Dyson Electric Vehicle Production Plan

December 12, 2017

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Module: ECN3017

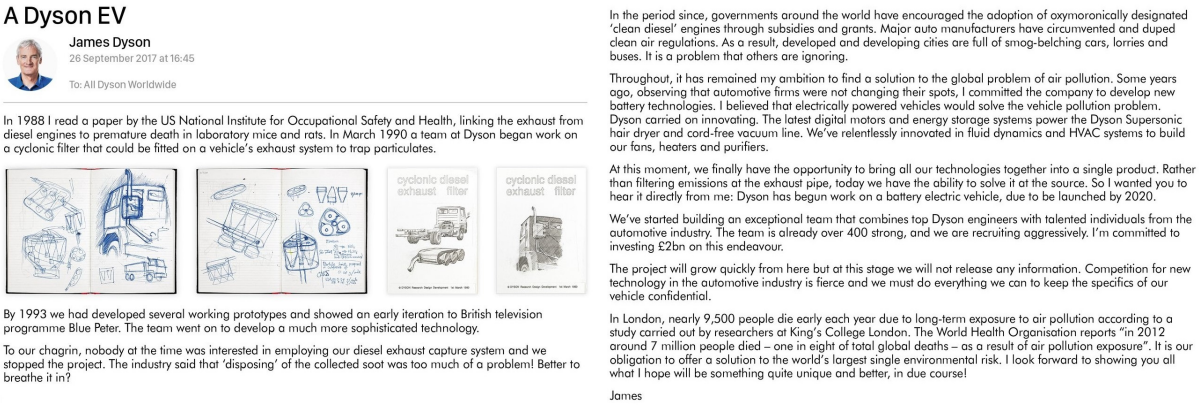
2020 words

Assignment description

James Dyson has announced that his company will bring an electric car to market in 2020. Applying theories of international trade and using examples from both the consumer electronics industry and the automotive industry, critically evaluate factors Dyson should consider in determining the nature and location of the various stages of design, production and sales/marketing of these electric cars.

Lately, an e-mail has been purposely leaked from the Dyson headquarters, in which CEO of the company confirmed his intention of starting a venture into the electric vehicle market. (Dyson 2017*a*) Even though the decision may sound surprising at first, there are many aspects to it, which argue for its reasonability.

Due to James Dyson's claim "It has remained my ambition to find a solution to the global problem of air pollution" (Dyson 2017*a*), an incentive of mass production of the Dyson electric vehicle exists. In order to complete such task successfully while reaching the Asian market first, proposing a viable supply chain model is crucial. This essay will therefore review theories developed by Porter (1998*a*,*b*) before examining Dyson's situation, identifying potentially feasible paths the business may take.



A Dyson EV

James Dyson
26 September 2017 at 16:45

To: All Dyson Worldwide

In 1988 I read a paper by the US National Institute for Occupational Safety and Health, linking the exhaust from diesel engines to premature death in laboratory mice and rats. In March 1990 a team at Dyson began work on a cyclonic filter that could be fitted on a vehicle's exhaust system to trap particulates.

By 1993 we had developed several working prototypes and showed an early iteration to British television programme Blue Peter. The team went on to develop a much more sophisticated technology.

To our chagrin, nobody at the time was interested in employing our diesel exhaust capture system and we stopped the project. The industry said that 'disposing' of the collected soot was too much of a problem! Better to breathe it in?

In the period since, governments around the world have encouraged the adoption of oxymoronically designated 'clean diesel' engines through subsidies and grants. Major auto manufacturers have circumvented and duped clean air regulations. As a result, developed and developing cities are full of smog-belching cars, lorries and buses. It is a problem that others are ignoring.

Throughout, it has remained my ambition to find a solution to the global problem of air pollution. Some years ago, observing that automotive firms were not changing their spots, I committed the company to develop new battery technologies. I believed that electrically powered vehicles would solve the vehicle pollution problem. Dyson carried on innovating. The latest digital motors and energy storage systems power the Dyson Supersonic hair dryer and cord-free vacuum line. We've relentlessly innovated in fluid dynamics and HVAC systems to build our fans, heaters and purifiers.

At this moment, we finally have the opportunity to bring all our technologies together into a single product. Rather than filtering emissions at the exhaust pipe, today we have the ability to solve it at the source. So I wanted you to hear it directly from me: Dyson has begun work on a battery electric vehicle, due to be launched by 2020.

We've started building an exceptional team that combines top Dyson engineers with talented individuals from the automotive industry. The team is already over 400 strong, and we are recruiting aggressively. I'm committed to investing £2bn on this endeavour.

The project will grow quickly from here but at this stage we will not release any information. Competition for new technology in the automotive industry is fierce and we must do everything we can to keep the specifics of our vehicle confidential.

In London, nearly 9,500 people die early each year due to long-term exposure to air pollution according to a study carried out by researchers at King's College London. The World Health Organisation reports "in 2012 around 7 million people died – one in eight of total global deaths – as a result of air pollution exposure". It is our obligation to offer a solution to the world's largest single environmental risk. I look forward to showing you all what I hope will be something quite unique and better, in due course!

James

Figure 1: Screenshot of an e-mail from James Dyson tweeted by Dyson (2017*a*)

According to Porter (1998*b*), all firms constantly face constraints imposed on them by agents in all markets they are involved in. These constraints, or market forces, are depicted in figure 2.

Horizontal dimension represents the two ends of a product supply chain. It begins with sourcing of production factors from markets of various degrees of competition, which determines input costs. At its end, the product faces demand determined by customer budget, preferences and other variables. In between, the firm faces competitors selling identical goods or services. Depending on their number and relative size, as well as the remaining two market forces, the type of competition is formed. New entrants to the market are likely to cause an outward shift in market supply, inducing decrease in profitability, while the product also faces competition of its substitutes.

The framework has served as a bridge between management science and theoretical economics through comprehensive formulation of essential microeconomic concepts. Nowadays, individual market analyses utilizing this model are demanded in the corporate world, acting as a solid starting point for strategic decisions.

Relating this to Dyson's example is MarketLine (2017*b*), outlining the market for new cars in Asia-Pacific region. It explains that the Asian market for new vehicles

has recently been growing and although there are high barriers to entry, established manufacturers of niche products, such as Porsche or Tesla did experience success in late years. This is consistent with the CEO's claim that he sees a "big market" in Asia (Vincent 2017, Dyson 2017*a*), making decision for the venture for an upmarket product seem reasonable.

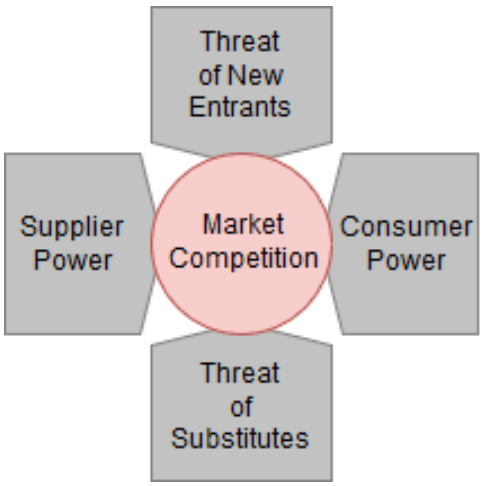


Figure 2: Five market forces (Porter 1998*b*)

Before the vehicle can be produced however, it is necessary to design supply chain facilitating the end-to-end process. Essential components of the product shall be identified and their production allocated among existing production facilities, planned locations, and potential destinations of further investment. A top-level framework to base such decisions on is Porter's diamond, illustrated in figure 3, which outlines essential factors determining suitability of an economy for Foreign Direct Investment into given activity. Furthermore, it allows for comparison between established and new locations.

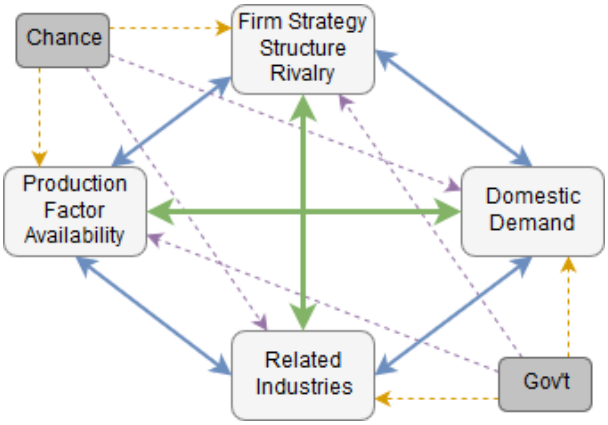


Figure 3: Porter's diamond (Porter 1998*a*)

Whether a firm aims for horizontal FDI, expanding into new geographic markets, or vertical FDI, reducing costs through forward or backward integration, they firstly need to assess availability of production factors, as well as related industries, which include potential suppliers. Immediate demand for their product within FDI destination is especially important when considering vertical expansion. Finally, selection of appropriate country to invest in must be in accordance with the overall strategy of the company and should integrate well into their existing supply chain. Governments of economies seeking financial inflows may incentivize this, for example through tax breaks.

For Dyson's intention, it is therefore important to secure production of intermediate goods in proximity of relevant natural resources, while ensuring efficient logistics to individual assembly facilities. These must then be located in strategic areas to reach targeted markets, while considering access to suppliers of components Dyson will not produce on its own.

Probably the most important part of an electric vehicle is a motor, which is conveniently also the main element in a vacuum cleaner, the firm's leading consumer product. (Wallop 2009) Dyson has accumulated numerous patents in this field and continues to develop the technology between their UK headquarters and the research facility in Singapore. (Pooler 2016) According to Dyson (2017*b*), all the firm's motors are made by the West Park, Singapore Advanced Manufacturing. The same source also claims that the facility has capacity to expand, for which reason it seems feasible to contain the production therein.

Further crucial component to the product is energy storage unit. Although Dyson's portfolio includes battery powered appliances, there is need for substantial increase in scale, as one of the key selling points is expected to be range traveled on a single charge. Being aware of this, the CEO has decided to invest in a US startup Sakti3 specialized in research of solid state lithium cells, as well as to abolish dependency on University of Michigan patents, possibly due to their obsolescence, which was however not officially confirmed. The firm continues to expand this research, while planning to invest into a new production plant specialized in batteries. (LeVine 2017)

Referring to Porter (1998*a*), such factory should be located in area with abundant supply of crucial materials. In case of solid state batteries, lithium hydroxide, of which over a third of the world's supply comes from China. This, combined with the same country being largest exporter of batteries (Simoes 2017), which suggests a comparative advantage, and availability of cheap labor, provides an opportunity for foreign direct investment. Rival companies selling EV battery units have a strong presence in China (Dinger et al. 2010), which suggests high demand for the materials, but also an increased degree of competition. However, the constantly growing demand for EVs as well as their batteries implies further opportunities. (Dinger et al. 2010)

Such for example include combining of sales center into the facility or sales of the intermediate product to established EV manufacture. The latter could be especially useful in case Dyson's own vehicle does not meet with success. Location of an assembly plants in the same area is also an option. More specifically, Shenzhen and Zhanjian provide an opportunity of marine logistics, facilitating supply chain efficiency.

Alternatively, locating the EV power units manufacturing in Singapore, alongside the existing research center may also be favorable. The city state seconds China in battery exports and may in comparison provide improvement in capital efficiency and diminish costs associated with international trade. (Denning 2011)

Another key part of the vehicle will be the electronic circuitry controlling the motors, converting power, and taking charge of premium features forming the vehicle's user interface. Identically with motors, the research is expected to be done in UK and Singapore, while CNC printing and component soldering may be facilitated by the Singapore factory. Alternatively, use of the facility near Calamba, Philippines, where the Singapore manufacturing subsidiary of Dyson is surprisingly registered (Shipsey 2017), may be an appealing opportunity. Electronics companies have been widely invest into manufacturing activities in the country, rendering the industry form nearly 60% of total exports. (Simoes 2017) Great production factor availability including capital and cheap labor, encouraging Government attitude towards FDI, and accessibility over the South China Sea all contribute to suitability of this choice.

Next, the kinetic energy generated by the motors requires transmission in order to reach the wheels and put the vehicle to move. Although some modifications of the mechanism are necessary, the material, capital type of labor, as well as expertise, remain unchanged when compared to transmissions used in combustion engine cars. The design phase of this product will require Dyson to hire mechanical engineers in both the UK and Singapore, while also investing in recent patents to kick-start the research process. Then, depending on the scale of production, suitable facility must be appointed to manufacture the final unit.

Should the volume of production be in order of units, the Singapore production plant may be suitable, if skilled labor is hired and sourcing of domestic steel secured. However, larger volumes will require the firm to invest into a business unit specialized in this task.

Suitable location may be Malaysia, where the firm already has presence. Owing to the ASEAN international trade organization, trade of steel between the two countries is tariff-free. Malaysia provides cheaper skilled and unskilled labor; The median wage has however been recently growing at a high rate of 6.5% in Q2 2017, while unemployment rate remains stable, below 3.5%. (Department of Statistics Malaysia, 2017) This suggests that additional alternatives, such as China should be considered.

Convenience of proximity to the aforementioned battery factory and abundant supply of steel are its major benefits. On the other hand, China is not a direct member of ASEAN, which may impose some trade restriction

Further feasible path entails reaching a long-term contract with PROTON, a major Malaysia-based car manufacturer, which may supply transmissions for the vehicle, made to specification. (MarketLine 2017*a*) Further automobile manufacturers with Malaysia-based manufacturing are Honda and Toyota, who may however see Dyson as a competitor, rather than strategic partner, due to their own high-end electric vehicle plans.

Chasis and frame for the automobile needs to be made to exact specification, ideally nearby the final assembly plant, as the main materials, steel and aluminum, are costly to transport due to their weight. Dyson will either need to build metal processing factory, or more likely source these from Singapore or China based suppliers, again depending on the scale of production and resulting decision between FDI and utilization of existing facilities.

Finally, other components, such as glass windshield and side windows, plastic components for the dashboard, lights, and exterior reinforcement, textiles and leather for the seats, or tires are most likely to be purchased from existing producers, established suppliers to the automotive industry.

Finally, for horizontal expansion, Dyson may consider entering the European market, where the demand for electric vehicles may be just emerging, but markets such as Norway and Denmark already develop a significant demand, with Tesla at roughly 25% of automobile market share in the former. Furthermore, the UK private hire vehicles have experienced an increasing share of hybrid vehicles, which may foreshadow future demand for Dyson's own vehicle.

Since the firm has recently acquired former RAF base near Hullavington, increasing their UK base tenfold (Tovey 2017), small-scale assembly plant of their EV, or its model revised for local needs, could take place there. Although the UK labor force is by far more expensive than in the Asian location, capital-intensive production facility minimizing the number of workers may still turn out profitable due to the magnitude of planned brand-premium.

Locally sourced steel parts, together with the key components imported from the Asian locations seem to be the most appropriate material provision.

Finally, it is necessary to mention that a joined venture with an established car manufacturer, who lacks an electric vehicle market presence would be the least risky route. The partner in this project should ideally be a company with a clear intention to attempt a release of emission free car. Dyson motors would provide a good starting

position to the vehicle marketer, while providing Dyson with highly leveraged income in case of success and a safe way out, should the venture fail. In addition, the British firm could focus resources on their electronics and power unit research, driving their competitive advantage further, instead of investing time and money in new production processes.

A real world example of similar venture may be Siemens, also known for home appliance manufacturing, and their cooperation with Volvo, who have combined their technology, producing both hybrid and fully electric prototypes. Volvo currently aims to make only hybrid and fully electric vehicles by 2019. (Vaughan 2017, Siemens 2011) For Dyson, an automotive industry partner could be the already mentioned PROTON, which would likely encourage marketing under Dyson's stronger brand name.

Distancing even further from direct participation could be taking of position of a key supplier of motors and batteries to the industry. Similar approach is followed by BOSCH, who has taken the role with their electronics and DC engines, allowing further diversification of risk while remaining fully committed to their initial activity. In addition, Panasonic has been an exclusive supplier of lithium-ion cells to Tesla, earning over 41% of market share in 2015.

Electric vehicle industry forms a connection between automotive and electronics sectors closer than ever before and forming partnership or executing acquisitions is definitely simpler process than vertical expansion of the proposed magnitude.

In conclusion, the range of options Dyson has at the beginning of their electric vehicle market venture is wide. Some of the supply chain steps, namely research, design, and manufacturing of motors and electronics, they are capable to fulfill using their existing facilities. For others, such as battery units, steel chassis, and the final assembly, FDI or external suppliers will be required.

Locations identified as suitable for FDI are China in case of lithium batteries and assembly, Philippines for production of electronic components in case of higher volume of production, and Malaysia as an alternative destination to assemble the final product. The main benefits of all mentioned is direct access to South China Sea facilitating cost-efficient logistics. In addition, Singapore, Malaysia and Philippines are all members of a tariff-free zone imposed by international organization ASEAN. With China, there is a trade agreement, which however does not abolish tariffs.

Should Dyson decide establish cooperation with existing automobile manufacturer, PROTON is a viable option, due to its expertise and potential for use of Dyson brand name in marketing of the vehicle. Alternatively, becoming a supplier to the automotive industry rather than entering it is the least risky option, with lower profit opportunities.

2020 words

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Written with LyX and passion