

# Pestle analysis of the car industry



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This report is a PESTLE analysis of the Car Industry. We have looked at Political, Environmental, Social, Technological, Legal and Environmental issues that affect the car industry based on innovations that have and are taking place. It is political factors which are creating market pulls on innovation in the automobile industry and having the greatest affect on the innovations which are produced. This is because the governments of many countries are concerned about global warming and lowering their emissions. And one way to lower its affects is for the automobile industry to create innovations which have less of an impact on the environment. The main ways through which governments are intervening are, Partnership for a New Generation of Vehicles, FreedomCAR, emission standards and the Kyoto Protocol.

The number of accidents and alcohol related accidents, which are social factors, are starting to increase. This has caused the automotive to innovate to help reverse this increase and lower the number of accidents on the road.

## **2. INTRODUCTION**

The aim of this report is to have an insight of the automobile industry, how it has been affected by innovation and what actions the car companies have taken in terms of innovation. We will analyse the external factors of the industry through a PESTLE analysis. The word PESTLE is an abbreviation of Political, Economic, Social, Technological, Legal and Environmental.

A PESTLE analysis is “ an audit of an organisation’s environmental influences” (CIPD, 2009) that are having an effect on the organisation/industry. The analysis can lead to seeing possible opportunities

that lie within the industry and where the major influences on the industry come from.

An innovation is the “ generation of a new idea and its implementation into a product, process or service” (Urabe et al, 1986, p. 3). An innovation can fall under one of the following categories:

“ Product - Changes in the things (products/services) which an organisation offers.

Process - Changes in the ways they are created and delivered.

Position - Changes in the context the product/services are introduced

Paradigm - Changes in the underlying mental models which frame what the organisation does.” (Tidd, Bessant and Pavitt, 2005, p. 10)

We will refer to this classification of different types of innovations throughout this report. The Henderson and Clark model of innovation will also be used, and according to it there are 4 types of innovation:

Incremental innovation is the enhancement of existing products or services. (Gaynor, 2002, p. 25)

Modular innovation is when new knowledge is required on a product as one part of a product is significantly improved but the overall the architecture of the product remains the same. (Innovation Zen, 2006)

Architectural innovation “ reconfigures a system of components that constitute a product, process or service” (Gaynor, 2002, p. 26).

Radical innovation is the “ introduction of new products or services that develop into major new businesses or spawn new industries, or that cause significant change in a whole industry” (Gaynor, 2002, p. 27).

### **3. THE PARTNERSHIP FOR A NEW GENERATION OF VEHICLES**

The Partnership for a New Generation of Vehicles (PNGV) was a program that started in 1993 by U. S president Bill Clinton and vice president Al Gore (PNGV, 2009). The partnership was between many government agencies including the United States Council for Automotive Research. (USCAR) This consisted of the big three American automotive manufacturers (Ford, General Motors and Chrysler), over 300 suppliers of automotive parts, small businesses, Universities and federal Labs (see appendix 1) (Turner et al, 2000).

In this partnership the U. S government would match the amount of capital the big 3 manufacturers invested into the research of technologies that would help achieve the partnership’s objectives and the big 3 manufacturers, small businesses, universities and laboratories would carry out the research (Jewett, 1997).

When this program first started, it had 3 objectives:

To increase the competitiveness of the U. S automotive industry.

Create a mid -sized vehicle that has the fuel efficiency of 80 miles to the gallon whilst keeping the performance and cost similar to those of vehicles

that were available in 1993. This vehicle would need to apply to the emissions standards of 2004.

Employ the innovations that were created in the program to conventional vehicles once the innovations became commercially viable. (Fosgard, 1995)

The government created this partnership for two main reasons:

The first is that they wanted to lower America's need on foreign oil (an economic factor) through the fact that more efficient vehicles would use less oil and this would increase America's national security (a social factor) (PNGV, 2009) because the country would be less reliant on other nations for fuel.

Secondly, the U. S government wanted to lower the amount of harmful greenhouse emissions that the United States emitted as a whole and lowering the level of emissions that the cars in the U. S was one way to fulfil this reason (PNGV, 2009). This was an environmental factor causing the creation of PNGV.

There was a requirement of the vehicles that were to be created in 2004, which was that they should be able to travel a certain distance on a full tank of fuel. Also there were short deadlines within the program an example was that by 1997 production prototypes of the vehicles that were most likely to meet the objectives were to be created. These two factors meant that architectural innovations over the regular internal combustion engine like a fuel cell or pure electric vehicle couldn't be pursued because they could not

meet the range requirement and required much longer to research than the deadline allowed (Sperling, 1996).

These are architectural innovations as they reconfigure the power source of the vehicle and no longer use an internal combustion engine. Such innovations would have been better at meeting objectives as they required little or no oil and emitted far less greenhouse gases.

The only option available to the automobile manufacturers was a hybrid electric vehicle. A product and modular innovation over internal combustion engines as they use a regular internal combustion engine in partnership with one or more electric motors (Toyota, 2009). The hybrid electric vehicle was originally created in 1899 by Dr. Ferdinand Porsche (Truett, 2006), which makes the hybrid the big three manufacturers created was an incremental innovation on Porsche's hybrid vehicle as their version was an enhancement of an existing technology.

In the end no vehicles were produced which could meet all the requirements (Washington Times, 2009) so it could be seen as a failure. However many incremental innovations were created because of this partnership. Examples are, all of today's hybrid vehicles use some battery technology that was created in PNGV (Business Week, 2006), and DaimlerChrysler made large strides in technology which makes vehicles lighter, up to 46% lighter than conventional vehicles which they use in their latest models (Vasilash, 2000).

Overall PNGV was a political factor affecting innovation because it was initiated by the government. This caused market pull on innovation in the automotive sector as the innovation was being carried out to meet a specific

need. A marketing pull is when a stimulus of innovation comes from the needs of the society or from a particular sector of the market (Open University, ND). This political factor was caused by environmental, social and economical elements. Even though the government wanted to free themselves from the need on foreign oil the conflicting objectives of the partnership did not allow pursuit of architectural innovations which would have allowed this but many useful incremental innovations did come out of the partnership.

#### **4. FREEDOM CAR PROGRAM**

Due to the failure of PNGV the U. S government created the FreedomCAR program (FreedomCAR, 2002). This program is a partnership between the U. S government, USCAR and five major energy companies (Green Car Congress, 2008). The program is based on the following principles:

Freedom from dependence on imported oil.

Freedom from pollutant emissions

Freedom for Americans to choose the kind of vehicle they want to drive, to drive where they want and when they want.

Freedom to obtain fuel affordably and conveniently. (U. S Department of Energy, 2009)

The program is based on similar economic, social and environmental issues as PNGV however the latter 2 principles are further social factors that caused the creation of FreedomCAR.

The long term focus of the program is to see whether hydrogen fuel cell vehicles can become the norm in the U. S by 2015 (Green Car Congress, 2005), this is because as previously explained the vehicles are an architectural innovation that do not require oil and produces no harmful emissions. The short term focus is to make internal combustion vehicles and electric hybrid vehicles as efficient and environmentally friendly as possible (Green Car Congress, 2005).

In terms of innovation in the automotive industry, the partnership is exploring research in a wide range of areas from creating lithium ion batteries for use in vehicles to making carbon fibre much cheaper to produce (Business Week, 2006). These are incremental innovations as they are improvement on existing technology and so it may seem that they are not pursuing the long term focus of the partnership but these incremental innovations are required to make the architectural innovation possible (Business week, 2006).

Just like PNGV, FreedomCAR is a political element that is having an effect on innovation in the automotive industry as it was created by the government because of several economic, social and environmental issues. The difference between the two programs is that FreedomCAR lacks restrictive deadlines and its main focus is architectural innovation which will hopefully meet the principles set.



## 5. CAR EMISSIONS

Car emissions have become an increasingly important issue for car owners and reducing individual's carbon footprints. Buying smaller cars have been encouraged to car owners by the media and many politicians. (Quirk, 2008)

The European Union is trying to reduce the CO2 emissions from cars and also improve their fuel efficiency which led to the creation of the ACEA agreement. The agreement is between the European Automobile Manufacturers' Association (ACEA), the Japan Automobile Manufacturers Association (JAMA), and the Korea Automobile Manufacturers Association (KAMA).

The table below shows how these targets can change into fuel efficiency standards for petrol and diesel cars according to the ACEA agreement.

### **Relationships between CO2 targets and fuel consumption**

**Year**

**Target**

**Petrol (Litres of fuel consumed per 100 km)**

**Diesel (Litres of fuel consumed per 100 km)**

2012

120 gCO2/km

5. 1

4. 6

2008

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140 gCO<sub>2</sub>/km

5. 9

5. 4

A failure for the car industry to meet the 2008/9 targets could lead to mandatory regulation in the future (Rajagopalan & Saini 2007).

For example BMW has built the Mini Cooper Diesel which meets the targets set above as they are below the criteria, making it an efficient car of its time. 64mpg is the cars combined fuel consumption and 104g/km of carbon dioxide is emitted. The 5-series saloon is also achieving these quality emissions “ where the 2. 0 - litre diesel version emits just 136g/km - about the same as a hatchback.” (Quirk, 2008)

The Society of Motor Manufacturers and Trades chief executive “ said that average emissions have fallen every year during the last decade. Through technological innovation and consumer education, manufacturers have made genuine progress towards meeting tough environmental targets,” (Young, 2009)

Several manufacturers including Saab think the solution to reducing vehicle emissions is through the use of Flex-fuel cars or bio powered cars. These types of vehicles “ can run on emissions free E85 ethanol or petrol or a combination of the two” (Quirk, 2008) Flexible fuel vehicles have been in production since the 1980s and have been made available to many customers who might not even know they have this type of engine in their car. (U. S Department of Energy, 2009). Flexible fuel vehicles do not

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experience any loss of performance when using E85 ethanol. “ However, since a gallon of ethanol contains less energy than a gallon of gasoline, flexible fuel vehicles typically get about 20-30% fewer miles per gallon when fuelled with E85.” U. S Department of Energy (2009).

Flexible fuel vehicles are an incremental innovation on regular internal combustion engine vehicles as most of the technology is the same. The only difference is that they can run on a different type of fuel. Flexible fuel vehicles produce no harmful emissions so they will help meet emissions targets but first consumers need to switch to using e85 ethanol and this will only happen if the price of e85 is not high as it has lower fuel efficiency than petrol.

E85 ethanol is still some way off from being readily made available to the public because there is a lack in the number of refineries to create the fuel and pumping stations to provide it. (Quirk, 2008). Flexible fuel cars are in the fluid phase of the Abernathy and Utterback model (see Appendix 3 for full definition) as a core component (the e85 ethanol fuel) is not widely available. This lack of availability of the fuel is also slowing the innovation of flexible fuel vehicles as the fuel is not there to run flexible fuel vehicles so the vehicle manufacturers are not going to put their full effort into improving the technology.

## **6. CONVENIENCE AND SAFETY CAR INNOVATIONS**

There have been many road accidents and the main contributors to these are alcohol and careless driving. To discourage drink-driving there have been many campaigns to reduce “ the number of casualties from road accidents.”

(National Statistics, 2009). In recent years there has been an increase in accidents involving alcohol compared to a sharp fall in the mid-1980s and mid-1990s. In 1986, 560 people were killed compared to 1000 people in 2000. (See Appendix 2 for full statistics) (National Statistics, 2009). Also according to Volvo, driver sleepiness is responsible for more road deaths than alcohol. In Germany, it is thought to account for a “ quarter of all fatal accidents and in the US about 1, 500 deaths a year.” (Automotive Engineer, 2006). This has therefore meant that car manufacturers have created innovations to help prevent these from happening again such as:

Volvo has created the collision warning system to help prevent accidents from occurring. This system uses a wide angle sensor to scan around the car for any objects that may be near much like radar technology. A signal alerts the driver to react, if for example the car is approaching a pedestrian which will give the driver enough time to divert the vehicle away from the pedestrian (Quirk, 2008).

To help lower alcohol related accidents Saab has created the Alco-Key. Saab has begun fitting this device as standard in their cars; it is a “ fully integrated system that requests the driver to blow into a wireless hand-held unit before driving the car. Their breath is then analysed and if the blood-alcohol limit is exceeded, a red LED will appear and the engine will not start” (Quirk, 2008).

Volvo has introduced the Sleep Detection system which includes Lane Departure Warning (LDW) and Driver Alert Control (DAC). “ LDW uses cameras located between the windscreen and the rear view mirror and monitors the car’s position between the road markings. Only after a certain

speed is reached does the system become active, if the car then wanders across any lane markings without using an indicator, the driver is audibly alerted" (Quirk, 2008).

These creations are product innovations as they are new innovations that car manufacturers have created and offer with their vehicles. The fact they have been produced as a response to help prevent alcohol related accidents, which is a social factor, makes them a response to a market pull.

The fact that the Alco-key is the first system that prevents drinking driving could lead to Saab gaining the first mover advantage, if such technology was to become mandatory. This advantage would be kept through the fact Saab has a patent on the technology (Free Patents Online, 2009) and a patent prevents other companies from using the technology without Saab's permission.

## **7. THE KYOTO PROTOCOL**

The Kyoto Protocol was an international agreement originally created in 1997 but in 2005 it was made legally binding, and is linked to the United Nations Framework of Climate Control. The agreement set targets for industrialised countries to cut their emission of harmful greenhouse gases (carbon dioxide, methane, plus several others) which are partially the cause of the increase of global warming. The countries that signed the Kyoto Protocol agreed to set their own targets e. g. Japan agreed to meet a 5% cut in emissions by 2008-2012 and most EU countries agreed to an 8% cut (BBC, 2005).

Carbon dioxide is created by internal combustion engine vehicles and given off from their exhaust; therefore it's a cause of global warming. To meet the

targets agreed, governments and automobile manufacturers need to work together. In 2007, the Japanese government agreed to spend 200 billion yen on the improvement of hybrid vehicles to lower their emissions (Reuters, 2007) as HEVs emit less harmful gases than a petrol engine (What Green Car, 2009).

Also in Japan, Toyota has achieved its target of reducing carbon dioxide emissions, from 2.12 million to 1.78 million tons. It did this through decreasing their energy usage by 40% and “replacing multiple production lines with single lines capable of producing different vehicles” (I. Rowley, 2005). The change in their use of production lines which increased efficiency is a process innovation as it is a change in the way the vehicles were created. Both of the above examples are market pulls on innovation for the fact the change is a response to a market/government requirement.

The Kyoto Protocol is a political factor based on an environmental factor (global warming), having an effect on innovation as the governments in many countries are trying to adhere to it and to adhere to it requires the government to intervene change the vehicles that the automobile industry produces and the way they are produced.

## **8. CONCLUSION**

It is clear that out of the PESTLE factors, the main one which is having the greatest effect on innovation in the automobile industry is political. Many governments are concerned about global warming and it is the automotive industry which is adding to worsening of the effects of global warming through the emissions of their vehicles and their manufacturing plants. This

has led to governments to intervene in the automotive industry to make vehicle manufacturers improve their own vehicles and facilities, through innovations which have mostly been incremental. However FreedomCAR looks promising for the environment as it is hoping to create an architectural innovation, the hydrogen fuel cell vehicles that have little impact on the environment, and help meet the governments' reason for creating these market pulls on innovation. It also lacks the restrictive deadlines and conflicting objectives that PNGV had which will help increase the program's chance of success. So it may be political factors that are having a direct affect on innovation but these political influences are mainly based environmental factors.

Social aspects are also having an affect on innovation through the improvement of safety of the vehicles that are produced. The increase in the number of accidents and alcohol related accidents has led to a market pull on innovation for vehicle manufacturers, as they have created these improvements in safety due to this increase.

As it is the political factors that are directly influencing the innovations that manufacturers create, means they are not doing it in response to the environmental factors themselves. This means the automotive industry are not wanting to help lower their affect on the environment even though it is them adding to global warming.

## **9. RECOMMENDATIONS**

This report shows that the vehicle manufacturers have only begun being environmentally concerned because of political factors their having on the

industry. We would recommend that the manufacturers start thinking in a more environmentally friendly manner e. g. by investing in new machinery and production facilities similar to those of Toyota which emit lower carbon emissions.

Another recommendation is the manufacturers start to create more flexible fuel vehicles and promote their availability which will increase the likelihood that consumers will switch to them. But also for consumers to switch will require that more refineries which can produce the e85 ethanol needed for the vehicles to be created. Also the price of the fuel will need to regulate as to prevent it from being too high as consumers may decide not to use e85 for the fact it has a lower fuel efficiency than petrol.

## **10. APPENDIX**

### **Appendix 1**

Diagram showing the structure of PNGV.

### **APPENDIX 2**

Casualties from road accidents involving illegal alcohol levels, 1986-2000

United Kingdom

Thousands

Source: Department for Transport, Local Government and the

Regions; Royal Ulster Constabulary

Casualties from road accidents involving illegal alcohol levels, 1986-2000



Thousands Serious Slight All Fatal injuries injuries casualties

1986 United Kingdom

1. 03

6. 57

19. 60

27. 20

1987

0. 93

6. 01

17. 99

24. 93

1988

0. 81

5. 18

17. 25

23. 24

1989

0. 84

4. 92

17. 05

22. 81

1990

0. 80

4. 23

16. 01

21. 04

1991

0. 69

3. 72

14. 00

18. 41

1992

0. 69

3. 40

13. 28

17. 37

1993

0. 57

2. 82

12. 25

15. 63

1994

0. 54

2. 95

12. 26

15. 75

1995

0. 56

3. 10

12. 89

16. 56

1996

0. 60

3. 13

13. 93

17. 67

1997

0. 57

3. 07

13. 90

17. 55

1998

0. 49

2. 68

13. 25

16. 42

1999

0. 48

2. 60

14. 64

17. 72

2000

0. 56

2. 71

15. 75

19. 02

Source: Department for Transport, Local Government and the  
Regions; Royal Ulster Constabulary

National Statistics (2009)

### **Appendix 3**

The Abernathy and Utterback model says that technology can be in 3 different phases, fluid, transitional or specific.

Fluid - Many uncertainties with the technology and in the market prevail. Large amounts of experimentation going on with the technology and core components are not fully available/developed. Very few competitors.

Transitional - Firms are learning more about the technology and a dominant design has been accepted by many of the competing firms.

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Specific - Companies are creating incremental innovation on the dominant design and are targeting specific market segments

(Innovation Zen, 2006)