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TESLA MOTORS: A BUSINESS MODEL INNOVATION IN THE AUTOMOTIVE INDUSTRY

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Chapter I - The gasoline alternatives and the market analysis

1.1 Introduction

The automotive industry has seen some big changes in the last few decades. The advent of new sources has always been related to the need in finding new solutions, especially in periods in which the oil price was increasing, or new techniques or technologies were found to innovate how people get around. Lots of innovations that we can find in modern vehicles came directly from 19th century, but these were either used just for small lots of cars or dismissed ones, because the gasoline engine proved to be better with regard to building simplicity – the very first innovation in building processes were made by Ford and Taylor at mid-1910s –, maintenance, affordability, reliability, cost and ease of use.

The 2008-2010 crisis which weakened the entire sector, has led to substantial consequences. The main reason of this crisis was the increase of the automotive fuel price, directly connected to the slow growth of the SUVs or pickup trucks, models which were very profitable for the Big Three (Ford, General Motors and Chrysler, the three most important American carmakers), but not so fuel efficient. The offer of fuel efficient vehicles was scarce and this led to the fall of the sales which, combined to the credit crunch which put pressure on raw material prices, convinced customers to demand more compact, fuel efficient vehicles, typically imported from Asia or Europe. The Big Three offers big tag price discount all over the country and new marketing campaigns which resulted unable to slow the drain in sales and margins. In 2014, a Mediobanca study showed how the sector is now in good health, being the third most profitable industry after the energy business and the electronic one, with Japan and Germany-based companies at the top¹. The recovery may be ascribed to the deep changes involving the sector, the development of new sources and strategies to be less oil dependent and the improved safety standards to protect both the inside passengers and the outside people. The main tendencies in the industry are:

- the development of small engines, turbo charged, with better fuel efficiency which emit less pollution. To do that, the engines are smaller, with less cylinders and are lighter (downsizing), they use technologies to reduce emissions like Stop and Start or Active Fuel Management technology. The designs are more complex to improve the aerodynamics and to reduce the drag coefficient;
- new studies on materials are financed to find the right ones to be both more eco-friendly, more resistant and to weigh less, by using new alloys and fibers;
- to improve safety, new cars are more and more connected to the internet to inform drivers about weather conditions and road traffic. They use very complex infotainment systems that control pretty much of each car's

¹ <http://www.mediobanca.it/it/stampa-comunicazione/news/r-s-pubblica-la-nuova-edizione-dell-indagine-sulle-multinazionali-2003-2013-con-un-focus-sull-automotive.html>

settings. Many carmakers are improving some infrastructures to aid the communication between different vehicles, with benefits on the safety and the driving comfort;

- technology helps to prevent car collisions and to improve the automatic driving system, by adopting all around radars and sensors that can brake and accelerate autonomously. They can send as well automatic SOS messages in case of emergency by using GPS location;
- performance improvements, by taking many technologies out of the auto racing industry.

In the following paragraphs, I will enlist many of the possible alternative sources to gasoline, by showing a brief history, how they work, strengths and weaknesses of every source and some information related to them, after a brief introduction about the industry itself and its latest implications. Then I will speak about the industry itself: the main players, their histories, their strategies, their numbers and their future perspectives.

1.2 The oil industry

In the last few months, oil prices have reached their lowest since the 2009 downturn. The commodity has lost about 40% of its value, while still representing a third of all the energy spent globally. This decrease has had an important impact on the world economy and geopolitical balance. This downward trend is linked to an excess in supply combined with a slow growth in global demand. This situation is mainly due to the following: the improved technology used in alternative solutions to oil, i.e. all the renewable energy sources like solar power, wind power or biomass; the new types of oil extraction, namely shale gas and shale oil, developed recently in the USA despite many criticisms regarding their methods, and which have helped

increase the oil supply²; and the geopolitical dynamics and interests of the main oil producers. The actors involved in this are mainly Saudi Arabia, the OPEC countries, Russia and the United States. The OPEC (Organization of the Petroleum Exporting Countries) is an agreement signed in 1960 that now gathers the interests of 13 countries, namely Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela. Their mission is to coordinate and unify the oil policies of the member states to ensure a balanced and efficient market, thus providing a regular supply to consumers as well as a proper profit to investors.

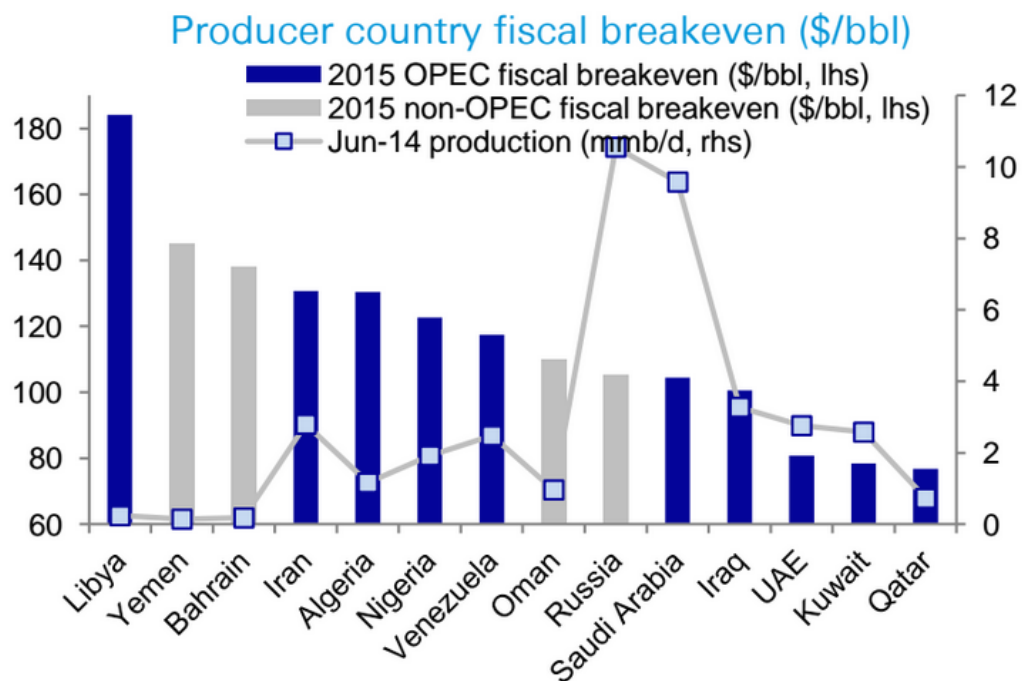
The recent geopolitical trends may also be helpful to better understand this price decrease, as oil prices have become a crucial matter. Saudi Arabia, being the first oil producer in the world, plays a fundamental role in them. Many times in its history, this nation has exploited the price of oil to reach its geopolitical goals. Saudis can keep the price low as they have cheap extraction costs related to both low manpower expenses (unlike the USA), and a relative ease in the extraction of the raw material, as opposed to Iran, for instance. These factors have led to its advantage against its competitors and it is the reason why the country benefits from lower prices in the long run. Low prices combined with constant production levels may be also helpful to reduce the profitability of new methods of extraction, like the aforementioned shale oil, which can represent a threat to traditional oil extraction, and damage countries that are highly dependent on it, like Russia and Iran. A proof of this last statement is that Saudi Arabia is giving discounts on the oil sold to China, who previously bought their oil from Iran. Iran's oil is costlier because it is located under deep waters, which results in a cost increase. The Saudis may be following this strategy to become again the leading country in the OPEC cartel, as they were in the past. In fact, a low oil price means less power for OPEC countries, because the demand is inelastic and a limitation in supply means a lower impact on the demand curve. A restricted supply is the only way to prevent the defaults of many OPEC, when prices are that low. This is all linked to an increase

² Shale oil is a recently discovered oil extraction technique. The petroleum is obtained by means of the fracking process, which is projected to bring the USA to energy self-sufficiency.

in Saudi power both inside and outside the cartel. Obviously, importing countries benefit from low oil prices, since both their disposable income and their propensity to consume increase, with a positive effect on economic growth and GDP (Gross Domestic Product), while an increased oil price is better for exporting countries and historically it has been one of the most important cause in depressions after the Second World War.

The impact on the American economy is twofold, since they are one of the biggest producers and the biggest consumer worldwide. However, the final balance should be positive, with an effect of wealth redistribution between producers and consumers. The former will invest their funds, narrowing the real economy. The latter, consumers, will benefit from an increase in resources, which can be invested in the real economy to boost growth without government intervention. Oil prices have had a negative implication on the Russian economy. The decrease in petroleum prices has led to a strong depreciation of their currency, the ruble, which has fallen by more than 50% from the beginning of 2014, and the fall of Russian oil companies' share prices. Russian exports depend on oil prices, as oil represents more than 70% of Russian goods sold abroad, and many governmental expenses are financed by petroleum, like it happens in other countries like Venezuela or Iran.

Iran will be affected as well. The country has been put at a disadvantage by the oil sale embargo to Europe and the USA, restrictions on global trade and fines due to its nuclear program. They started using their petroleum reserves, because the actual oil price is below their break-even point (BEP), like for many others countries. The following graph shows the break-even point for the main oil producing countries:



Source: IMF, Deutsche Bank

This image depicts the current situation: almost every producer is partially using its reserves to meet the demand, since the price alone is not enough to cover costs. In effect, the current price for an oil barrel (bbl in the image) is around 45\$.

According to many researchers, this phase of low oil prices may last until 2017-2018, because the prices of recent years, up to \$140 per barrel, boosted petroleum companies' investments that are just partially completed and will not be done until 2018. Even the price of shale oil, which had proved to be unaffected by oil price fluctuations, started to drop in the third quarter of 2015 and the outlook is negative for the future. The American production of shale oil decreased by half a million barrels in the last year and some producers, like Bakken Oil, have already gone bankrupt.

Petroleum prices have a huge impact on currencies. Historically, there has been a logical correlation between oil prices and the US dollar, the only currency used to price the petroleum. When the price of oil is low, the dollar strengthens and vice versa. For many years, this interdependence has been illustrated by the massive flow of US petroleum imports. According to Goldman Sachs Jeff Currie, from the

early 2000s this trend is no longer confirmed. He studied the 2008-2014 period and noticed the dollar has weakened his correlation to oil prices. In 2008, when the USA were importing about 12 million barrels every day, the price of oil was around \$150, one of the highest prices ever recorded, and one dollar was equal to 1.6 euros, the lowest exchange rate ever observed. He compared the 2008 situation to the 2014 one and noticed that the numbers were very different. He underlined that lapse of time as the period in which the correlation started to decrease. In 2014, the United States imported less than 5 million barrels per day, almost the 60% less than they did previously thanks to the “shale revolution”; oil prices hovered around \$80 and one dollar was equal to 1.25 euros. According to Jeff Currie, “this has significantly reduced the correlation between commodities and the US dollar.” He also writes: “Along with the post-crisis financial market normalization, [the lowered petroleum imports] has dramatically reduced the correlation between oil and the USD, to around 0% today from historical highs near 60% in 2008/2009.”³ The actual situation, a strong dollar and low oil prices, corroborates the point.

1.2.I Diesel

The real first innovation to surface in the automotive market, the first tangible gasoline alternative, was the diesel engine. It was invented in 1897 by Rudolf Diesel. Like a gasoline engine, a diesel engine is a type of internal combustion engine. An internal combustion engine is just one where the fuel is burned inside the main part of the engine where power is produced, this main part is called cylinder. In a gasoline or diesel engine, the fuel burns inside those cylinders. Internal combustion is more fuel efficient since it wastes much less energy because the heat doesn't have to flow from where it's produced into the cylinder: everything happens in the very same place. That's the reason why internal combustion engines are more efficient than external ones (they produce more energy from the same volume of fuel). The first versions were widely used for big displacements, indeed

³ <http://www.goldmansachs.com/our-thinking/pages/the-new-oil-order/#overview>

they were employed mostly in planes, trains, trucks, military vehicles, ships. The first products were not as refined as the traditional engines, they were louder, not that efficient, they cost much more than gasoline units, they took a long time to start up and the spare parts were difficult to be found. The first installation of such an engine in a mass production car was in the 1936 Mercedes 260 D. From that moment onwards, many improvements have been made and the R&D departments are still trying to make them even more efficient, competitive and economic. The introduction of the turbo diesel engine units (1962), common rail injection (1997) – just to name two of the most important innovations – have helped to reach the goal of the parity between gas and diesel units.

The main strength of this kind of fuel is its price. In most countries, the diesel price is lower than the gas one mainly because the first one needs less processes to be transformed into the finished product. Sometimes the final price is influenced by local taxes. Usually, lots of taxes and duties weigh on the total amount of price paid by customers, but this spread varies from country to country. For example, Italian taxes on the diesel price are about 55%, while the amount of taxes on gas are about 60%. The situation is different in countries like England, Norway or the USA where diesel costs more than gasoline; the main reason of the higher costs can be ascribed to the taxes that discourage the use of diesel engines that release more NO_x (nitric oxide and nitrogen dioxide) in the air.

The regulation that revolves around diesel units is very strict too. Different kind of laws are applied in the various countries and producers need to face these constraints to be able to sell their own products in the different markets around the world. In Europe, from 1st September 2015, every new car sold needs to satisfy EU's Euro 6 standards criteria. These standards impose a further, significant reduction in NO_x emissions from previous Euro 5 diesel engines (a 67% reduction compared to Euro 5) and set standards for both gasoline and diesel which are now pretty much aligned. The implementation of Exhaust Gas Recirculation (EGR) reduces the quantity of nitrogen available to be oxidized to NO_x during combustion. Euro 6 diesel cars may also be equipped with:

- A NO_x absorber (Lean NO_x Trap) which stows NO_x and reduces it to Nitrogen over a catalyst;

- Selective Catalytic Reduction (SCR) which utilizes an additive – Diesel Exhaust Fluid (DEF) or AdBlue – containing urea injected into the exhaust to have Nitrogen and water from NOx.
- The use of Cerium, a liquid injected into the fuel tank every time the vehicle is refueled, which helps the regeneration of the DPF (Diesel Particulate Filter) by reducing the temperature needed for regeneration.

The authority that regulates the light vehicles emission in America is the EPA (Environmental Protection Agency). At the moment, car makers must follow the laws contained in Phase 3A, announced by Barack Obama in 2009 and signed into law during March 2014. The EPA rules require a certain level of emission that must not be exceeded, while EU set of laws prescribe some devices that must be used to reduce emissions. In particular, every State has its own internal set of laws in addition to the Federal ones, in some States (like California) there are stricter rules than in others. Another step, the Phase 3B, is almost ready to be applied within 2016. The main difference between European and the US legislation is that the latter has stricter laws on NOx emissions, but higher levels of CO as we can observe in the following chart:

USA

<i>Category</i>	<i>NMOG (g/km)</i>	<i>CO (g/km)</i>	<i>NOX (g/km)</i>	<i>PM (g/km)</i>	<i>HCHO (g/km)</i>
<i>LEV</i>	0.047	2.1	0.03	-	0.010
<i>ULEV</i>	0.025	1.1	0.03	-	0.005

EU

<i>Category</i>	<i>CO (g/km)</i>	<i>HC (g/km)</i>	<i>HC + NOX (g/km)</i>	<i>NOX (g/km)</i>	<i>PM (g/km)</i>	<i>PN (*10¹¹ n/km)</i>
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<i>Euro 6 gas</i>	0.50	-	0.17	0.08	0.005	6.0
<i>Euro 6 diesel</i>	1.0	0.10	-	0.06	0.005	6.0

Source: Quattroruote special.

Regulatory authorities in the EU, the USA, and Japan have been under pressure from engine and equipment manufacturers to harmonize worldwide emission standards, in order to streamline engine development and emission type approval or certification for different markets.

1.2.I.bis Diesel gate

The Volkswagen Group has been the center of one of the major scandals in the automotive industry, which has been called the “Diesel gate”.

During spring 2014, the ICCT (International Council for clean transportation, an American non-profit company) started a research between Europe and the USA to evaluate real car emission, measured at the exhaust, to demonstrate the main differences between the two different types of homologation (EU rules and the EPA rules). In the USA, the University of West Virginia, which was designated to do this research, warned the EPA that emissions were far from what declared. They carried out a test on three vehicles, but just two of them (two Volkswagens, a Jetta and a Passat) released 5 to 35 times the NOx declared during homologation, where the tests were carried out on rolls in a laboratory. So the EPA, alongside the CARB (Californian Air Resource Board), started an investigation on the whole Group. In October, the ICCT published its studies in a book called “Real world exhaust emission from modern diesel cars” where it explained the research results⁴. In December 2014, VW admitted that they found the issue and they started a campaign

4 <http://www.theicct.org/real-world-exhaust-emissions-modern-diesel-cars>

to recall half a million vehicles to modify ECUs, but the CARB decided to continue its tests, finding out that NO_x were still higher than allowed. During April 2015, Volkswagen of America started another recall campaign for diesel powered vehicles stating that a new ECU needed to be installed, without mentioning the investigation. On 8th July, Washington considered to not give the homologation to the model year 2016 VW Group vehicles, because the explanation of the problems were considered unsatisfactory and vague. The EPA, on 18th September, alerted the violation of the laws on the quality of the air on behalf of Volkswagen Group, Volkswagen AG and Audi AG, in relation to the 4 cylinder diesel engines, the EA 189, used from 2009 to 2015. The accusation dealt with a software able to calibrate ECU if it reveals an emission test is underway, by reducing the emissions. Over half a million cars just in the US are involved in that scandal. Two days after, the USA VW stopped the sales of the units fitted with EA 189 engine. On 21st September, the VW CEO Martin Winterkorn stated to be unaware of the cheating devices and deeply regretted to have betrayed customers confidence, ensuring the customers that the cars are reliable and safe to use. Both VW and Audi lost 20% of their stock value on that day. On 22nd September, the company stated that the software, made by Bosch, was installed on over 11 million vehicles, while the stock prices continued to go down. In the USA, the DoJ (the Department of Justice) launched a criminal affair against the Group, asking for an 18 billion dollars fine. On September 23rd, VW's CEO Winterkorn resigned and Matthias Müller was appointed as the new CEO of the Group. The following day, the case became viral and random checks were assured in lots of VW main markets. Other car manufacturers, like BMW or FCA, declared to be not involved in that scandal. The "diesel gate" has caused an earthquake in the diesel automotive industry. Many journalists, analysts and researchers have questioned about what this scandal may represent for the future for diesel engines. The need to regain the trust is central for the entire industry and, above all, for the Volkswagen Group itself, that will probably face harsh consequences from the implications of this disgrace.

1.2.1.ter Biodiesel

Biodiesel refers to either a vegetable oil or an animal fat-based diesel fuel consisting of long-chain alkyl (methyl, ethyl, or propyl) esters. Biodiesel is widely made by chemically reacting lipids (e.g., vegetable oil, animal fat) with an alcohol producing fatty acid esters. Biodiesel is intended to be used in standard diesel engines. Biodiesel can be used alone, or blended with petro-diesel, the traditional diesel, in any proportions. Biodiesel blends can be used as heating oil as well. The first car to run on biodiesel was the 1933 Citroën Rosalie, even if Mr. Rudolph Diesel revealed the first prototype at the end of XIX century, stating that biodiesel would become as important as traditional fossil fuels over the years. Different blends of biodiesel and conventional hydrocarbon-based diesel are the most commonly products distributed for use in the retail diesel fuel marketplace. To state the amount of biodiesel in any fuel mix, much of the world uses a “B” factor to indicate the ration between traditional diesel and biodiesel. These are the most common:

- 100% biodiesel is identified B100;
- 20% biodiesel, 80% petro-diesel is called B20;
- 5% biodiesel, 95% petro-diesel is named B5;
- 2% biodiesel, 98% petro-diesel is labeled B2.

Blends of 20% biodiesel and lower can be used in diesel engines without any modification, or just minor ones, even if some manufacturers do not extend warranty coverage if the engine is damaged by these fuels. Biodiesel can also be used pure (the B100), but it requires important engine modifications to prevent damages and maintenance issues. The most common form sold in the marketplace is the B5 and the B20, which do not represent a risk even for the new common rail diesel engine, where the inside pressure could reach extreme levels (around 29,000 PSI).

The properties of this fuel are: a better fuel efficiency, because the biodiesel has less wastes and it is more efficient compared to the standard petro-diesel; thanks to an improved internal combustion, which helps the fuel to be burnt well and to release less NOx, even if the CO levels are still the same. The main concerns are instead: an excessive wear of the engine, mainly in the long run, where the fuel loses its lubricity; the viscosity of the fuel is, nevertheless, not comparable to

traditional diesels, and it may cause the impossibility to use such fuel at low temperatures and finally, especially with some types of engines, the performances are not as good as with the petro-diesel ones. Some issues are linked to the production of this kind of fuel that can cause serious harm for the environment.

The EU is the biggest biodiesel producer (mainly France and Germany) and lots of incentives are applied for both the producers and the consumers worldwide, according to the different State laws.

1.2.II Bioethanol

It is mostly used as an additive to gasoline, bioethanol is a form of quasi-renewable energy that can be made out agricultural feedstocks. Potato, corn and sugarcane are commonly used to produce it. In the last few years, bioethanol has been considered as the successor of traditional gasoline, even if there are still concerns about both the production, which needs ample arable lands to be made, and the cost of the whole operation for production on a larger scale. Recently, the discovery of a new kind of production, the cellulosic ethanol one, has weakened many of these concerns, even if there are still doubts of the usability of such a kind of technique for a larger scale. Ethanol is widely used in the USA and Brazil, as there are many vehicles running on 100% bioethanol or E25 (25% bioethanol, 75% gasoline). In Europe, Sweden has the biggest fleet of E85 flexi-fuel vehicles, which run on 85% ethanol and 15% traditional gasoline. The first production car running on ethanol was the 1978 Brazilian Fiat 147. The efficiency of a gallon of ethanol is equal to 75% of a gallon of fossil-based gasoline, much higher than many comparable alternative sources.

1.2.III Natural gas

A Natural gas vehicle (NGV) is one of the alternative fuel vehicles that can be further divided in Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG). Though LNG and CNG are both considered NGVs, the two technologies are very different. These differences can be found, for example, in the refueling equipment, fuel cost, pumps, and tanks. One thing they share is that they both have gasoline engines. Traditional gasoline-powered units may be converted to run either on CNG or LNG; they can be dedicated (using natural gas only) or bi-fuel (using either gasoline or natural gas). LNG and CNG tend to corrode and wear out the parts of an engine slower than gasoline and emissions are cleaner per equivalent distance traveled. There is generally less wasted fuel and the price of it is usually cheaper than gasoline or diesel. On the other hand, the two NGV are not that common all around the world, their presence is wide only in those countries that produce the fuel. They are also more complicated and more expensive to build and they are not as roomy as the equivalent petrol or diesel vehicle, because they need some room to install an extra tank. The range is limited as well, typically half of a gasoline unit, and they are not a renewable source, as they are a fossil fuel. For both of them, the storage is very difficult, since they need very high pressures and low temperatures to be stored.

1.2.IV Hybrids

A hybrid electric vehicle (HEV) is a vehicle where a conventional internal combustion engine propulsion system is combined with an electric propulsion one. The electric powertrain is intended to achieve either better fuel economy than traditional vehicles or better performance. Hybrid engines can be both diesel and gasoline powered. The first one is more common, since there are less problems in making the two engines (electric and gasoline) work. There are different degrees of hybridization: full hybrids, i.e. cars that can run only in EV mode, and mild hybrids, where the electric engine has not enough power to move the car and it just gives both a better fuel economy and performance. The hybrid system is a good compromise to increase the range (which is typically limited in just electric

vehicles) and to reduce the exhaust emissions. These kind of vehicles can proceed at a low speed for some kilometers only in electric mode after that, when the batteries are out of power, the electric unit helps the gasoline or the diesel one both in performance and in fuel consumption. In these last years, hybrids have been used in hyper sport cars as well, mainly to increase the power and the performances, with an eye on fuel consumption. They can have plug-in engines too that typically allow to improve the range and the speed of the EV mode (Electric Vehicle mode, also called Zero Emission Vehicle – ZEV – mode). Thanks to these modes, they can enter limited traffic areas, like a full electric vehicle. In many countries, the taxation is lower and there are incentives in buying these cars. The main drawbacks are the prices, which tend to be higher than normal diesel or gasoline cars, as well as the weight, which is higher too. First examples of gasoline-powered hybrids made on a large scale are the 1997 Toyota Prius and the 1999 Honda Insight, even if an early attempt was made at the beginning of XX century by Ferdinand Porsche. The first diesel-powered hybrid was the 1997 Audi Duo III, produced in small numbers due to the high tag price and the low demand.

1.2.V Electric Vehicles (EVs)

This vehicle uses one or more electrical engines instead of a traditional one, to give the propulsion. They have a pack of batteries which can be charged either by traditional power sockets or by charging stations that can be found in the major cities and provide high voltage power to recharge the batteries quicker than traditional power sockets. These vehicles are rated ZEV, Zero Emission Vehicles, because they do not release NO_x or CO, so they can enter city centers and limited traffic areas. There are many discounts in buying these cars in a lot of countries and the taxation is favorable, too, since sometimes it is possible not to pay certain taxes or tariffs. The efficiency is higher than a traditional engine car, as it may reach about 65% (like when the energy is produced by a hydroelectric plant) in lieu of the 20% generated by a traditional engine. They have expensive batteries inside that can

either be bought or rented monthly, even if there are some problems in their disposal, normally after 10 to 20 years. The range they offer is very limited, as they are thought mainly for an urban use, and sometimes the speed is just sufficient to be used in highways. Their use is sometimes restricted to big cities, as they do not represent a valid alternative to traditional cars especially for people who work extensively with cars like salesmen or cab drivers. Another major issue is charging time which tends to be longer, above all if traditional sockets are used. Even if the running costs are lower than traditional fossil fuels, the price to buy these cars has always been higher and the maintenance is not cheap as well. These engines are noiseless, so they represent an issue for pedestrians in cities. Traditionally, these cars were related to slow small-sized ones, unusable out of the city centers. Different examples, like Tesla Roadster, Mercedes SLS AMG Electric Drive and Audi R8 E-Tron, have proof that the idea behind modern EVs has a substantial room for improvement and they can represent a possible solution for different categories of vehicles.

1.2.VI Fuel cell (Hydrogen)

These vehicles have an electric motor which is powered by a fuel cell. The mode of operation is similar to an electric engine, without the need to be recharged as they have a tank that is filled with hydrogen. All fuel cells are made up of: an anode, a cathode and an electrolyte. These vehicles emit just water and heat from the exhaust therefore they are considered ZEVs. Their use was very wide in the space industry, even if the first hydrogen car example can be found in the 1966 Chevrolet Electrovan, a two-seater van with a big tank in the back. It was just a one-off and never went on sale.

The efficiency of Fuel Cell Electric Vehicles (FCEV) is the highest among other kinds of fuels. The 80% of the energy made by hydrogen is converted into electrical

energy⁵ and another 80% is the rate of efficiency when converting it to mechanical power, this led to 64% of overall efficiency, more than three times than the 20% of a traditional gasoline engine car. One of the main issues is the lack of an infrastructure. In 2013, New York Times stated that there were just 10 filling stations all over the USA, 8 of which located in Southern California, maybe the state where there is a strong idea in developing new alternatives to traditional fuel², as of the 2015 stations are 12 but, in 2014, 20 million \$ a year have been allocated per 10 years to build up 100 new stations in the sole California. Outside the United States, Japan and Germany are two of the main countries investing in fuel cells, with respectively, 40 and 50 stations to be built.

The problems of hydrogen propulsion are: some concerns regarding the safety in the storage, due to the low operative temperatures this gas needs; wide lacks in regulations and infrastructures, which lead to extra costs that may discourage some countries from introducing this new fuel; the durability of the materials used, since they work at very low temperatures and always need to be efficient in order not to waste the energy produced. Even if it's not so new as fuel, it's still quite pricey compared to the others and, in some cases, just small fleets had been rented to the final customers to make road tests. At the moment, the only production car is the Toyota Mirai sold in Japan and recently launched in California. In Europe its arrival is expected by 2017, but the production is still limited to 3,000 units per year.

1.3 The mass electrification of the industry and the partnerships inside the sector

Even if it is still hard to have a clear vision of the future, the process of electrification in the automotive industry is the new target for many carmakers. Electricity represents the most tangible competitor to traditional petroleum-based

⁵ http://www.nytimes.com/2013/11/24/automobiles/fuel-cells-at-center-stage.html?_r=1&adxnnl=1&pagewanted=2&adxnnlx=1385313339-SWDXRwwueS6Exot9wFmA+Q

fuels, also because the hydrogen technology is not as refined and still present questions about the feasibility to adapt some common standards valid for the entire sector, which is estimated to hit almost 74 million vehicles by the end of 2015. Many carmakers are implementing different solutions affordable in the long run as well, to understand the real possibilities of these alternatives and to appreciate their effects on their strategies.

The technology evolution has led to benefits under different points of view:

- new chemical materials are used to produce the batteries, which lead to a longer life and range and a better reliability;
- the development of a widespread infrastructure and the improvements in energy production, exploiting various methods to produce electricity from renewable sources;
- a better effectiveness in vehicles production, limiting flaws and weaknesses, alongside with incentives and bonuses given by States to modernize car fleet, have brought to the spread of different ways an electric engine can be used in transportations.

Institutions play a central role in the development and the success of the industry too. By giving incentives, they push the sales of all those alternatives to traditional combustion engine, conceding benefits in taxation like rebates on car taxes or implementing new ways to improve the experience like offering, alongside with the car makers, the chance to lease batteries for a small monthly amount or the installation of private recharge columns for a part of the price. An example can be found in the United Kingdom, where the government offers grants of 25% off the cost of the vehicle (up to 5,000£). Moreover the VED, Vehicle Exercise Duty i.e. a duty which includes vehicle tax, road tax and car tax, is free for those who buy an EVs and, if they live in London, they can reach the city center without paying the Congestion Charge, having also some discounts in park tariffs. The institutions are studying a way to standardize the market, in order to simplify the adoption of a worldwide common criteria. This will represent a challenge because of the dissimilarities among different power outputs both in term of frequencies and in term of voltages.

The industry will face the entrance of new players, mostly from the emerging markets, that will challenge the traditional car manufacturers. These players can be already part of the industry, but they can play in different industries as well. All those dynamics will lead to an unpredictable and very complex scenario and the high level of uncertainty will force players to be very flexible and to sign strategic partnerships or to build joint ventures in order to share the risks and to have more resources to handle. These solutions offer numerous benefits:

- they prevent the surface of high transaction costs that are common in new markets, as in the electric vehicle sector;
- these solutions help to prevent the leak of strategic knowledge out of the firm;
- the risk sharing help the stakeholders to have just some responsibilities and obligations, knowing that other participants will do the same to reach common targets;
- to exploit scope and scale economies and learning curves faster.

Some examples may be traced in Toyota's strategy. PEVE (Primearth EV Energy) is the joint venture between Toyota and Panasonic-Sanyo which supplies batteries for Toyota plug-in hybrids from 2011⁶. Panasonic-Sanyo is a leader group in developing and constructing ion batteries, while Toyota has gained experience in developing electric vehicles since the beginning, as it has been one of the most important car makers to push first the hybrid, then the electric technology, in modern vehicles. To compete against the stiff competition that has arisen in the last few years, in the past PEVE had to deal with managerial problems, as the two companies were part of different industries, with different managerial styles and diverse goals. Other major issues can be identified in the two different technological backgrounds, even if they are both big groups which can count on solid bases to operate. Sizing is an important strength as well. Likewise other industries, big groups tend to be more ready and have more resources to set market standards and to implement technologies that can change the panorama. Fundamental is the

⁶ <http://www.marketwatch.com/story/panasonic-reportedly-to-reduce-stake-in-toyota-hybrid-battery-jv-2009-10-28>

contribution given by universities and research centers, an essential block to build a network to share flows of information, strategic in an industry like this also considering that many times, these small parts tend not to have the necessary funds to develop R&D projects and to assume the risks connected to them. Another aspect to be taken into account is the penetration into new markets, which implies new challenges and new problems to deal with. China, for example, is probably the biggest market for electrical innovation. For this reason, many car makers, like BMW (with Brilliant) and Daimler Mercedes (with Shenzhen BYD), have entered the competitive Chinese market, both to improve their presence there (the Chinese Government fostered the cooperation between local manufacturers and European or American ones) and to join the knowledge of local producers.

Vitali (2012) defines three different types of partnerships: partnerships among companies; partnerships between public and private companies; partnerships between electricity players and the EV sector companies⁷.

The first type of partnerships is the most common in the market, involving both the big carmakers and the small group of researchers. The main reason for having such a strategy is the cost of control, avoiding over expenses in R&D and research, transferring new knowledge and technologies from outside to the inside of the firm. Many of these agreements concern the improvement in the batteries technology, mainly in the autonomy which is one of the biggest weaknesses of EVs. The advancements are focused in improving the density of the batteries, making them lighter and more compact. Some examples of these partnerships can be the collaboration between Bosch and Daimler to build the electric engine for Smart EV, while Hanwa Azdel, a joint venture between PPG and General Electric created to develop new high-performance thermoplastic composites designed to improve batteries performances.

The second classification, between public companies and private ones, is intended to set the market standards. For this purpose, the world public companies are studying different ways to uniform those standards to make it easier to create a unique market all around the world. One of the main concerns deals with the way

⁷ Agreements and Joint Ventures in the Electric Vehicle Industry by G. Vitali in: G. Calabrese, "The Greening of the Automotive Industry", GERPISA, 2012.

in recharging the car batteries. It can be done either by using public sources on the road, which has the problem of the slowness of the entire operation, or by using private columns inside the garage. As regards to the slowness of the operation, many attempts have been made to make the process quicker, but there are still some technical barriers that prevent these improvements: batteries are incapable to absorb all the amount of power needed in a short lapse of time and the energy suppliers are still unable to give the quantity of electricity needed to reach the full charge. Tesla Motors in 2013 gave a solution to this matter by arranging some stations where it is possible to change the battery pack of its Model S in about one and a half minute, faster than any traditional refueling⁸. The society is also involved in the development of both a public charging infrastructure (Tesla Superchargers) and domestic installations (Tesla Powerwalls), which are spread across most of the European countries and in North America.

The third option, partnerships between electricity suppliers and companies out of the EV sector, are signed to develop the existing infrastructure and to recycle the battery components when they end their life cycles. Such agreements may be: the international collaboration between Nissan and Green Charge Networks to sell second-life batteries out of Nissan Leafs, in order to reduce waste and increase sustainability⁹, or between Enel and Daimler Mercedes (E-mobility Italy project, started in 2008) that has built more than 400 charging stations in the major Italian cities and have given 100 Smart EVs to customers taking part in this project¹⁰.

1.4 Industry analysis and carmakers' strategies

8 http://www.teslamotors.com/it_IT/videos/battery-swap-event

9 <http://nissannews.com/en-US/nissan/usa/releases/nissan-and-4r-energy-partner-with-green-charge-networks-for-commercial-energy-storage-featuring-second-life-electric-vehicle-batteries>

10 https://enel Distribuzione.enel.it/it-IT/e_mobility

The Five Forces Model was originally identified and developed by Michael E. Porter, a professor at Harvard Business School and an advisor for the Boston Consulting Group. Both entities were looking for an utterly new and updated method to develop strategies in the field of competitive advantage. Porter applied the principles of microeconomics alongside business strategy theories to analyze requirements in individual sectors. Today, the Five Forces Model developed by Michael E. Porter is a tool widely used to analyze the opportunities and overall competitive advantage of a product, a company or an industry. It consists of five forces that help define the intensity of the competition and the potential attractiveness of a certain area. This tool can be useful in analyzing a specific project and its strategic opportunities, as well as the opportunities, the effectiveness and the profitability of a whole organization or a sector. The stronger competitive forces inside the industry are the less profitable it is. A sector with low barriers to enter, with few buyers and suppliers but multiple substitute products and competitors will be seen as a very competitive one. This industry will not be very attractive, because of its low profitability.

The following forces are identified within the Model:

1. Threat of new entrants
2. Bargaining power of buyers
3. Bargaining power of suppliers
4. Threat of substitutes
5. Rivalry among existing competitors

The picture above shows the original Porter's representation of the Five Forces Model, published in the January 2008 issue of the Harvard Business Review.

The Five Forces That Shape Industry Competition



from "The Five Competitive Forces That Shape Strategy" by
Michael E. Porter, *Harvard Business Review*, January 2008

- Threat of new entrants: this threat is determined by how easy (or not) it is to enter a specific industry. If it is profitable, with just a few barriers to enter, rivalry should be very intense. This leads to falling profits and it is crucial for existing organizations to create high barriers to enter to discourage new players from joining the industry.

Some high threats of new entrants may be:

- when the amount of capital needed to enter a market is low;
- when existing firms do not have established brand reputation or patents or when those companies can do little to retaliate;
- if there are low switching costs, i.e. the cost to switch from an industry to another one is low;
- when customer loyalty is poor;

- if products are very standardized;
 - when government regulation is weak;
- Bargaining power of buyers: a strong bargaining power is when buyers have the power to ask for a lower price or higher product quality from their suppliers. A lower price is directly correlated to low profits, while higher quality means higher production costs and consequently lower revenues.
- The bargaining power of buyers is higher when:
- large stocks of products are bought;
 - there is the threat of backward integration, i.e. when a manufacturer acquires the channels of distribution;
 - there are many substitutes and there are just few buyers in the market;
 - buyers can easily switch to other suppliers both because of low switching costs, especially when they are very sensitive to the price.
- Bargaining power of suppliers: the bargaining power allows suppliers to sell their products for a higher price to their buyers. They can sell lower quality products as well. The profits of the buying firms are directly influenced since they pay more for materials.
- Suppliers have higher bargaining power if:
- there are limited suppliers and many buyers and there are just few substitutes;
 - suppliers are large and there is the threat of forward integration, i.e. vertical integration whereby activities are extended to embrace control of the direct distribution of its goods;
 - the switching costs are high.
- Threat of substitutes: this is particularly threatening when buyers can find alternative products easily, with tempting prices or better quality and a buyer can switch from a product or service to another easily, with moderate cost.

- Rivalry among existing competitors: this force has an enormous impact on the competition and the profitability of an industry. In a competitive industry, firms have to contend violently for their market share, and this leads very often to low profits.

The intensity of rivalry is higher when:

- exit barriers are high and the competitors are copious;
- products are very standardized and can be quickly substituted;
- the industry's growth is slow or negative and the size of the players is very similar;
- customer loyalty is low.

This framework can be applied to the automotive industry.

As for “threats of new entrants”, the industry is characterized by high barriers to entry, so that the menace from newcomers is low. Just a few groups and entrepreneurs have reached success in the sector besides the traditional ones. An example of this is Tesla Motors, while many others like Fisker, Saab or Hummer, have showed the difficulties of entering a complex industry like the automotive one. Other aspects can be traced to the fact that big groups and multi-national companies benefit from scale and scope economies, key competences, patents and trademarks, research and development projects, and mergers and acquisitions of companies on the supply chain. To enter the automobile market means investing huge amount of capital, skilled managers and engineers and the time necessary to gain market acceptance and the customer trust essential to generate sales and revenues sufficient to operate without the constant need of cash injections from investors and finance activities.

Reputation is crucial in this industry; established companies benefit from lower marketing costs and their brand value goes up while the customers' price sensitivity goes down. To further raise the barriers, every car firm is increasing its production capacity to face the growing demand, especially from emerging countries on which many carmakers rely. Furthermore, there are no tangible switching costs to move to a competitor. Different government regulations have made entrance to the sector harder, since there are different standards in safety, emissions and standards. Recent history has proved that, besides Tesla Motors, no new player has entered the

automotive industry in a significant manner in the last decades, but there have been a lot of M&A operations, partnerships and joint ventures. We have seen many brands shifting to a different segment, like the premium or the S (sports car) segment, like Hyundai Kia Group or the DS brand, a sub-brand of Citroën.

Regarding the “bargaining power of buyers”, the automotive industry has three main buyer clusters: private customers, commercial companies and governments. Commercial companies, like rental companies or leasing companies, represent a conspicuous part of the sales for the car companies, while private buyers buy a new car less frequently on average. The turnover of corporate fleets is higher than the one for private users. Buyers have great power in negotiating prices with local dealers, they are very informed thanks to sources like traditional magazines and the Internet, they compare the different alternatives available and choose the most appropriate to their needs after a long decision process, as buying a car represents one of their biggest expenses. Switching costs are pretty much absent and customer loyalty represents a strategic aspect for each manufacturer that should be considered and kept under control. Every car producers’ aim is to steal buyers from competitors, in order to enlarge their customer base. Mercedes, for instance, wanted in the early 2010s to lower their customers age without losing their faithful buyers that were the oldest among the luxury manufacturer (European consumers between 45 to 55 years of age). For that reason, they launched an all new model, the A class, which alongside with the renewed B Class, has reached the goal to decrease their average buyers’ age by 13 years in just five years¹¹. In most of the automotive segments, customers are very price sensitive, so small variations in prices may imply either an increase in customer numbers (if prices go down) or a decrease in it (if the prices are raised). Only in the S segment or in the super luxury one clients prove to be price insensitive, as price represents a status or a symbol of wealth for uncommon or special vehicles, which are sometimes handmade or made in small lots. Finally, the already stiff competition became even stiffer after the crisis because producers needed to saturate their plants in order to survive, by giving discounts and incentives to buy, as mutually agreed with governments. In the last

¹¹http://motori.ilmessaggero.it/motori/mercedes_classe_a_nuova_salone_francoforte_2015/notizie/1533403.shtml

few years, even in the luxury segment competitors have started coming from developing countries, like it happened in the late 1980s, when producers like Toyota, Honda and Nissan, started their luxury cars divisions up: Lexus, Acura and Infiniti, respectively.

Suppliers, in the automotive sector, are members of a very vast sub industry, which includes everything from spare parts like brakes, tires, and gearboxes, to services like technical, financial and legal advisory. Many suppliers are located around the mother company, constituting the so called “supply chain”. Their bargaining power is very strong when they operate in a monopoly or an oligopoly. The presence of substitutes weakens their power, while being the sole producer of a certain good strengthens it. Examples of this are Bosch, a German OEM producer, which has the leadership of the production of electronic systems like ESP (Electronic Stability Program) and ABS (Antilock Braking System) or ZF Friedrichshafen, the world leading transmission systems supplier, which has recently bought TRW, establishing its Active and Passive Safety Technology division¹². Sometimes the carmakers buy the supplier or sign exclusive agency agreements to ensure the knowledge remain inside the firm (forward integration), but these acquisitions are rather rare. A central matter is the cost to switch from a technology to another one, which may prevent a carmaker from changing its suppliers. Many times, like with the infotainment systems, the supplier has a particular software or specific applications that are specific and cannot be changed. This phenomenon makes the buyer highly dependent from the specific product and this raises the barriers to exit for carmakers.

As for the “threat of substitutes”, the industry has recently seen increasing competition from new services. Car sharing and carpooling are two recent concepts that renovate transportation. The first service consists of a fleet of cars that can be rented with either a tariff per kilometers/miles or a time-based one. Carpooling is the sharing of car journeys so that more than one person uses the same car in order to save fuel, road fees and emissions. For instance, UberPop, a web-based service to ask for and give lifts among private members, has represented an important issue

¹²http://www.zf.com/corporate/en_de/press/press_releases/press_release.jsp?newId=22096936

for many governments and, in many cases, it has been banned due to law violations¹³. The competition such methods pose is higher when fuel prices go up. The increase in fuel prices has been pushing many urban drivers to switch to public transportation or to those new modes of transportation. Many car owners agree that using a personal vehicle is not convenient anymore, due to the increases in fuel prices and in car taxes and tolls. This will represent an increasing threat if the trend continues and carmakers are not be able to create more cost-efficient solutions to face this menace. For all these reasons, is it possible to consider the threat of substitutes as a modest one.

As for the last one, the “rivalry among existing competitors”, inside competition is indeed stiff. Firms compete on two dimensions: price and non-price. Every carmaker has a precise brand identity that makes them recognizable from the others. This identity may be related to tangible assets like safety for Volvo or off-road capacities for Land Rover vehicles. Marketing is crucial to build and strengthen brand identities as it is one of the most important aspects to deal with in the entire industry, for carmakers, OEMs and suppliers. Marketing campaigns have proven to be very effective and car firms invested a lot to buy spaces during sporting events, like the Superbowl¹⁴, or by sponsoring them, like in the case of the Hyundai A-League. Another crucial aspect is sales. Many producers rely on those markets which have shown the biggest growth levels, especially Asian, Central and South American and Eastern European countries, while the traditional markets, such as North America and Europe, do not have much room for growth. The sales for numerous carmakers, mostly those which operate in the premium segment, have been hit by the slowdown of China’s economy and they have been forced to lower their valuations, all leading to a decline in the growth of the automotive sector and its margins. Another trend in the industry is the concentration of the players. Since 2010, the year in which this sector struggled the most due to the economic crisis, many car firms struggled to survive, facing problems of overcapacity and overstaffing. That is the reason why more and more carmakers founded new groups

13 <http://www.reuters.com/article/2015/10/13/us-uber-tech-belgium-idUSKCN0S71VQ20151013#ZKk36Uu7ZrOepZTZ.97>

14 <http://www.forbes.com/sites/michellekrebs/2012/01/31/secrets-of-winning-super-bowl-car-ads/>

and partnerships, which has meant that the competition has become even stiffer. In addition to this, exit barriers are high; in fact huge capitals are required to start a new business and just a few entrepreneurs decided to enter the market. Given these reasons, we can consider this threat as low and the automotive industry is unattractive to newcomers, even if some opportunities do still exist.

The following analysis will revolve around the main players in the automotive premium segment, some facts and numbers, their future strategy and an overview of current and future alternatives to traditional combustion engine cars.

1.4.I BMW Group

The BMW Group is made by: BMW, M performance, Mini and Rolls Royce. The BMW group has also built motorcycles since the 1920s. The car manufacturer produces city cars, sedans and wagons, coupe and convertible sports cars and SUVs. The group is active in more than 150 countries all over the world.

In 2007, BMW formulated Strategy Number ONE, with two targets: be profitable and enhance long-term value in times of change. The strategy's four pillars are: growth, shaping the future, customers and profitability and access to technologies. The group is firmly focused on the premium segments of the international automobile markets and their mission is clearly defined: to become, by 2020, the world's leading provider of premium vehicles and services for individual mobility¹⁵. The group sales and revenues from 2010 to 2014 are reported in the following chart:

	2014	2013	2012	2011	2010
Sales	2,118	1,964	1,845	1,669	1,461

15 <http://www.forbes.com/sites/jacquelynsmith/2012/06/07/the-worlds-most-reputable-companies/2/>

Revenues	75,153	70,630	70,208	63,229	54,137
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Source: BMW Group site.

Note: Sales number in thousand units (000); Revenues in million €.

The group is investing in electric and hybrid vehicles. In 2007, the BMW I brand was founded, after an investment of 400 million euros, and the first two vehicles were launched respectively in 2013 (BMW i3) and in 2014 (BMW i8). The BMW i3 is sold both in an electric version and in a plug-in hybrid one, with a petrol 647cc two cylinder engine, with a maximum range of about 200 km for the electric one and 300 km for the hybrid model. It's a premium city car made of refined materials, like Carbon Fiber Reinforced Plastic (CFRP) for the lightweight chassis and recycled material for the sophisticated interiors. It is also a safe car, obtaining a four out of five stars rating by the Euro NCAP, a voluntary vehicle safety rating system based in Belgium, backed up by the European Commission, seven European governments, as well as motoring and consumer organizations in each EU state. At the end of the first half of 2015, more than 30,000 vehicles were sold¹⁶. The BMW i8 is the other model out of the BMW's I family. It is a totally different car from the i3, it's a hybrid premium sports car, with a traditional 1.5 liters engine combined to a 131-hp electric unit, which produces a total power of over 360 hp. The performance is comparable to the main competitors' one, with an all-electric range of 30 km and emissions are limited to 49 grams per km CO₂ (g/km, 4 times less than competitors). In order to limit the weight of the car, carbon fiber is widely used and ultra-resistant plastic alloys are employed for the interiors for the same reason. The results is a weight just under 1,500 kg, even with all wheel drives and two engines. Sales exceeded the 5,000 mark in the first months of 2015 and the model is sold in 50 countries¹⁷.

¹⁶http://www.bmwgroup.com/bmwgroup_prod/e/0_0_www_bmwgroup_com/unternehmen/unternehmensprofil/strategie/strategie.html

¹⁷ <http://www.bmwblog.com/2015/07/10/worldwide-sales-of-bmw-i3-and-i8-exceed-30000-units-in-2015/>

BMW, like many global players, signed many agreements with supply chain companies and third parties to improve the preservation of a strategic knowledge and assets inside the group. In these last years, an alliance between Toyota and BMW has been signed. This partnership is intended to give Toyota's technicians to BMW to develop other platforms which can be, one day, the basis of new models of vehicles with a hybrid drivetrain and an electric one, in exchange of BMW's sport engines that will be fitted in Toyota's future sports cars. Another partnership BMW secured is with Apple, in 2015. This agreement deals about the Apple interest for the external structure of BMW's i3, made of carbon fibers, to be adopted in the future Apple's car, Project Titan, to be sold by 2020, in exchange of Cupertino-based company's researches on the connected car services. This agreement may be the foundation of an enduring one, to develop new technologies and new standards to be shared between these two companies. Another partnership, signed in 2013 with Schneider Electric, a third party power supplier, was intended to place fast wall charger into i-models customers' house, with Schneider Electric as the manufacturer of BMW i Wallbox (domestic wall charger) and as the recommended installer.

As for future plans, the group is working to widen the electric and the hybrid base models, by extending the plug in model on their SUVs (The X series) and their sedans, offering the electric alternative to all those models for sale. The goal is to enlarge their presence on strategic markets, like American, Chinese and European ones, and to expand to new emerging ones, with growing demands of premium products quality. They are also developing fuel cell technology, as a long-run alternative to electric vehicles, even if there are still a lot of doubts about it. BMW's head of sales and marketing, Ian Robertson, said that limits with hydrogen fueling stations will outweigh problems with EV's charging and range. But he also stated that the real concerns revolve around the possibility to supply hydrogen in the marketplace at fair cost¹⁸.

18 <http://www.hybridcars.com/mercedes-and-bmws-future-emphasizes-fuel-cell-vehicles-over-battery-electric-cars/>

1.4.II Audi

Audi is one of the companies of the Volkswagen group, which include also: Volkswagen, Seat, Skoda, Lamborghini, Porsche, Bentley, Bugatti, in the sole automotive industry. Their market share has seen a substantial growth in Asia, especially in China. The models encompass from small city cars to big SUVs, from sedans, station wagons and crossovers to coupe and cabriolet sport cars, under the RS badge, its sport division. The brand mission is to delight worldwide customers, by focusing on innovations, environmental responsibility, improving experience. The following chart displays the main data of the Audi AG:

	2014	2013	2012	2011	2010
Sales	1,741	1,576	1,455	1,303	1,092
Revenues	53,787	49,880	48,771	44,096	35,441

Source: Audi Group site.

Note: Sales number in thousand units (000); Revenues in million €.

The strength of Audi is that it is a part of one of the biggest groups in the car industry. The Volkswagen Group introduced in 2012 the modular platforms MQB, thought to be adopted by front engine, front-wheel drive (or all wheel drive) vehicles, and MB platform, designed for longitudinal engine cars. Going against the increasing complexity that has been the standard for this industry, the group created a standardized, interchangeable set of parts from which it is possible to build a variety of vehicles, reaching the goal to cut the time taken to build a car and to cut the costs too. The biggest feature is the position of all motors and transmissions, by fitting all motors into the same place; in that way the group hopes to cut down both on engineering costs and weight and, consequently, complexity when porting the car over to other models. These two platforms were thought to be implemented to host the battery packs underneath for plug-in and EV models, to be launched in a forthcoming future. As a matter of fact, the so called “E-tron” family models were

developed, both electric and hybrids, with models going from the small A1 and A3, to the bigger E-tron Quattro Concept (a SUV concept to be sold by 2018) and R8 E-tron (a sport coupe that is expected to be launched in 2016). According to many journalists and columnists the VW Group, since 2013, pushed heavily on the development of new fuel sources, that can represent an alternative to the bestselling diesel engines, which have always to deal with even stricter regulations to be sold globally (the recent diesel gate scandal is a proof of that). The big E-tron Quattro Concept, the study for the next generation premium full size SUV, was designed to compete against the main rivals in the industry, new Tesla Model X among everything. The Concept is all electric with three engines, two on the rear and one in the front part, providing over 430 hp in standard configuration, 500 with the overboost, ensuring 500 km of range, with 95 KW/h batteries. The R8 E-tron is a completely different product. After the first attempt, which never went on sale because of the high development costs, the R8 E-tron 2.0 is a brand new vehicle. The batteries are on the back of the seats and inside the center tunnel to keep the weight balanced and there are housed lower to give a better handling and to lower the center of gravity. It will be rear-wheel drive, with a total power of 456 hp and 450 km of range. The aerodynamics is completely different from the gasoline model, lowering the Cx and improving the efficiency and the performance. The portfolio of E-tron is completed by an A3 E-tron, a hybrid compact sedan, with a traditional 2.0 liters engine and an electric one, which allows the car to have decent performance with emissions of just 37 g/km CO₂.

After the diesel gate scandal, the Audi long term strategy will be surely affected in their priorities. The EPA asked for an 18 billion fine for the VW Group and the costs to modify the 2.1 million car's ECUs probably will affect their future moves. The need to regain credibility and the customer's loyalty as soon as possible is very important for the future growth of the group. Audi's green alternatives may be fundamental in order to regain the preeminence in the luxury sector and big investments in this area may be necessary to ensure a future to the brand.

1.4.III Mercedes

Daimler AG is made by: Mercedes, Smart and the motorsport division AMG. The main data about the group are the following:

	2014	2013	2012	2011	2010
Sales	1,630	1,467	1,452	1,381	1,277
Revenues	73,584	64,307	61,660	57,410	53,426

Source: Mercedes-Benz Group site.

Note: Sales number in thousand units (000); Revenues in million €.

Mercedes name has always been well known for its building quality and the luxurious interiors. Its model engines, which range from small displacement units for compact city cars to big V8s thought to be used in SUVs and sport car models, vary from the traditional gasoline or diesel-powered to all electric ones, from hybrids (which run both gasoline and diesel) to NGVs. The new B-class EV model, launched in 2014, is a compact sports tourer car, developed to rival the BMW i3. The drive system, a 177 hp engine, comes from Tesla and consists of a lithium-ion battery pack under the car's floor that allows the car to have a range of 200 km. A sport model, the 2014 SLS AMG Electric Drive, was made in a small series to prove the efficiency and the reliability of electric cars even in the super sports car industry. The car had an all-electric engine, developing 751 hp and 1,000 Nm of torque, with a range of about 250 km. The battery pack consists of 12 modules, each made up of 72 lithium-ion cells. The SLS Electric Drive charging time is three hours via an optional 22-kW quick-charge station. Other Mercedes models which utilize electric engines are hybrids. Mercedes is the only premium manufacturer to have diesel hybrids in its fleet, the C-class 300h, as well as NGVs, both B and E-classes. Mercedes has an ongoing partnership with the Ford Motor Company for the development of fuel cell technology. In 2013, Nissan Motor Company signed an agreement with the AFCC (Automotive Fuel Cell Cooperation, the society born

from the partnership) to develop next-generation fuel cell technology, with the goal to produce the world's first reasonable priced, mass-market fuel cell electric vehicles as early as 2017. The AFCC, the Canadian based company, will be responsible for the research projects and product development of automotive fuel cell technology for the collaboration. In August 2015, Thomas Weber, member of the board of management of Daimler AG Group Research & Mercedes-Benz Cars Development, stated that the future for electric cars is uncertain, there are still many interrogatives that can make the electric technology just a transition technology to the fuel cell hybrids, which has still many issues to deal with. He affirmed that the focus of the group is still on hydrogen as the future leading technology will be this over electric¹⁹.

1.4.IV Volvo

The AB Volvo is a world-leading Swedish manufacturer of commercial vehicles, owned from 2010 by the Chinese company Geely, even if Volvo remained autonomous. The sales both in units and millions are displayed in the following chart:

	2014	2013	2012	2011	2010
Sales	465,866	427,840	421,951	449,255	373,525
Revenues	129,959	122,245	124,547	125,525	113,100

Source: Volvo Group site.

¹⁹ <http://www.hybridcars.com/mercedes-and-bmws-future-emphasizes-fuel-cell-vehicles-over-battery-electric-cars/>

Note: Revenues in million SEK.

The Volvo Cars strategy has always been focused on the safety and on the sustainability of their models. The Swedish carmaker, has recently introduced one of the most comprehensive electrification strategies in the industry, in which plug-in will be introduced across its full range. It will develop an utterly new range of electrified smaller cars alongside with a fully electric car for sale by 2019, with the goal to reach up to 10% sales in the medium term. The first element of this strategy involves the introduction of plug-in hybrid versions of its 90 series and 60 series larger cars, both based on the Scalable Product Architecture, the company's new common platform. This process has already started with the launch of the XC90 T8 Twin Engine All-Wheel Drive plug-in hybrid version of Volvo's full size premium SUV and will continue with the new S90 plug-in hybrid, to be launched in 2016, and other forthcoming models. Volvo Cars' XC90 T8 Twin Engine is one of the cleanest and most powerful SUV available, delivering 407 hp from its 2.0 liters petrol engine, with just 49 g/km CO₂, plus an all-electric range of 43 km. Plug-in hybrid cars will be offered also with a brand new front-wheel drive Twin Engine variant, to be adopted under the hood of smaller series, like the 40, based on the Compact Modular Architecture (CMA). Both the new platforms, CMA and SPA, have been designed from the outset for electrification, both plug-in and pure electric powertrain configurations. Håkan Samuelsson, President and CEO of Volvo Cars, stated that electric technology is no more a niche product and, currently, hybrid technology represents the best combination of efficiency, range and convenience for customers²⁰. This mix of power, efficiency and environmental friendliness will be the distinctive characteristic of all Volvo Cars' future models. Peter Mertens, Senior Vice President for R&D at Volvo, stated that we have now come to a point where the cost versus benefit calculation for electrification is positive. Battery technology has bettered, costs are decreasing and public opinion on electrification

20 <https://www.media.volvocars.com/us/en-us/media/pressreleases/168142/volvo-cars-unveils-global-electrification-strategy>

is no longer questionable. For all these reasons, the Swedish carmaker will play an important role in the industry.

1.4.V General Motors (Cadillac)

Cadillac is the premium division of the General Motors Company. Recently, GM has started to sell its cars in the whole Europe, mostly the ATS, CTS, STS models and the Escalade SUV. These are the main company numbers:

	2014	2013	2012	2011	2010
Sales	9,925	9,722	9,228	9,024	8,390
Revenues	155,929	155,427	152,256	150,276	135,592

Source: General Motors Company site.

Note:

- Sales number in thousand units (000); Revenues in million \$.
- Data referred to the entire GM Group.

The firm strategy is widely electric-oriented as it has no other alternatives besides traditional gasoline engines. The 2013 Cadillac Escalade was the first hybrid car for the brand, which has been recently discontinued. It was a full size SUV, with an enormous six liters engine and two electric engines, developing a total power of 337 hp. The idea behind the car was to build a perfect highway cruiser, with acceptable emissions and fuel consumption. The year 2016 will see the launch of the new ELR ED model, an extended range version of the traditional ELR, which declares over 550 km with both engines and a full electric range of 65 km. The sport coupe will be charged in just 5 hours from a 250 v power socket and many US states will benefit from a 7,500\$ federal tax credit. GM announced earlier this year a further cut in its electric models' tag prices of 10,000\$ to push sales which have

been tepid so far and an addition of power as well²¹. Johan de Nysschen, the new president of Cadillac, has recently announced the repositioning of the brand by moving the brand in New York City, separating its business units from the mother company. In his future plans, every car model will be renamed and the first product to be sold will be the all new CT6, a prestige sedan to compete against the German rivals, offered with plug-in hybrid electric (PHEV) propulsion. The structure is very lightweight thanks to the wide usage of aluminum and high-strength steel, with a lithium-ion battery pack to be placed between the rear seats and the trunk. GM has widely proved, over these last years, its capacities in developing electric technology, as the GM Volt and Opel Ampera's sales proved. The CT6 Plug-In Hybrid system is designed to give all-electric driving for most daily commutes, while improving fuel efficiency at higher speeds and with higher loads, by using the energy stored in the battery. The launch is scheduled for the late 2016 and the car will be assembled in GM's Hamtramck plant²².

1.4.VI Jaguar Land Rover

Tata Motors, India's largest carmaker, acquired Jaguar and Land Rover from Ford in 2008. In 2013, it merged the two brands into a single company and its success has flourished. Sales and profits have risen year after year, as we can see in the following table:

	FY 2015	FY 2014	FY 2013	FY 2012	FY 2011
Sales	462,209	434,311	374,636	357,773	241,975
Revenues	21,866	19,386	15,784	13,512	9,871

Source: Jaguar Land Rover Group site

21 [http://www.autonews.com/article/20150415/OEM04/150419929/2016-cadillac-elr-to-get-\\$10000-price-cut-more-power](http://www.autonews.com/article/20150415/OEM04/150419929/2016-cadillac-elr-to-get-$10000-price-cut-more-power)

22 <http://media.cadillac.com/media/us/en/cadillac/news.detail.html/content/Pages/news/us/en/2015/apr/0419-ct6.html>

Note:

- Revenues in million £.
- FY = Fiscal Year, the year from October 200x to September 200x+1.

With European prestige carmakers scrambling to respond to the unexpected and disruptive arrival of electric-car companies, like Tesla Motors, many car brands have been showing off their electric concepts in the most important motor shows all around the world. Jaguar Land Rover, as part of this group, is determined to keep up with both its higher-volume German competitors and the new American rivals. The group strategy is only focused on the development of electric and hybrid models, neglecting other technologies, like fuel cells. Jaguar showed a concept, named C-X75, at the 2010 Paris Motor Show. The car was intended to be produced with Williams F1 Team, but the launch was cancelled in 2012. The technology adopted in the concept will be the basis for future production cars, to reach the 2020 goal of reducing emissions. The models lineup for the group is just a diesel-powered hybrid engine fitted on the Range Rover, a mild hybrid with adequate performance and an improved fuel efficiency comparing to the traditional diesel-powered engine. Jaguar, instead, is testing a hybrid version of its brand new compact sedan, the XE model, based on the new Ingenium diesel engines. The future of the group will be based on three concepts announced in September 2015. They span from minimal electrification to full battery-electric power. Concept_e MHEV is a mild-hybrid system comprising an electric motor-generator that recycles wasted brake energy into electricity, stored in a battery and later reused to power minor features like air conditioning. The Concept_e MHEV system is made of a hybrid module placed between the transmission and internal combustion diesel engine. Concept_e PHEV is plug-in hybrid concept which pairs a gasoline engine with a larger electric motor. The latter powers the wheels, supported by traditional engine if needed. The lithium-ion battery pack is housed under the trunk. Concept_e BEV has an all-electric powertrain designed to fit Jaguar Land Rover's new lightweight aluminum platform, employed in its latest vehicles. The electric powertrain is a 70 KW/h lithium-ion battery pack, located in the vehicle floor, to power two engines placed

one on each axle, giving all-wheel drive systems used in both Jaguar and Land Rover models. This setup is very similar to the one Tesla uses in its “D” models.

1.4.VII Toyota (Lexus)

Lexus is a part of the Toyota group. As a part of it, they have built their position on hybrid technology from the launch of the RX400 h, the first luxury-branded production hybrid SUV, in 2004. As for the year 2015, the brand lineup goes from compact sedan to premium full size SUV, sold globally in a hybrid configuration. The following chart shows the group’s results.

	FY 2015	FY 2014	FY 2013	FY 2012	FY 2011
Sales	8,972	9,116	8,871	7,352	7,308
Revenues	27,235	25,692	22,064	18,584	18,994

Source: Toyota Group site

Note:

- Sales number in thousand units (000); Revenues in billion ¥.
- Data referred to the entire group.
- FY = Fiscal Year, the year from April 200x to March 200x+1.

Lexus, being the first to introduce a concrete alternative to traditional fuels in the premium segment, has a leading position in the industry. As a part of Toyota, Lexus benefitted from the mother company’s technologies and platforms, used and modified to develop its own luxury image. The units which equipped the lineup models are the following: the 200 h, the 300 h, the 450 h and the 600 h. The 200 h is the powertrain used for the small CT. This engine is the same as the Toyota Prius’, with 136 hp and front-wheel drive. The 300 h is housed under the hood of the IS, GS and NX model and represent the top selling engine of the brand. It’s a 2.5 liters

engine, with two steps of power (197 or 223 hp), paired both with rear-wheel drive or all-wheel drive. The 450 h and the 600 h, with respectively 345 and 445 hp, are the engines used in larger vehicles like the premium sedans (GS and LS) and the full-size SUV (RX). Future models will enlarge the models lineup: the LF SA Concept is a study for the city car of the future according to Lexus. New lightweight materials and 2+2 seat configuration add some innovative features in this segment. Contrarily, the LF-LC, shown at the 2015 Tokyo Motor Show, will be a sporty large sedan, with a length of over 5.3 meters, which will be both electric and hydrogen powered, with the traction on four wheels.

1.4.VIII Nissan (Infiniti)

Infiniti is Nissan's luxury car division. After experiencing poor sales due to rather flat models and wrong targeting, Infiniti was going bankrupt. So, the brand focused on developing a new range of vehicles that guaranteed the brand's future. The brand is currently making its way through European markets. These are the main figures of the group:

	FY 2015	FY 2014	FY 2013	FY 2012	FY 2011
Sales	5,318	5,188	4,914	4,845	4,185
Revenues	11,375	10,482	9,630	9,409	8,773

Source: Nissan Group site

Note:

- Sales number in thousand units (000); Revenues in billion ¥.
- Data referred to the entire group.
- FY = Fiscal Year, the year from April 200x to March 200x+1.

The focus of the brand is the global expansion aimed at expanding to those emerging countries demanding for premium products, as the recent China expansion (2013) demonstrates. In 2011, Infiniti established a partnership with Red Bull's F1 Team and Infiniti became involved in the technological side of the team as well as sponsoring it. The partnership helped Infiniti to reach a new audience of Red Bull's loyal customers and gave Infiniti a relevant name among automotive and racing enthusiasts. Infiniti lineup is made of sedans and SUVs, powered by gasoline, diesel and hybrid engines. The last ones represent a valid alternative to diesel, especially for European customers, while gasoline and hybrid-powered vehicles are the top selling models in America. The hybrid engine is a 3.5 liters, 364 hp, fitted on the two brand's sedans: the Q50 and the Q70. The electric unit is capable of 67 hp and, being a mild hybrid, it just helps the engine to improve performance and fuel economy. The future for the brand is to expand on two different sides: the big premium sedans and sport cars, more iconic and remunerative, and in the compact premium segment, in order to broaden the client base. The Q60 and Q80 will be two sedans that will further develop their hybrid technology, with a sport car performance. Then, the EMERG-E Sport Car Concept is an idea of mid-engine sports car, capable of 402 hp from an electric engine, emitting zero emissions. This model will be the brand's first sports car and the first car to be entirely made, from the design to the production, in its brand new European research laboratories and facilities. In the compact segment, Infiniti has just launched its first compact SUV, the QX30, which will be followed by Q30, a small sedan. They share the Mercedes A-class platform (Nissan and Mercedes have an ongoing partnership) as well as engine and many technologies, differentiating from the German-made hatchback for a more personal image.

Chapter II - The business model

2.1 Business model definition and literature

There is not a widely accepted definition of business model. Even if many publications have been released by numerous authors, scholars have yet to develop a common interpretation of the term. In 2010, Zott et al., released their paper “The Business Model: Recent Developments and Future Research” with the goal of

giving a very comprehensive and up-to-date literature review on the business model definition²³. They examined more than 1720 publications on the subject, considering only academic journals, and they noted that “despite the overall surge in the literature on business models, scholars [still] do not agree on what a business model is.” Its concept can be dated back to the mid-1990s, with the same period that saw the advent of the Internet Era. In fact, the authors found that more than 90% of those articles were published in the period of 1995-2000. According to other scholars, this boom in publications can be related to the steep growth in emerging markets and the interest in issues related to them (like Prahalad & Hart in 2002, Seelos & Mari in 2007 and Thompson and MacMillan in 2010). According to other authors (like Perkmann & Spicer in 2010) this increased popularity of the theme can be linked to the augmented dependency on postindustrial technologies by firms and organizations.

The business model has been considered in many different ways: for instance as a statement (according to Stewart & Zhao in 2000), as a description (like by Applegate in 2010), an architecture (like by Osterwalder & Pigneur in 2002) a structure template (Amit & Zott in 2001) and a framework (by Afuah and Tucci in 2001). We can see some of those definitions in the following chart:

23 “The Business Model: Recent Developments and Future Research” (Zott et al.), *Journal of Management*, 2011

Author(s), Year	Definition	Papers Citing the Definition
Timmers, 1998	The business model is “an architecture of the product, service and information flows, including a description of the various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenues” (p. 2).	Hedman & Kalling, 2003
Amit & Zott, 2001; Zott & Amit, 2010	The business model depicts “the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities” (2001: 511). Based on the fact that transactions connect activities, the authors further evolved this definition to conceptualize a firm’s business model as “a system of interdependent activities that transcends the focal firm and spans its boundaries” (2010: 216).	Hedman & Kalling, 2003; Morris, Schindehutte, & Allen, 2005; Zott & Amit, 2007, 2008; Santos, Spector, & Van Der Heyden, 2009; Bock, Opsahl, & George, 2010
Chesbrough & Rosenbloom, 2002	The business model is “the heuristic logic that connects technical potential with the realization of economic value” (p. 529).	Chesbrough, Ahern, Finn, & Guerraz, 2006; Chesbrough, 2007a, 2007b; Teece, 2007, 2010
Magretta, 2002	Business models are “stories that explain how enterprises work. A good business model answers Peter Drucker’s age old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?” (p. 4).	Seddon, Lewis, Freeman, & Shanks, 2004; Ojala & Tyrväinene, 2006; Demil & Lecocq, 2010
Morris et al., 2005	A business model is a “concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets” (p. 727). It has six fundamental components: Value proposition, customer, internal processes/competencies, external positioning, economic model, and personal/investor factors.	Calia, Guerrini, & Moura, 2007
Johnson, Christensen, & Kagermann, 2008	Business models “consist of four interlocking elements, that, taken together, create and deliver value” (p. 52). These are customer value proposition, profit formula, key resources, and key processes.	Johnson & Suskewicz, 2009
Casadesus-Masanell & Ricart, 2010	“A business model is . . . a <i>reflection</i> of the firm’s <i>realized</i> strategy” (p. 195).	Hurt, 2008; Baden-Fuller & Morgan, 2010
Teece, 2010	“A business model articulates the logic, the data and other evidence that support a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value” (p. 179).	Gambardella & McGahan, 2010

Source: The Business Model: Recent Developments and Future Research (Christoph Zott, Raphael Amit and Lorenzo Massa); Journal of Management, May 2011.

The most simplistic view on the term business model, i.e. the definition of the words “business” and “model” themselves, might help us understand the concept behind it. In the Princeton WorldNet dictionary, the definition of “business” is “the activity of providing goods and services involving financial and commercial and industrial

aspects.” Model is defined by the same source as “a hypothetical description of a complex entity or process” and “representation of something (sometimes on a smaller scale),” concepts similar to which we find in business model literature. So, the business model is an effort to split business activities into something simpler and more concrete. The lack of a universal definition can be connected to the recent discovery of the term in the specialized literature. The previous definition of business model has been used to illustrate three different events: 1) the growing use of Information Technology (IT) inside the firms; 2) strategic choices, for example competitive advantage or value creation; 3) innovation and technology management.

The implementation of internal and external IT systems has meant a lot to firms. New ways of commerce have emerged as e-commerce and e-markets have been set up. The term e-business encompasses all those associations between business relationships made over the internet. It has become the main driver of the hike of interest in business models as these relationships became more numerous and their cost went down while their importance grew. The aim of scholars has always been to describe e-business model categories and to enlist their components. As for the former, many researches have tried to explain e-business models a classification. Applegate in 2001, for instance, introduced six classifications of e-business models; Weill & Vitale (2000) described eight types of it; Tapscott, Lowy & Ticoll (2000) found five clusters they called business webs. As for their components, the literature identified first and second-tier topics among the components of an e-business model: for example, Alt & Zimmerman in 2001 identified mission, structure, processes, revenues, legal issues and technology as first-tier themes, each of them having some second-tier ones like goals, vision and value proposition under the mission theme.

The representation of a business model has been an issue as well. Many researches attempted to illustrate it as a value map (Tapscott et al., 2000), others like a conceptual modeling approach (Gordijn & Akkermans, 2001). Referring to e-business, many scholars found differences in the relation between firms and customers, providing different business models like Pauwels and Weiss’ “fee and free” one, to provide digital content over the net. Authors found that strategic

marketing is at the core of a business model, giving the entrepreneurs or managers the help they need to design a coherent business model (Huizingh, 2002). We can say that those efforts led mainly to a focusing on development of brand new models, flexible to be adapted in many contexts and to the rapid changes of IT technologies. Those business models represent the combination of different “pieces”: networks or relationships between clients and firms or organizations and suppliers, a value proposition (the core of the business model according to many studies) and a revenue model.

Zott et al. (2010) and Hamel (2000) claimed that the business model is immediately tied to the business since it is really the business concept employed in practice. According to Johnson (2010), a business model is made up of four complementary blocks that, taken together, create and deliver value. They are: key resources and key processes, value proposition and profit formula.

Zott et al. (2010) concluded in their paper that a common definition of business model has not been agreed upon yet. The authors’ suggestion is to take the common aspects they found. Their business model proposal is “a new unit of analysis, a system-level concept, centered on activities, and focusing on value,” where the business model is:

- a new unit of analysis between firms and networks;
- a prospect on how firms do business;
- a strong emphasis on firm activities;
- the prominence of value creation.

According to the authors, the previous definition represents a synthesis of the current state of business model theory.

In the paper “From Strategy to Business Models and to Tactics” by Casadesus-Mansell and Ricart (2009), the authors noted that business models can be viewed under numerous points of view and various levels of detail²⁴. Some years later, the topic has been recalled by Schallmo & Brecht and by Wirtz. Schallmo & Brecht (2010) spoke about five business model levels. They were, namely, the industry

24 “From Strategy to Business Models and to Tactics” (Casadesus-Mansell and Ricart), Long Range Planning, 2009.

level, the company level, the business unit level, the product level and the abstract level. The following year, Wirtz identified just four business model levels as he excluded the last one (the abstract level). The abstract level is the least specific one. It is the same for every industry as it describes universal codes on how to operate. The second one, the industry level, is very general too, even if it is focused on how companies can operate in an industry. The example proposed here is the comparison between the ad-based business model and the subscription based one. The corporate level is different from one company to another. It revolves around the company's operation, while it is less environment centered. At the business unit level, there is a description of the business model of strategic business units in large organizations; it is more focused than the previous level. The lowest level, the product one, is the most detailed one, where the main product or service features are described. The example, chosen in the paper is the Apple iPhone, where production, software and the "App Store" are parts of its business model.

Baden-Fuller & Morgan (2010), in their paper "Business Models as Models", analyzed one of the many ways in which the concept is used²⁵. The authors noted that the term business model is widely used as a taxonomy or a typology to describe the several existing business types. While some organizations prefer linking the name of the firm to their business type, as in "Southwest Airlines business model", others would rather use a counterpart description such as "the low cost airline model". According to the authors, the former can be classified as a role model (i.e. an ideal case that other firms try to copy) while the latter can be seen as a scale one (namely a real representation of actual world businesses, where only the most important features are described). Baden-Fuller & Morgan pointed out the importance of innovation and experimentation for corporate business models. They can be used as recipes for managers when they try to modify the original ones, since they help communicating the change both in strategy and in organization structure. The authors concluded that business models are a mix of these features (scale models, role models and recipes) at the same time. As we can see from the papers'

25 "Business Models as Models" (Baden-Fuller & Morgan), Long Range Planning, 2010.

analysis, the research on a univocal business model definition has still not reached a common paradigm. Nevertheless, we can enlist some common traits:

- they all agree on some key points such as value creation, core activities and an holistic approach in order to understand the business;
- there is a growing interest in finding a common definition and application by the scholars;
- other aspects which have proven to be very frequently featured are the level of modelling and the normative models.

Another trait which has drawn the attention of scholars is business model approach. We have chosen to illustrate some efforts to better explain the business model as a construct, its level of conceptualization and desired application.

Zott & Amit (2010) define business model as “the design of transaction content, structure, and governance so as to create value through the exploitation of business opportunities.”²⁶ According to the authors, the recent business model literature bolsters an activity system perspective. Their definition of a business model is “a system of activities which are interdependent that transcends the focal firm and spans its boundaries.” When a manager or an entrepreneur tries to design a business model, the authors suggest considering two main features for the activity system: design elements, such as content, structure and governance, which depict the activity system architecture; and design themes, as novelty, lock-in, complementarities and efficiency, that define the roots of the activity system’s value creation. As for the design elements:

- content refers to what activities should be carried out. The example provided is Bancolombia, which added microcredits to their traditional retail bank activities;
- structure illustrates the bonds among activities and the reason why they are important to the business model. For instance, IBM shifted its core activities, becoming a service provider;

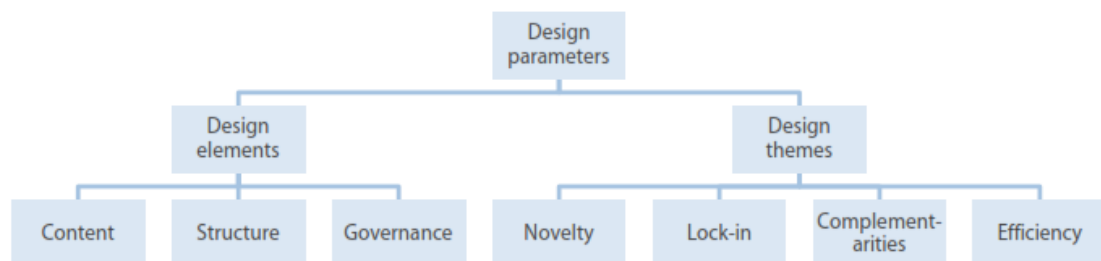
²⁶ “Business Model Design: An Activity System Perspective” (Zott & Amit), Long Range Planning, 2009.

- governance is about the subject who performs the activities. In the paper, Seven Eleven franchising stores imported by Suzuki in Japan are the example for activity system governance.

On the other hand, we have what the authors called the “NICE design themes” (the acronym stands for Novelty, lock-In, Complementarities, Efficiency):

- novelty: activity system characterized by the adoption of innovative contents, structures or governances. Apple, for instance, included a music distribution activity (content innovation), connected to the development of the Ipod hardware and software (structure innovation), while pushing customers to download music legally from Itunes (governance innovation);
- lock-in: the design theme is framed to retain business model stakeholders as customers or third parties. Ebay is the example given, because its business model is structured to prevent the loss of users, making sure they find on Ebay an e-marketplace where they can find a huge variety of goods at a convenient price;
- complementarities: more value is generated by bundling activities rather than keeping them separate. For example, in a commercial bank, deposit activities are a complementary source for the bank’s lending activity;
- efficiency: an efficiency-centered design aims at reducing transaction costs by reorganizing activities with aims of reaching greater efficiency. For instance, many low cost airlines dismiss some non-essential activities like on board meals or seat assignment to reduce their prices.

The following picture shows the aforementioned approach:



Source: The Business Model: Recent Developments and Future Research (Christoph Zott, Raphael Amit and Lorenzo Massa); Journal of Management, May 2011.

Zott & Amit's ontology is a general approach to the business model construct. The center of their attention is posed on the activities' structure, content and governance, as well as considering the business models design themes (NICE) to further describe the roots of activity system value creation.

The next paper analyzed is "From strategy to Business Models and to Tactics" by Ramon Casadesus-Masanell and Joan Enric Ricart in 2009. The two authors define business model as "the logic of the firm, the way it operates and how it creates value for its stakeholders" (inspired by Baden-Fuller, Lecocq, MacMillan and Demil's paper) and as the first phase of their two-stage competitive process framework (the second stage concerns strategy and tactics). Their business model representation is a causal loop diagram, used to clarify managerial choices and their relationships with each other. It consists of:

- choices (top management decisions on how the firm should function). Choices like procurement contracts or the location of facilities have different consequences (for instance the impact of pricing choices on sales). There are three types of choices:
 - o policies (the course of action which a firm selects to adapt every aspect of its activities);
 - o assets (tangible resources used by the organization);
 - o governance of assets and policies (the structure of contractual agreements that give decision rights for both policies and assets);
- consequences are the outcomes derived from the choices.

Later in the paper, the two authors add another entity which explains the connections between choices and consequences. This entity is "theories".

The authors clarify that it is difficult to enlist every possible choice and consequence for a modern organization which is characterized by high levels of complexity and interactions. So they identify two ways to easily represent the

business model: aggregation and decomposability. In aggregation, choices and consequences are gathered in a wider construct, like when we zoom out a picture. In that way, we can see every aspect of a business model, even if we should pay attention not to look at the model from very far away, in order not to lose any features. Decomposability, on the other hand, is the technique used when choices and consequences are not linked together. This technique helps the reader to depict them independently, focusing only on real connections between them.

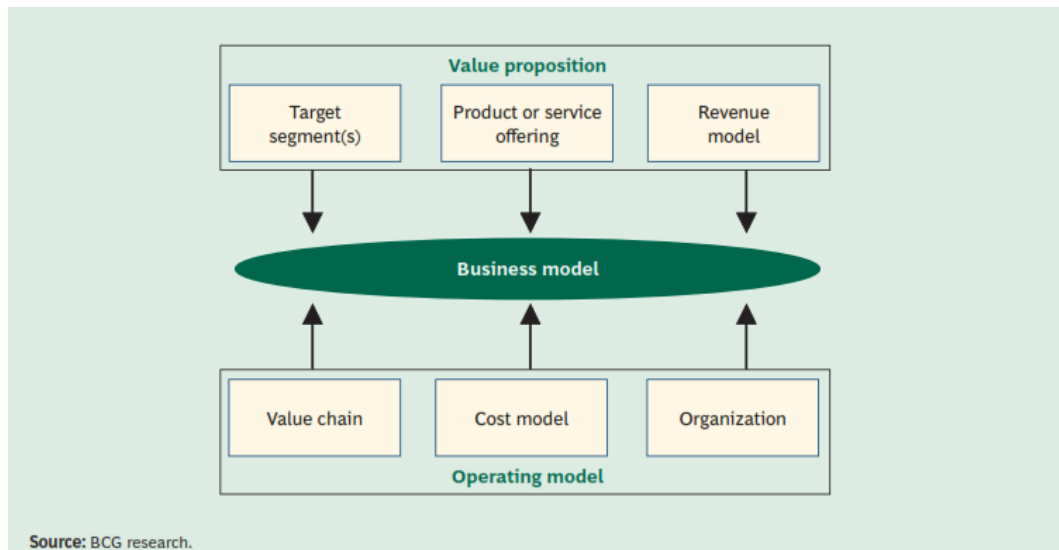
Boston Consulting Group (BCG), a management consulting firm focused on strategy, published the paper “Business Model Innovation” (2009) in which they give their definition of a business model²⁷. According to the authors (Lindgardt, Reeves, Stalk & Deimler), a business model consists of two parts: the value proposition and the operating model.

The value proposition is further divided into 3 sub-categories (target segment(s), product or service offering and revenue model) and it provides an answer to the questions “What are we offering?” and “To whom?” The target segment is about identifying the right customers and understanding their needs, and trying to satisfy them. The product or service offering answers the question, “What are we offering the customers to satisfy their needs?” The revenue model deals with the firm’s remuneration for the products or services provided.

The operating model gives an answer to the question, “How can we deliver our offering profitably?” It is divided into three sections: value chain, cost model and organization. Firstly, the value chains involve customer demand and the analysis of outsourced or in house activities. The cost model deals with the assets and costs in order to deliver the value proposition in a profitable way. Finally, the organization is about the way to deploy and develop BCG’s workforce to defend and improve its competitive advantage.

This is the representation provided by the authors:

27 “Business Model Innovation. When the Game Gets Tough, Change the Game” (Zhenya Lindgardt, Martin Reeves, George Stalk, and Michael S. Deimler), BCG Publication December 2009.



Source: Business Model Innovation. When the Game Gets Tough, Change the Game (Zhenya Lindgardt, Martin Reeves, George Stalk, and Michael S. Deimler), BCG Publication December 2009.

This business model representation is meant to be used by managers and strategy practitioners, as it shows a more practical approach than the ones provided by the scholars which I have listed earlier. It is very useful in very dynamic contexts and innovative markets, and it overtakes single-function strategies. Since it includes a multidimensional and orchestrated group of activities, the model is challenging to put into practice and difficult to copy too.

Gunther McGrath (2010) in her paper “Business Models: A Discovery Driven Approach”, gives us another approach to business model theory²⁸. According to the author, a business model is made up of two core competences: the unit of business, and process or operational advantages. Today, the “unit of business” concept is very helpful to analyze a business model. It is something for which the customers pay, whether it is a product or a service or any other thing offered by the firm. However, these days, terms like “product” or “service” do not capture the variety of new ways a firm can be paid. The author gives us the example of guarantees (as in insurances)

²⁸ “Business Models: A Discovery Driven Approach” (Rita Gunther McGrath), Long Range Planning, 2010.

that can represent a kind of revenue. In the communication and computing technologies industry, we have seen that new developments have brought the expansion of the unit of business. Some examples clarify the notion of “free” embedded in the business model concept. Nokia, for instance, with its “*Comes With Music*” devices incorporate the cost of the service (music) with the cost of the hardware. There are six cases in which we can see the element of “free” present in business models: advertising, cross-subsidization, promotion, “freemium”, barter, and gratis. An advertising model is that in which companies are remunerated by the advertiser for attracting potential buyers. A cross-subsidization (or bundling) model consists in giving certain business units for free or at a reduced price to increase the margin on another part of the business (e.g. printer producers make higher margins on ink cartridges than on printers). A promotion model consists in giving away some low cost products to promote something else, which may be very different (e.g. McDonald’s toys sold alongside with the burgers). “Freemium” models are all those basic versions of products given for free by companies, hoping that customers will upgrade to the “premium” or “professional” version of the product (many examples can be found in smartphone applications). Barter models imply that a product is offered for free to the customers, in exchange of something valuable for the organization (e.g. pharmaceutical companies offer free drugs to doctors to test them on patients). In a gratis (or gift) model, a valuable contribution is given for free in order to interact or make a contribution (open source software may be an example of this model). In this last case the business model can be still profitable.

In addition to the business units, we have another set of choices, namely process or operational advantages, i.e. the sets of activities put in practice to sell the business units. To identify these sets, we need some “key metrics”; that is, those activities that have an impact on the company’s performance. A new idea can represent an innovation in business model, even if the unit of business is not revolutionary. In fact, an organization can create a competitive advantage by delivering the unit of business in a particular way. Key metrics are very often some industry constraints; if the company succeeds in innovating by bypassing these constraints, this can yield an advantage. The harder it is for this innovation to be copied by competitors, the

longer the advantage will last. Experimentation is central to reach this innovation and all those physiological failures that occur when a company tries to innovate are necessary to make a breakthrough in the industry.

2.2 Business model innovation

The multiple definitions of a business model reflect numerous difficulties to find a “one best way” to define its innovation unambiguously. The term has been used by many researchers, as Chesbrough & Rosenbloom (2002), to explain how technology is made profitable. According to Christensen & Raynor (2003) instead, innovation for business models is necessary to spread new technologies as much as possible. As technology is becoming always more expensive, Chesbrough’s advice to managers and entrepreneurs is to innovate their business model as well, declaring that a good one may be better than a proper idea or product. In a study conducted by Giesen, Bergman, Bell and Blitz (2006), managers at IBM, they show how innovation helps make bigger profits than anything else.

Santos et al. (2009) define innovation in business models as a new set of activities in the organization’s business model which represent a change in the traditional products or services offered in the industry. The transition to an utterly new business model is central in this definition. The BCG defines business model innovation as the combination of different elements in a diverse way in order to transmit a new value to the final customer.

As we can see, there is no common agreement on what innovation is, as it was for the definition of a business model. One of the main unsolved questions is the one about minimum threshold that needs to be met to consider the innovation as a noteworthy one. Many authors consider the differences between business model change and business model innovation, as the latter is seen as the most significant one. Scholars also disagree when it comes to classifying what the central aspect of business model change is. Some of them consider the process while others focus on the result. But their common focal point is the change to a new business model,

leaving the old one behind because it had proved itself not to be ready for the change.

In their IBM Global CEO Study (2006), Giesen et al. identify three different groups of innovation: industry model, revenue model and enterprise model²⁹. The former change implies diversification, i.e. moving to other industries, or redesigning existing sectors. But it can also be seen as a creation of new industries, by offering something different from the competitors' offerings. The second, revenue model innovation, is the change in the way profits are made. This task can be fulfilled by bringing a change to the company's offering. The latter is the value chain modernization. The enterprise model innovation is possible if we shift our focus to the value network, that is to say suppliers, buyers, third parties. This last point is particularly crucial to the authors, as a firm can use partnerships and joint ventures to stimulate change in the industry. The whole study shows as well that this innovation has a benefic impact on profitability and margins, as it is exploited by all those successful organizations analyzed by the authors.

In their paper "Toward a Theory of Business Model Innovation within Incumbent Firms", Santos et al. (2009) claim that there is a connection between activity reconfiguration and business model innovation³⁰. The changes can take various forms: relinking, repartitioning, relocating, and reactivating. Relinking is about the modifications in the linkages between different units inside the firms. Repartitioning is the transformation of cultural, physical and institutional borders of the organization units which perform activities. Relocating is the modification of location between strategic units that perform an activity. Reactivating is about the transformation of all those activities carried out by a firm. As shown, these authors focus more on activities performed by the organization rather than on the value creation.

29 "Three ways to successfully innovate your business model" (Giesen et al.), IBM Global CEO Study, 2006

30 "Toward a Theory of Business Model Innovation within Incumbent Firms" (Santos et al.), INSEAD, 2009

The approach proposed by Lindgardt et al. (2009) is more practical, as their model is set to be ready to be employed by customers (they work for BCG, a prominent consultancy firm)³¹. The scholars identify three main categories: value proposition, operating model and business system innovation, as analyzed earlier. Their classification can be seen in the following chart:

Value proposition	The product as service and outcome <i>General Electric</i>	The product as an experience <i>Apple</i>	Trust premium <i>Whole Foods</i>	Free (or nearly free) <i>Google Vélip'</i> <i>JC Decaux</i>
Operating model	Deconstruction <i>Li & Fung Limited</i>	Integration/ acceleration of the supply chain <i>Zara</i>	Low cost <i>TaTa Motors</i>	Direct distribution <i>Nestlé Nespresso</i>
Business system architecture	Open <i>Facebook</i>	Person to person <i>PayPal</i>	Adjacency <i>Ikea's Mega Mall division</i>	Serial <i>Virgin Group</i>

Source: Business Model Innovation. When the Game Gets Tough, Change the Game (Zhenya Lindgardt, Martin Reeves, George Stalk, and Michael S. Deimler), BCG Publication December 2009.

This approach is more focused on the internal features of a business model. Innovation is seen as a well-rounded remodeling of a firm's business model, from the old one to a new one, in which many elements are changed. If we compare this to IBM's approach, we can see that the latter takes into account both internal and external elements (i.e. value chain repositioning and diversification).

Processes to innovate a business model are also a matter on which the literature has never agreed. In his paper "Business Model Innovation: Opportunities and Barriers" (2010), Chesbrough proposes the following: experimentation, effectuation and organizational leadership to switch from the old business model to an alternative one³².

32 "Business Model Innovation: Opportunities and Barriers" (Chesbrough), Long Range Planning, 2010

- Experimentation is the only process to distinguish and implement a new business model. According to the author, experimentation is a technique that helps a firm reach a final result following a trial and error approach. It must be based on two principles:
 - high fidelity: the trial is only valid under correct market assumptions;
 - low cost: the cost of experiments should be fair;
 - quick-performing and usefully informative: a trial should have this two features to be relevant.
- Effectuation: the author points out that is almost impossible to gather all the information necessary to fulfill a thorough analysis. So it is crucial to choose only the most critical.
- Organizational leadership: the transition from the old business model to the new one is not always instantaneous, so two business models can coexist. This shift needs a solid organization culture to succeed. Top management should be willing to adopt different ways of doing things, which is not simple. Their support is essential to create a strong commitment in the organization to be successful, as stated by the IBM Global CEO Survey too.

This approach targets the importance of testing and pilot programs, because the base of a new feasible business model is uncertainty. Moreover, both theories require a strong top management in order to face the inevitable challenges that arise when a firm tries to innovate its business model.

The main challenges a company will probably face when trying to change its own business model are the following: the first mover advantage and the control on the twofold business models.

First mover advantage consists of all those benefits that come from being the initial significant occupant of a segment. If a firm has first mover advantage this means it has the possibility to control resources. First movers can thus exploit this advantage and be rewarded with bigger margins; but, if the company does not take advantage of it, it will give opportunities for new firms to enter the market. Those companies can be more efficient and effective than the first mover, gaining the so called

“second mover advantage.” Teece (2010) identifies a successful competitive advantage when the model is both differentiated and hard to be imitated by newcomers of competitors³³. As stated by the author, to avoid being copied, a firm should adopt the following recommendations:

- when implementing a new business model, a firm should have some distinctive capabilities to inhibit another firm to reproduce its model. Capabilities give the firm the possibility to innovate, as in the Dell’s direct sales model. Even if some competitors as Gateway Computers tried to copy it, they have never had similar success;
- in order to make it difficult to identify the drivers behind the change, the organization must have a certain level of opacity. That makes it hard for an external firm to figure out the exact implementation of the business model;
- even if it is clear how to copy a successful business model, the incumbents in the industry may be unwilling to go through with the process when it involves cannibalizing current margins and sales, or modifying other existing business relationships.

The topic of two coexisting business models has been very popular in the literature. In his positioning approach to strategy, Michael Porter identifies a cluster of “stuck in the middle” companies because they try to follow various different strategies, with underperformance as a result. Christensen and Raynor (2003) analyze many business model innovations and they note that these are successful only when the disruptive innovation is generated by another entity, separate from the original one³⁴. This happens because the old system hinders change, so a new entity becomes advisable.

33 “Business Models, Business Strategy and Innovation” (Teece), Long Range Planning, 2010.

34 “Why Hard-Nosed Executives Should Care About Management Theory” (Christensen and Raynor), Harvard Business Review, 2003

2.3 Business model and strategy

Business model theory and strategy have many points in common. These words are quite recent in the literature and, as with the concept of business model, the scholars have not found a sole paradigm yet. Many times, the interpretations are in conflict with one another and there are many divergent schools of thought, so it is hard to find which one is valid. The topic of strategy is linked with business model innovation as well. In fact, although their nature may seem completely different, the two notions are very close and can be used together to handle strategic challenges. Many authors think that their definitions are almost the same. Santos et al. (2010) state that even if there is still a connection between the two topics, it is important to separate them as strategy offers many applications useful to describe a business model. According to Richardson (2008), strategy may be described as “the firm’s theory on how to compete, and many of the frameworks aim to assist the firm in devising a good theory [...] namely leading the firm to competitive advantage and superior performance.”³⁵ The frameworks analyzed by the author are: the five forces framework, the SWOT analysis, the VRIO framework and the value chain. The five forces and the value chain frameworks were both created by M. E. Porter. The former has already been analyzed in the first part of this thesis, while the latter deals with the activities and resources an organization needs in order to execute the strategy. This approach is very similar to the VRIO framework presented by Barney (2002). This scholar tells us that a resource is precious to the firm if it is Valuable (useful to the firm to neutralize external menaces), Rare (that is if a resource is controlled by a few people), difficult to be Imitated and if the firm is Organized to exploit it and catch the value it produces. The SWOT analysis is very useful in strategy to underline the firm’s Strengths and Weaknesses and, when it consider the external environment, if there are Opportunities or Threats in the industry in which it operates. As reported by Richardson, the business model differs from strategy because it is a conceptual framework that sustains the link between

35 “The Business Model: An Integrative Framework For Strategy Execution” (Richardson), John Wiley & Sons, Ltd., 2008

the theory on how to compete (i.e. the company's strategy) and the execution of this strategy (namely the firm's activities). He also created a framework, the business model framework, which helps us think strategically about how the firm manages its businesses. At the base, there is the idea that a business model helps delineate how a firm makes money by delivering its products or services to the final customer. The framework's aim is to demonstrate how it is possible to use the model in the strategy process to outline or control the way an organization executes it. The business model framework revolves around three main components: value proposition, value creation and delivery system, and value capture. The value proposition is what a firm offers to its customers and how much are they willing to pay for it; this is further divided into: offering, target customers and the basic strategy to win buyers and gain the competitive advantage. The value creation and the delivery system is about the "how" a firm creates and delivers this advantage, i.e. the sources of its competitive advantage. This component has also three sub-categories: resources and capabilities, organization and value network positioning. The last component, value capture, is the way the firm generates margins, and it is subdivided into the topics of revenue sources and the economics of business. As we can see, the model is focused on the concept of value. The superior value created for the customers by the firm is the true essence of strategy.

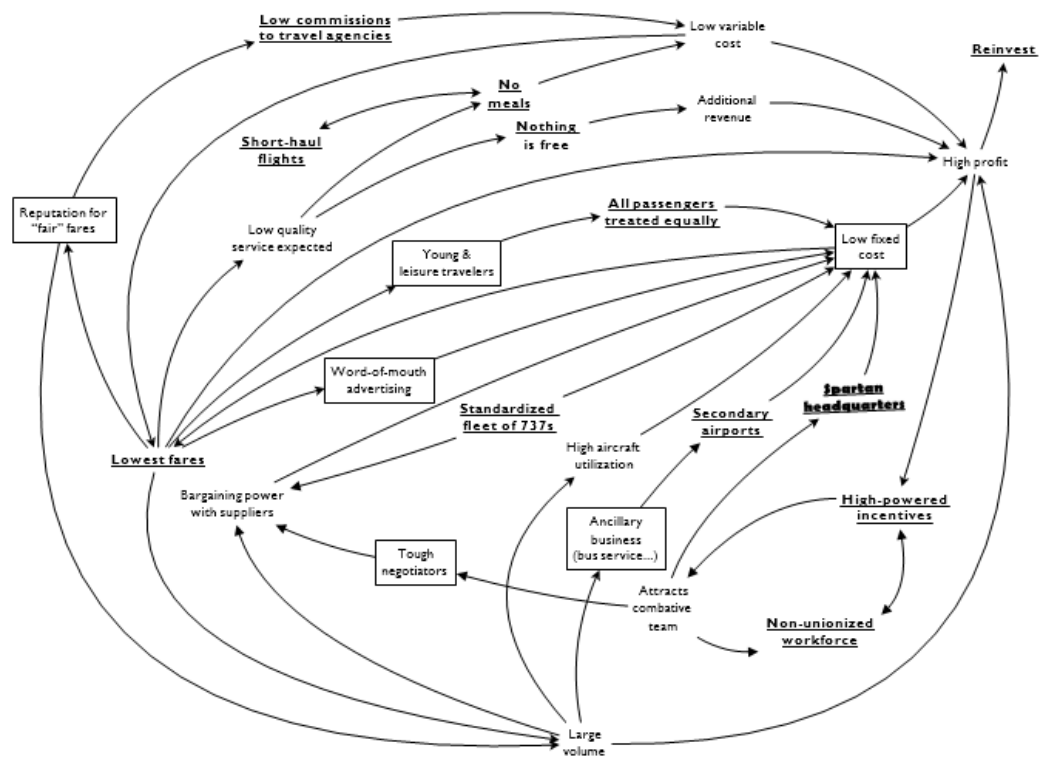
A well rounded business model outlines and coordinates the organization's activities to put its strategy into practice. However, a good strategy is not merely based on activities or satisfying the customer base. The firm must consider its position in the value network, as a good business model increases value for both the customers and the firm itself. The value network should be capable of seeking either a low cost advantage or a differentiation one as intended in the company's strategy. A competitive advantage should also be founded on a VRIO set of resources. A well balanced business model offers a neat image of an organization and its operations with a strong logical structure to execute the strategy, helping a strategist coordinate the firm, with an eye on activities and their features.

Richardson concludes that a well-reasoned business model does more than just connecting activities and strategy. It is essential to complete the representation of a firm's strategy and it creates a logical picture of how the combination of an

organization's activities shape its strategy. The framework helps students understand how these activities should be coordinated and carried out, and it is also useful to define the organization's decisions about what activities should be kept inside the boundaries and which activities can be outsourced. In conclusion, this approach may be useful in strategy research too, as it facilitates the comparison between two firms that have similar business models and strategies.

Casadesus-Masanell & Ricart (2009), in their paper "From Strategy to Business Model and to Tactics" define strategy as "a contingent plan of actions designed to achieve a particular goal." According to them, choosing a business model implies choosing a strategy, a way to compete. They use the Ryanair example to show how a company that was struggling to survive changed its business model and its strategy accordingly, adopting a plan of action, which was to become the "Southwest of Europe." Briefly, strategy regards the contingent plan that describes the business model to be employed. Strategies are composed of provisions regarding future scenarios that may never happen.

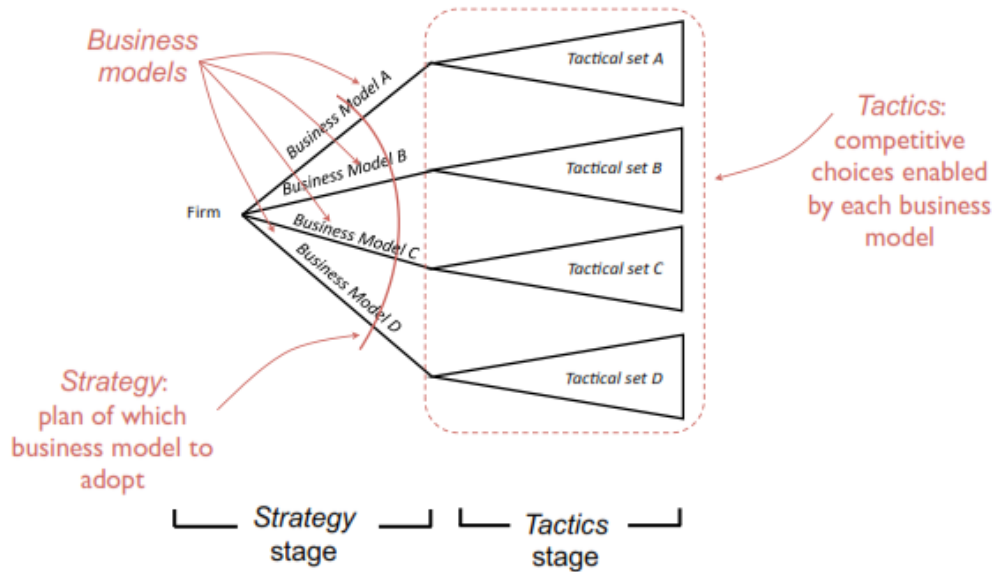
The generic two-stage competitive process framework, namely the framework introduced by the authors to describe the relation between strategy and business model, needs another element: tactics. By "tactics", Casadesus-Masanell & Ricart mean "the residual choices open to a firm by virtue of the business model that it employs." They are important to define the value which a firm creates or captures. This is the representation of Ryanair business model with this framework:



Source: From Strategy to Business Model and to Tactics (Ramon Casadesus-Masanell & Joan Eric Ricart). Long Range Planning, 2009.

As shown in the image, the business model definition, even if it is related to strategy, is different from it. Under particular circumstances, a remarkable difference between the two notions emerges when a firm must modify its business model because of a new plan of actions. These circumstances may be, for instance, an event outside the company's control like the recovery from a recession period or an unexpected move made by a competitor. Another difference between strategy and business model is that, while the former is not completely observable, the latter is easily recognizable. This lead us to the fact that a business model is required for every firm, whereas a strategy is not compulsory, given that there are companies without a plan of action to face potential contingencies. The available actions for a strategy are choices, the basis on which a business model can be built upon. In that way, strategy is a means to an end, because it permits an organization to reach its ends by shaping its business model. So, the business model is a reflection of the strategy performed, while tactics are courses of action that occur inside the borders set by the business model.

The representation of their model is the following:



Source: From Strategy to Business Model and to Tactics (Ramon Casadesus-Masanell & Joan Eric Ricart). Long Range Planning, 2009.

The authors continue by explaining the difference between strategic and tactical choices. The former category is further divided into policies, assets and governance structures of both assets and policies; strategic choices are difficult to be reversed or it is very costly to do so. Policies choices identify how an organization wants to focus on a certain activity. Asset choices designate how the company plans to invest, while governance choices are, for instance, how the firm delivers incentives and bonuses to its employees. On the other hand, tactical choices (like prices or product modifications) can be changed easily or inexpensively.

This difference in the framework proposed by Casadesus-Masanell & Ricart exists because strategy and business models have two different constructs, where the strategic one is more complex to be delineated. This difficulty may be summed up in three different points:

- strategic choices and their relative payoffs are difficult to be mapped, because they have an effect on tactics too;
- it is complicated to foresee a competitor reaction when there is a change in the set of strategic choices;

- in the many strategies the rules of the game are not completely specified as there are some restrictions on how a business model can be constructed.

Another approach of the relation between strategy and business model is the one by De Wit & Meyer's. In their book "Strategy: Process, Content, Context" (2010), the two scholars identify three different levels in which we can see this relationship: business models and strategy processes, business models and strategy contents, business model and strategy context³⁶.

Strategy processes are defined as how strategies are built, so they enclose the subjects participating in the strategy, how this happens and what features or techniques are used to implement, modify and manage the strategy. In that case, different types of business models may be employed to draw inspiration from, replicated, or be found by experimentation, as previously stated by Baden-Fuller & Morgan (2010). In the first two hypotheses, managers can analyze most of the companies operating in the same industry and delineate the scenario of all the different types of business models used. This research may be employed as an input for the strategy process or as the base for a feasible value creation. In this case, the business model outlines strategy both as an input and as an output in the process for all those firms which use a business model.

Business models may be useful for experimentation as well. In this situation, managers or entrepreneurs can analyze a wide selection of business models and choose the one which suits them best.. This last approach is the most common in the literature.

Strategy content is the outcome of a strategic process. While strategy may be connected to diverse levels of aggregation, based on the firm's aim, business models are often linked to the organizational level, even if some of the activities go beyond the scope of the company itself. According to the authors, the aim of strategy is to outline in which area a firm should compete (i.e. the scope of the firm), the value proposition offered and how it should be made up (namely the value chain), and finally, the crucial assets and resources needed to carry out those activities. The business model, on the other hand, is a picture of the formulated

36 "Strategy: Process, Content, Context" (De Wit & Meyer), Thomson, 2010

strategy, with an eye on value created, transferred and captured by the business system.

Strategy context refers to all the external contingencies of strategy. Industry modifications may be noted when analyzing business models. Divergent business models are typical of the first phases of industry development, where experimentation is essential to survive. These kind of models are very common in dynamic environments, where disruptive innovations change the scenario frequently. Conversely, convergent business model types may be traced in stable marketplaces, where there is a dominant business model layout. As stated by Christensen and Reynor (2003), a disruptive model is a model that breaks up an established value proposition by delivering products and services in a more convenient way. These models represent an utter change in the sector and they are very difficult to be predicted, so that many firms (mostly the incumbent ones) may struggle to adapt to this modifications. Many times, these changes imply the coexistence of multiple business models that can also jeopardize present sales or the company's reputation, gaining the top management's opposition, too (Chesbrough, 2010).

The writings examined previously show the deep interrelation between business models and strategies, involving many aspects. Like the other topics considered, this one has still not reached a common definition and a joint scope, too. The theme of business model innovation is related to strategy as well. We have pointed out that a business model can be the portrait of a realized strategy, and they can underline many popular features of an industry. Business model can be viewed as an input as well as an output for the realized strategy, a recipe to start a strategic change inside the organization, a solid base to build the strategy upon, an interesting tool to delineate the overall strategy. The disparate context levels in strategy are reflected in numerous types of business models, so that those models cover strategy from the lowest level of detail (i.e. industry) to the highest (products or services).

2.4 The Osterwalder & Pigneur approach to the business model and the Business Model Canvas

2.4.I The Osterwalder & Pigneur approach to the business model: its classification, and design

In their work “Business Model Generation” (2010), Osterwalder & Pigneur present a business model classification that proposes some patterns, i.e. similar groups of models, with comparable features, that are neither static nor exhaustive but change over time as new patterns appear³⁷. The authors present the following patterns: unbundling, the long tail, multi-sided platforms, and FREE open business models. Unbundled corporations are those companies that have several business models within them, and where every model can be clustered into three different types of businesses: customer relationship businesses, product innovation, and infrastructure ones. These types should be “unbundled” into different entities to avoid frictions and unwanted trade-offs. An example can be found in the private banking sector, where companies like Maerki Baumann unbundled their business model. In fact, they now focus on customers, leaving Incore Bank (the new entity born some years ago) to offer banking services to other banks and sell securities. In the same sector, Pictet, another Swiss private bank, has preferred to stay integrated. The long tail theme was firstly introduced by Chris Anderson, in Wired Magazine. It is about selling a large amount of niche products, each of which has poor sales. This so the inventory costs are lowered and strong platforms are available to customers so they can buy a wide range of niche goods. This model works as just as well as the traditional one, where just a limited number of bestsellers makes most profits. The example provided is LEGO. LEGO Factory also sells customer-assembled kits through their online shop. Those kits have helped the factory sell a wider offer of products, which used to be very limited in the past when only few parts were sold (the most common ones) while many others went almost unsold.

37 “Business Model Generation” (Osterwalder & Pigneur), John Wiley & Sons Inc, 2010

A multi-sided platform model allows to group different but interdependent customers bases together and facilitate communication between them. In order to be valuable, these platforms must embrace all groups. A multi-sided platform increases its value by attracting new users, creating the so called “network effect”. Google, for instance, gives customers a no ads search engine, while selling advertising space to companies that are sponsored when a user looks for a specific word that may be related to them. This model needs a high critical user mass in order to be effective.

In the FREE business models at least a customer segment benefits continuously from a free-of-charge offer, many times financed by other part of the model or another customer segment. This offer is available thanks to different patterns. FREE business models can be seen in the newspaper industry, where traditional publications are threatened by free ones, such as Metro. Since its audience is thought to be young readers, interested in a new formula of journalism, Metro is struggling against free online news providers, as charging money for news has become increasingly more difficult.

The “freemium” pattern is linked to this. This pattern can be noticed in the software industry, where the free versions of products many times include just a few features. Only by purchasing the full (or premium/professional) version is the user able to exploit the whole functionality of the product. Examples of this are Skype and Red Hat.

Open business models are those used by organizations to generate and capture value by cooperating with other external companies. The terms “open innovation” and “open business model” were first used in 2004 by Chesbrough, in “Open Innovation”. The cooperation can be inside-out (when a company gives its ideas or assets to another one) or outside-in (when an external idea is employed inside the organization). The example provided is the Procter & Gamble’s. To increase their internal and R&D activities with the external environment, the company focuses on three innovative sources (“bridges”): technology entrepreneurs out of universities, problem solvers at Internet platforms and P&G’s retirees.

The approach proposed by Osterwalder & Pigneur is quite similar to others studied

previously. The approach proposes different categories, all on the same hierarchical level, starting from a bottom-up view.

In “Business Model Generation”, the two authors present how to design a business model. Every firm needs a custom business model that can be adapted to the challenges and obstacles each firm faces, as well as all those critical factors every organization should target to reach success. The starting point and the contexts are also various, because while some companies may be facing a crisis phase, others are looking for new growth potential, while others are just newcomers (like startups) trying to position their products or services. In their representation, every business model has a common starting point upon which every firm can customize its business model, and the process is made of five phases: mobilize, understand, design, implement and manage.

The first phase, mobilize, aims at preparing a successful business model design project. In this phase, the focus is on setting the environment, delineating the motivation and determining a unique language for the process. In this phase, a company needs to create awareness of the new business model. Crucial aspects, like top management support and cross-functional teams, need to be contemplated in this stage. The principal activities are framing the aims of the project, testing preliminary business ideas and planning the whole project. One last activity is the assembly of the team, where the focus is on choosing the right people, with adequate experience and knowledge. An issue of this stage is overestimating the value of the starting idea.

The second phase is a solid understanding of the environment in which the company will compete. In this stage, the firm needs to know the customer it will serve, the technological developments and it may require to study potential competitors’ business models. Other key processes are to see beyond the established customer base and industry constraints. The main problems are related to the costs due to over-researching, namely the disconnection between research and objectives, and researches influenced by prejudices to a determined business idea.

The third phase is the design. This is the phase where all the information collected in the previous steps is converted into a prototype of the business model. The process is run by a team and brainstorming is central to succeeding in the generation

of breakthrough ideas, leaving the status quo during ideation. This is a phase where testing has a crucial role, because every team should take the time to analyze each idea. Moreover, people joining these teams should be part of different departments of the organization to help the process and inhibit barriers in the following phase. The two main dangerous aspects that can threaten this step are: the quick repression of valid ideas and, on the other hand, the excessive emphasis on mediocre ones. Implementation is the following phase, where the ideas start translating into something more concrete. The focus is on managing the uncertainties, by monitoring risks and results, as well as using techniques to easily modify the model to the market. Other key factors to succeed in this phase are to align the old model with the new one and look for project sponsorships. A jeopardy here is that the momentum may not be strong enough or that it is lower than before. In the last phase, manage, the authors focus on the validity of the business model over time. Since the environment is changing, the team needs to understand the implications of external factors on it and try to prevent their consequences. So it is important to scan the external environment, to continuously evaluate the model and to align it all over the company. The perspective is on the long run and it is necessary to be proactive to face the market challenges, otherwise a company may become a victim of its own success.

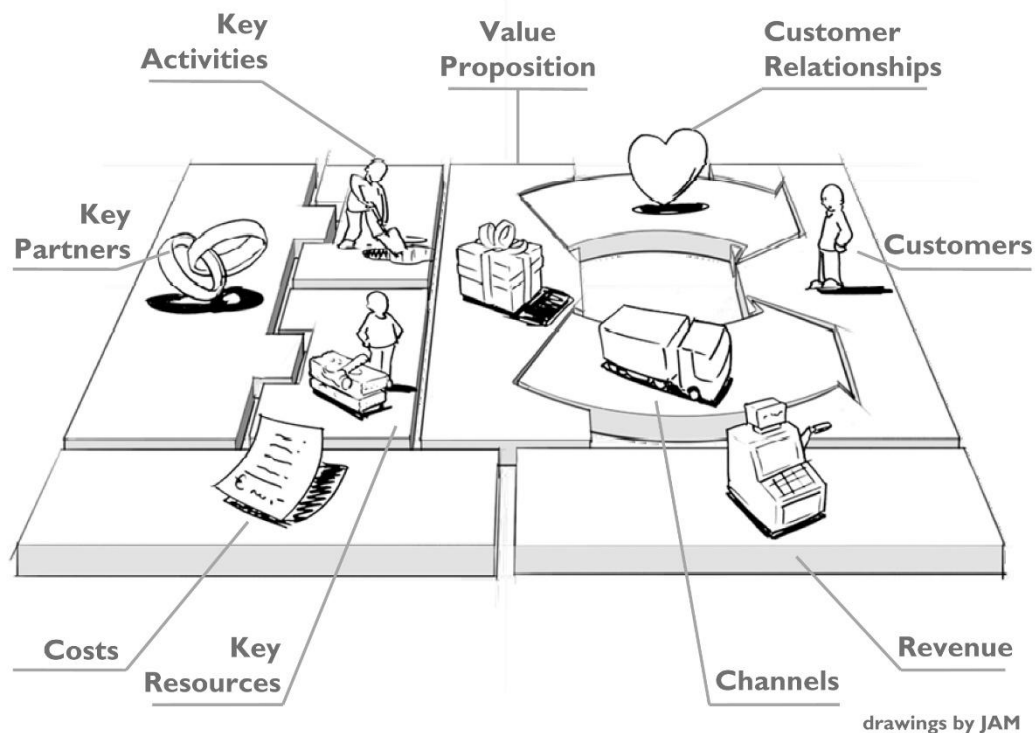
2.4.II The Business Model Canvas: its depiction, features and critics

The Business Model Canvas was first introduced by Alex Osterwalder and Yves Pigneur. The model was presented in their publication “Business Model Generation” that saw the collaboration of 470 experts and advisors from different countries of the world. The book is a proper management handbook, with practical tools to help the reader implement the model in a practical way. The Canvas has its roots in Osterwalder’s PhD thesis in 2004 (“The Business Model Ontology”), where there is a draft of the final concept adopted six years later. “Business Model Generation” has generated a real international movement of experts and enthusiasts

of the model. Osterwalder created Business Model Innovation Hub some years after the publication, which immediately achieved resounding success among entrepreneurs, students and advisors, who compare themselves daily on the site.

The model has revolutionized the way to depict a business model. Everyone has the chance to understand the difficulties that lay behind an organization. In fact, the Canvas has a great communicative efficacy and, if we compare it to other models, just a few of them are as effective, because many of them have a complex visual representation. One of the main strengths of the model is that it has been influenced by many other strategic models, creating a thorough synthesis of them. The model can become a shared language that helps students, managers and entrepreneurs to clearly delineate and manage business models to find new strategic choices. Without a common language, it is harsh to evaluate assumptions regarding one's business model and bring something utterly new. The employment of the Canvas is quite easy: it can be printed in a big size, to facilitate teamwork. In every sector, it is possible to draw, add post-its, to foster communication among participants, enhancing the comprehension of the themes and the analysis of the business model. Creativity and sharing are facilitated as well.

The structure of the model is made of nine basic "Building Blocks". They display the logic of how an organization plans to make profits and they embrace the four main subjects of a business, namely offer, customers, financial viability and infrastructure. The business model is like a scheme where the user can implement its own strategy by using organizational structures, systems and processes. The "Building Blocks" are: Customer Segments, Value Propositions, Channels, Customer Relationships, Key Resources, Key Activities, Key Partnerships, Revenue Streams and Cost Structure. The original representation of the Canvas is shown in the following picture:



Source: Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers (Alex Osterwalder, Yves Pigneur). John Wiley & Sons Inc, 2010.

1. Customer Segments: this block outlines the various groups of buyers or firms that are the company's target. According to the authors, customers are the core of a business model, because every firm needs a strong buyer base to survive. The company can divide this group into various subgroups, characterized by common attributes such as behaviors or needs. A company should take seriously the decision about which segment to aim at. That is mainly because the business model is customized for it and it requires a strong comprehension of the desiderata of buyers. It should be clear as well which segments should be ignored, in order to focus the efforts only in the right direction without wasting resources. A group of customers is defined like that if:

- they have similar needs that require a different offer;
- the profitability they have is diverse from another group;
- they need different types of relationships;
- the distribution channels used to reach them are dissimilar;

- they can afford to pay more for some features of the offer.

Examples of types of Customer Segments are, for instance, mass market business models, where the end users are pretty much the same, as a company does not distinguish between them; their application can be seen in the consumer electronics industry, where the focus is shifted to large groups of buyers which have comparable needs and problems. On the contrary, niche markets have a specific model, very specialized to a particular segment, tailored to them, like in the car part manufacturer industry, where the carmakers rely on the OEMs to produce the part they need.

2. Value Propositions: in this block, the authors include all those products or services that are valuable for a particular customer segment. They are aggregations of benefits that an organization proposes to customers. Value propositions are the motivation why a buyer chooses a product or service over another one. In these propositions, a company embeds a set of selected products/services to satisfy the requests of a customer segment. A successful value proposition may offer new products/services that represent a disruptive innovation or can propose something more to an existing market. The value generated can be both quantitative (e.g. price) and qualitative (e.g. improved design). Some other elements that improve the customer value may be: upgraded performance, especially in very technological industries such as the PC sector; customization of the product/service to better meet the customers' needs; newness consists in proposing an utterly new offering, many times related to technology (e.g. cell phones).
3. Channels: the Channels Building Block delineates both the company's communication strategy and the channels through which it reaches its customers to deliver the value proposition. Channels are the interface between the company and its buyers, which play a crucial role in the customers' experience. We can distinguish sales, communication and distribution channels. Their functions include:

- increase awareness of a company's product or services among customers;
- delivery the firm's value proposition to customers, allowing them to buy specific products/services;
- give post-purchase support;
- help buyers evaluate the company's value proposition.

Finding the proper channel to deliver the value proposition correctly is central to satisfy customers. Channels can be both direct and indirect: direct channels are owned by the firm (a typical example is the web site), indirect ones are not directly owned by the organization, but by third parties (as wholesalers, partners or retailers). This last option leads to lower margins but can be useful to expand the company's range, while benefitting from the partners' knowledge. Direct channels can be costly to manage but bring typically to higher margins. A combination of both direct and indirect channels is possible, too.

4. Customer Relationships: this Building Block outlines what kind of relationships a company sets up with its customer base. As relationships can vary from personal to automated, every firm should make clear what type of relation they desire to establish with each customer segment. These relationships are mainly driven by customer acquisition and retention, or to boost sales. The overall customer experience is affected by the customer relationships called for by a firm's business model.

It is possible to define numerous groups of customer relationships, for instance:

- self-service relation, where there are no connection between the firm and the customer;
- communities, which are used by organizations to have a better understanding of the customer base and to promote connections among members (e.g. GlaxoSmithKline's Alli, a private online community);

- co-creation, namely going beyond the usual connection between customers and vendors, co-creating value with customers (like Amazon's customer product reviews).

5. Revenue Streams: the Revenue Streams Business Block is the cash generated by a firm from each customer segment. As stated before, if customers can be considered as the heart of the model, revenue streams represent its arteries. If a company is able to answer correctly to the question, "How much is each customer segment willing to pay?", then it can generate cash from the different customer segments. Different customer segments correspond to different price policies and diverse pricing mechanisms as fixed list prices, auctioning, bargaining. The authors distinguish transaction revenues and recurring ones; the former come from one-time buyers payments, while the latter result from ongoing payments.

In order to generate revenue streams, a company can use several ways:

- asset sales, which generates margins by selling of ownerships rights to a physical product;
- usage fee, where the price paid by the end customer reflects the cash flow obtained by the firm;
- licensing, where revenues come from the right to use protected intellectual property materials. This form of revenue stream is very common in the media industry.

The pricing mechanism is divided into fixed and dynamic pricing. The first case is the one in which the price is based on static variables (such as price lists or volume dependent pricing), in the second one it is influenced by market conditions (such as auctions or yield management).

6. Key Resources: this block represents the main assets a firm needs to build a solid business model. These resources let an organization delineate and offer a well-built value proposition, reach the intended markets, maintain relations with the customer base and obtain revenues. Different resources are needed according to the business model; some industries require capital-intensive production facilities, while others demand human resources. Key resources can

be divided into four groups: physical, financial, human or intellectual. Furthermore they can be controlled or leased by the firm or acquired from third parties. By physical resources, the authors meant all those physical assets like building facilities, vehicles and machineries. Retailers rely massively on these resources, which are in many cases capital intensive (e.g. Amazon or Walmart). Intellectual properties are central to build a powerful model. They are difficult to be imitated and have a great value to the company when they are innovative. Some examples of intellectual properties are: patents, brands, partnerships, knowledge and customer databases. Qualcomm, a supplier of chipsets for mobiles, owns numerous patents and licenses that have allowed it to gain a strong potential in the industry. Human resources are particularly strategic in some sectors, as they represent the core of a business model, even if every company needs a strong workforce. Novartis, the well-known pharmaceutical company, depends on its staff, made of scientists and researchers as much as a strong sales force. Financial resources or guarantees are required by certain types of business model. They can be cash, lines of credit and stock options. Ericsson, a telecom manufacturer, has the strategy of borrowing funds from both banks and markets and use a portion of them to give vendors financing to provide tools to customers, in order to place orders with the company, rather than other players.

7. **Key Activities:** the Key Activities Building block outlines the core task a company must perform to make its model works. Activities are really important to the enterprise to perform well. Every business model has some specific key activities needed to shape and offer a certain value proposition, reach target markets and customers, strengthen customer relationships and earn profits. A PC manufacturer like Dell has a different set of activities (supply chain management) from a consultancy firm like McKinsey (problem solving).

Key activities can be grouped into three categories: production, namely activities linked to designing, producing and delivering a product in large quantities or in a different way (e.g. manufacturing); problem solving, i.e. activities able to come up with innovative solutions to the buyers' problems (as is the case with consultancy companies); platform/network, specifically

business models built on a platform/network that are dominated by a set of a platform or network-based activities (as e-marketplaces).

8. **Key Partnerships:** this block delineates the network that allows a business model to work. By network the authors mean the relationships established with suppliers and partners, fundamental in many business models. These partnerships are created to lower the risks, optimize the model or obtain new resources. In a competitive environment characterized by uncertainty, risks are reduced when it is possible to share them among the existing players. The firms can compete in an area while having an alliance with the same competitors in another one. The optimization of a business model leads the company to better efficiency, cost reductions and scale economies. It is not possible for most companies to own all the resources or be self-sufficient, especially in highly competitive industries. Rather, they rely on other firms to acquire patents, knowledge, and licenses to perform a certain activity.

Key partnerships can be further divided in four different types:

- coopetition, namely strategic partnerships between competitors;
- strategic alliances signed between non competitors;
- strong relationships between the firm and its suppliers to ensure a reliable supply;
- new businesses developed thanks to joint ventures.

9. **Cost Structure:** the Cost Structure Building Block defines every cost due to business model operation. The sets of activities previously described all incur costs. These costs can be estimated after defining key resources, activities and partnerships. Even if unnecessary costs should be avoided in every business model, some of them focus more on this side than others. For instance, the “low-cost industry” (as seen in transportation or retail trade industries) focuses deeply on the cost structures block of their model. So, it is possible to classify two broad types of models: cost-driven and value-driven (however many business model are positioned in the middle of these extremes). Cost-driven models try to reduce costs wherever possible. The aim of this strategy is to create and sustain a lean cost structure, with low-priced value propositions, a wide use of automation and outsourcing (e.g. Southwest Airlines). On the contrary, value-

driven companies focus on value creation. The industries where these companies operate are characterized by value-driven business models, with high level of personalization of services/products (e.g. Four Season Hotels).

Every cost structure has these features:

- fixed costs, which are independent to the volume of production;
- variable costs, which are related to the volume of goods/services produced;
- scale and scope economies, namely cost advantages related, to the expansion of the output and to the enlargement of the scope of operations respectively,.

Its brief history notwithstanding, the Business Model Canvas has been praised and, at the same time, criticized by researchers and scholars.

Kraaijenbrink (2012) underlines that some components are missing in the Canvas. According to the author, these features should be kept under control since they have a central role in the development of a well-rounded model, and otherwise the final result will be distorted. On the contrary, other elements examined in the model are not considered crucial by the author, in fact their exclusion will have no deep impact on the final result according to him. The first weak point is the exclusion of the firm's strategic purpose in the model, i.e. its mission, vision and strategic objective. The assumption at the base is that the goals of every company are profits and margins, without considering any further purposes. Kraaijenbrink's opinion is that not every business has this precise goal. Non-profits, governmental companies, social organizations as well as some for-profit businesses have other final purposes, while the only goal considered by Osterwalder & Pigneur in their model is making money. The second critic is that the Canvas lacks a definition of competition. The focus is on the target company and its money-making logic. Thus, it does not pay attention to competitors and their models. The author also notices that even if it can be sufficient to compare the firm's Canvas to its competitors, the model would still be something difficult to implement because it would require a thorough knowledge of existing and potential competitors that sometimes is either not available or is very complex to identify. A business model is meaningful only if it is compared to

the external environment (competitors, laws and regulations). A third weak point is that the Canvas is a mix of different levels of abstraction. The nine Building Blocks do not have a comparable level of abstraction or aggregation; some blocks have higher levels of them if compared to others. Some parts are emphasized more than others, as these are decomposed in more detailed parts while others are not. When a student or a manager is filling up the Canvas, it is necessary to consider the different levels of detail, so the result is an unbalanced model. Kraaijenbrink refers to “Customer Relationships” and “Channels” (on the right side of the depiction), “Key Activities” and “Key Resources” (on the left side of the representation). These components are more detailed and less abstract than others; “Customer Relationships” and “Channels” are very detailed elaboration of the marketing side of the model that require to be formalized in two different stages. Conversely, “Key Activities” and “Key Resources” have just a thin line of demarcation. According to the author, these blocks can be defined later, when a higher level of detail is needed, or they can be omitted without losing any meaningful feature.

Kraaijenbrink, in 2013, added three more shortcomings to further underline the weaknesses of the Canvas³⁸. The first is that no priorities are established among the blocks. For this reason, the author presents three ways a reader can interpret the picture: outside-in (from right to left), inside-out (from left to right) and value driven (from top to bottom). Anyway he clarifies that still no order is set. The second is that the visualization is very complex, because of unnecessary elements. The third and last critic is referred to the term “strategic values”, which raises many doubts. Many students and entrepreneurs, as reported by Kraaijenbrink, did not have a single definition of the term. His opinion is that “strategic values” should be interpreted as core values rather than the organizations’ general strategies. For this reason Kraaijenbrink proposes to adopt the term “key values”.

Another critic comes from Spanz (2012). Even if he points out three main strengths of the model (simplicity, practice-orientation and the possibility to start from scratch), he underlines five weaknesses: there is no wide competitor analysis; competition structures are not considered (and neither are the possible synergy

38 <http://kraaijenbrink.com/2012/07/shortcomings-of-the-business-model-canvas/>
<http://kraaijenbrink.com/2013/01/more-limitations-of-the-business-model-canvas/>

effects); business goals are not defined, there is no trace of performance indicators and key performance indicators (KPIs); the Canvas is useful to innovate, but it does not that much to renovate a company's business model.

Maurya (2010) is an entrepreneur who found a lack of features in the Canvas: the first is coping with problems, which are not mentioned in Osterwalder's model, to give the market a proper product/service. The second dearth is solutions to these problems that allows the manager/entrepreneur to solve the issue and to motivate the group working on a product/service. The third weakness Maurya found is the absence of key metrics. The author wants to focus the attention on few important KPIs to the product/service success and the survival of the company. Maurya delineates a fourth critic: the model lacks a box for unfair/competitive advantage. This point, which should be identified after the beginning stage, consist in outlining those core competences and advantages that cannot be copied with ease.

The Business Model Canvas has been tested and applied by many well-known companies around the world, as Ericsson, IBM, Deloitte, and even in the public sector (Public Works and Government Services of Canada). Despite the critics, this model has proved to be an efficient, simple and detailed method to describe the dynamics inside the company and its relations with the external environment.

Chapter III - Tesla Motors and the study of its business model

3.1 Tesla Motors: history, models and results.

Tesla Motors was founded in 2003 in San Carlo, California by Martin Eberhard and Marc Tarpenning, later gaining the interest of Elon Musk, who was to become the current CEO. He soon took the lead of the company, by financing \$7.5 million, thus becoming the majority stakeholder. His interests were the design of the vehicles and finding the necessary funds to fulfill his own dream: to build and sell electric cars. He moved the headquarters to Palo Alto, California, where there are about twelve thousand employees. The main concern was to build reliable cars available to the mass market, since no one had ever created such electric vehicles. In February, 2005 Musk led another round of investments of about \$13 million to fund the development of its first production model. On the same year, Tesla Motors signed an agreement with Lotus to produce all of the car minus the powertrain.

On July, 19 2006 the first Tesla model was displayed to some investors and it soon won the Global Green Product Design and the Index design awards. This model was the Tesla Roadster, which was launched in 2008 and, 2500 units were produced till 2012, when the contract with Lotus ended.

In 2007, Musk and some other investors (Technology Partners) raised an additional \$40 million. Technology Partners was composed of well-known entrepreneurs and investors like Larry Page and Sergey Brin (Google), Jeff Skoll (Ebay), The Bay Area Equity Fund (controlled by JP Morgan Chase). In May, 2007 another round of investments led to overtake the \$100 million threshold.

However, the company was still burning money when Ze'ev Drori became CEO and president of Tesla Motors in December 2007. He started to fire unnecessary resources inside the firm (about 10% of the total workforce) and the company became profitable. The successful high-tech CEO was employed for just a year in Tesla Motors, after that he was appointed as vice president (while Musk took the lead) and he resigned some months later.

In 2009, Daimler AG bought about 10% of Tesla's equity for \$50 million, 40% of which was sold some months later to Aabar Investments, an Abu Dhabi private fund. In June of the same year, a \$465 million interest-bearing loan was conceded to Tesla by the United States Department of Energy, funds which had been necessary for the development of the Model S sedan. This loan was fully repaid in 2013, unlike the ones taken by Nissan, Fisker and Ford.

In 2010, Tesla indicated its intention to file an IPO, an Intentional Public Offering. Toyota agreed to join Tesla in a strategic partnership by purchasing \$50 million in stocks. The partnership was aimed at developing electric technologies, parts and production systems. The Toyota Rav4 EV is the product born from this agreement. The IPO allowed the company to raise over \$220 million, being the first US carmaker to go public since Ford (in 1956). The stock prices fell when some Model Ss caught fire in 2013, but the problem was rapidly solved. So, the price continued to grow after that episode and Tesla confirmed to be one of the top performers on the Nasdaq that year.

In 2015, Tesla announced to have started negotiations with the Chinese government for opening a factory there. This factory could build the vehicles for the market, also considering the forthcoming advent of the Model 3, the new Tesla compact sedan. Moreover, this would have been useful to avoid local taxes and, consequently, lower the price of the car itself. However, Elon Musk clarified that the assembly line would remain in the US.



The first Tesla model was the Roadster. The company's strategy was to first introduce a niche product such as the Roadster, a two-seater convertible, and then move to other segments which were more

affordable, since this could help the company increase volumes. The money earned from the Roadster helped the company to project and assemble the Model S. In Musk's words, "The strategy of Tesla is to enter at the high end of the market, where customers are prepared to pay a premium, and then drive [down-market] as fast as

possible to higher unit volume and lower prices with each successive model." The Roadster, as we mentioned before, is a convertible, sports car made from 2008 to 2012. It was the first serial production full electric vehicle to hit the market. At around \$110,000 it wasn't an economic choice for sure, but it benefitted from many reductions and incentives on the final price paid by customers and from road taxes. The car has a lithium-ion battery pack of 53 kw/h and an autonomy of more than 200 miles per charge (around 320 kms). The drivetrain is capable of supercar performance, in fact 0-60 mph is covered in less than 4 seconds, with a top speed of 125 mph (about 200 km/h) limited electronically. On July 2005, Tesla signed an agreement with Lotus, a British sports car maker, for the supply of products and services based on the Lotus Elise. In effect the British carmaker provided advices regarding the development of around 2,500 partially assembled vehicles, without the engines. The structure of the Roadster is made of resin transfer molded carbon fiber composite, this in order to save weight and to improve resistance and performance.

In 2008, production started in the facilities located in California and in Hethel, United Kingdom, the latter chosen to assemble and deliver European cars (through its Tilburg branch), which have to satisfy different regulations. In 2009, in occasion of the 2010 model year, the car received a major upgrade to its performance and yielded better efficiency (the upgrade was for its firmware version). The new model got new features as well, like renewed interiors and different suspensions. Meanwhile, in July 2010, the Roadster 2.5 was launched with external and internal improvements; this model was sold till January, 2012, when the last car was delivered. A completely new model is expected to be sold in 2017.

Despite their high price tag, all the cars produced were sold by 2012. Of the approximately 2,450 units made, 575 cars were intended for European customers.

The second model of the Californian carmaker is the Model S, which is a five-door all-electric sedan. This model has earned numerous prizes



like the MotorTrend Car of the Year 2013 and the World Green Car of the Year 2013. The development of the car started in 2008 and the first prototypes were shown to the press the following year. The official launch was on 22nd June 2012 and in December the assembly line was capable of producing 400 units per week, reaching 700 cars in May 2014. There are two assembly lines: the Tesla factory in Fremont, California to serve the American markets and the Tilburg facility (which has been recently renewed and expanded) in Holland intended for the EU markets. In this plant components such as battery packs and the engines are reassembled and adapted to satisfy European standards.

The Tesla Model S is sold in two different levels of power: the 60 Kw/h and the 85 Kw/h one (with two engines, one in the front and one in the rear part), with 370 and 500 kms of range respectively. The configuration is both rear-wheel drive and all-wheel drive (this one is adopted in the most powerful setups) and the performance is similar to that of a sports car: 0-60 mph in 3.3 seconds and a top speed of 155 mph (restricted, around 250 km/h). In the second quarter of 2015, the all-new 90 version was launched, with an increased autonomy as well as increased performance (762 hp instead of 85's 700). The weight of the car is around 2,000 Kg, where the battery pack alone weighs almost 550 Kg, thanks to the widespread use of light fiber composite materials and aluminum alloy. Charging the battery requires different amounts of time depending on the voltage and the amperage of the electronic system, and the residual battery capacity. Anyway, Tesla affirms that traditional chargers have a capacity of 45-95 km per hour, while a full charge can take just an hour with the Supercharger. Prices range from \$70,000 to \$118,000, in line with the main German competitors (Audi A8, Mercedes-Benz S-Class and BMW 7-Series).

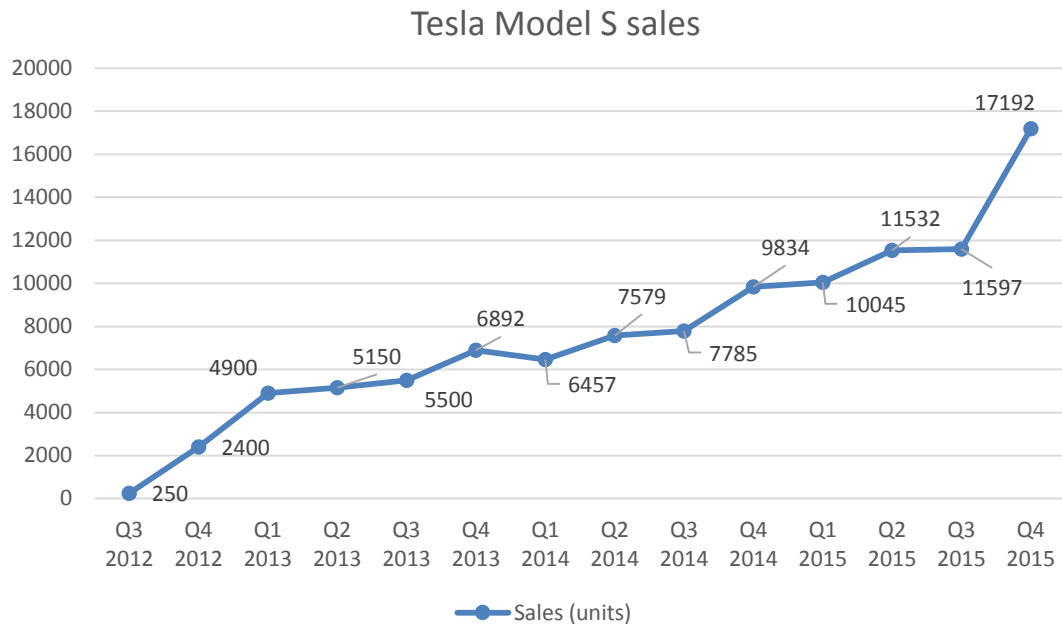
Tesla, in 2013, announced the possibility to swap the batteries in Tesla Stations in less than two minutes, thus doubling the range of its Model Ss. The car is luxurious and original, with lots of technological features inside. The materials used are eco-friendly and recycled and the technology adopted is the best on the market: there are two monitors (12.3 and 17 inches) useful to manage every feature of the car from the speedometer to the navigation systems, web surfing and cameras, thanks to a processor developed by NVIDIA. Due to the lack of a traditional engine, the

Model S has a lower center of gravity and a reduced total height if we compare it to traditional models, and above all it can accommodate 7 people. The absence of a traditional engine also allowed the car to be rated with five star from both the NHTSA and the Euro NCap, in every category of both tests (NHTSA and Euro NCap are two independent agencies that certificate the safety of road vehicles). During 2013 and 2014 a few different Model Ss caught fire both in North American and in European markets. Tesla promptly recalled the vehicle ensuring the customers that the problem would be solved. They added a triple underbody shield to prevent fires inside the cabin, even if no injuries related to the fires were reported. In the occasion of the October 2015 update, the car received the Autopilot feature, namely the possibility to drive itself. In fact, thanks to its cameras, sensors and radars, and their interaction with the navigation system, the car can drive itself in cities or highways without crashing. Even with the differences in regulation among the various States, the car proved to be the first autonomous driving production series vehicle to be sold on the market in a large scale³⁹.

Tesla Model S has almost maintained its sales forecast globally. In 2013, effective sales were a bit more than 22,400 units, surpassing the previsions of 21,500 deliveries. The first quarter of this year saw the first profits earned by the company in conjunction with Model S's sales, which did better than both the main German competitors (BMW 7 Series and Mercedes-Benz S-Class) and every EV car sold in the US. During this year the amount of vehicles sold benefitted of many orders coming from European countries, especially Norway, Switzerland and Holland, and these last two countries became the company's largest per capita sales markets according to a statement by Musk. 2014 saw the right-hand-drive version sold in UK, Hong Kong, Japan and Australia and the first deliveries in China. During this year, Model S surpassed the 50,000 vehicles mark and over 31,600 units were sold that year, a bit less than predictions (33,000). Most of the sales come from the North American market (55%), followed by the European (30%) and the Asian (15%). As of the third quarter of 2015, more than 33,000 vehicles have been sold worldwide and the Model S surpassed both the 75,000 and the 100,000 units sold mark in this year. The first market is always the North American one, where the infrastructure

39 <http://www.wired.com/2015/10/tesla-self-driving-over-air-update-live/>

is better implemented, with Norway and China to be the second and the third market for Tesla, respectively. Here is a chart of the Model S sales divided by quarter:



Source: personal re-elaboration based on Tesla Investor Relation's data (<http://ir.teslamotors.com/>)



In September, 2015 Tesla launched a full-size SUV named Tesla Model X. It's a premium crossover built in the same factory as Model S (Fremont, California). The deliveries have been rescheduled many times, from the

beginning of 2014 to the actual presentation in late September of the following year, because of some issues related to the production of its doors and its cooling system.

The car shares many components with the Model S sedan, even if it weighs 8% more. The engines are also the same: the 70 version, with one engine, with a range of 220 miles (400 kms), and the two-engine 90 version, with around 250 miles of range (450 kms), also available in Performance version (P90D), with sports cars-

like performance (0-60 mph in 3.2 seconds, top speed 155 mph or 250 km/h). All these models have permanent electric all-wheel drive. Tesla reports a fuel economy which cannot be compared to traditional engine-powered vehicles, with just \$650 to \$700 in costs to drive for 15,000 miles, the average distance covered yearly by a driver.

Many important features are taken from the sedan, such as safety, which is the best in the SUV premium segment, and the inside room, which can accommodate up to 7 people while also having two trunks. Safety and internal room are the best in class thanks to the employment of electrical engines, which occupy less space than a traditional engine, thereby giving more room to the occupants and the baggage. The electrical engine is placed under the cabin, alongside with the batteries, with benefits in safety (the Model X has achieved five stars in both NHTSA and Euro NCap tests) and a lowered center of gravity, which increases its handling. The external safety is well implemented in the Model X, too, with numerous sensors and radars that check lots of information, such as when the driver crosses a line without turning on the blinkers and emergency braking even at highway speed. Moreover, the crossover has some particular characteristics like an HEPA filter (High-Efficiency Particulate Arrestance), namely an air filter that blocks bacteria, smog and pollen outside the vehicle and falcon-wings doors with sensors, which are more practical than a traditional door, especially in small spaces.

Although the first deliveries started in late September, Tesla started taking orders in 2012, back when the car was announced and the price was still unknown. Around 30,000 pre-orders were taken until August 2015, more than the number of Model S preorders. The price starts at \$80,000 for the 70 base version and it can reach \$130,000 for the fully-equipped 90 version. Those prices do not reflect the different price incentives that may vary among different countries. Tesla added the Signature Series version, a limited edition with many extras, priced \$142,000 with its most powerful engine, sold from December onwards. The units delivered in the fourth quarter of 2015 are more than 200, as the production has slowly started. In 2016, Musk announced that the factory can produce up to 1800 vehicles (Model Ss and Xs combined) per week.

As for the future, Tesla announced the new Model 3 to round up their strategy that started with the premium convertible. This car, which should compete against the BMW 3-Series, Mercedes C-Class and Audi A4, should have a starting price of around \$35,000 without considering any incentives. The launch is expected for 2016, but production would start as soon as late 2017, maybe 2018; however full production would be reached in 2020 according to Musk. The Model 3 will have the hard task to give Tesla the numbers to compete against the main German competitors, as many of the carmaker sales will come from this smaller model. Just a few bits of information are known: the body will be in steel, to keep the costs low (while in Model S is made of aluminum) even if all the most important technologies taken from the bigger models will be adopted in this model and it will be characterized by a personal styling. The success of this model will be crucial to the survival of Tesla Motors, as this model will launch the Californian carmaker into the premium mass market industry.

According to Musk, the future for Tesla will see further improvements in Autopilot features, the autonomous driving technology. By 2020, this characteristic will be improved and available on the market, even if some issues related to the modification of laws and regulations would still be present as stated by the entrepreneur⁴⁰. Moreover Tesla claimed that the Model X will have a smaller version to be named Model Y, which will be their first compact SUV to hit the market. 2019 will probably see the next version of their first model, the Roadster, based on a totally new platform. The range of future models will be upgraded as well, in fact Tesla has registered a new system that will allow its vehicles to reach up to 400 miles (around 640 kms) per single charge, so competing on equal terms with traditional engine cars. This patented battery system combines metal-air with traditional lithium-ion batteries, where the former is used as a generator to recharge the latter, as it happens in hybrid cars, which use traditional petrol engines to recharge the batteries⁴¹.

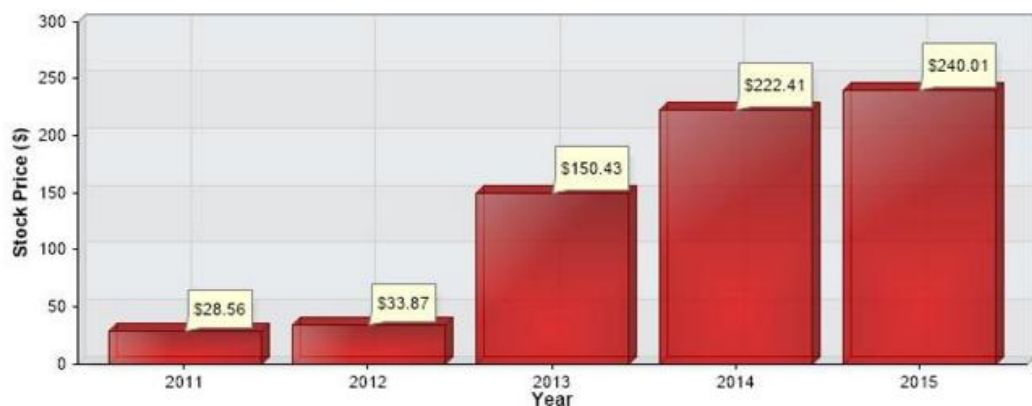
40 <http://www.investing.com/news/stock-market-news/elon-musk-joins-self-driving-car-chorus-309968>

41 <http://cleantechnica.com/2013/09/19/new-tesla-patent-400-mile-battery-pack-using-metal-air-lithium-ion-batteries>

Tesla, on 29 June 2010, launched its IPO; the last in the US automotive industry was Ford's in 1956, with 13,300,000 shares at \$17.00 per share. Some incidents notwithstanding, such as the Tesla Model S fires, the price has grown from the initial \$17.00 to the current \$220.00, approximately.

The following charts show the evolution of company's year-end results:

Year End Stock Prices



Source: Tesla Investor Relations site

(http://ir.teslamotors.com/stocklookup.cfm?historic_Month=1&historic_Day=4&historic_Year=2016)

The main factors that led to the rise of the stock price may be:

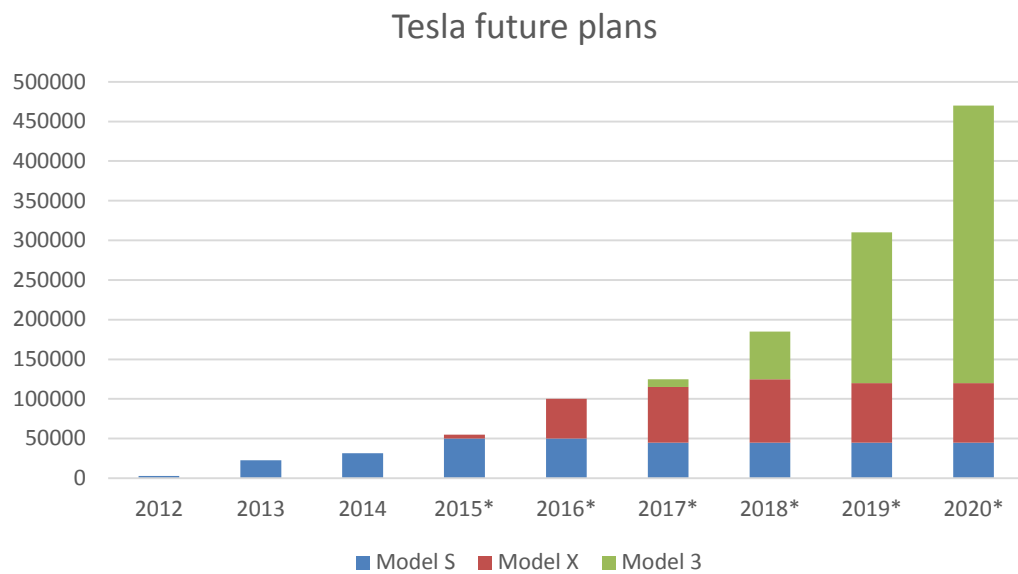
- the offering of “green products” is aligned with the current global trend that sees an increasing demand for such products;
- the management at Tesla has a proven record of past success and they are passionate about making the company an important player in the industry;
- their recent expansion in Asian markets and the latest news on pollution in that area will probably lead to an increase in the demand of such products, making Tesla one of the most real alternative to traditional vehicles;
- their sales are rapidly growing and the company is making profits;

- the Californian carmaker has strategic partnerships with big players of the automotive industry (Daimler and Toyota), as well as with important names in the batteries sector (Panasonic).

The goal for the company is to reach 500,000 deliveries by 2020, as stated by its CEO. In his own words, "I do remain confident about half a million cars in 2020, and maybe being able to exceed that. [...] That's five years from now. If you go five years in the past for Tesla, we were producing 600 cars per year, now we can produce 600 cars in three days. So I think going from here to 500,000 cars a year is a much smaller leap."⁴² According to Bloomberg, this aim can be possible even if the company has had many delays over its history. This is connected to the fact that the company does not have any potential competitors nor any examples to be compared to. Since Tesla Motors is building an entire new type of car, they have completely redesigned the manufacturing process and recently built the Gigafactory, one of the biggest factories in the industry, a forecast is hard to outline. The revolution is so important that many times Musk's creation has been compared to Ford's first car, the Model T.

Tesla's plans to reach the 500,000 mark of vehicles sold, reported during the announcement for the Model 3 sedan, is as follows:

42 <http://www.bloomberg.com/news/articles/2015-08-10/here-s-how-elon-musk-takes-tesla-to-500-000-cars-in-five-years>



Source: personal re-elaboration of Tesla plans, as of June 2015 (* projections).

3.2 Other Tesla products: Tesla Powerwall, Tesla Supercharger and the all new Tesla Gigafactory



Image: Tesla Supercharger (left) and Tesla Powerwall (right) (source: <https://www.teslamotors.com/>)

Tesla is active as well in the energy production and storage sector, with the Tesla Energy brand. On the 30th April 2015 Musk announced the availability by the end of the year of a battery pack that allows to generate the energy required to power a

house. This device takes energy from solar panels, or from the grid when the price of utilities is less expensive, and it stores this energy into lithium-ion batteries, energy that will be available whenever needed. Its functions are the following: it prevents power outages, by providing a backup electricity supply; it can be combined with other similar Powerwalls to provide more energy; it can make a home independent from the power grid; it is easy to install and needs no maintenance. The electricity stored from solar panels or taken from the energy network is converted through an inverter to make it possible to use it inside the house. There are two versions of the Powerwall: the 7 KW one, priced at \$3,000, useful for daily use, while the 10 KW, which is intended for backup purposes, costs \$3,500. Despite these sizeable storage capacities, Powerwalls can be combined to provide bigger amounts of energy. Tesla commercializes another version, the Powerpack, intended for industrial buyers, which can stock up to 100 KW of electricity. The Powerwall has been an instantaneous success, in fact it allowed Tesla to gain over \$800 million in reservations just in the first week. After the presentation, two other producers decided to offer similar products: Daimler AG announced that its version will be on the market by the end of 2015, using a lithium-ion battery; BYD (a Chinese car and battery producer) announced the production of a 5 MW system, which will allow to power about 2,500 homes.

Another Tesla product is the Supercharger. It represents the fastest way to charge an electric vehicle at the moment, with a power of 120 KW. The network of Superchargers is well developed mainly in the US, and the infrastructure is growing in Europe and Asia-Pacific. As of the end of 2015, Tesla has built almost 3,400 of them and 585 stations, located near points of interest like shopping malls, restaurants, and cafes so that the customers can eat something or surf the net during the recharge process. All Superchargers have from 2 to 12 parking stalls, where the chargers guarantee that the batteries of an 85 KW Tesla Model S will be fully charged in 75 minutes, while a 50% charge takes just 20 minutes. Moreover the recharge is free because Superchargers use the solar power or other renewable sources, so it is fully sustainable.

Tesla mission is to accelerate the transition to a world of sustainable transportation. To meet its goals of producing 500,000 units by 2020, Tesla alone will use the complete current production of batteries in the world. That is the reason why, in 2013, the company decided to build its own factory named the Gigafactory (later renamed as Gigafactory I because they intend to build more of such factories, as stated by Musk during a conference). The plant will provide batteries primarily for Tesla Motors, but they expected to sell their excess of production to other competitors in the automotive sector as well as in other related fields. Some of its production will be sold to SolarCity, another company founded by Elon Musk. The projections talk of almost 35 GW per hour in a 1,000 acre facility, which will lead the company to save on prices to build both Powerwalls and electric batteries for vehicles. The available locations were numerous, but the company decided to build its facility in Reno, Nevada, benefiting from \$1.25 billion government's incentives. The batteries will be shipped from Reno to Fremont, California, for the final assembly. In 2014, Panasonic joined the construction of the site, with \$2 billion of the total approximate cost of \$5 billion, which will be shared among other strategic partners. The facility should start producing batteries by 2017, but only by 2020 it will be fully operative and it will employ around 6,500 workers. In 2015, Tesla announced that the projected plant will not be enough to satisfy the demand, so that they bought other lands adjacent to the factory to growth in the future, as stated by Alexis Georgeson, Tesla spokeswoman⁴³.

3.3 Elon Musk: the man behind Tesla Motors and many other successful ideas.

Elon Reeve Musk is a South African-born Canadian American engineer, investor and inventor. He was born in Pretoria (South Africa) the 28 of June 1971, where he lived with his father after the divorce of his parents. Since he was 10, he learnt

43 <http://www.rgj.com/story/money/business/2015/07/20/tesla-planning-double-gigafactory-plant-size/30313473/>

computing with the Commodore VIC-20 and, two years later, he sold his first Basic-based videogame to PC and Office Technology magazine for around \$500. When he was 18, he went to Canada where he attended Queen's University in Kingston, Ontario. After that experience he moved to the US, where he took his Bachelor of Science degree in physics at the University of Pennsylvania and another one in economics at Wharton University. In 1995 he transferred to California to take his PhD in physics at Stanford University, but he soon left to dedicate himself to its main interests: renewable energy, Internet and outer space. In fact, this year he started Zip2 with Kimbal, his brother, with \$28,000. The company was a web software one which dealt with an online city guide for the newspaper publishing sector. After the merger with CitySearch, the company was acquired by Compaq for \$307 million and \$34 million in stock options in 1999. The same year, Musk reinvested part of the funds gained from the sale of Zip2 in X.com an online financial services and email payment company, being the cofounder alongside with Bill Harris. The following year they merged with Confinity and they focused on the online service named Paypal, which became the new name of the company in 2001. As he was appointed as CEO, he had several disagreements with the management and decided to leave the year before it was acquired by Ebay, for \$1.5 billion in stocks (\$165 million of that was given to the South African entrepreneur). After the X.com experience, he founded SpaceX (Space Exploration Technology) in 2002, and he was elected as CEO and CTO. The company's aim is to further develop the space rocket technology and launch space vehicle in the outer space. After the first two launches of the Falcon 1 and Falcon 9, SpaceX signed a \$1.6 billion contract with NASA to further develop its technologies. In just two years, the company has built over a thousand working Merlin 1D engines. Elon Musk's goal is to decrease the cost of a space flight by 10% in the next 10-20 years. Besides Tesla Motors, SolarCity has been one of his latest efforts. He is the inventor behind this company that provides the second most quantity of solar power systems in the US. The aim of SolarCity is to help fight against global warming and it has provided many technologies to Tesla vehicles, like the solar rooftop. Disappointed by the high speed rail system in California, Musk had another brilliant idea: it dealt with a new way to transport passengers between San Francisco and Los Angeles, named

“Hyperloop”. It will take just 35 minutes to cover around 560 kms (faster than a traditional airplane) and it would cost less than this way of transportation. His most recent project, OpenAI, is an idea for a no-profit artificial intelligence research company with the aim to implement AI so as to be used in many ways by humans.

3.4 Tesla Motors' supply chain strategy

The two main Tesla factories are located in California (Fremont, location of the so called “Tesla Factory”) and in Holland (Tilburg). This last branch is intended only for European production, even if all of the most important operations regarding both the chassis and the batteries are done in California. Only some crucial parts are bought externally, from third party companies, making the level of vertical integration very high. For the production of the Model S, Tesla requires more than 2,000 parts from 300 suppliers all over the world. Many of them have exclusive partnerships with the California based company, especially those who build batteries and other key components, and these are based on short-term deals. The reason is that Tesla is always looking for other suppliers or to build those parts internally (vertical integration), even if this would entail issues in their production lines. Among its partners we find Daimler and Toyota, which have helped develop batteries and engines used in their production cars. Panasonic, since 2010, has been the only supplier of the battery cells necessary to build battery packs. In 2011, the next-generation batteries were born from the partnership between the two companies. In 2013, Panasonic signed another agreement to build 1.8 billion batteries for Tesla until 2017.

Lithium ion battery packs are the most important item for a company like Tesla Motors. In 2014, Morgan Stanley's analyst Adam Jonas wrote about the company: “We believe the days when Tesla was known as purely an auto company are numbered. [...] We are witnessing the most disruptive intersection of manufacturing, innovation and capital experienced by the auto industry in more than a century. [...] Tesla may be in position to disrupt industries well beyond the

realm of traditional auto manufacturing. It's not just cars.⁴⁴ Tesla's strategy is different from that of any other traditional carmaker. It can be compared to the relationship between Apple and Foxconn, where the former builds all the key parts for its products, while the latter is responsible for the production of batteries, displays and processors. Haresh Kamath, energy storage manager at EPRI (Electric Power Research Institute), noted that the higher costs related to electric vehicles when compared to ICE vehicles (Internal Combustion Engine) can be connected to the battery price. In most cases, producers tended to lower that price by maximizing the value: battery packs are very tiny and intended to be used at their maximum power so that they are discharged as much as possible during every drive. An example can be found in Toyota Priuses, where the all-electric range is just 11 miles. On the contrary, Tesla's approach is utterly different from Toyota's: Musk's creations have big battery packs, to reach higher ranges and high prices, consequently. Tesla now has the chance to save costs through sheer scale, because it is producing many KW/hours for each vehicle. Their idea is to increase production volumes to the maximum, in order to let prices fall and enjoy scale economies. This is probably the most important reason behind the construction of Gigafactory. However, sales must increase significantly to justify such a strategy, otherwise the company will be stuck with huge investments and poor revenues. In the past, many other organizations in the industry tried similar strategies that ended up in big failures. But Tesla has done something different from its competitors: it is building its own market and it has gained some success in doing so, as of today. Moreover, SolarCity, another creation of Musk's, has already started the development of new Tesla-battery-pack based energy storage systems alongside with solar applications in B2B (business-to-business) and B2C (business-to-consumer) fields. A lower cost in Tesla's batteries and improvements in lithium-ion technology could benefit energy storage and the related market (i.e. energy storage) could grow very quickly.

Peter Carlsson, Supply Chain Vice President at Tesla, helped the company to innovate its supply chain, renovating the car's design and technology. During the

44 <http://www.greentechmedia.com/articles/read/Tesla-Giga-Factory-Update-4-to-5-Billion-Price-Tag-With-Production-Slate>

crisis in 2008 and 2009, he aided Tesla in getting some bargains for items that would have been costlier otherwise. During the downturn, the company negotiated good agreements and benefitted from them. That was possible because they had a surplus of capacity in its facility located in Fremont, California. Tesla can take advantage of Musk's numerous companies and share the workforce with those organizations (SpaceX, Open AI, Hyperloop) even if they belong to different industries. SpaceX engineers, particularly, helped Tesla to develop its IT system and to share it with the aerospace enterprise. Despite the fact that the two companies operate in different industries, many suppliers are common as new information and ideas generated in these relationships⁴⁵. Supply chain management at Tesla is very similar to other firms operating in the sector, always considering innovation as a crucial matter. The company knows as well that being a small carmaker implies that every decision should be made considering all the possible consequences that could have negative implications for the future of the company. The two main agreements with two relevant players in the sector (Toyota and Daimler) were very useful to procurement solutions and relations with the suppliers, but Tesla always wanted to have its own network and to produce unique components, so they could not be replicated by competitors. An example is the Model S' infotainment system, which is entirely made inside the Tesla Factory, with the help of SpaceX engineers. Differently from other carmakers, Tesla has the unique opportunity to work alongside suppliers outside the traditional auto supply universe. As a result, the company began developing its own supplier base for each component in their cars.

Location is another strength. According to Carlsson, being the only carmaker to operate in the Western part of the United States, in a location where there are many important technological firms (Silicon Valley), is another strong point. In his own words: "We are very close to our biggest market and we are very close to our development, which means we can do drive, design and technology implementation really fast." Anyway, the Midwest, which is typically where the main carmakers are settled, is 2,000 miles away and this represents a logistic disadvantage that the company has always tried to overcome. Their goal is to develop a new car in less

45 <http://www.mypurchasingcenter.com/electronics/articles/tesla-builds-supply-chain-own-image/>

time than any other competitors (they expect to produce a car from the project stage in two and a half years). To do so, they need a faster and more agile supplier base than anyone else, so they are not slowed down. Each partner should be able to reduce the tooling lead times, and they must be able to think proactively and work hard to reach the speed and the flexibility required by the California-based company. So far, this plan has been a success, with over 300 suppliers for the Model S alone, even if the first phases were very hard because it was the downturn period and the Tesla name was not as important as it is these days.

3.5 Tesla's business model study and business model innovation

3.5.I Introduction

Tesla Motors is an example of how a start-up company can revolutionize a traditional industry as the automotive one. In this chapter I will analyze the company using the Business Model Canvas by Alex Osterwalder and Yves Pigneur, described in their publication Business Model Generation. This framework is a visual one intended to devise, develop and test the effectiveness of a company's business model. This approach is a very simple yet complete one, which can help understand how the company is performing under different aspects, called "blocks" by the authors. At a visual level, it is very intuitive and flexible, as it can be quickly adapted to the various conditions of the market. The following chapters will deal with the study of the Tesla business model, the innovation that this company has brought to the traditional automotive sector and a final discussion, dealing with future trends and opportunities.

3.5.II Tesla's business model analysis using the Business Model Canvas

In the following paragraphs, I will list the 9 building blocks that compose the Business Model Canvas, as applied to the Tesla Motors case. I will start with the infrastructure part, composed of Key Partners, Key Activities and Key Resources. Then I will analyze the Cost Structure and the Revenue Streams blocks, which make up the financial side of the model. After that I will examine the offering, composed of the Value Proposition block, and finally, I will study the customer side, that is Customer Relationships, Channels and Customer Segments.

The Business Model Canvas Designed for: _____ Designed by: _____ One _____ Iteration: _____

Key Partners Why are we the best partner? Who are our key partners? Which key partners are we seeking to partner with? Which key partners do we need to partner with? Which key partners do we need to partner with? Which key partners do we need to partner with?	Key Activities What key activities do we do? What key activities do we do? What key activities do we do? What key activities do we do? What key activities do we do? What key activities do we do?	Value Propositions What value do we deliver to the customer? What value do we deliver to the customer? What value do we deliver to the customer? What value do we deliver to the customer? What value do we deliver to the customer? What value do we deliver to the customer?	Customer Relationships What kind of relationship does each of our Customer Segments expect us to establish and maintain with them? What kind of relationship does each of our Customer Segments expect us to establish and maintain with them? What kind of relationship does each of our Customer Segments expect us to establish and maintain with them? What kind of relationship does each of our Customer Segments expect us to establish and maintain with them?	Customer Segments For whom are we creating value? Who are our most important customers? Who are our most important customers? Who are our most important customers?	
Key Resources What key resources do we need? What key resources do we need? What key resources do we need? What key resources do we need? What key resources do we need? What key resources do we need?	Channels Through which Channels do our Customer Segments want to be reached? Through which Channels do our Customer Segments want to be reached? Through which Channels do our Customer Segments want to be reached? Through which Channels do our Customer Segments want to be reached?	Cost Structure What are the most important costs incurred in our business model? What are the most important costs incurred in our business model? What are the most important costs incurred in our business model? What are the most important costs incurred in our business model?			Revenue Streams For what value are our customers really willing to pay? For what value are our customers really willing to pay? For what value are our customers really willing to pay? For what value are our customers really willing to pay?

www.businessmodelgeneration.com

3.5.II.A Key Partners block

As for the key partnerships, Tesla has signed some important agreements over time with strategic partners in both the automotive and the battery manufacturing industry. The first strategic alliance was with the German carmaker Daimler AG, the owner of the world-famous brand Mercedes-Benz. This agreement was signed

in 2009 for about \$50 million; with this, Daimler bought 9.1% of the California-based company⁴⁶. The alliance was made by the German carmaker to develop the battery technology to be adopted by some Mercedes and Smart models. In 2014, despite Daimler selling all its Tesla shares, the two companies kept on developing the lithium-ion battery technology together. The results of this cooperation can be seen in the Mercedes B-Class EV and Smart EV models. Another important agreement was signed in 2010 with Toyota Corporation, the world's best-selling carmaker. Toyota was the pioneer in the hybrid and electric powertrain fields and, after a meeting between the two CEOs, they signed an important contract that considered the production of an all-electric Toyota vehicle, the RAV4, which used the technologies developed by Elon Musk's company. Due to the RAV4 EV's poor sales, Toyota decided not to confirm the model after the last facelift, as the management decided to bet high on fuel cell technology. From both alliances, Tesla Motors took the knowledge of two of the biggest players in the sector, which was used in the development of both the Model S and X and for future implementations. Being a small carmaker allows Tesla to prove its abilities and the state of the art of its technology in the lithium-ion batteries industry.

In October 2013, Panasonic Corporation and Tesla Motors announced their partnership in which the former would expand the production of automotive-grade battery cells for the latter. The first cooperation between the two companies dates back to 2011, when the Japanese supplied more than 2 billion cells over 4 years, which were used to power Tesla's entire production. The two companies, which have developed this next-generation battery cell technology, aim at being the main producers for such kind of innovation, as they have already powered more than 150,000 vehicles, with best-in-class technology (Panasonic's cylindrical cell was designed specifically for enhancing electric vehicles quality and life). The Japanese firm has another crucial role for the Californian company: it is its main sponsor in the forthcoming launch of the GigaFactory, and it is reported to have invested around 30-40% in the deal⁴⁷. Since batteries are still expensive to produce and make

46 https://www.teslamotors.com/it_IT/blog/strategic-partnership-daimler-acquires-stake-tesla

47 <http://www.reuters.com/article/panasonic-autos-batteries-idUSL3N0YU31Z20150608>

up a big part of the cost of a car, Tesla and Panasonic's aim is to drive down the battery costs thanks to improvements in their manufacturing processes and by increasing the production volumes of battery cells and packs. After the news of the GigaFactory, many other players in the industry decided to follow the same strategy: in the USA, LG Chemical teamed up with General Motors for the construction of two EV models to be priced in the lower segment; BYD, a Chinese automaker, decided to build its own factory to compete directly against Tesla in the automotive as well as in the domestic consumption market.

Another important Tesla partner is NVIDIA. The tech company provided the infotainment, navigation and instrument-cluster system for both the Model S and the Model X, based on its latest Tegra family processors. These systems allow the car to save energy. This agreement is expected to continue for future infotainment systems in the coming Tesla vehicles, and NVIDIA created a new division in its operations designed for the automotive.

Finally, other key partners can be seen in Musk's other companies such as SolarCity and SpaceX, which share their knowledge with the Fremont-based operation; especially SolarCity, which has currently very close relationships with Tesla for the developments of technologies that can be used in both industries.

3.5.II.B Key Activities block

Tesla Motors started its operations as a traditional carmaker, but it recently added several more activities to its portfolio. Car production and manufacturing represent for the company the biggest part of its revenues and they are the reason why this organization is widely known. Another theme of importance associated with the company name is innovation. Innovation is an important key factor for Tesla Motors as the company has always wanted to modify traditional ideas about mobility and sustainability. To achieve this, in mid-2014, Musk announced that a new Research and Development (R&D) center will be opened in England in the next few years to meet the requests of the growing European customer base. This center will collaborate with the main one, located in Fremont, California. As many

high-tech companies, Tesla has no structured R&D department, but its engineers typically work on new ideas on a regular base. Sometimes this work is performed during spare time, and these ideas are at the base of development and technologies of future products. Besides technology, other fields of applications of these breakthroughs are: new materials, with the aim of diminishing the environmental impact and reducing costs, and new processes, designed to save time and increase productivity. Being a critical factor for the success of such a company, not much information about them is made public.

Another important activity is that Tesla sells electric powertrains to competitors. As reported before, the company gave electric powertrains to two big carmakers such as Toyota and Mercedes. The aim of GigaFactory, in fact, will be to produce cells and batteries for both these companies, which are investing in the structure, and for external clients as well.

The Supercharger network is another important activity for Tesla Motors. The infrastructure has been entirely built by the Californian firm and it is growing month after month in the EMEA area and in North America. The charge is free for every Tesla model, but other EV or hybrids can recharge their batteries by paying for their consumption. In this way, the company sells energy through these stations that are totally powered by solar energy and are eco-sustainable. The network is well developed in the United States and Canada and in most parts of Western Europe, but the plans forecast growth in other strategic markets (e.g. China), to further broaden the infrastructure.

3.5.II.C Key Resources block

As for the key resources, patents have assumed a crucial part in the technology development of Musk's car company. It was founded to accelerate the transition to sustainable transportation and to do that, Tesla ideas should ideally be protected against competitors. The reality is different, though; according to Elon Musk, open source ideas will be useful for the growth of the sector, and to achieve his goal of ending global dependence on hydrocarbons. Even if there is the menace coming from big automotive groups to appropriate those ideas and use them by taking

advantage of their larger size, the founder's opinion is that since the number of EVs is very limited (less than the 1% of the world's vehicle fleet), this threat is very limited. Open source means that the technology can be implemented by anyone who wants to enhance it and share with other peers. Among its patents and trademarks, Tesla has some important ones such as the battery swapping technique, and some others regarding battery technology (like the optimization of the charge rate or the battery coolant) or car technology (principally concerning the infotainment system and safety features).

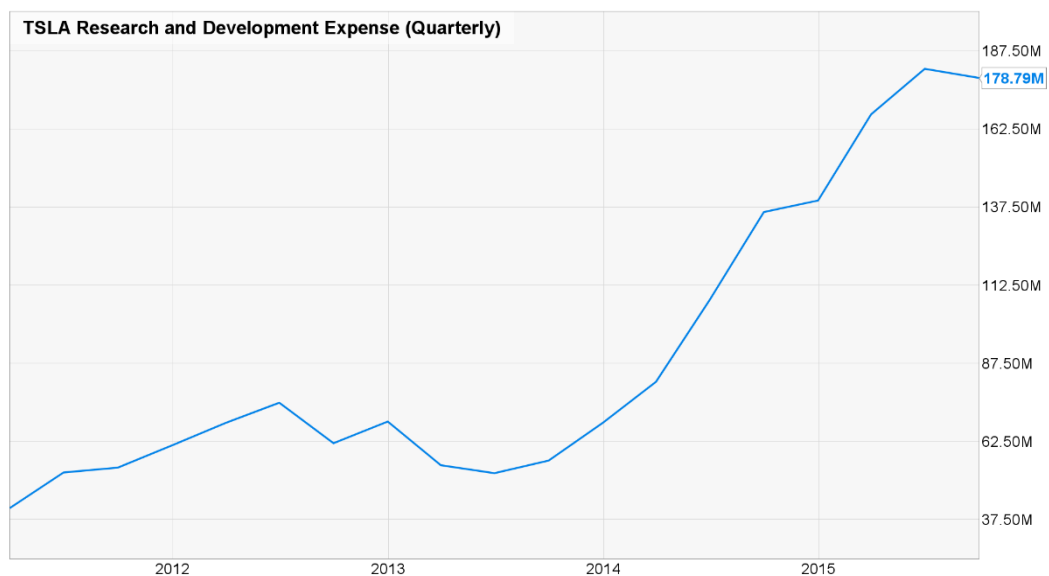
Human talent can be considered strategic to the purposes of the firm. The Tesla workforce is shared among other Musk creations (SolarCity and SpaceX) and the flow of knowledge is constant. The management team that works at Tesla has important backgrounds related to the automotive and the high-tech industries. The CEO himself has a proven track record of successful entrepreneurial companies as well. Another important factor is location: Silicon Valley represents a fertile area for high-tech enterprises like Tesla. That is the reason why many of the greatest companies operating in the most innovative industries run their operations there.

Among its key resources, it is impossible not to mention the upcoming inauguration of the GigaFactory, which will provide 35 GW/hour for battery cells and 50 GW/h for battery packs. This facility, which will be sufficient for the production of half a million Tesla vehicles, will be completely powered by renewable sources, gaining the title of net zero energy factory, i.e. it has no energy consumption. According to many sources, in order to achieve that goal, Tesla would be able to sell the excess energy to utilities. In Musk's words: "it will actually be bigger than the sum of all lithium-ion battery factories in the world."⁴⁸ The rationale behind the plant is to reduce the price of batteries for automotive and domestic consumption purposes. Considering all the factors listed, Tesla can be considered probably as one of the most important and well-rounded players in the automotive industry, as far as alternative sources to traditional fossil fuels and sustainable mobility are concerned.

48 Elon Musk, Powerwall presentation, 1st May, 2015.

3.5.II.D Cost Structure block

One of the costlier activities for a company like Tesla Motors is Research and Development. At Tesla, R&D expenses weight very much on the final prices of the products offered. In the second quarter of 2015, for example, a Model S was sold losing around \$4,000 per car⁴⁹. Even if at the end of the year the organization reached to gain a margin for the sales of its vehicles, R&D costs still represent a big chunk of the final price. Especially in the last two years, when the Model X was brought from a paper project to an actual car, these costs have further increased up to the \$179 million mark. This trend is expected to go up, with the coming launch of the Model 3 and the other projected models. Here is a graph of the R&D expenses in the years 2012 to 2015:



Souce: personal re-elaborated version of Tesla R&D expenses data (<https://www.teslamotors.com/>)

Salaries are another relevant item of expenditure. As stated before, Tesla personnel come from different backgrounds related to the automotive and high-tech fields. Many of them have been taken directly from the major carmakers (Ford and GM,

⁴⁹ <http://www.cnbc.com/2015/08/10/tesla-burns-cash-loses-more-than-4000-on-every-car-sold.html>

as well as German brands) or from important IT companies as Cisco, Apple and Oracle.

The marketing strategy at Tesla requires almost no expenses. The company is using an unconventional strategy to delivery its value proposition. In 2015, the marketing budget was approximately 0 while, for instance in 2012 Nissan, spent about \$25 million to promote its EV vehicle called the Leaf. Moreover, the organization has just 7 employees working in the marketing department, without a Chief Marketing Officer (CMO). In the founder's opinion, marketing is not a priority, as his focus is shifted to the production side and R&D activities. The best marketing is the excellence of the models sold by the company, as Musk has stated many times in different interviews. The founder catches the attention of his potential buyers through truly extraordinary statements, like the numerous announcements regarding the features embedded in their lineup vehicles or their presentations to the media, which are conducted in an unconventional way. For the moment, Tesla has numerous marketing tools that are *de facto* driving demand: an original retail strategy, high customer satisfaction, word of mouth, and free test drives.

Another part of the company's cost structure is firm-owned retail stores (called galleries). These are located in strategic places to catch the attention of potential customers. Part of the mission statement is that the company wants to sell its products directly to customers through their stores, totally owned by the Californian-based firm. Owning these galleries represents a cost that it is not present in other automotive firms and, since Tesla is still not allowed to sell cars directly to customers everywhere (as it is the case for Texas, West Virginia, Connecticut, Arizona and Michigan; for more information, see the Channels block), with a consequent loss of potential buyers living in those states. The biggest chunk of the car cost is represented by manufacturing. Tesla always seeks perfection in everything it makes. The expenses in this area are relevant also because, up to present date, the batteries are expensive to build. They still require some particular components that are more expensive than the ones used in ICE (Internal Combustion Engine) vehicles and the manufacturing operations present more issues for a company like Tesla, which has small numbers when compared to the biggest players in the industry. Part of these costs will be cut down with the implementation

of the GigaFactory, at least those concerning battery packs and cells. The materials used in the production of the vehicles are expensive as well. Carbon fiber, aluminum and light alloys increase the final cost compared to traditional steel, which is the most used material in car production.

Finally, Tesla Motors represents a well done example of a value-driven business. The goal of the Californian company is to always offer best-in-class technology embedded in its products, and therefore customers are prone to pay more to buy the goods this firm presents to the market.

3.5.II.E Revenue Streams block

The main revenues for the firm come from the two fields in which it operates: energy and vehicles. The company has had a long period of losses, due to the employment of refined materials (as carbon fiber or titanium) and techniques to build the products it showcases. Elon Musk has always stated that in its first phase, Tesla may be not that profitable because that is the phase where a company traditionally tries to raise awareness of its brand name. This stage began with the launch of the Roadster model, which was built in small numbers and was aimed to a niche market (wealthy early adopters with a passion for new technologies). The money generated from the Roadster and the public loans granted was used to finance the Model S, intended for a larger audience. The recent Model X aims at the same target, exploiting the relatively recent SUV trend. The earnings produced by these two models should provide the necessary funds to build the small Model 3 sedan car, intended for the mass market and which can compete with many top selling vehicles.

Even though the company was founded in 2003, the first profits came in 2013. In many countries, Tesla benefitted from public incentives that helped reduce the tag price of its vehicles: a base discount of \$7,500 is available everywhere in the USA. To this amount, many states offer additional discounts that may vary depending on the income of the buyer, on the model selected and on the installation of additional products (like the Powerwall).

The selling of ZEV credits represents an important revenue stream for the firm. ZEV credits (Zero Emission Vehicles credits) are awarded by the CARB (California Air Resources Board) to all those carmakers that comply with the air pollution limits prescribed. Tesla Motors has benefitted from the sales of such credits to other carmakers that have higher emissions and therefore need a higher number of them. Forbes estimated that, only in the third quarter of September 2014, the contribution was more than \$76 million, as they represent 8.2% of the total revenues in that period and the 23% of the gross margin of that fiscal year⁵⁰. The sales of electric powertrain components to competitors is another key revenue stream for Tesla. The partnerships with Daimler and Toyota allowed the company to gain in knowledge and industry awareness and, mainly, in economic terms. The chance to sell these components to other players and the future possibility to market also batteries or cells to other OEMs through production from GigaFactory will represent a solid income for the firm, needed in order to diversify business activities.

3.5.II.F Value Proposition block

Tesla Motors tries to maximize the perceived value to its customers by offering them unique features in its cars. These allowed to change the previously held conception of electric cars, which were considered slow, unreliable and uneconomical. Tesla produces eco-friendly vehicles, using sustainable operations in its plant. The company offers different ways to customize a vehicle, by presenting the choice of different interior colors, options and external characteristics. Moreover, a buyer can decide to buy its automobile with a different battery option and with multiple configurations (each vehicle can be ordered with one or two engines, making the car rear-wheel drive or all-wheel drive, respectively). The varied lineup is a strategic factor that increases value for the customers. The company offers sedans, SUVs and the upcoming compact sedan and sports car. It

⁵⁰ <http://www.forbes.com/sites/chuckjones/2014/11/12/teslas-10-q-reveals-zev-credits-had-a-major-impact-in-the-quarter/#3853ecf47f3a415f54f37f3a>

is a wide range for a small carmaker like Tesla. These choices can meet the different buyers' desiderata and widen the customer base. Moreover, the performance offered is better than any direct rivals', and it can be compared to that of several sport cars. The design is unconventional as well, making these vehicle objects of desire.

A long-standing issue with electric vehicles has always been the range. The first models only allowed to drive around the city or for very short trips, as the range was limited to 100/150 Km (about 60/90 miles) for every charge. With its new developments, Tesla cars now can drive for more than 500 Km (310 miles) per single recharge. In addition to this, Tesla offers a widespread infrastructure of Superchargers, which allow every customer to charge their own car for free with an important benefit on the price paid annually (Tesla declares that 5-year savings with their vehicles amount to more than €5,500 when compared to a traditional ICE car). Alongside these savings, many countries offer discounts on taxes and tributes that let buyers see this kind of cars as more convenient.

The Californian firm already offers some futuristic features that many other organizations are trying to develop. Autonomous driving technology was offered in Model S sedans as an update in late October 2015. Through this characteristic, the car can drive itself with the driver seated in the cabin. This technology allows for the reduction of car accidents, lowering the stress caused by every-day driving. This is made possible by using different radars, which check the surrounding environment many times per second. As reported by the media, many other important competitors intend to join the segment, from both the automotive (Mercedes and Nissan just to mention two of them) and other related sectors (Google and Apple are two of the main examples). According to Musk, who has hired many engineers to improve this technology up to the end of 2015, Tesla lineup models will be fully automated in 3 years, anticipating the original deadline of 2020⁵¹. Besides the competition, the carmakers have to fight against state regulations, which do not allow a car to be conducted autonomously at the moment. Related to this topic is the chance to receive Over the Air (OTA) updates (as it happens with smartphones or computers) that equip the car with the newest features

51 <http://www.wired.com/2015/10/tesla-self-driving-over-air-update-live/>

and technology. This is utterly innovative when compared to traditional carmaker strategy, as these companies have never offered such a novelty in automotive history.

If we consider the B2B industry, Tesla is strategic to those OEMs that rely on its supply of drivetrains and batteries. The two big partnerships mentioned previously are essential for a small company like Tesla, as they represent a big deal for a small organization. These numbers are expected to rise in the near future, since part of the production will be sold to competitors which will use this technology.

3.5.II.G Customer Relationships block

Tesla Motors is famous for its public events. In 2015, two presentations to the public were held at the Fremont facility: the Model X and Powerwall debuts. During these presentations, the press and potential buyers are invited to the factory to discover the features of the products introduced by the company. These are broadcasted on the Internet on the company's official site, and on the main social video platforms (Vimeo and YouTube). The company offers some test drives of its cars as well, to let the potential buyer feel the difference of driving a Tesla versus a traditional car. Tesla vehicles, and the Model S in particular, were rated as the best car in annual customer satisfaction rankings in 2013 and 2014 by Consumer Report⁵². This classification considers many aspects such as driving comfort, the quality of the interiors and operating expenses; these aspects were graded as "very high" by the owners. The participants were also asked if they would rebuy their car and the 98% of them answered positively in the case of the Model S. Besides this prize, the Tesla Model S won one of the most important awards for a vehicle: it was named Motor Trend Car of the Year in 2013. After the ban of Tesla vehicles sales in some US States, many supporters of the brand showed up in person at state capitols to

⁵² http://www.greencarreports.com/news/1095745_tesla-model-s-tops-consumer-reports-customer-satisfaction-index-again

complaint against the suits brought against the Californian carmaker⁵³. Tesla is a perfect example that even if a company does not spend much in advertising (counting just on word of mouth marketing and selling its vehicles in private showrooms) increasing customer satisfaction and brand awareness among its audience remains important. In today's increasingly social world, the key to create enduring brand loyalty is transparency. Every company wants to build long lasting relations with their buyers and one way to achieve this goal is by using open communication. In the automotive sector, no one does this better than Tesla. The company has increased its reputation for quality and customer support by reaching its consumers through social media and the Tesla blog. Thanks to this transparency, buyers feel like they are personally connected to the carmaker. For instance, in August 2014 two Tesla drivers presented an open letter to Elon Musk through a Californian newspaper in order to propose some changes to the vehicles be made. The founder himself answered them on Twitter saying that some of the changes would be included in future production vehicles.

Another strong point in Tesla's relations with its customer base is the so called Tesla Best Resale Value Guarantee Program. This consists in keeping the company's car value higher than any premium rival car in the market. This guarantee is created alongside with Wells Fargo Bank and it is personally backed by Mr. Musk in order to give buyers complete peace of mind about the value of Tesla products in the long run. That policy allows the customer to return the car after three years of usage, with a fixed value determined when the car is bought. A similar service to business clients was launched in 2014. Business Leasing is offered by Tesla Finance, a subsidiary created for this reason, and promises to simplify the concession of leasing services.

3.5.II.H Channels block

The Californian-based company has brought a relevant innovation in the way its vehicles are sold. Differently from any carmaker, but much more similar to many

53 <http://www.usatoday.com/story/money/cars/2014/09/06/why-tesla-has-the-most-loyal-customers/15139377/>

electronic device producers, the company decided to sell its vehicles through direct sales. The model works this way: most people have already decided what car they want to buy before going to the dealer so, when they go there, it is just a matter of negotiating on the price. Instead, Tesla wants to educate its potential customers in purchasing a completely new vision of cars. That is the reason why the stores (or galleries) are located in high foot traffic malls and shopping streets, where people often walk by them. This allows the buyers to interact with Tesla's sales representatives (Tesla Product Specialists) before deciding which new car to buy. These specialists, unlike traditional dealers, do not receive any commission on the price, so they are not interested in selling the brand's cars. The vehicles can be ordered by placing a reservation on the Internet or at these galleries by depositing a down payment. So, the carmaker wants to both own and operate the stores. In the USA, however, this is still illegal in many states. The rationale behind those laws is that a franchise model is required to sell a new car and the carmakers need to negotiate the prices with private car dealers. The argument is that if Tesla can sell directly cars to customers, many other firms can do the same, and therefore dealers would face the competition of the carmakers themselves. This matter has led to numerous trials in many states promoted by NADA (National Automobile Dealers Association), with uneven results. For instance, in May 2014, Tesla fought against North Carolina, and won, with the result of the elimination of the law which upheld the ban⁵⁴. In 2015, New Jersey eliminated the ban to the direct sales too, after a legal dispute that had lasted for over three years⁵⁵. As of early 2016 the only States in which Tesla cannot directly sell its lineup are: Texas, West Virginia, Connecticut, Arizona and Michigan. However, Tesla galleries are available in those states, but the cars can be sold through nearby state galleries and shipped without the registration plate.

54 <http://www.forbes.com/sites/markkrogowsky/2014/03/15/after-the-new-jersey-ban-heres-where-tesla-can-and-cannot-sell-its-cars/>

55 http://www.huffingtonpost.com/2015/03/18/new-jersey-tesla-ban-lifted_n_6896896.html

3.5.II.I Customer Segments block

As for the last block, Customer Segments, Tesla delivers its value proposition to a determinate target: early adopters of electric vehicles and car enthusiasts. These clusters of customers all have in common that their income is above average. However, during its brief history the company has aimed at different targets. When the Roadster was launched, the target demographic of the company was wealthy people who were looking for an innovative sports car, with high performance and zero emissions. At that time, there were no possible competitors as Tesla was the only proposal in this segment. Then the company shifted to a wider target (with higher profitability): the premium luxury sedans segment. The Model S was aimed at both families and professionals, again with an above average income. After that, with the launch of the Model X, the organization's target became wealthy families who wanted to buy a full-size premium vehicle that was different to any other competitor's. In fact, just like in the Model S sedan segment, both cars had no direct competitors when they were launched. The first premium rivals should arrive in the next few years for both models. Then, with the announcement of the Model 3 compact sedan, the company shifted to the mass market, thus completing its intended mission. This vehicle will be always fully electric, but its costs will be kept low to compete in the compact sedan market. With a starting price of around \$35,000, the Model 3 will broaden the customer base of the company, pointing at younger people with lower incomes who want something different than a traditional internal combustion engine car. The customer segments use word of mouth to promote Tesla vehicles among their peers, as the company uses marketing less than any conventional carmaker. The average customer knows the organization's lineup models thanks to the Internet (through social networks and its own blog, translated in many languages), where the Californian carmaker is very active. Tesla vehicles have been sold to taxi companies and to professionals too. For both categories, the company offers the Business Leasing program explained in the Customer Relationships block.

Tesla offers its battery products to B2B clients too. The production of such kind of products will be further augmented when the GigaFactory is operative.

3.5.III Tesla's business model innovation in the automotive industry

Differently from any other OEMs, the Californian company used a completely new way to structure its strategy: entering from the high-end market, with a premium sports car with a high price, aimed at a very narrow target, and then moving to the mass market with a compact sedan, priced in line with the competition, with a broader potential customer base. The traditional strategy to enter this industry has been to target first the low-income market, with cheap city cars or small multi-purpose vehicles and then move up to more luxurious segments, because the cost to own an EVs was high in the first place. These moves are very important if the company wants to create an affordable mass market of fully-electric vehicles. To reach this, Tesla decided not to protect its trademarks and patents, so that any other player interested in the technology can use it and improve it without incurring in any arbitration. Following the company's example, Toyota did the same for hydrogen technology in order to make it a mass market as well. At the roots of Tesla's strategy lies the high level of innovation embedded in its lineup vehicles compared to those of its direct rivals, and the "learning by doing concept", whereby productivity is increased through practice, continuous innovation and self-perfection.

To market such innovative products, Tesla needed a new way to deliver its vehicles. Traditional OEMs rely on a pronged selling network with one-brand and multi-brand dealers. They receive a commission for every vehicle sold and benefit from privileged relations with the mother company. This system implies that some vehicles can remain unsold for many months or years, which leads to price discounts or buyer incentives. Tesla Motors, going against this deeply rooted system, decided to market its vehicles through the Internet, in the so-called direct sales system. The founder's mindset is that a car should not be sold through the local dealers' network, where it is only a matter of fixing the final price paid by the customer. The decision phase takes place before then, when the potential customer is looking for which vehicle to buy; this is where Tesla wants to focus. For this

reason, the task assigned to its stores (Tesla galleries) is to introduce the customer to a new driving experience, and the sellers are not paid on a volume base, their wages being fixed instead. The strategic location of its galleries (in highly congested areas on inside shopping malls) helps customers consider the purchase of a Tesla vehicle during their everyday routine. It is also possible to reserve a car online by depositing a down payment. Through this channel, there is no possibility to negotiate on the tag price, as it happens with traditional dealers.

Another relevant difference with every traditional player of the EV industry is that Tesla produces its cells and battery packs internally. Unlike any other carmaker in this segment, Tesla teamed up with Panasonic to build its own cells and battery packs for both its needs and to sell them to other players. This will be possible when the GigaFactory is operative. Following the Tesla example, many other carmakers have started building their own facilities to build battery packs themselves or they have teamed up with other players: Nissan will produce them in England; Ford is expanding its R&D on batteries with the collaboration of the University of Michigan. Many of them are adding the domestic consumption market to their core activities as Tesla did with the Powerwall: Mercedes is offering a Tesla Powerwall's competitor to be presented in 2016, BYD will offer a similar product intended to the B2B market.

Another innovation Tesla has brought to the traditional business model is its infrastructure and the battery swapping service offered. The main limitation of every EV in the past had always been their poor range, which made the vehicles suitable only for short distances and restricted them to mainly urban use. Tesla, combining a vast network of Superchargers and the possibility to change the battery in less than two minutes, has reduced the so-called range anxiety to zero, so much so that Tesla cars can be effectively compared to traditional vehicles when they are driven in zones where the network is developed. No other OEM has moved in that direction as of now; only some electricity distributors and energy manufacturers have joined this sector, and their coverage remains incomparable to Tesla's. In addition to this, the electricity generated in the Superchargers stations is totally sustainable as it comes from solar panels. The network is open also for other EVs if they pay for their energy consumption, while it is free for every Tesla owner.

Traditionally, OEMs invest heavily in marketing campaigns and advertisements. These operations are very expensive for them and the competition is stiff. Traditional carmaker investments are focused in buying spaces during the most important events, such as the Super Bowl (when a TV spot can cost millions of dollars). Tesla's expenditures in marketing and advertisements are approximately zero as the company uses an unconventional approach to attract potential customers. There is no marketing department inside their Palo Alto's offices, nor a Chief Marketing Officer, and the people employed in the department are less than ten. Musk's organization relies on word of mouth marketing as the best advertisement is the customer himself, since a satisfied buyer will share his thoughts to his peers. In addition to this, Tesla leverages the media and the press by opening the Fremont facility to journalists and experts in various occasions as for the presentation of new products presentations and press releases, as well as many events involving the clients.

Another Tesla difference has when compared to the traditional carmakers is the way the company generates revenues. Usually, OEMs rely just on vehicles sales to be profitable. The Californian company, besides selling its vehicles, generates profit in two ways that no other carmaker has ever used: the organization sells electric powertrains and technologies to competitors, and it creates cash flow by selling ZEV credits to other OEMs. Traditionally, in the automotive sector, companies secure partnerships and alliances among them, where every part of the agreement is committed to a certain task. Many times the R&D functions are shared or the companies team up to reduce costs and share platforms, engines or components. These kinds of agreements have become very numerous in the last years, when reducing the costs has had a prominent role for the firms operating in this industry. Tesla, on the other hand, established some partnerships with two big players like Toyota and Mercedes to sell them its technologies and the output of its know-how. Those companies bought from the Californian OEM drivetrains and batteries to be used in their own models, in exchange for a part of Tesla's shares. The partnerships established, moreover, were not aimed at reducing costs or sharing platforms, but rather the goal was to prove that these alternate technologies are more affordable and reliable to the entire market, and that they can be used in mass market vehicles.

The Californian company takes advantage of selling ZEV credits to competitors as well. This is possible because its complete lineup has zero emissions, while many other carmakers still rely on traditional fossil fuels to power their cars. In the USA, those carmakers need to compensate their higher emissions by buying ZEV credits from other players to whom they are not necessary. This has represented an unconventional revenue for the Californian company, which accounted for more than \$70 million just in the third quarter of 2014.

3.5.IV Discussion

The electric vehicle market (EV market) is still in its introduction stage and a dominant design has still not been established. The EV market has been in the emerging phase for a long time. A decisive turning point happened when oil prices began to rise, a phenomenon which was connected to stricter climate protection policies, the rise of those services that allow the customer to forego owning a car (like car sharing, carpooling or car ride services) and the improvements in battery technology and reliability. According to many car companies and car experts, electric vehicles will play an important role in the near future, and important goals are set by public institutions for reducing emission and increasing sustainability. For that reason, many traditional carmakers either have already added some all electric models or expect to extend their lineup with such models soon. Despite these ambitious targets, the reality is that the numbers are far from what was planned, as the electric vehicle sales accounted for less than the 1% of all the vehicles sold globally. In this segment, Tesla Motors fulfills a remarkable role, contributing with disruptive choices and alternatives, innovating and reinvigorating in that way the traditional industry. Differently from any other players in the automotive sector, the company has an entrepreneurial mold. Usually, entrepreneurial firms have less constraints in evaluating new changes and have a higher flexibility when they pursue radical business models. Unlike traditional companies, which take the usual approach to the business model, the Californian company provides disruptive innovation alternatives. EVs traditionally were

considered as slow, unreliable and unusable for long distances; Tesla has proven to the industry that these limits can be overtaken by investing in new technologies, producing vehicles that can be compared to the traditional ones. One of the main problem for EVs was still the limited range and the slowness to recharge the batteries. Musk's organization is committed to creating and enlarging an infrastructure that allows potential customers to not worry about range. As a matter of fact, Tesla offers battery swapping in many Californian stations (this service will be soon offered in other parts in the United States), which will potentially extend the range to that of any other internal combustion engine vehicles. In addition to this, the growing Supercharger network represents a strong asset for the firm, especially in Europe and North America, where there are almost 600 stations. Tesla offers also the possibility to install its own Powerwall in customers' houses, in order to charge the car (and power the entire house) with minimum cost for the user. In that way, the company is proving to be a versatile player in the automotive industry, as it is the first to give such additional services, offering the car owner an all-inclusive package. In the industry, such a thing has never been offered by any traditional OEMs, which are focused just on the vehicles and the usual after sales services.

The importance of low emission vehicles will grow in the next few years. Europe, North America, China and many other countries decided to enforce stricter policies regarding car emissions by 2020. Even if with differences, the laws will allow levels which should be half than those permissible in 2015 and the OEMs that exceed these limits will be fined. Mechanisms like the ZEV (Zero Emission Vehicles) program will be adopted in many other places outside the United States, so that carmakers who don't comply will be forced to buy credits from more sustainable competitors. Therefore, having zero-emission lineup models will help Tesla to both benefit from these inflows from other OEMs and further push its sales, thanks to the relevance the brand has gained in the automotive space. Moreover, the low-impact production techniques and the sustainability of its facilities, galleries and stations will play a crucial role in pursuing emission reduction. Future production cars will have to meet the criteria imposed by the supranational institutions; for that reason many carmakers have signed agreements between them, either by buying

low-emission carmakers or by projecting new cars intended for this purpose. As a matter of fact, after the Tesla experience, other carmakers are betting on electric technology, even for upper end vehicles, niche segments (like sports cars) or full size SUVs, while other forms of unconventional fuels (like hydrogen) are still not viable. Many of these producers are considering this shift to avoid problems with diesel engines, which were previously considered the easiest option to stay below the emissions cap, after the scandals affecting the entire sector (the Volkswagen's Group Dieselgate scandal is considered by many renowned sources just "the tip of the iceberg", as other similar accusations have surfaced for the Nissan-Renault Group in the past few weeks). All these facts will lead to a change in how cars are tested, making it impossible for OEMs to cheat on emissions and therefore making them present more accurate numbers about emissions and fuel consumption to their customers.

Another trend that is emerging in the industry is having cars that are progressively more connected, cars which can drive themselves without human intervention. By autonomous driving cars we understand any vehicle which uses a technology that permits it to brake, accelerate and steer without any (or with limited) driver interaction. Many players in the automotive and other companies in related fields (e.g. ICT and startups) are conducting tests on the road to improve the technology, in order to let the cars be fully autonomous in the near future. Additionally, through the navigation systems, cars can be connected to the Internet, get news on the traffic and on the weather, warn the driver if there are accidents or road works, and automatically call emergency numbers in case of a crash. These cars "observe" the traffic around them using sensors and radars and can evaluate when there is an obstacle in the trajectory, can read road signs and lanes and share that data with other vehicles. In these last few years, many companies have been covering thousands and thousands of miles with self-driving cars, and according to many experts, we will see this technology as standard in a wide selection of next generation vehicles. The most important companies which are testing their technologies on the open roads are Mercedes, Ford and Toyota; while, among the other firms operating in closely related industries we can mention Google, Apple and Baidu. Among the OEMs listed, Tesla Motors has given the market a

considerable technology: it has offered, for the first time in the market, a mass produced vehicle that can drive itself on the highways, which is also connected to the net and can offer full connectivity with other devices on board, like smartphones and notebooks and with other Tesla vehicles in the same area to exchange information about traffic. These efforts are paired with the ones made by governments and institutions to renovate laws and to adapt them to these innovations. Many tests are conducted by national organizations as well, aiming at an increase of these new technologies that will lead to a fewer number of car accidents and car deaths (according to a KPMG report, 93% of them are caused by human errors, and in the UK alone, self-driving cars will prevent 2,500 deaths from 2015 to 2030⁵⁶), and thus improving driving conditions and reducing the stress connected to them as well. Other benefits self-driving vehicles can bring to mobility could be: reduced insurance prices due to the lower number of car accidents; less car thefts and a reduced number of vehicles in fleets (with a reduction in emissions, as these technologies will probably increase services like car sharing and carpooling). By 2018, Tesla Motors plans to introduce a fully autonomous driving technology, where the driver can even fall asleep. According to Elon Musk, these goals are expected to require from two to three more years to be legalized by governments worldwide, hence the OEMs need to prove their efficacy on open roads⁵⁷.

3.6 Future trends in the automotive industry

The future in this industry is still uncertain due to the numerous and very complex variables involved. One of the main factors that will influence the near future is the price of oil, which is in itself affected by different aspects. Global demand,

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<https://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/Documents/self-driving-cars-next-revolution.pdf>

57 <http://www.cbc.ca/news/business/self-driving-tesla-expected-within-3-years-elon-musk-says-1.3107475>

availability, and national and international policies are just three of the various variables underlying its market price. Although its price may be not a concern in this phase (it stands now at \$40 per barrel, the minimum registered in over ten years), the fact that oil is not renewable implies that global mobility can no longer rely on such a kind of fossil fuel. Researchers, public institutions and the most important companies are trying to find new solutions and alternatives to traditional fossil fuels. The two main options that are gathering a lot of interest at the moment are hydrogen and electricity. Many carmakers are betting on the former as the fuel of the future, a substitute for oil and its derivatives: among these companies we include Toyota, BMW and Nissan. Hydrogen is fully renewable and very clean, as the outcome from its combustion is just water. The fuel cell-powered engine recharges the batteries that allow the car to work, without any impact on the environment as far as car emissions. However, producing hydrogen is very complex at the moment and it is not very sustainable as well if we consider the complete cycle of production. Moreover, the batteries use very refined components (rare materials) that are still very expensive, and these engines need high-pressure tanks made of carbon fiber to stock the hydrogen (which is dispensed at around -250° C). There is still the problem of the poor infrastructure in almost every part of the world, as only Japan, England, Germany, Denmark, South Korea and California have recently started building their own network of distributors. According to Alan Baum, analyst at Baum & Associates in Michigan, we will see fuel cells as a technology in the 2020s, with a small but increasing effort in the first part of the decade, similarly to what we saw some years ago with EVs⁵⁸. To be successful, fuel cells need to increase their sales, so that costs go down and this market can become as a mass one. A study conducted by Julian Fox on Clean Technica shows how fuel cells are more expensive compared to gasoline, even considering the fact that almost all the hydrogen produced comes from methane, a natural gas, and despite the fact that producing this fuel from electricity is possible, it is very costly and consumes a massive amount of energy⁵⁹. In order to produce hydrogen, the process

58 <http://www.bloomberg.com/news/articles/2013-10-10/toyota-shows-hydrogen-prototype-in-race-toward-fuel-cells>

59 <http://cleantechnica.com/2014/06/04/hydrogen-fuel-cell-vehicles-about-not-clean/>

called electrolysis is fundamental, because it separates the hydrogen from water through the use of electricity. Then the hydrogen is converted again into electricity to generate the necessary power to fuel the vehicle, but the efficiency is about 25-30%. Electric technology, instead, has an efficiency of 75-80% and the infrastructure is much vaster and is easier to build, too.

Electric batteries will benefit from new technologies that will allow OEMs to save on their costs and customers to drive longer per single charge. The actual cells, composed of lithium-ions, will be soon abandoned in favour of new ones, which will adopt a lithium-air combination, where oxygen will be used instead of metal oxides. These studies are conducted by many prominent laboratories in the industry: LG Chemical, Samsung SDI, BYD, Wangxiang, IBM, AESEC and Tesla-Panasonic partnership, as well as the University of Cambridge. The expectations are to reach from 650 Km up to 800 Km per charge by 2025, and, according to Navigant Research, next-gen batteries will represent the 12% of the total market by 2023⁶⁰.

The future for the entire sector is still unpredictable. The shift to an electric mobility system will imply a twisting in the value chain of the automotive sector. As a result, internal combustion engines will become less important, while battery packs and charging infrastructure will assume a critical function for the development of the market. The growth of EVs and an increased demand for such products will be fundamental for OEMs like Tesla. The industry is expected to grow rapidly as new entrants are ready to join it in the foreseeable future, and new technologies will have an important influence for the increase in demand. More players in the sector would lead to a decrease of the prices and a faster success of the dominant design that is common for the whole industry. Much of the success of the next-gen technologies will depend on the governments' laws and regulations that would help the success of a certain technology over another one. The shifting of the demand to new emerging markets, located in Asia and South America, will set new challenges to carmakers, because even though these markets are far from being totally saturated, we are observing limited growth of sales there. According to IEA (International

60 Quattroruote, January 2016 issue, page 20.

Energy Agency), the sales of EVs are expected to see a 7% increase by 2020⁶¹. This trend should be confirmed due to the reduction of the production costs and the increase of the outputs (in term of both cell batteries and mass vehicles marketed).

3.7 Conclusions

The future of mobility is still uncertain and even the researchers and the main experts are still doubtful about what to expect in the short run. Oil prices and eco-mobility will gain an even higher relevance in future debates on the topic, as the two new alternatives that appear to be the most significant as prospects are electricity and hydrogen (fuel cells). The former has a higher reliability, as the first production models were sold in the late 20th century. Even with many flaws and problems this technology still caught the attention of the carmakers, which have used it in several ways, also in conjunction with traditional internal combustion engines powered by gasoline or diesel. Over the years, thanks to the refinements in the technique and with an increased need to find new alternatives, the huge improvements made have allowed battery-based engines to be compared to traditional ones on equal terms. The relative ease to build a network from scratch and the renewability of this source allow this kind of engine to be considered as a possible way forward by many OEMs. These vehicles provide a smooth ride, in complete silence, with zero emissions and can be used for both long and short distances, as opposed to the past when their use was restricted to urban boundaries due to their low reliability and limited range. This last problem, the so-called range anxiety, is something that has always kept many potential buyers away from such a choice; however the combination of an increased range (due to the use of better quality batteries, which can run more than 500 Km with a single charge) and the enlargement of the recharging infrastructure has led to the broadening of the customer base. The slow decline of ICE vehicles started when oil prices were high and has grown sharper during the last global downturn, when the awareness of

61 https://www.iea.org/publications/globalevoutlook_2013.pdf

finding new, more economical alternatives was raised. The announced incoming technologies and a global positive outlook on this source will enlarge the gap with other unconventional fuels while the spread of traditional fossil fuels is expected to become thinner. These doubts have been strengthened in these past months with scandals that have involved the entire automotive industry. The Volkswagen Group and Renault-Nissan Group are just two of the big names involved at this time, but many others are under investigations for possible frauds on emissions. Even Carlos Ghosn, CEO of the Renault-Nissan Group, stated that diesels have reached the top of their technology and a further growth is difficult to take place. The scandals affecting the sector are a proof that OEMs are struggling to face the increasing challenges promoted by national and international organizations. He continues by stating that the only way to renovate the industry is to shift to other sources to pursue the target of zero emissions and to invest on new technologies to improve the quality of the life on board, as the autonomous driving technology⁶².

Over the years, Tesla Motors has proved, model after model, that its brand is based on solid ground to defend the success gained so far and to increase it in the future. Even though the automotive industry is dominated by big players, with huge capitals involved and where minor players usually offer products for a niche market or aimed at very narrow segments, the Californian-based company has established its name by bringing utterly new features to the industry and technologies. Many of its success (and the one in EVs) will be related to the future trends of the sector and the governments' eventual policies. The most relevant segments in car costs are fixed, so it is important to increase the market share to be profitable. Its strategy to first target the narrow market of sports cars and then moving to a more profitable one appears to have worked so far, and the numbers could be even higher with the next launch of the new Model 3, which is expected to be presented in the first half of 2016. This model would permit the company to compete on a wider market, dominated by German sedans and in which price is an important issue, to increase the customer base and move to the mass market. The success of this vehicle will be crucial for the company, which has relied on bigger (and more expensive) vehicles

62 Auto, January 2016 issue, page 24

thus far. The fact that other premium carmakers are commercializing or expecting to launch electric vehicles in the near future is a clear sign that this technology is ready to be used in mass markets, which will enlarge the customer base. As the importance of traditional engines decreases in favor of electric powertrains and batteries, Tesla would also assume a relevant role in this context as a well-known battery packs supplier, in addition of being an industry player. This target can be achieved with the help of Panasonic, a renowned player in the battery industry that can provide the necessary knowledge, and through the implementation of the aforementioned GigaFactory, which can grant the company the necessary capacity to produce for both Tesla's needs and for the external markets. Opening its innovations to the public (and to competitors as well) is another move that can let the market reach critical mass, permitting faster innovations with lower costs. The same approach, totally new to this industry but very common in others (such as e-companies), has recently been used by Toyota too, in order to create a mass market for hydrogen vehicles⁶³. With the goal to increase its numbers, the company should rely on a wider network of dealers, modifying its direct sales-based model to a more open one, which should allow car sales through different channels besides the online one.

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TESLA MOTORS: A BUSINESS MODEL INNOVATION IN THE AUTOMOTIVE INDUSTRY

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Chapter I – Alternatives to gasoline and market analysis

The automotive industry has seen some big changes in the last few decades. The advent of new resources, together with the increase in oil prices, has encouraged car manufacturers to find new technologies. The first innovations in building processes were made by Ford and Taylor and were related to maintenance, affordability, cost and ease to use.

The 2008-2010 crisis was determined by the increase of the automotive fuel prices and by the slow sales growth of SUVs and pickup trucks. The offer of fuel efficient vehicles was scarce and this fact led to a fall in sales which, combined with the credit crunch, pushed customers to demand fuel efficient vehicles. In 2014 the sector saw a recovery which may be ascribed to the deep changes involving the sector, the development of new strategies to be less oil dependent, and improved safety standards.

In the last months, oil prices have reached their lowest since 2009, dropping about 40%. This downward trend is linked to an excess of supply combined to a slow growth in global demand. This situation is caused by the improved technology used in alternative solutions to oil, the new types of extractions, and geopolitical interests of the main oil producers. Saudi Arabia, the first oil producer in the world, can keep the price low as they have cheap extraction costs related to both low manpower expenses and a relative ease in extracting the raw material, differently from Iran, whose oil is costlier because it is located under deep waters, which results in a cost increase. Saudi Arabia wants to become once again the leader country in the OPEC cartel as it was in the past. In fact, low oil prices mean less power for OPEC countries, because the demand is inelastic and a limitation in supply means a lower impact on demand curve. Obviously the importing countries benefit from low oil prices since both their disposable income and their willingness to consume increase, with a positive effect on economic growth and GDP (Gross Domestic Product), while an increased oil price is better for exporting countries. The impact on the American economy is twofold, since the US is both the biggest producer and the biggest consumer. Oil prices have had a negative implication on the Russian economy. The reduction in petroleum prices has led to a strong depreciation of their

currency, the ruble, which has fallen by more than 50% since the beginning of 2014. Russian exports depend on oil prices. Iran has been affected as well. The country suffered an embargo to oil sales to Europe and the USA, restrictions on global trade and fines due to its nuclear program.

According to many researchers this phase of low oil prices may last until 2017-2018. Petroleum prices have a huge impact on currencies. Historically there was a logical correlation between oil prices and the US dollar, the only currency used to price petroleum: when the oil price is low the dollar strengthens and vice versa.

Among the various alternatives to gasoline, these are the main ones:

- Diesel: similarly to gasoline, it is derived from oil. Its price is lower in many countries and it produces less emissions, but the laws regulating it are stricter. Recently it has been questioned by many experts due to the scandals that have affected the industry (Volkswagen Dieselgate can be an example).
- Natural gas (Liquefied -LNG- or Compressed -CNG-): vehicles running on it still need a petrol engine but they are cleaner. They need an extra tank and their range is limited. As with diesel, this is also a nonrenewable source.
- Hybrids and Electric Vehicles (EVs): both of these use an electric engine powered by a battery pack: the former uses an extra internal combustion engine (ICE) to increase the total power and the range, while the latter employs only the power generated from batteries. EVs are zero emission vehicles (ZEV), hybrids emit less than a comparable ICE vehicle, with better performance.
- Hydrogen: these vehicles employ a battery engine powered by fuel cells. Those cars emit just water and they are considered ZEV. The main issues are the lack of an infrastructure and the price of the hydrogen itself.

The process of electrification in the automotive industry is the new target for many carmakers. Electricity represents the most tangible competitor to traditional petroleum-based fuels, also because the hydrogen technology is not as refined and still presents questions of adaptability to some common standards. The carmakers are implementing different solutions affordable in the long run to understand the real possibilities of these alternatives and to appreciate the effects on their

strategies. The evolution of technology has helped and led to several benefits under different points of view: new chemical materials are used to produce better batteries, with longer life and increased reliability; the development of a widespread infrastructure and the improvements in energy production, exploiting various methods to produce electricity from renewable sources; a better effectiveness in vehicles production, limiting flaws and weaknesses, alongside with incentives and bonuses given by governments to modernize car fleets, have brought the spread of electric engines (both hybrids and EVs).

In this way institutions play a central role in pushing the sales of all those alternatives to traditional combustion engines, conceding benefits in taxation like rebates on car taxes, offering the chance to lease batteries for a small amount, or the installation of private recharge columns for a part of the price. The industry will face the entrance of new players that will challenge traditional car manufacturers, mostly from emerging countries; they can be already part of the industry, or operate in different industries as well. All these dynamics will lead to an unpredictable scenario and the high level of uncertainty will force players to be very flexible and to sign strategic partnerships (as the Tesla-Panasonic one). According to Vitali (2012), we can find three types of agreements: partnerships among companies, partnerships between public and private firms and partnerships between electricity players and EV industry firms. The first category is the most common in the market, involving both carmakers and researchers. The second classification is intended to set the market standards: public companies of the world are studying different ways to unify those standards to facilitate the creation of a unique global market. One of the main concerns is the way of recharging the car batteries and the slowness of the operation with traditional power sockets. Many attempts have been made to make the process quicker but there are still some technical barriers that prevent these improvements: batteries are incapable of absorbing all the amount of power needed in a short lapse of time and the energy suppliers are still unable to give the quantity of electricity needed to reach a full charge. In 2013 Tesla Motors gave a solution to this matter by arranging some stations where it was possible to change the battery pack (battery swap) of its Model S in about one and a half minutes. The company is also involved in developing both

a public charging network (Superchargers) and domestic installations that are marketed in Europe and North America, until now. The third option, partnerships between electricity suppliers and companies of the EV sector, are signed to develop the existing infrastructure and to recycle the battery components when they end their life cycle. An example is the collaboration between Nissan and Green Charge Networks to sell second-life batteries out of Nissan Leafs or the partnership between Enel and Daimler (E-mobility Italy project) to increase the penetration of EVs and improve the infrastructure in the country.

The contribution of universities and research centers is fundamental, an essential block to build a network of information, strategic in an industry like this. Another aspect to be taken into account is the entrance into new markets, which implies new challenges and new problems to deal with. China, for example, is probably the biggest market for electrical innovations. Many carmakers like BMW and Daimler have entered the competitive Chinese market both to improve their presence there and to join the knowledge of local procedures.

The analysis of the automotive industry has been conducted using the Five Forces Model, originally identified and developed by Michael E. Porter, a professor at Harvard Business School and an advisor for the Boston Consulting Group. Porter applied microeconomic principles alongside with business strategy theories to analyze requisites in individual sectors. Today the model is a tool widely used to analyze the opportunities and overall competitive advantage of a product, a company or an industry. It consists of five forces that help define the intensity of the competition and the potential attractiveness of a certain area. This tool can be useful in analyzing a specific project and its strategic opportunities as well as the effectiveness and the profitability of a whole organization. The forces are identified within the model:

1. Threat of new entrants: this is determined by how easy it is to enter a specific industry. If it is profitable, rivalry should be very intense. This leads to falling profits and it is crucial to create high barriers to enter, to discourage new players to join the industry;

2. Bargaining power of buyers: a strong bargaining power is when buyers have the power to ask for lower price or higher quality product from their suppliers. A lower price is correlated to low profits, while higher quality means higher production costs and consequently low revenues;
3. Bargaining power of suppliers: the bargaining power allows suppliers to sell their products for a higher price to their buyers. They can sell lower quality products as well. The profits are directly influenced since they pay more for materials;
4. Threat of substitutes: a relevant menace is when buyers can find alternative products easily, with a better quality and buyers can switch from a product or service to another easily, with moderate costs;
5. Rivalry among existing competitors: this force has an enormous impact on the competition and the profitability of an industry. When the competition is stiff, firms have to contend violently for the market share, which leads very often to low profits.

This framework can be applied to the automotive industry. As for “threats of new entrants”, the industry is characterized by high barriers to entry, so that the menace from newcomers is low. Just a few of them reached success in the sector (Tesla Motors), while many others (Saab, Hummer) failed. Big groups and multinational companies benefit from scale and scope economies, key competences, patents and trademarks, research and development projects. Entering the automotive means investing a huge amount of capital, skilled managers and engineers and the time necessary to gain market acceptance and the customer’s trust, which is essential to generate sales and revenues sufficient to operate without the constant need of cash injections from investors and finance activities.

Reputation is crucial in this industry; established companies benefit from lower marketing costs and their brand value goes up while the customers' price sensitivity goes down. To raise the barriers, every car firm is increasing its production capacity to face the growing demand, since there are no tangible switching costs to move to a competitor. The recent history has proved that, besides Tesla Motors, no new player has entered the automotive in the last decades.

Regarding the bargaining power of buyers, the automotive industry has three main

buyer clusters: private customers, commercial companies and governments. Commercial companies, like rental or leasing ones, represent a conspicuous part of the sales for the car companies, while private buyers buy a new car less frequently on average. Buyers have great power in negotiating prices with local dealers, they compare the different alternatives and they choose the most appropriate to their needs after a long decision process. Switching costs are pretty much absent and customer loyalty represents a strategic aspect for each OEM which should be kept under control. Every carmakers' aim is to steal buyers from competitors in order to enlarge their customer base. In most of the automotive segments, customers are very price sensitive, so small variations in prices may imply a wider or a reduced customer base. Only in the S segment or in the super luxury one clients prove to be price insensitive, as price represents a status or a symbol of wealth for uncommon or special vehicles. Finally, the already stiff competition became even stiffer after the crisis because the producers needed to saturate their plants in order to survive.

Suppliers in the automotive sector are a very vast sub industry. Their bargaining power is very strong when they operate in a monopoly or an oligopoly. The presence of substitutes weakens their power, while being the sole producer of a certain good strengthens it. Bosch, for instance, is a German producer of electronic systems as ESP and ABS. A central matter is the switching costs from a technology to another one, which may prevent an OEM from changing its suppliers.

As for the threat of substitutes, the industry has recently seen increasing competition from new services. Car sharing and carpooling are two recent concepts that have renovated transportation, thanks to factors like the increase of fuel prices. This menace can be considered as a modest one.

As for the rivalry among existing competitors, inside competition is indeed stiff. Firms compete on two dimensions: price and non-price. Every carmaker has a precise brand identity that makes them recognizable from the others. This identity may be related to tangible assets like safety for Volvo or off-road capacities for Land Rover vehicles. Marketing is crucial to build and strengthen brand identities, both for OEMs and suppliers. Another crucial aspect is sales. Many producers rely on those markets which have shown the biggest growth levels, such as Asian,

Central and South American countries, while the traditional markets like North America and Europe do not have much room for growth.

Another trend in the industry is the concentration of the players. Since 2010, many car firms have struggled to survive, facing problems of overcapacity and overstaffing. That is the reason why more and more carmakers established new groups and partnerships. The exit barriers are high, as huge capitals are required to start a new business and just a few entrepreneurs have decided to enter the market. For all these reasons, we can consider the threat as low and the automotive industry is unattractive to newcomers even if some opportunities do still exist.

Some of the carmakers that operate in the luxury section of the automotive are: BMW Group, Audi (part of the Volkswagen Audi Group), Mercedes-Benz (Daimler AG), Volvo, Cadillac (General Motors), Jaguar Land Rover Group, Lexus (Toyota), Infiniti (Nissan).

Chapter II – The business model

The second chapter is about the business model, its definition and literature, its innovation and its relationship with strategy. After an introduction on the matter, the Business Model Canvas model by Osterwalder and Pigneur is presented and described.

There is not a widely accepted definition for a business model. This concept dates back to the mid-1990s with the advent of the Internet Era. The business model has been considered in many different ways: as a statement, an architecture, a structure template and a framework. The business model is an effort to split business activities into something simpler and more concrete. The representation of a business model has been an issue as well. It can be a value map or a conceptual modelling approach. In Johnson's view, a business model is made up of four complementary blocks that create and deliver value. They are: key resources and key processes, value proposition and profit formula. Zott et al (2010) stated that there is still not a common definition available, even if they agreed on some factors that outline a model: it is a new unit of analysis, whose center is value creation and it can be seen as a prospect on how firms do business, with an emphasis on their

activities. Other authors explained that a business model consists of two parts: the value proposition and the operating model.

Multiple definitions of a business model reflect numerous difficulties to find a “single best way” to define its innovation unambiguously. Business model innovation is necessary to spread new technologies as much as possible. According to Santos et al. (2009), innovation is when a new set of activities is introduced in the organization’s business model, which represent a change in the traditional products or services offered in the industry. In an IBM study, Nielsen et al. (2006) found three groups of innovation: industry model, revenue model and enterprise model. The former change implies diversification; the second is the change in the way the profits are made; the latter is the value chain modernization. The enterprise model innovation is possible if we shift our focus to the value network, that is to say suppliers, buyers, third parties. Chesbrough’s approach (2010) is focused on the importance of the testing phase and pilot programs when a company wants to innovate its model, because the base of a new feasible business model is uncertainty. In order to face the inevitable challenges that arise when a firm tries to innovate, a strong top management is required. The main challenges a company will probably face when trying to change its own business model are the following: the first mover advantage and the control on the coexistence of two models (Teece, 2010).

Business model theory and strategy have many points in common. This last topic is linked with business model innovation and the two concepts can be used together to handle strategic challenges. Some authors think that these two concepts are quite similar; however, others underline the importance to separate them. Strategy may be outlined as something that offers many useful applications to describe a business model (Santos et al., 2010) or it may be defined as “the firm's theory on how to compete” (Richardson, 2008). The business model differs from strategy because it is a conceptual framework that sustains the link between the theory on how to compete and the execution of this strategy. The business model framework, in Richardson’s view, revolves around three main components: value proposition, value creation and delivery system, and value capture. The first is the offer to customers, the second is about how the firm creates its competitive advantage, the

third is the way the firm generates margins. A well rounded model describes and coordinates the organization's activities to put its strategy into practice, even though strategy is not merely based on activities or satisfying the customer base. A firm must consider also its position in the value network, as a good business model increases value for the customers and the firm itself.

A business model can be analyzed using different models, among which there is the Business Model Canvas by Osterwalder and Pigneur. In their work "Business Model Generation" (2010), the authors present a business model classification that proposes some patterns with comparable features that are neither static nor exhaustive. In this work the two scholars present how to design a business model, which should be adapted to the challenges and obstacles each firm faces, as well as all those critical factors every organization should target to reach success. The approach proposed delineates three different categories on the same hierarchical level, using a bottom-up view. Business models have common starting points upon which every firm can customize its personal one, and this process is composed of five phases: mobilize, understand, design, implement and manage.

The Business Model Canvas was first introduced by the authors in the aforementioned publication. The book is a proper management handbook with practical tools to help the reader implement the Model in a practical way. The structure of the Canvas is made of nine "building blocks", which display the logic of how an organization plans to make profits through these four main subjects: offer, customers, financial viability and infrastructure. The model is similar to a scheme where the user can implement its strategy by using structures, systems and processes. The "building blocks" are the following:

1. Value Propositions: in this block there are all those products or services that are valuable for a particular customer segment. They are aggregations of benefits for customers. The value generated can be both quantitative and qualitative. A successful value proposition may offer something more or something new to an existing market.
2. Key Partnerships: in this block there is the network that allows a business model to work, that is, the crucial relationships established with suppliers and

partners. There are four types of partnerships: coopetition, strategic alliances, strong relationships firm-supplier and joint ventures.

3. **Key Activities:** they are the core task a company must perform to make its model work. Those activities are business model specific and can be further divided into: production, problem solving and platform/network.
4. **Key Resources:** they are the main assets a firm needs to build a solid business model. As for the activities, these are also specific and can be classified into: physical, financial, human and intellectual.
5. **Customer Segments:** this block outlines the various groups of buyers or firms that are the company's target. The company can divide this group into various subgroups, with common attributes as behaviors or needs. The business model is customized for the customer base chosen.
6. **Customer Relationships:** these are the relations a company sets up with its customer base. The overall customer experience is affected by the customer relationships called for by a firm's business model.
7. **Cost structure:** this block defines every cost due to business model operation. Every activity incurs costs that can be estimated after defining key resources, activities and partnerships.
8. **Revenue Stream:** is the cash generated by a firm from each customer segment. Different customer segments correspond to different price policies and diverse price mechanisms. The pricing can be fixed or dynamic.
9. **Channels:** this block delineates both the company's communication strategy and the channels through which it reaches its customers to deliver the value proposition. They can be both direct and indirect.

Chapter III – Tesla Motors and the study of its business model

Tesla Motors was founded in 2003 in San Carlo, California, by Martin Eberhard and Marc Tarpenning, gaining the interest of Elon Musk, who was to become the current CEO. He is a very famous entrepreneur for its renowned companies such as Paypal and Zip2. He moved the company's headquarters to Palo Alto, California, where there are about twelve thousand employees. The aim of the company is to build reliable electric cars that are available to the mass market. Tesla's mission is

to accelerate the transition to a world of sustainable transportation. To meet its goal of producing 500,000 units by 2020, Tesla alone will use the complete current production of batteries in the world. That is the reason why the company decided to build its own factory named the Gigafactory. The plant, which was born from the Tesla-Panasonic agreement, will provide batteries primarily for Tesla Motors, but they expected to sell their excess of production to other competitors in the automotive sector. The first model of the company is the Roadster (produced from 2008 to 2012), which was partially built by Lotus, with the exception of the powertrain. This vehicle is a two-seater convertible sports car, a niche product, with only 2,500 units for sale. The money earned from the Roadster helped the company to project and assemble the Model S, which is a five-door all-electric sedan that has won many prizes. This model was launched in 2012 and is sold in different steps of power: from the 60 Kw/h to the 90 Kw/h version, with sports car's performance. The configuration is both rear-wheel drive and all-wheel drive, with the use of advanced technologies and refined materials. In 2015, the car passed the 100,000 units sold mark. In September 2015 Tesla launched a full-size SUV named Tesla Model X. It is a premium crossover built in the same factory of the Model S, with the same engines and all-wheel drive. Many important features are taken from the sedan, such as the safety, which is the best in the SUV segment, and the inside room, which can accommodate up to seven people. This is made possible thanks to electrical engines that occupy less space than a traditional one and are placed under the cabin, alongside with batteries. As for the future, Tesla announced the new Model 3, to round up its strategy, started with the Roadster and continued with the Model S. The launch is expected by 2016, but the production would start in late 2017. The model 3 will have the hard task to give Tesla the chance to compete against the main German competitors, with a tag price around \$35,000 to aim at the mass market. The success of this vehicle will be very important for the survival of the company itself. According to Musk, the future for Tesla will see further improvements in technology features as the Autopilot one, the autonomous driving technology that is present in every Tesla model. The company also has developed both a network of fast rechargers, named Superchargers, where the recharge is free for its vehicles and a battery pack that allows to recharge the car and the entire

house with the energy generated (Powerwall and Powerpack for industrial purposes).

The two main Tesla factories are located in California (Fremont) and in Holland (Tilburg, intended only for the European models). Musk's creations have big battery packs to reach higher ranges when compared to other EVs. Tesla now has the chance to save costs through an increase in production volumes, in order to let prices fall and enjoy scale economies. This is probably the most important reason that lies behind the building of the Gigafactory. However, sales must increase significantly to justify this strategy, otherwise the company will be stuck with a huge investment and poor revenues.

Peter Carlsson, Supply Chain V.P. at Tesla, helped the company innovate its supply chain. The company knows well that being a small carmaker implies that every decision should be made considering all those possible consequences that may have negative implications for the future of the company. Tesla has always wanted to have its own network and to produce unique components, in order not to be replicated by competitors. Differently from other carmakers, Tesla has the unique opportunity to work alongside with suppliers outside the traditional auto supply universe. Location is an important strength. Being the only carmaker to operate in the western United States, where there are many important technological firms (Silicon Valley), is a strong point. “We are very close to our biggest market and we are very close to our development, which means we can do drive, design and technology implementation really fast” (Carlsson). Their goal is to develop a new car in less time than any other competitors and, to do so, they need a faster and more agile supplier base than any other OEM. So far, this plan has been a success, but the beginnings were not easy because of the downturn period and the company's name, which was not as important as it is these days.

The following part will be about the company analysis using the Business Model Canvas by Osterwalder and Pigneur presented previously. Tesla Motors is an example of how a start-up can revolutionize an industry like the automotive one. Starting with the Value Proposition Block, the company tries to maximize the perceived value to its customers by offering different possibilities to customize its

vehicle (power, interiors, options). An important new characteristic that differentiates Tesla vehicles from competitors' is their range, which is comparable to traditional ICE vehicles. The widespread Superchargers network allows to further increase it without any additional cost. The technology offered on the Californian-based firm's cars is revolutionary. The Model S was the very first vehicle to offer an autonomous driving system, which will make the car fully automated by 2018, according to the founder. Tesla is also strategic to those OEMs that rely on its supply of drivetrains and batteries, which are expected to grow in the near future, when the Gigafactory is operative.

As for the Key Partnerships Block, Tesla has signed some important accords over the years (Mercedes-Benz and Toyota). These alliances were made to develop the battery technology, adopted in some models of both OEMs. In 2013, the Californian company announced another strategic partnership with Panasonic Corporation, in which the latter would expand the production of automotive-grade battery cells for the former. The two companies have developed next-gen battery technology and are committed together in the construction of the Gigafactory, for which Panasonic is the main sponsor. Another partner is NVIDIA, the supplier of all the electronic equipment in the Tesla's lineup models. Other partnerships can be seen in Musk's other companies (SolarCity and SpaceX).

Tesla's Key Activities are car production and manufacturing (which represent the biggest part of its revenues), even if it has recently added the energy storage activity. Research and development (R&D) is an important factor for the firm as it has always wanted to modify traditional ideas about mobility. The function has no structured department, but its engineers work on innovative ideas on a regular base (R&D centers are in California and soon in England too). The Superchargers network, completely developed by Tesla, can be listed as another crucial activity as well as the sales of electric powertrains to competitors.

In the Key Resources Block, patents have an important role in the technology development. Tesla ideas are open source for the growth of the industry, so that anyone interested can implement these. Human talent can be seen as a strategic asset to the firm, as the workforce is shared among other Musk companies. In the future, the development of the GigaFactory, completely powered by renewable

sources, will allow the firm to sell the excess energy to utilities and should reduce the price of batteries for automotive and domestic purposes.

R&D activities are one of the main items in the Cost Structure Block. The trend of these costs is expected to go up, exceeding the \$179 million mark of 2015. Unlike any other OEM, Tesla has approximately no expenses in the marketing field, since it uses an unconventional approach to delivery its value proposition. Another expenditure is for the Tesla galleries, i.e. firm-owned retail stores, as the firm uses a direct sales model, with no traditional dealers and dealerships. Tesla is an example of a value-driven business.

The main revenues come from the two fields in which the firm operates: energy and vehicles. At the beginning, Tesla has had a long period of losses, due to the employment of new features and technologies and the first profit came in 2013. A relevant item is the selling of ZEV credits, awarded by the CARB to all those OEMs that comply with the air pollution limits, to competitors, which has yielded the company around \$76 million in the third quarter of 2014 alone. Finally, the sales of electric powertrains represent a key revenue stream to the firm.

As for the Customer Relationships block, Tesla is famous for the presentations in its Fremont facility, where the company offers test drives to let the potential buyers feel the difference with a traditional car. Model S won many prizes and has reported a very high level of customer satisfaction. Tesla offers the Best Resale Value Guarantee Program to customers, to keep the value of their cars higher than any direct rivals, and a Business Leasing Program to business clients.

The company delivers its value proposition to early adopters of EVs and car enthusiasts with an above average income. The launch of the Model 3 will see the company competing in a more mass market segment, which should broaden its customer base.

The channel used by the company is direct. The cars are ordered through an online reservation or at the Tesla's galleries. During the years, the direct sales model has created many issues for the firm with United States local laws; however, the company now can sell its vehicle almost everywhere.

Tesla Motors has offered an innovative business model when compared to traditional ones, in many ways more similar to a high-tech company than a

carmaker. The strategy used, entering from the high-end markets then moving to mass ones, is the opposite of the usual one, where the leading target is the mass market and then there is a move upwards to more luxurious segments. The example of open ideas and patents, to create a more affordable market, which has been recently adopted by Toyota in hydrogen technology is a totally new conception in the industry. With such innovative products, Tesla adopted the direct sales model to market its cars, going against an old established system. Unlike any other player, Tesla will produce its battery and packs internally, when the GigaFactory is operational. This example has been recently adopted by many other players like Nissan or Ford. Tesla's Superchargers infrastructure, which is the first example of such kind of innovation in the industry, and the possibility to change battery in some particular stations (battery swap) are two new features brought by the company to the automotive field, with the goal to reduce the "range anxiety" that prevents many possible buyers from purchasing an EV. Other relevant distinctions with traditional OEMs are that Tesla's marketing expenditures are almost zero, since the company relies on other unconventional methods (word-of-mouth and leveraging the media and the press) and the way the firm generates revenues, through the sale of powertrain components and ZEV credits, differently from any other player.

The future for the automotive sector is still uncertain due to the many variables involved. The two main alternatives that are gathering a lot of interest are hydrogen and electricity, especially after the recent scandals that have affected the whole industry. Producing hydrogen is still very complex and expensive and it is not very renewable as of now, if the entire cycle of production is considered. Fuel cell-powered engines need to increase in sales to lower costs and to solve important issues, such as the total lack of an infrastructure in many parts of the world and its poor efficiency compared to ICEs and electric ones. The shift to a new mobility system will imply a twisting in the value chain of the automotive, as the focus will shift from engines to batteries (used in both EVs and fuel cells). Much of the success of the next-gen technologies will depend on the governments' laws that will drive the success of one technology over another one in the industry. More players in the sector would lead to a decrease of the prices and a faster success of a dominant design, which will be common for the whole industry. According to many car

companies and car experts, electric vehicles will play an important role in the near future and important goals are set by public institutions in reducing emissions and increasing sustainability. For that reason, many traditional carmakers have added some all-electrical models or expect to extend their lineup with such models soon. Actual electric vehicle sales account for less than the 1% of all the vehicles sold globally, but this number is expected to increase rapidly. In this segment Tesla Motors fulfils a remarkable role, contributing with original choices and alternatives. Traditionally, EVs were considered to be slow, unreliable and unusable for long distances; Tesla has proven the industry that these limits can be overtaken by investing in new technologies. The growing Superchargers network represents a strong asset for the firm and its importance will increase in the future, as it has no direct competitors.

Over the years, Tesla has proved that its brand is based on solid ground to defend the success gained so far and to increase it in the future. The Californian company has established its name by bringing all new features and technologies to the industry. The future launch of the Model 3 and the GigaFactory will be relevant for this success to continue. With the goal to increase sales, the company should rely on a wider network of dealers, modifying its direct sales-based model to a more open one, with multiple channels.

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