difficulty of finding an industry expert to confidently predict the future of electric cars. Consideration was given for interviews, however, as it is such a conflicting space, People are reluctant to speak regarding the topic, as there is no certainty that their comments would be correct.

Ethical Considerations

By employing both qualitative and quantitative research and data collecting methods, the reader is brought closer to the work, since they know they are not reading made-up ideas. Leading on from the previous point of a limitation, the study is qualitative and subjective in

nature, as there is no right or wrong answer if the switch to electrification is now. This study aims to provide clear and simple information for the reader, as the car industry can be confusing to understand. There are so many aspects to buying, researching, running and maintaining cars. The electrification switch has added another variable to consider and therefore, this study looks to breakdown and simplify the shift in the industry. Using both methods of analogy to provide depth and different perspectives, the reader should have more of an understanding regarding the shift to electrification. It is important to discuss this topic, as the majority of people today own, or has someone in their family who drives a car. Cars have become an essential item that costs a lot of money and therefore, people need to know the state of the industry, especially as the electric car push is relatively new. This study does not go into too much complicated detail, as the average reader would not be interested in it.

Analysis and Findings

This section of the piece looks too breakdown explain and prove the hypothesis that the car industry and the people are not prepared for the shift to electrification. After conducting a survey of 51 people, we can gather information to back up the hypothesis along with referencing articles online.

Electric vehicles have become popular over recent years, with governments pushing for them more and more. Also, manufacturers are attracted to the trend and they're investing huge amounts of money in electric cars, producing them, and also advertising them to the public. Interestingly, in the survey that was conducted, 90.2% of people have noticed more electric cars on the road and also 90.2% of people have noticed more advertising of electric cars.

The advertising from car manufactures has been successful and across multiple platforms of advertising, but it can be concluded that TV and social media advertising is the most effective, accounting for over 65% of the question. Car manufactures and governments have power to influence people as per the survey results; 100% of the people believe it is a good idea to push for electric cars. 66.7% of them believing it is unrealistic at the current state. Do this raise the question that it is too early to push so much for electric cars?

If people were going to buy an electric car, it is remarkable to note that before purchasing an electric car, it is evenly spread out regarding the sources of information people would use when researching. Online articles just winning out at 37.9% over dealership websites, which still shows how much influence car manufactures have on the population. Again, this adds to the question, should car manufactures concentrate on advertising electric cars, if they can influence people to buy their combustion engine rivals.

Climate change is not a great concern for people either, with only 35.3% of people would buy an electric car due to the climate advantages. Also, interesting to note is that 58.8 percent of people believe that with further development, they would be inclined to buy an electric car. This is a proving fact that currently, they do not feel the time is right considering the infrastructure. We learnt earlier on in this piece that the price of electric cars is high compared to equivalent combustion engine vehicles. It is a conclusive result from the survey which showed that from a scale of 1 to 5 (one being less likely), people would not buy an electric car, as the average score was 1.82. This shows the price of electric cars throw people off buying them.

Key Findings: below are the main key findings associated with the survey conducted and the analysis concluded by the results. These key areas look to outline the main topics centered around the shift to electrification in the car industry, which, will help the reader understand the key analysis of this piece.

- Are people noticing EV advertising – yes

After somewhat emerging from the COVID-19 global pandemic, things are getting back to normal. Regarding the car industry, manufacturers are able to start producing more cars and therefore, increase advertising their model lineup. advertising is key for manufacturers in order to generate sales, and with electric vehicle advertisements being pushed, it is important for manufacturers to target their market accordingly. As seen in the survey that was conducted, 46 out of 51 people have noticed more electric vehicle advertising recently, as the trend develops. This is a crucial statistic for manufacturers, as their marketing is effective for electric cars in comparison to their combustion equivalent. It can be concluded, from this question that, as the electric cars are new type of technology, it is not always easy to attract

people's attention towards a different product, in comparison to what they are used to. Whether it be good or bad thoughts associated with electric cars, the goal of the marketing teams for the manufacturers was successful, engaging with customers leaving a lasting memory of their advertisements. With 50% of people noticing electric vehicle advertisements on TV, the social media world is quickly developing and overtaking traditional methods of appetizing. Mentioned earlier by (Slattery, 2021) in the literature review section, television viewing among those aged 15 to 34 has declined by 12% each year. This is important to note for the marketing teams, as they will have to change the method of advertising to match the potential customers as they get older.

- *Manufactures are successfully advertising their cars, adapting to the digital world* – yes

The marketing teams for car manufacturers are pushing EV advertisements a lot lately compared to combustion engines cars, this could be seen as risky move considering the lack of industry knowledge the people have. However, mentioned earlier with targeted ads and online advertisements, they are appealing to the next generation that will be buying their cars using new technologies to their advantage.

Drawn from the survey, 30 out of 51 people would be inclined to purchase an electric car, which, is a high number considering the drawbacks that currently come with electric vehicle ownership. Although manufacturers may inflate their range estimates, charging times and incentives for buying an electric car, there is not much they can do for the lack of charging infrastructure in the country. Mentioned briefly, there are only 1000 charge points in Ireland for electric cars (Energia, 2022). Currently the infrastructure is not matching up to the demand for electric cars, which, is relatively low, but also the charging infrastructure is not matching up to the marketing associated with the cars.

A major negative of electric cars currently is the charging infrastructure, most people are aware of that, so it is the one thing holding electric cars back. As the cars themselves are improving technology wise, with longer range and increased efficiency, it is now out of the marketing teams control to make the push adapting people to electric cars. Because of the huge disappointment of the charging network, it is impressive that the manufacturers are

successfully advertising their cars, convincing people that electric vehicles are the way forward. Marketing teams have used different strategies such as, penetration marketing, to create a wave of thoughts for people to switch to electric cars, as it is the next big craze. With the results from the survey showing the people are very willing to purchase an electric car, it is clear that the marketing strategies are successfully working.

- Are people ready to switch to electric cars – no

Although people may be noticing more electric cars on the road and noticing them being advertised more, a general consensus is that it is too early for the shift to electrification in the industry. Interestingly, everyone that completed the survey was in favor of electric cars shift, whether that be now or in the future. Contrary to the earlier statement from (Ghayad, 2022), people do believe that electric cars will be good for the future. Why? Well, it's not clear why.

Surprisingly, the reasoning why people would buy an EV is not due to the climate connotations that are attached with electric vehicles either, as only 35.3% of people who completed the survey said that they would buy an electric car because of the climate benefits. The rest of the people rather the car to bring them from A to B or, they just did not care about the climate benefits. This is a key point to note as one of the main reasons for electric cars in the future is the promised climate benefits they bring. If people do not care about this, the question has to be asked are the marketing teams missing a step explaining the reasoning for electric cars in the first place?

Perhaps it is too early for the major shift to electrification, as explained in the report by Volvo earlier on in this study, there is not much difference between combustion and electric vehicles emissions until a lot of mileage is complete. Currently, as electric cars aren't much better for the environment than combustion engine counterparts, the question changes to, are the manufacturers ready to switch to electric cars? With lots of research and development and resources needed, why would they bother in the first place, if people are not interested in the benefits that they bring?

- People are interested in electric cars at a lower cost – yes

Electric cars are new to the market, and therefore, because of the new technologies that are being researched and developed constantly, the costs of electric cars are substantially higher in comparison to combustion engine counterpart. As mentioned earlier in the study, electric cars can be up to 50% more expensive. Even with government incentives, the costs of electric vehicles are extortionately high, pushing people away from the switch. Also, as EV's are relatively new tech, people are less attracted to buying an electric car as their next vehicle, due to possible reliability issues, different driving dynamics and new learning curves. Electric vehicles are different compared to what people are used to, so, it is not easy to transfer a whole population.

Interesting to note, according to the survey an average score of 1.82 from a scale of 1 to 5 (1 being less likely) was scored for how likely people would buy an electric car considering the prices now. This means that electric car prices are extremely high for the ordinary person. That is an expected outcome, as it is extremely difficult to convert people to pay more for technology they do not fully trust or understand. If the prices of electric cars were reduced, there would be more of an incentive to purchase an electric car, boosting brand awareness and the potential to help the environment in the future.

If governments across the world intervened more instead of taking away grants for electric cars it will be easier to convert and shift the population two electric. Furthermore, with a lower price and extended grants from the government, this would provide an assurance for buyers that electric cars are the future. If the grants were abolished, this would leave question marks over the government's direction for the car industry. If the goal is to have a million electric cars on the road by 2030, incentives must be there for people to purchase an electric car.

From analyzing multiple articles online and the survey conducted, the main question that sticks out is, that there is confusion within the electric car industry, and it is affecting both the people and car manufacturers themselves. The survey designed was not specifically aiming towards a positive or negative outcome, however, it is clear from analyzing these survey that people are in two minds around electric cars. It was expected that people would not be willing to switch to electric car now but, in the future, they would, considering the potential

climate benefits. However, as per the results from the survey, the climate benefit question outcome was not expected as the majority of people (64.7%) did not care for the environmental impact that electric cars had. This strange outcome raises the question and the point of electric cars, because, the main goal of electric car is in the future, is to benefit the environment instead of using fuels we use today. So, should governments and manufacturers push more for electric cars to be fully sustainable, or could they develop like Porsche (as mentioned above), an EFuel that can work on current combustion engines?

However, after analyzing all the data from the survey, the majority of people are in favor for electric cars for the future. Some people do believe cars are the future and with backed up statements like showing there saving on fuel, there is no right or wrong answer to the studies question. It is subjective in nature, as electric cars may suit some people needs but also, others are against electric cars, as it does not suit their lifestyle. With technology advancing all the time, it will become more acceptable that everyone should be driving electric cars. But, for the time being, as there is not and yet enough reliable data to prove the critics wrong, the hypothesis of this study is somewhat true, that the people are not yet ready for the shift to electrification as there is currently too much uncertainty in the market.

Discussion and Conclusion

This research is aimed to describe how marketing has changed for the automotive industry, stating why car manufactures are changing the way they market their cars, as they strive to outdo each other in this changing market. With the introduction of electric cars, the industry is shifting and companies are using different methods of marketing to leapfrog the competition. But it is crucial for car manufacturers to understand how much real demand there is for their electric cars. Should they even put their energy into the marketing their electric cars, and completely forget about regular combustion engines? With various reports stating that electric cars are not the future and even a car manufacturer Volvo, declaring the reality of the climate benefits, it is not a full blown conclusion that EV’s are the way forward.

Considerations of electric cars and how they affect the industry

As everyone knows, the car industry is massive with 75 million units of cars sold pre-pandemic in 2019 (Statista, 2021). There are so many car companies, which have vast network branches. This results in a huge employment rate four people worldwide. Not to mention, there are third party companies attached to the car industry to make a living. Car dealerships, independent dealers, mechanics, taxi drivers, car journalists, and many other connections all need cars to keep their jobs going. With the shift to electrification, this is having a major change to many sub industries connected to cars.

As mentioned earlier in this study, there are only 1000 charge points across Ireland that have been installed, which is nowhere near enough to fulfill actual demand. The wave of electrification the car industry has created many new jobs, companies and opportunities in the sector. There are various different types of charge point companies now other developing charges worldwide. This can be seen as a positive interpretation as it is a growing sector, there are only going to be more jobs offered for similar roles. It is not just the car industry that is affected by the shift to electrification. Petrol stations for example will have a question to ponder regarding there fuel source and output. Should they try convert their petrol pumps to electric car charge points? We know from earlier on in this study, there is a wait time while charging electric car and people would like somewhere to go sit down and wait for 20 minutes. This is another consideration that shops and petrol stations will have to adapt to.

The shift to electrification it's not that simple, a whole new industry is essentially being created as it is a complete change in comparison to combustion engine vehicles. With the phasing out of petrol and diesel coming, there will be many new jobs created along with new education being created for the new technology. As the electric cars can be complex, mechanics may have to be retrained, along with charge point installers and even electricians, when they install home chargers.

There are lots of positives associated with the shift to electrification, even on a national level, if Ireland were to accelerate the shift to EV's, there would be more prepared for the future and ahead of other countries. As we know, the car industry is huge. If Ireland could capitalize on this shift, it may benefit them in the longer run as there will be trained personnel to cope with electric vehicles. This may be of use, if other countries need assistance with their own

infrastructure in the education around electric cars. Also worth mentioning, as previously stated earlier on in this study, the climate action plan set by the EU is an ambitious target for all the countries. Hypothetically, if Ireland were to radically accelerate the shift to electrification, they would impress the European Union with regards to their climate action plan. Furthermore, by embracing new technology, it shows that Ireland would be a high tech advanced country with the latest and greatest form of transportation.

Clearly from a national level, there are many positives associated with the shift to electrification in the car industry. However, changing to electric vehicles is not an easy task and it presents many issues. Although there may be many new jobs created, there will also be many lost jobs as soon as petrol and diesel are phased out. Fuel tankers, oil companies, some mechanics, petrol stations will all be affected by the switch to electrification. With lots of negative press and connotations associated with EV's, there should be a sense of uneasiness from governments pushing electric cars. With lots of investment into charging infrastructures, jobs, and other sources of employment, this will be a huge problem, if electric cars do fail, and another fuel replacement enters the market. We already know that some manufacturers like Porsche are working on synthetic fuels, which, will take away from the market share of electric cars if it is produced. There needs to be lots of more work done to make electric cars and electric driving viable for the people. Regarding the hypothesis of this paper, are people ready for the switch to EV? Along with the survey results, backed up by statistics and online article opinions, a consensus can be drawn to state that the people are not ready for the shift to electrification in Ireland as of 2022.

It will be intriguing to find out what the future holds for electric cars and the transport of Ireland. As this new industry is relatively new, there is lots to be learned and changed to make electric cars efficient for Ireland. In a few years' time, it will be interesting to compare the survey results from this study in 2022, by seeing how the answers have changed. Going back to the question of this study, electric cars have caused uncertainty in the industry and again it will only be a matter of time to see if it is worth the car manufacturers time to advertise their electric cars. Who knows, maybe this study will be drastically outdated in the future, like combustion engines, but only time will tell.

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Discussion and Conclusion

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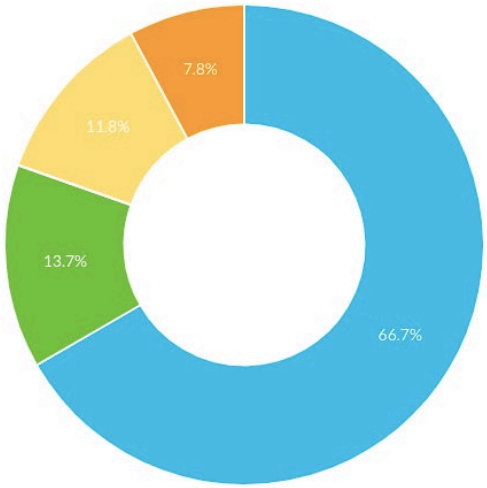
Appendix

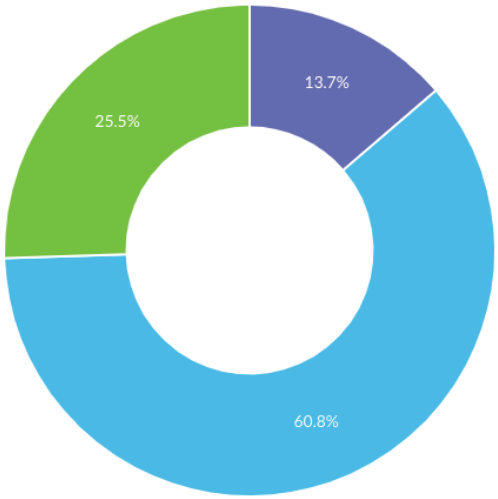
Survey Results graphs

Q1 What age are you?
Multiple Choice



Choice	Total
Less than 18	0
19 -25	34
26 - 40	7
41 - 60	6
60 plus	4

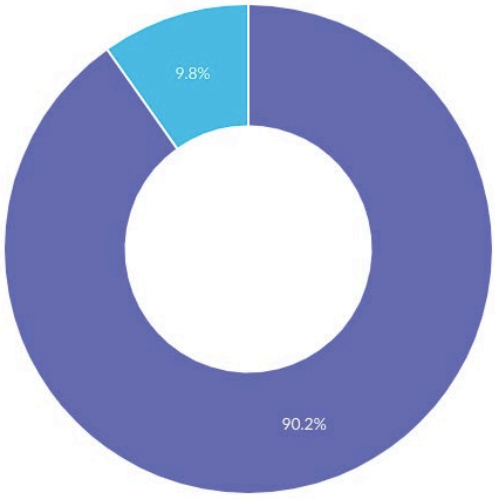
Q2 The car industry is within the stages of shifting to electrification, do you or family members drive an electric car already?
Multiple Choice



Choice	Total
Yes	7
No	31
Myself or my family drive a hybrid	13

Q3 Have you noticed more electric cars stand out on the roads?

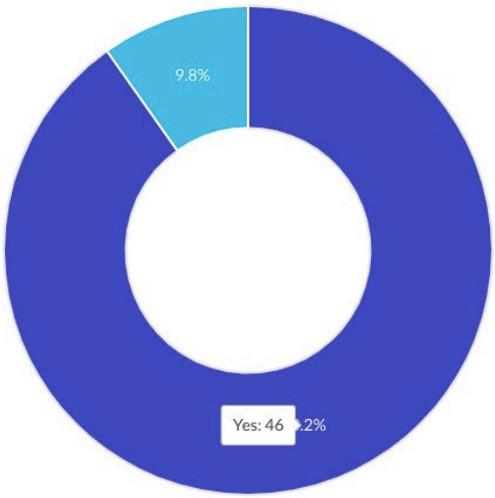
Multiple Choice



Choice	Total
Yes	46
No	5

Q4 Have you noticed an increase in advertising of electric Cars?

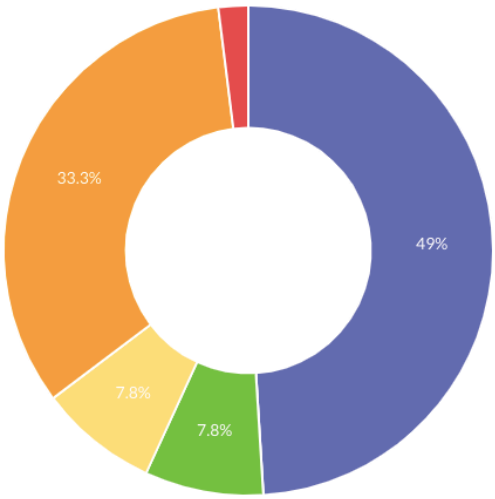
Multiple Choice



Choice	Total
Yes	46
No	5

Q5 Where have you mostly seen advertising of electric Cars?

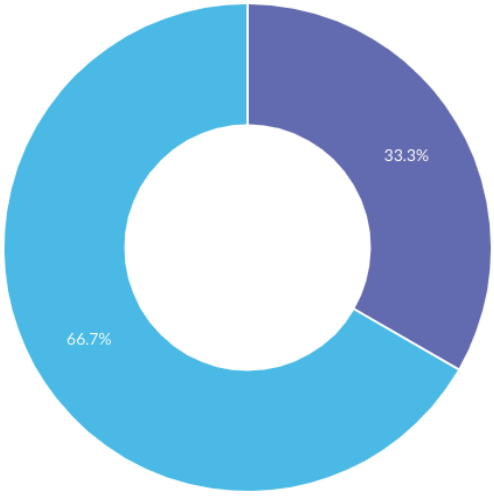
Multiple Choice



Choice	Total
TV	25
Printed Press	0
Billboards	4
Online Advertising - Streaming services	4
Online Advertising – Social Media Platforms	17
Other	1

Q6 Do you think the push for electric cars is a good idea?

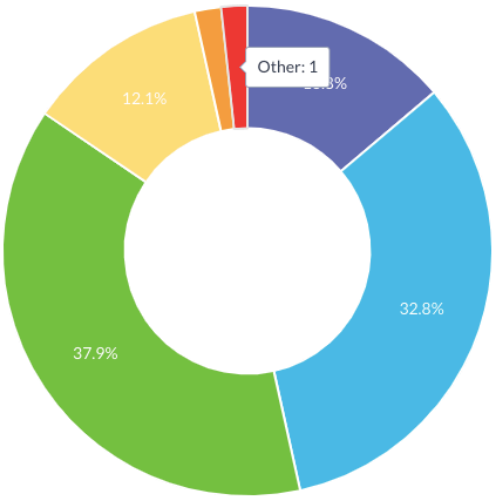
Multiple Choice



Choice	Total
Yes, this would be great for Ireland	17
Good idea, but unrealistic currently with limited infrastructure and industry knowledge	34
No, I don't feel electric cars are the way forward	0

Q7 If considering buying an electric car where would you go to find more information

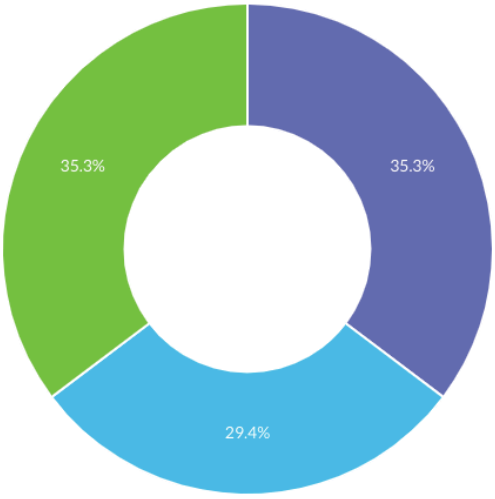
Multiple Choice



Choice	Total
Social networking sites	8
Dealership websites	19
Online articles	22
Influencer reviews	7
Magazines	1
Other	1

Q8 Are you interested in electric cars because of the added benefits they offer? e.g, Climate change

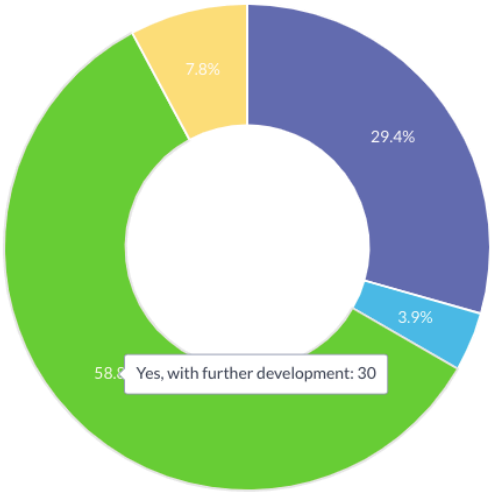
Multiple Choice



Choice	Total
Yes	18
No	15
No, I just like a car to bring me from A - B	18

Q9 With advancements in technology and a shift in the industry, would you be inclined to buy an electric car?

Multiple Choice



Choice	Total
Yes	15
No	2
Yes, with further development	30
Not until we are forced to purchase them	4

Q10 On a scale of 1-5, (1 being less and 5 being more likely), considering electric cars can be 15% to 50% more expensive than regular cars, how likely would you be to buy one?

Scale