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Role of Global Suppliers in Luxury Car Industry

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… To my Professor, for his valuable insights

… To my friend Amir, for his encouragements

… To my sister, who I share laughter with

… To my father, for his immeasurable support

… To my mother, for her perpetual love

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Abstract

Purpose - The goal is, in the context of globalization, to see how various countries contribute to the design, supply, and manufacturing of the automotive components for the brands of the other countries, with "luxury and high-performance" carmakers in mind. To achieve this end, the characteristics of a luxury product, especially in the automotive industry, are highlighted. This is coupled with the identification of features and peculiarities of the outsourcing of parts for automobiles.

Design/methodology/approach – the approach of the thesis is based on the combination of collecting data of components suppliers and eight case studies of luxury brands, embedded with the literature review around the luxury industry and outsourcing in automotive industry.

Findings – the ten companies with the most contribution to the supply of parts to luxury-performance cars are identified. Robert Bosch stands in the first position as the leading company in terms of total annual sales. And, Germany is the leading country with regard to numbers of global mega-suppliers.

Originality/value – the attempt at establishing a link between luxury management and managing supplier network in the luxury performance car industry is the main contribution of this work which helps lay the foundation for future works. Thus, having the two concepts side by side is the novelty of this thesis.

Practical and managerial implications - The thesis can be used as a starting point for academics and professionals pursuing the luxury industry and automotive supply chain. Particularly, for whom interested in contributing to the knowledge surrounding the supply chain of "luxury-performance automotive" brands.

Limits and future research - The results could not illustrate a thorough map of suppliers for each brand due to lack of full access to data. Also, SME, Tier-2 and -3 suppliers, and auto brands that share the same platform and/or modules are not entirely included.

Abstract (Italian)

Scopo: l'obiettivo è, nel contesto della globalizzazione, vedere in che modo vari paesi contribuiscono alla progettazione, alla fornitura e alla produzione dei componenti automobilistici per i marchi degli altri paesi, tenendo conto delle case automobilistiche "di lusso e ad alte prestazioni". Per raggiungere questo obiettivo, vengono evidenziate le caratteristiche di un prodotto di lusso, specialmente nell'industria automobilistica. Ciò è associato all'identificazione di caratteristiche e peculiarità dell'esternalizzazione di parti di automobili.

Design / metodologia / approccio: l'approccio della tesi si basa sulla combinazione di raccolta di dati dei fornitori di componenti e otto casi studio di marchi di lusso, integrati con la revisione della letteratura sull'industria del lusso e l'outsourcing nell'industria automobilistica.

Risultati: vengono identificate le dieci società con il maggior contributo alla fornitura di componenti per auto di lusso. Robert Bosch si posiziona in prima posizione come azienda leader in termini di vendite annue totali. E la Germania è il paese leader per numero di mega-fornitori globali.

Originalità / valore: il tentativo di stabilire un legame tra la gestione del lusso e la gestione della rete di fornitori nel settore delle auto di lusso è il contributo principale di questo lavoro che aiuta a gettare le basi per i lavori futuri. Pertanto, avere i due concetti fianco a fianco è la novità di questa tesi.

Implicazioni pratiche e gestionali - La tesi può essere utilizzata come punto di partenza per accademici e professionisti che perseguono l'industria del lusso e la catena di approvvigionamento automobilistica. In particolare, per coloro che sono interessati a contribuire alla conoscenza della catena di approvvigionamento dei marchi di "automobili ad alte prestazioni di lusso".

Limiti e ricerche future - I risultati non sono stati in grado di illustrare una mappa completa dei fornitori per ciascun marchio a causa della mancanza di pieno accesso ai dati. Inoltre, i fornitori di PMI, Tier 2 e -3 e i marchi automobilistici che condividono la stessa piattaforma e / o moduli non sono interamente inclusi.

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Abbreviations

AM – Aston Martin

BEV - Battery Electric Vehicle

CSF – Critical Success Factors

FCA – Fiat Chrysler Automobiles

FCEV – Fuel Cell Electric Vehicle

GM – General Motors

GT – Gran Turismo

HLS – High Luxury car Segment

HNWI – High Net Worth Individuals

ICE – Internal Combustion Engine

IT – Information Technology

LV – Louis Vuitton

M&A – Mergers and Acquisitions

OEM – Original Equipment Manufacturer

PR – Public Relations

PSA - Peugeot S.A.

R&D – Research and Development

ROI – Return on Investments

RR – Rolls-Royce

SCM – Supply Chain Management

SUV – Sport Utility Vehicle

SWOT – Strengths, Weaknesses, Opportunities, and Threats

USD – United States Dollars

VW – Volkswagen

Executive Summary

The topic, the importance of

The idea for this thesis started with my interest in the super sports car industry and developed further with my supervisor Prof. Brun. The goal is, in the context of globalization, to see how various countries contribute to the design, **supply**, and manufacturing of the **automotive components** for the brands of the other countries with **luxury and high-performance carmakers** in mind. The luxury performance car industry is concentrated in Europe with countries like the United Kingdom, Italy, France, Germany, and recently-add Sweden. Around the world US and Japan make contributions and it is expected that China, as the largest market for luxury cars, to also chip in with their own brands. Luxury industry has become a topic of interest for academics since the industry is becoming bigger and bigger each year, the industry is valued at **€1.2 trillion** in 2018 (Bain & Co.) and luxury car market is the largest segment comprising **40%** of the sales almost double the sales of personal luxury goods (at 22%).

The relevance and the novelty of the topic

Luxury performance carmakers limit their production output to retain the **exclusivity** of their products. This means low sales volume and low liquidity making it harder to invest in **Research and Development** since delivering high technical performance is considered the core competence of these companies. Sales volume is also proportionately related to macroeconomic conditions since it affects customer's perception regarding luxury products. These all make luxury car makers vulnerable as small companies.

Furthermore, implementing the best supply chain practices is considered as an added-value activity for any automaker. From the 1990s, globalization on one hand, and ever-growing competence and specializations of suppliers around the world on the other has aggravated "the **outsourcing** of auto parts to global mega-suppliers". Focusing on the supply side of the value chain, luxury performance carmakers are no exception. Even Ferrari known as a company that insists on developing its technologies in-house are compelled to buy specialized systems (like transmissions) from global suppliers.

The pursuit of superior quality and latest technologies has made luxury performance carmakers to opt for the outsourcing option and the topic of this thesis.

Implications of outsourcing in luxury performance auto industry could be a topic of interest to managers of luxury brands and supply chain managers of both supply-side and demand-side of the automotive parts industry.

Structure of the thesis

This thesis is comprised of six chapters:

Chapter 1: Introduction

This chapter gives a broad overview of the topic of luxury performance car industry and acts as a catalyst for the reader.

Chapter 2: Literature Review

This section will examine the extant knowledge in two fields:

- 2.1 Luxury Industry:
  Starts by indicating the importance of this industry, then we see if it is possible to apply a definition to the word luxury; after that the most important implications from industries experts like Kapferer and D'Arpizio is provided to better understand the differences between a luxury and a non-luxury product or experience, and to see if there are differences between various forms of luxury.
- 2.2 Supply Chain Management in Automotive Industry
  It starts by providing definitions for supply chain and its managerial implications, then we examine the latest knowledge about one of the hottest topics of supply chain, outsourcing and in particular, supply of automotive components. After that, an overview of the automotive industry in Italy is presented, followed by the impact of globalization on the automotive supply chain, the relationship between supplier and manufacturer, and finally we see how global mega-suppliers emerged.

For this purpose, academic publications in the areas of the luxury industry and supply chain management and the most useful information from popular automotive websites have been collected, compared and adapted to the relevance of the topic.

Then a connection is established between the two and the literature gaps are highlighted in Chapter 3.

Chapter 3: Research Methodology

Chapter 3 highlights the research question and explains the methodology I've gone through to provide an answer, which is a combination of gathering data about suppliers and case study of eight brands. It is divided into:

- 3.1 Overview of Research methodology
- 3.2 Purpose of writing this thesis
- 3.3 Literature Gap
- 3.4 Research Questions
- 3.5 Steps taken to provide an answer

Chapter 4: Case Studies

In order to identify the most important global suppliers delivering parts to luxury performance carmakers, eight brands have been selected as the basis of the study. The selection criteria already explained in the previous chapter in here only the results are demonstrated. Each case study covers these points:

- Companies' Background
- Product Portfolio
- Suppliers' map
- Companies' SWOT Analysis

Chapter 5: Results Analysis and Discussion

Here the main results from the study of each of the eight brands and their supply network are acknowledged. Then the peculiarities of parts supply for luxury performance cars are discussed. Thus, the points discussed are:

- Leading Countries and Top Suppliers
- Co-design and Co-development
- Synergies
- Impact of Product Recalls on Suppliers
- Regulations and New Technologies

Chapter 6: Conclusion

In the last part of the thesis the conclusion is constructed with:

- Summary of the Results
- Final Considerations
- The usefulness of the study (theoretical implications, practical/managerial implications)
- Limitations of the study
- Future research development

Chapter 1: Introduction

If something is possessed by the few, it is perceived as rare and rare things are in more demand. People assign more value to the things they can't have. When someone achieves something valuable, he/she feels valuable. This is the essence of a luxury product.

But what is it about luxury-performance cars that make people swoon over them? Is it only because we perceive them as rare? Or is there something more to it? Is it only the superior quality? If this was the case, why people don't dream of having a high-quality mid-range family car?

This thesis firstly tries to capture the essence of a luxury car and to see what makes a car stand out among its peers making it more valuable. How it is possible to sell a car for millions of dollars.

Secondly, outsourcing has become a common practice in the automotive industry. Globalization and free market enabled competition among brands from different countries and made it possible for brands to outsource their needs for better cheaper solutions. No industry is immune to this and the automotive industry is one of the most important enablers of this notion. Today, many brands decide to buy solutions from manufacturers in other countries. By focusing on luxury-performance auto industry this thesis intends to see how countries contribute to the supply of parts and systems for the brands of other countries. For example, to see how much of an Italian sports car is actually developed in Germany and vice versa.

The implications of this study can be useful for academics and professionals interested in the topic of the supply chain of a luxury performance car manufacturer.

Chapter 2: Literature Review

2.1 Luxury Industry

This part of the thesis reviews the recent literature and research done in the field of luxury Industry as a whole. Firstly, I present the importance of luxury in today's economy, next, I try to give an overview of the many attempts by scholars to give a proper definition of the concept of luxury, and lastly, we will see how auto industry's experts define a luxury car to lay the foundation of the discussion of thesis.

Academic research in luxury industry has gained momentum in the past decade due to the increasingly global market value - at almost **€1.2 trillion** in 2018 (up 5% from 2017) (Bain & Co., 2018). It shows that the luxury segment has become an industry by itself. Positive economic outlook means the luxury products will be in more demand and conversely a positive trend in luxury market value can indicate a healthy economy. This is especially signaling a healthy economy that recently witnessed a global crisis. Another reason for this growth is the increasing purchasing power of consumers in emerging markets such as China and the growing number of wealthy individuals globally. These are all good enough reasons to make luxury industry a topic of high interest to academics and researchers.

Most works in the field of luxury including the concepts proposed by academics and data provided by consultancy firms are related to personal luxury goods, mainly **fashion products**. But they can be propagated and generalized to other luxury products including luxury cars.

But what can be called luxury? Bain & Co. differentiates luxury goods and experiences into 9 segments. Namely, these nine segments are 1. luxury cars, 2. personal luxury goods, 3. luxury hospitality, 4. fine wines and spirits, 5. gourmet food and fine dining, 6. fine art, 7. high-end furniture and housewares, 8. private jets and yachts, and 9. luxury cruises. Luxury cars, luxury hospitality, and personal luxury goods are leading segments and when combined, comprise 80% of the total market value.

Luxury cars dominate the market with the sales value of €495 billion, (growing 5% - a slight decline in the growth rate vs. 2017), this is followed by personal luxury goods at €260 billion (growing 6% - which outperformed other segments in terms of growth rate) and luxury hospitality at €190 billion. (Bain & Co., 2018) (Fig. 1)

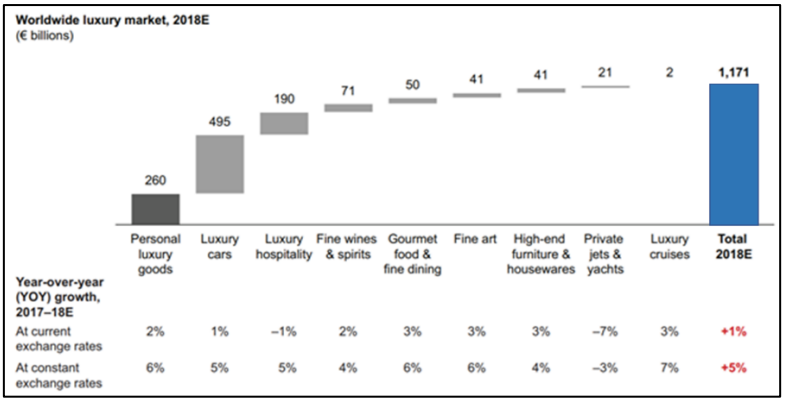


Figure 1 The global luxury market grew to nearly €1.2 trillion in 2018, up 5% from 2017

Source: Bain & Co. 1

It is worthwhile to mention that Italy is the leading country in terms of number of Luxury goods companies while France is the best-performing country in terms of sales growth rate. (Deloitte Report, 2019)

Now that the importance of the luxury industry became evident, a proper definition is needed to understand its concept and to better distinguish a luxury product from a non-luxury one by assigning features that are specific to a luxury product. By exploring past academic publications, one will realize that defining a unique definition of luxury is of no concern to academics any more since a given definition may not fully apply to other products and/or in other segments. The dictionaries tend to deliver a definition based on the contemporary public perception of the word while academics may find those definitions as incomplete or even in some cases incorrect. Merriam-Webster defines luxury as such:

luxury noun

lux·u·ry | \ ˈlək-sh(ə-)rē, -zh(ə-)rē \

plural **luxuries**

Definition of *luxury*

1 : a condition of abundance or great ease and comfort : sumptuous environment
// lived in *luxury*

2 **a** : something adding to pleasure or comfort but not absolutely necessary
// one of life's *luxuries*

b : an indulgence in something that provides pleasure, satisfaction, or ease
// had the *luxury* of rejecting a handful of job offers
— Terri Minsky

3 *archaic* : LECHERY, LUST

The above definition does not consider the exclusivity of a product like owning a one-off Ferrari. Or a product that is endowed with superior quality or performance is not included, or any other attribute that one can find important while the other does not care about. Before we try to see what luxury is, it is worth to look at the origins of the word and the concept of luxury.

Brief history

The word luxury is originated from the Latin word *luxuria*, meaning 'extravagance, excess'. In ancient Rome, *luxuria* connotes riotous living and sinful waste (Turunen, 2018). The word then ceded through Norman French - took the meaning of lust or lechery - into English, first recorded in 1340. But it was only by the beginning of the seventeenth century that the word appears in English texts with its modern interpretation that refers to *luxury* as 'wealth, opulence and indulgence' (Wilton 2013, (Turunen, 2018).

While the word originated from Roman times its concept has existed long before as far as the emergence of hierarchies in societies as small as a tribe. It was the few elites of each society that had "the luxury" to indulge themselves in the excess and to show off their lavish lifestyles as a symbol of status and power, while inaccessible to many. For example, in ancient Egypt, pharaohs, priests and those around them exuded status through exclusive accessories such as perfumes (Kapferer and Bastien,2009, Turunen, 2018), Let us not forget to mention that they were buried with their most precious items to accompany them to the after-life whilst being mummified.

The concept of luxury has been a topic of controversy among the ancient Greeks, often seen as the opposite of poverty. But it was until the Renaissance that the perceptions surrounding Luxury changed and were no longer seen as something entirely sinful (Franchetti 2013). Sociological issues regarding its good or bad is not a topic of this thesis since negative perceptions of luxury has been diluted in today's world and it has become an industry of high significance. Starting with the Industrial Revolution, the societies' living standards ameliorated making luxury products and experiences more affordable and acceptable in general public opinion. It has always been the society that has defined what can be luxury and to what extent they can accept it. For example, using skins or tusks of endangered species like tigers are not acceptable anymore.

Now we need to understand what is considered as a luxury. So …

What is the definition of luxury?

"… luxury is to be intended as a byword for exclusiveness, research, experimentation, purity, class, discrete richness. Luxury is not to be shown because it is made up of details. Displaying it means vulgarizing it. Showing your richness."

Franca Sozzani [Italian fashion journalist]

Unfortunately, as mentioned earlier, there is no one universal definition for luxury since it is subjective and has personalized interpretations and while one applies to a specific product or experience, it is not fully applicable to another product or experience. Is it

something that is expensive, rare, with high quality, crafted by skilled workers, or a brand with high value, or …?

Luxury is made of a set of attributes and each product based on its nature does not have all these attributes and those attributes are carried to some degree, in probabilistic terms ("The luxury strategy," 2013). D'Arpizio, Catry, and Kapferer are three of the experts of the luxury industry. Instead of trying to provide a definition for luxury, they focus on providing classifications of luxury products and assign differentiating functions to luxury brands. The following is the classifications provided by each of them:

Management of Luxury Brands

Managing a luxury brand first and foremost requires managers to distinguish well between a luxury and non-luxury brand and different forms of luxury products. It is also very important to understand and identify potential customers.

According to Kapferer (1997), the industry guru, these are the basic principles of managing a luxury brand:

- Must be desired by all, but consumed only by happy few; in order to achieve this end a brand must have visibility in the media, but its diffusion must be limited
- Protect clients from non-clients; the product must be targeted toward a niche market, this is achieved by pricing strategies and limited distribution
- A Luxury product cannot deceive; it is not possible to offer an aesthetic product that lacks quality or a basic feature, for a luxury product outer beauty comes with inner beauty.
- Keep licensing limited; multiplication of licenses can lead to the democratisation of the product and finally its commoditization.
- Insisting on tradition; this can lead to the disappearance of the brand as today's consumers desire modern features. Hermes offers its new suitcases also in carbon fiber, in addition to leather.
- Updated practicality: they should not lag behind basic brands Benefiting from economies of scale and higher liquidity basic and premium brands develop new technologies and set the bar higher for "basic quality". The new €180 William Painter sunglasses come with aerospace grade titanium frame thus they don't break while €500 Cartier sunglasses break easily.

Classification of luxury brands by D'Arpizio

Developed for Altagamma Foundation, Claudia D'Arpizio of Bain & Co. (2007) provides a classification of luxury brands based on three layers. Each brand in order to succeed must be positioned accurately within one of the layers. The model is divided into accessible, aspirational, and absolute luxury [1]:

- **Accessible luxury**: more affordable brands, purchased mainly by middle-class households; the brand is a reminder of product performance characteristics; advertising, PR and events are the main marketing channels. (e.g. Burberry and Tiffany & Co.)
- **Aspirational luxury**: these products are targeted toward customers who appreciate the distinction and recognizable status. To re-connect the consumer with the emotional oasis through artistic and stylistic design elements in addition to performance characteristics. Their main communication channels are events and PR with the advertising in the supporting role. (e.g. Gucci and Yves Saint Laurent)
- **Absolute luxury**: despite their heritage, some of these brands are known to few and are recognized by research, this type of brand knows no boundaries and targets for the extreme in every possible attribute. The main marketing channels are PR and events. (e.g. Hermes and Brioni)

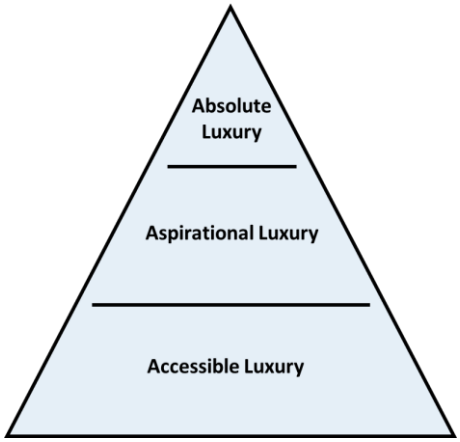


Figure 2 Classification of luxury brands by D'Arpizio

Classification of luxury goods based on their perceived rarity

"Like magicians, the luxury incumbents seek to perform an illusion where actual scarcity is replaced by a perceived rarity." Bernard Catry

In his article the Great Pretenders, Bernard Catry suggests that luxury goods can be classified based on their "*perceived rarity*". In an attempt to justify the production volume while having the products distinct from one another, companies add a virtual dimension of rarity through "*artificial shortages, limited series, marketing policies such as selective distribution, or the selling environment*". Thus, he defines four types of rarity:

- Natural rarity: products with naturally scarce components like diamonds; innate rarity as opposed to virtual

- Techno-rarity: Brands that continuously offer innovative features to their products. First TVs, refrigerators, and also ABS and airbag systems in cars first introduced by luxury car brands. This type of rarity needs constant investment in R&D since other competitors will soon follow
- Limited-editions: the company purposefully limits the supply to create a more virtual perception of rarity, as seen in many luxury car brands such as Ferrari
- Information-based rarity: though the product may not be limited in supply, the company creates an illusion of rarity by the information they provide to the public versus the information they deliver to their more exclusive customers through marketing, PR, secrecy. E.g. Donna Karen vs. DKNY.

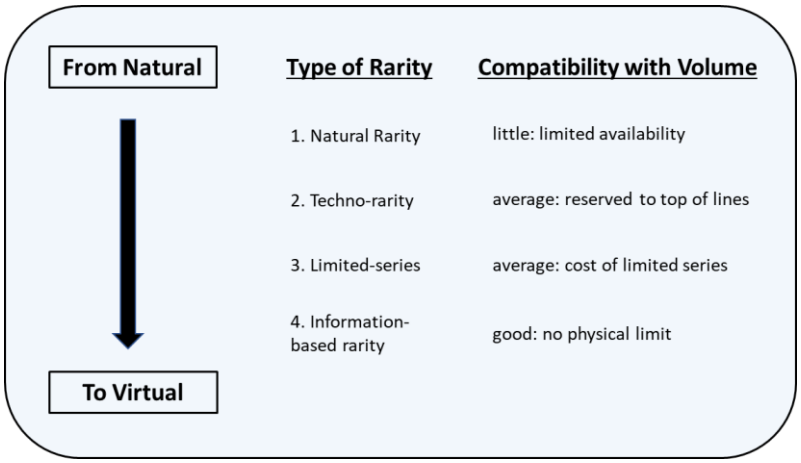


Figure 3 From natural to virtual rarity: their compatibility with volume ambitions

Classification of luxury brands based on their strategy

'it is not the price that makes luxury, but luxury that makes the price'

Kapferer and Bastien, 2012: 74

Instead of trying to give a universal definition for luxury, Kapferer and Bastien ("The luxury strategy," 2013) focus on how brands by casting their magical spell add more value to their products. The more powerful the brand, the higher the margins it can obtain (e.g. apple), it means that luxury follows the anti-law of marketing, i.e. it's the luxury that makes the price. Thus, differentiating the brands based on strategies they adopt for their brands:

- **Fashion strategy**: mainly adopted by Italian fashion houses; despite having attributes of luxury products such as higher price tag, they are short-lived, they lack one important attribute of a luxury product which is thinking long-term.
- **Premium strategy**: the brand itself is not strong enough to justify further increases in the price, therefore it needs to be superior in one way or another "*compared*" with other products in that category. For example, the price of a BMW car cannot exceed the actual value it brings, even if they leverage quality and performance better than the competitors (i.e. mid-range models). This model is mostly adopted by US premium clothing brands such as Calvin Klein.
- **Luxury strategy**: the higher price does not require any justification since the heritage, country of origin, the artistry, and the dream are the intangibles that often-times can make the product priceless. This model is mainly adopted by French companies (e.g. Bugatti).

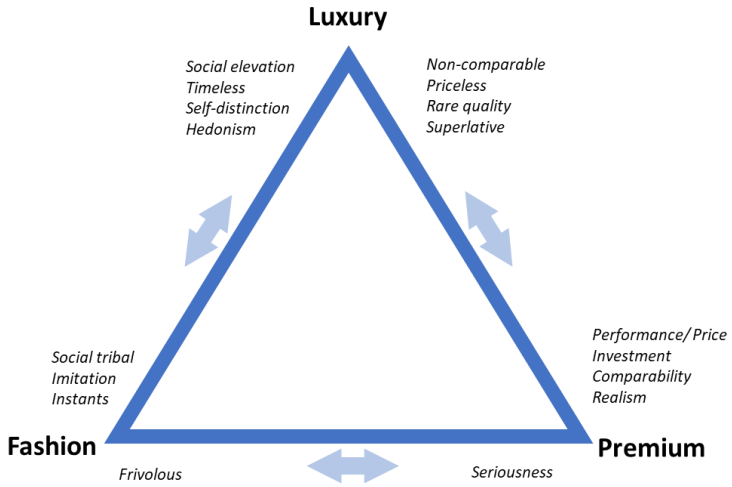


Figure 4 Positioning of three business models; Source: Adapted from Kapferer and Bastien, The luxury strategy (2012: 32)

As we saw in the 3 classifications described above, they are well suited to differentiate consumer fashion products, while with a small modification they can also be applied to the luxury automotive industry. As an example, we cannot define a luxury car brand strategy as a fashion strategy since cars if made for the purpose to suggest a luxury car, see the long-term although they may become obsolete technologically. On one hand, we can perfectly apply the premium and luxury strategies to cars, the prime examples would be BMW and Lexus as the premium and Ferrari, Bentley and Bugatti as the luxury category.

Critical Success Factors for a Luxury brand

Any company with a luxury strategy in mind needs to assign a set of attributes to their products so that customers consider it as luxury. these CSFs can be (Brun et Castelli, 2013):

- Premium quality: delivering the superior quality for the product by using the best materials and being coherent with the specifications and by executing best supply chain practices.
- Heritage of craftsmanship: to be known as a brand that uses skilled workers and engineers in the production processes.
- Exclusivity: bringing a perception of rarity by using either rare materials, superior technical performance or a more virtual type of rarity like putting a limit on production output.
- Emotional appeal: giving customers an exceptional unforgettable experience, like enhanced shopping experience or unique driving experience.
- Brand Reputation: the brand is well known and has associated itself with other attributes that suggest luxury
- Recognizable style and design: a design that is unique to that brand which makes it instantly recognizable. Like a Ferrari, they are usually red with a curvy silhouette. Or a brown LV bag.
- Country of origin: a country that is known to be the source of excellence for a particular type of product. Like Persian carpets or Italian leather shoes and furniture.
- Uniqueness: things that make the product one of a kind like imperfections in handcrafted products for example carved wood statues.
- Superior technical performance: exhibiting unrivalled performance such as in super sports cars. Investments in R&D are of high importance in these industries.
- Lifestyle: a distinctive lifestyle only achievable by having that product.

It is not an obligation for a luxury product to have all the above attributes, but it needs to have some of them, most importantly is exclusivity since it's been mentioned the most by experts and academics (Catry, 2003; Brun et Castelli, 2013).

Consolidation of luxury brands

Consolidation happens in most industries the luxury industry included. Many luxury companies in any sector have been merged or acquired by their counterparts to leverage on size and the other synergic benefits. Synergy means to achieve a greater return by combining two or more units and while if considered individually it is not possible. Ijaouane and Kapferer (2013) motivated by the series of acquisitions by Louis Vuitton investigated the value creation by the consolidated luxury groups. They suggest that acquisitions of luxury firms in order to leverage on the created synergies cannot be based only on cost incentives. Another valuable insight from their work is that they suggest that luxury brands, when acquired and managed by a non-luxury group, can be in threat (e.g. when Ford acquired Jaguar; used low-quality engine and components). But in most cases

when the small luxury division maintains its autonomy it can achieve greater success. Like in the case of Lamborghini which has been acquired by Audi.

Moreover, when a group acquires a luxury brand or when a luxury brand becomes a listed company, either way, it may feel pressured to achieve decent levels of performance. This puts the company in a volume-exclusivity dilemma. The brand must control its production volume to maintain its exclusivity, on the other hand, it is forced to sell more to achieve a satisfactory financial objective.

In any case, consolidations occur to achieve synergies at the corporate level. In the map below we can see typology of synergies within luxury groups:

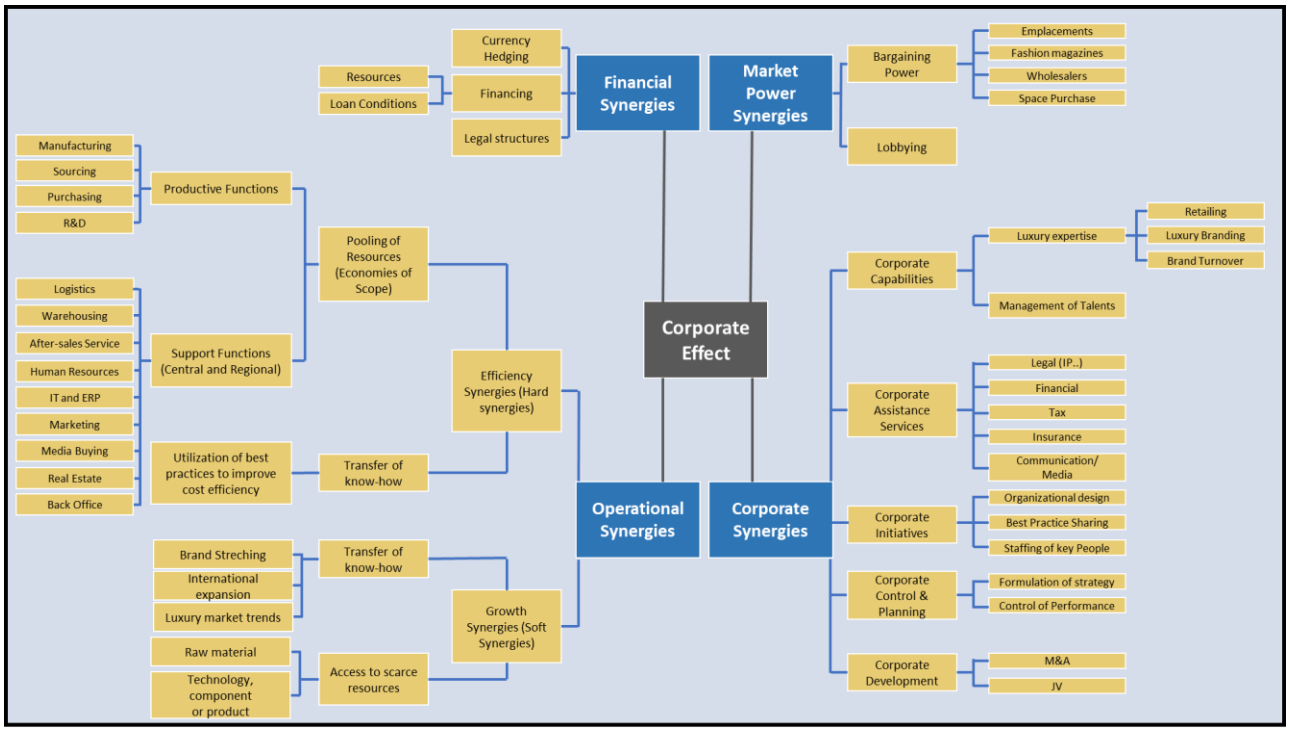


Figure 5 Typology of synergies within luxury groups

Source: Ijaouane and Kapferer (2013)

For the sake of our thesis luxury car companies will gain much more from operational and financial synergies. Because:

1. Operational synergies: almost all the luxury car makers before they become part of a large automotive group used to have skilled workers for their production and assembly lines. But with the aid from the group they acquire the know-how and the investments to establish an automated assembly line, a group also gathers engineers from all over the corporation to leverage on a centralized and shared R&D (Hajizadeh et Brun, 2010)
2. Financial synergies: Luxury automakers need to cap their production output to keep the exclusivity of their products. On the other hand, low production means low sales and because the sales of the luxury products are directly influenced by global macroeconomic conditions, which means in times of economic turmoil

sales of luxury products hinder and it might leave the company in serious financial trouble. This is the case of many luxury companies around the world that faced bankruptcy and revived again in a favourable economic situation. A group, in this case, can come to the rescue and provide the luxury division with financial aid to safely transition.

3. Corporate synergies: this type of synergy is notable because a group can leverage the potential of their talents across the portfolio and offering them exciting new career paths. This incentivization helps motivate the employees across the group.

2.1.1 Automotive Segment of the Luxury Industry

This part will demonstrate and argue the different non-standardized classification of cars, then briefly mentions the history of luxury cars and general information regarding this industry, concluding with the different companies' philosophies around what constitutes a luxury car according to different car brands.

As seen previously, Luxury cars alone account for more than 40% of the sales in the luxury industry collectively in 2018, followed by personal luxury goods at 22%.

Over the past century luxury cars have been associated with technological marvel, a heritage of craftsmanship, premium quality, attention to detail, and the thrill of the ride. As a marriage of art and engineering, luxury cars have been a symbol of self-expression among the rich and affluent.

Classification of cars

Historically a luxury car referred to '*spacious sedans, providing comfort*', equipped with the latest technologies, often included with luxury accessories such as expensive suitcases and umbrellas, that shifted the driving experience as something exhausting to joyful. But since the second industrial revolution and mass production in the auto industry, more and more automobiles equipped with elements of comfort and this definition of luxury for cars remained until today. As an example, Lexus is marketed as a luxury brand based on this notion while customers, as well as scholars of the luxury industry, consider it as a premium brand as opposed to an absolute luxury brand for instance Rolls-Royce.

Unfortunately, there is no academic reference regarding how a luxury car is defined, each consultancy firm and even car manufacturers themselves segment the cars with different criteria. As an example, the table below shows how Volkswagen classifies its brand subsidiaries:

Table 1 Volkswagen's subsidiaries

Volume	Premium	Super Premium	Truck & Bus	Procurement/ Components	Financial Services	China
VW	Audi	Porsche	MAN	Procurement	VOLKSWAGEN FINANCIAL SERVICES	Region China
Škoda	Lamborghini*	Bentley	Scania	Components**		
SEAT	Ducati*	Bugatti	Power Engineering*			
VW LCV						
MOIA						

This arrangement by VW is done for the sake of managerial simplification while Lamborghini as a subsidiary of Audi is considered a Premium by Volkswagen, we know that Lamborghini is priced much higher than an Audi and even higher than Porsche (which considered Super Premium) except one model (911 GT3). Even in the industry as a whole Lamborghini is not a premium brand since it has always been associated with track performance, a heritage of craftsmanship and exclusiveness. Lamborghini brand itself was the tenth most powerful auto brand in 2017 (Brand Finance Auto 100 & Tyres 10 February 2017). So, in reality, Lamborghini is not premium or super-premium but a truly luxurious car.

It is worth mentioning that some brands add a luxury division to their portfolio with a different brand name. but in fact, they are adding a premium division. A prime example is Toyota with its subsidiary Lexus. The name Lexus is a derivative of luxury and it is marketed as a luxury car, though it is not a true luxury car and like its counterparts BMW and Mercedes lean towards premium or accessible/aspirational (Bain & Co.) luxury. Thus, we need to better understand the differences between a luxury and premium car.

What is the difference between a premium and a luxury car?

Firstly, a premium car is manufactured in high volume, its production output is not limited in order to add a perceived rarity and the product is targeted towards upper-middle-class households. Higher sales reduce the product's exclusivity and exclusivity is the most mentioned criterion for a luxury product (Castelli et Brun, 2013). The brand is not powerful enough by itself, the customer is not willing to pay more than a premium car's actual value and any increase in price must be justified ("The luxury strategy," 2013). Examples are Mercedes, Lexus.

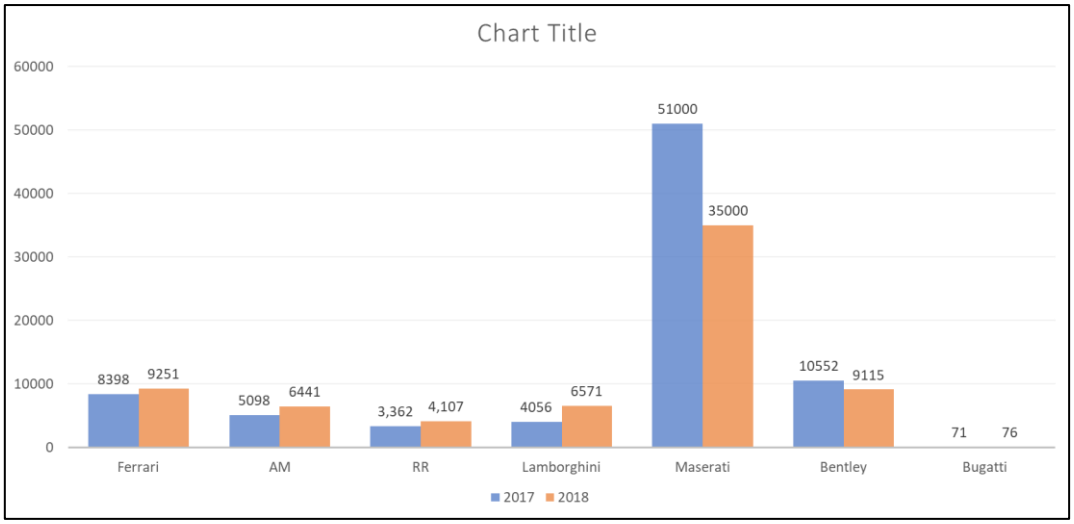


Figure 6 Sales of different luxury brands showing higher sales affecting exclusivity of the brand

Source: brands' annual reports

Notes: Porsche is not included with the annual sales of more than 250,000 units

On the other hand, a luxury-performance car offers the best performance, developed with innovative technologies often derived from the company's experience on track races such as Le Mans and Formula1. A luxury car has history, heritage and brings excitement for its passengers. It is not merely a mean of transportation, but a luxury product coupled with a luxury experience. Luxury cars are designed with unique sleek/ aggressive style, associated with a specific designer or design studio or even an engineer, such as designers Giorgetto Giugiaro and Pininfarina and engineer Shelby. A luxury car thinks long-term, in contrast with other cars with a shorter lifespan, they are made to stay in mankind's history, they are presented in movies, they are part of our cultural heritage and a symbol of a country's utmost engineering marvel together coupled with artistic mastery and passion.

How a luxury car is defined, characteristics

As mentioned earlier, there is no standardized definition or classification for luxury cars or even cars in general. To differentiate between the public perception of a luxury car and a true luxury car we use the term High Luxury car Segment (HLS) as coined by Aston-Martin in their annual report (2018). Though it is not a term by academia, it is a differentiating term by industry's experts (i.e. Aston Martin)

The High Luxury car Segment (HLS) includes the famous "*poster cars*" such as Ferrari, Lamborghini, Rolls-Royce, Bentley and Aston-Martin and the focus of this thesis. Based on price range and sporting capabilities the high luxury cars consist of hypercars, supercars, sports cars, grand tourer cars, super grand tourer cars, SUVs and sedans. Hypercars, limited editions, and one-offs are at the top level of the luxury market.

Interestingly, according to Aston-Martin, limited series models provide a "*halo effect*" for the product range of that brand since they increase the average selling price, bring new technologies to future range models and add to the brand's image.

Brief history

Since the advent of carriages, there have always been the royal families, elites and affluent of each society that expressed their wealth and power with their belongings and among them, their means of transport, their carriages. In 1870 the first combustion engine was introduced and since then, it was the wealthy and the enthusiasts who were the first customers of automobiles, since the new technology - in this case, the car itself - was considered a luxury, a techno-rarity (Catry, 2003). Thus, the early production models of Ford (e.g. Model T) and Benz were considered as luxury. Later, these brands shifted their target market towards mass production and mass-produced premium cars, giving space to the rise of true luxury car brands such as Bugatti (founded in 1909 by engineer Ettore Bugatti coming from an artistic family background (his father was a furniture and jewelry designer)) that established their brands with the purpose of creating the best in class, the combination of artistry and engineering and to convey exclusivity not something that all could possess.

Luxury Automotive Market

According to Bain & Co. (2016), the top end of the market absolute luxury cars (hypercars included) witnessed fastest growth rate in all the luxury market during period 2012 to 2016 (Fig. 7). The increasing number of High Net Worth Individuals (HNWI) worldwide is the main reason for such growth. According to Euromonitor [2], HNWIs are individuals having more than 5 million dollar worth of assets and they are mainly in the US, UK, France, China, and Japan. Short-term fluctuations in economy slightly affect HNWI, but other factors such as declining ROI or social acceptance may negatively impact their willingness to buy HLS cars.

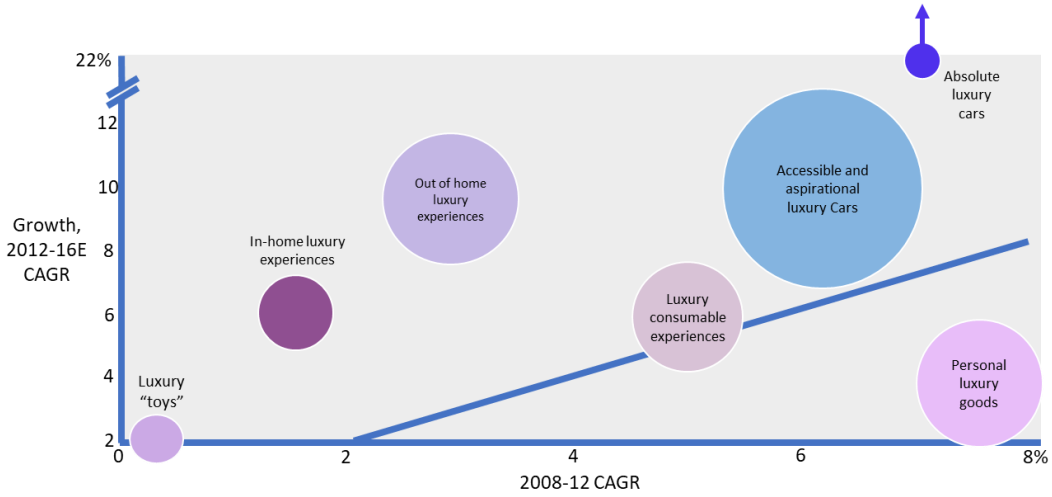


Figure 7 Growth of global luxury goods segments, 2008-2016E (€billion)

Notes: Out-of-home luxury experiences include luxury hospitality, cruises, and restaurants; in-home luxury experiences include designer furniture and fine art; luxury consumables experiences include beauty, fine wines and spirits, and fine food; luxury "toys" includes private jets and yachts

source: Bain & Co.

IHS Markit in their annual market outlook of 2019 (Aston Martin Lagonda 2018), forecasts growth for all the High Luxury cars, including luxury GT and super GT, luxury sports and luxury mid-engine segments. For luxury SUVs, IHS forecasts rapid growth of 30% from 2018 to 2030, since this type of car is relatively new to the luxury car segment.

According to Aston-Martin having luxury mid-engine and sedan segments in a company's portfolio, generally, has the ability to increase the average selling price of a company's models, since they are priced higher than GT and super GT models and can add to a company's image

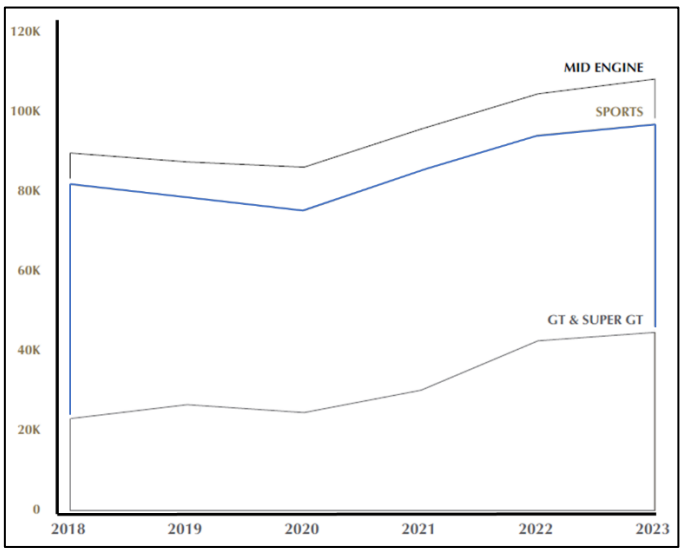


Figure 8 GT, Sports, Mid-engine Growth (units)

Source: IHS Markit Global Automotive Outlook, 2018

At this point it is important to mention that for instance in the case of Ferrari, they plan on a lifecycle of 4 or 5 years [3] for each completely new model, meanwhile introducing a modified version of the existing models every year. For a mass-produced Ferrari like California model (2500 units annually) it takes around three weeks to build one and additionally, it requires customers to wait for two years to get one. [4].

As another example, the Swedish Koenigsegg, manufacturer of hypercars with a price tag of three million euros, makes only 25 cars per year and the waiting list reaches up to four years. Its main competitor Bugatti manufactures 5 examples of each model and the waiting list is three years.

Likewise, on the high end of the spectrum of exclusivity where one-offs and limited editions are situated, a company like Ferrari needs more than a '*mere willingness to buy*' to sell a wealthy individual these types of cars. According to a hardcore enthusiast and long-time customer of Ferrari, it takes one having already 5 Ferraris to just be considered in the waiting list of a LaFerrari (2013 - 2016) model among other criteria defined by the company.

2.2 Supply Chain Management

What supply chain is?

According to the Council of Supply Chain Management Professionals, a supply chain is defined as:

> 1) starting with unprocessed raw materials and ending with the final customer using the finished goods, the supply chain links many companies together.
>
> 2) the material and informational interchanges in the logistical process stretching from the acquisition of raw materials to delivery of finished products to the end-user. All vendors, service providers, and customers are links in the supply chain.
>
> Basically, a Supply Chain Network can look like this (Fang et al., 2018):

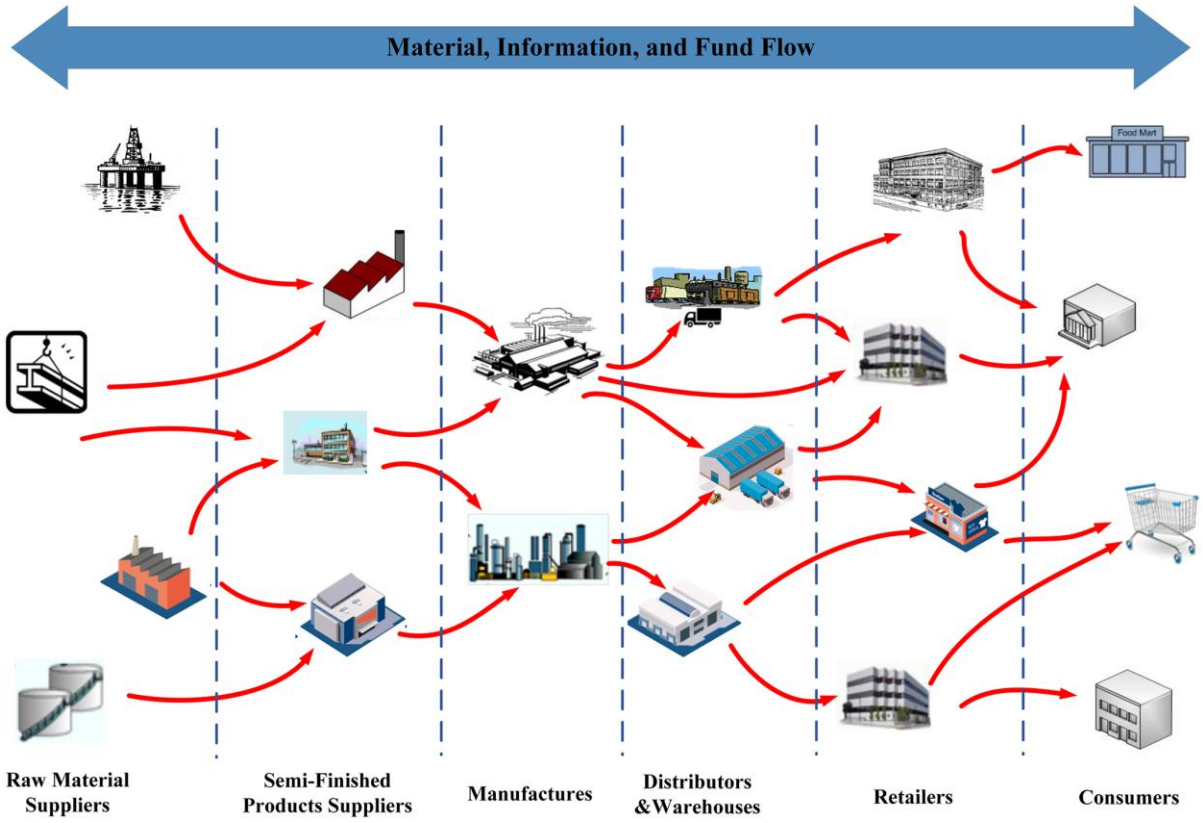


Figure 9 Example of a Supply Chain Network

What is Supply Chain Management?

Supply Chain Management (SCM) as defined by the Council of Supply Chain Management Professionals (CSCMP): *"Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply*

and demand management within and across companies. Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance, and information technology."

As stated by IBM *"supply chain management affects product and service quality, delivery, costs, the customer experience and ultimately, profitability"*. IDC ("IDC Technology Spotlight," n.d.) in their 2018 study detailed that in 2017 the data generated due to supply chain processes was 50 times more than it was five years prior. But less than a quarter of this amount of data is actually being processed. This database can provide predictions such as weather conditions, political instabilities, sudden demand fluctuations, etc.

According to Bart Perkins and Thomas Wailgum ("What is supply chain management (SCM)? Definition and best practices | CIO," n.d.), Supply Chain Management consists of 6 components:

1. Planning: companies need to forecast demand and manage resources for their production unit by designing an effective and efficient supply chain network.

2. Sourcing: or procuring what is needed for production from suppliers. Effective Supplier-manufacturer collaboration known as Supplier Relationship Management or SRM can have a larger impact on the whole supply chain network.

3. Making: the coordination of activities including receiving the materials from suppliers, manufacturing, testing the quality, packaging and shipment groundwork is accomplished by supply chain managers.

4. Delivering: the management of the finished goods until it is received by the final customer, this part of the activities can be outsourced to companies offering Logistics services.

5. Returning: in cases of defective parts or unsold products the supply chain needs to be prepared to manage product returns.

6. Enabling: Enabling processes include finance, HR, IT, facilities, portfolio management, product design, sales, and quality assurance to help to monitor information throughout the network and to make sure the regulations are not violated.

Bart Perkins and Thomas Wailgum suggest that in three scenarios a supply chain management can increase value to supply chain cycle:

- Identifying potential problems: by analyzing data, a manufacturer can make better predictions about a customers' potential order

quantity, increase the effectiveness of Customer Relationship Management, and avoid any complaint by the client.

- Optimizing price dynamically: to adjust prices in real-time when demand meets fluctuations. For example, hotel and flight prices can be dropped in low season to increase demand, or when fashion companies offer discounts to empty the warehouses in end-of-season.
- Improving the allocation of "available to promise" inventory: using analytical tools to better schedule work by making sure the required resources are available.

2.2.1 Outsourcing

Outsourcing has become a common practice not only in the automotive industry. And it does not happen merely in the procurement for the production line, but it can also be seen practically in any other functional areas like IT department, marketing, and advertising divisions, Human Resource Management, etc. for a bunch of reasons.

The literature regarding outsourcing is abundant, many books, handbooks, publications addressed many different aspects and issues around it for any industry and it is an ongoing matter of discussions. In common terms, outsourcing is the same as to decide whether to make an asset, resource, product or service inside the organization or buy it from third parties. Nevertheless, Council of Supply Chain Management Professionals defines Outsourcing as:

"To utilize a third-party provider to perform services previously performed in-house. Examples include the manufacturing of products and call center/customer support."

There are three components to outsourcing, the "*client*", i.e. the organization that transfers the work to a third party, the organization that accepts and handles the work is known as "*vendor*", and the work that has been transferred between the two organizations is referred to as the "*project*".

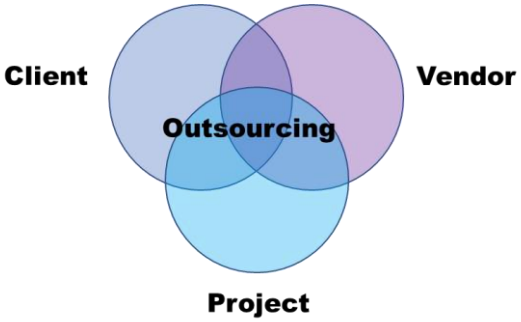


Figure 10 Three components of outsourcing

An organization after conducting its assessments could find many reasons to decide to transfer responsibility to a party outside its boundaries. For example, in the automotive industry in the 1990s, developing countries like China and Brazil decided to ameliorate the development of their automotive industry by substituting imports with foreign investments in the form of Joint Ventures (Humphrey and Memedovic, 2003) by developed countries such as US. From the perspective of the foreign companies this was advantageous since by offshoring parts of their value chain they could leverage the low-cost labour while capturing their market. But there could also be other reasons. According to the Outsourcing Handbook (M.J. Power et al.) the following factors are driving the need to outsource:

Figure 11 Factors driving the need to outsource

In the automotive industry as in others, the initial motivation of outsourcing is to reduce cost thus it was financially driven, but there are also strategic motivations. In the early stages of product development, the client is assumed to be the source of knowledge but in time the vendor becomes more competent and the flow of knowledge changes its direction pointing from vendor to the client.

This is the case in the automotive suppliers' industry. After the 1990s the third-party suppliers became competent to the point that the company has to buy some very advanced technologies from the global vendors. An example could be Ferrari, despite their heavy investments in R&D and benefiting from their expertise in Formula 1 they buy technologies such as transmissions from Magna the third biggest global parts supplier according to Automotive News. Magna which operates globally has an annual revenue of around 40 billion USD and compared to the sales of an Original Equipment Manufacturer like Ford with annual revenue of 160 billion USD it is evident that the importance and scale of business functions of tier 1 supplier is nothing less than its clients (i.e. OEMs). Table 3 shows a comparison between leading OEMs and top suppliers in

terms of revenue, number of employees, number of countries they have their operations in and the total number of manufacturing facilities.

Table 2 Comparison between leading OEMs and top suppliers in terms of size

	Italy		North America	
	FCA	**Magneti Marelli**	**Ford**	**Magna**
Revenue (in Billion Euro)	110.4	8.2	144	35.9
Number of employees	198,545	44,000	199,000	174,000
Number of countries	40	20	Worldwide	28
Number of manufacturing facilities	102	85	61	348

Regarding the make or buy decision, a company prefers to develop in-house when it sees the needed technology is technically complex (Novak and Eppinger, 2001). This will help the company to reduce the difficulties stem from the coordination of activities from vertical integration. This is the case for brands with high technical performance such as sports cars. As an example, most of these companies prefer to design their own engines because it is viewed as very technical and of great importance to the final performance of their products.

2.2.2 Automotive Supply Chain

As a result of globalization and offshoring production, and outsourcing to suppliers of parts, automakers are required to manage multiple manufacturing sites and to deal with the high number of their suppliers spread among regions worldwide. For this reason, a supply chain network can look complicated, for the sake of simplicity then, an automotive supply chain can look like this:

- Dealerships: dealerships distribute and sell cars. They can be owned by the manufacturer or sign partnership contracts. these companies buy cars directly from the manufacturer and sell them to clients. In this case, the customer may not experience any delay in the delivery of their car, it is especially important in the case of High Luxury car Segment that customers are put into two-year waiting-

lists. Dealership contracts are of importance in countries where the carmaker doesn't have a showroom of its own.

- Manufacturers: they are often referred to as Original Equipment Manufacturer or OEM. Companies that design, procure components from suppliers, assemble, do the marketing and sell the cars under their brand (e.g. Toyota, FIAT).
- Tier-1 suppliers: companies that supply materials and components (e.g. aluminum for body kit and lamps) or modules (e.g. headlights or infotainment system) to the OEM. In many cases, they are closely tied to the design and production processes alongside OEM, involved in co-design and co-development.
  Examples of tier 1 suppliers are Martinrea offering steel metal and Aluminium solutions, and Aptive for their safety solutions like airbag units.
- Tier-2 suppliers: these are the suppliers to tier-1 suppliers, they range from complex items such as GPUs (e.g. Nvidia) to more basic items like wirings which compete over offering lower prices.

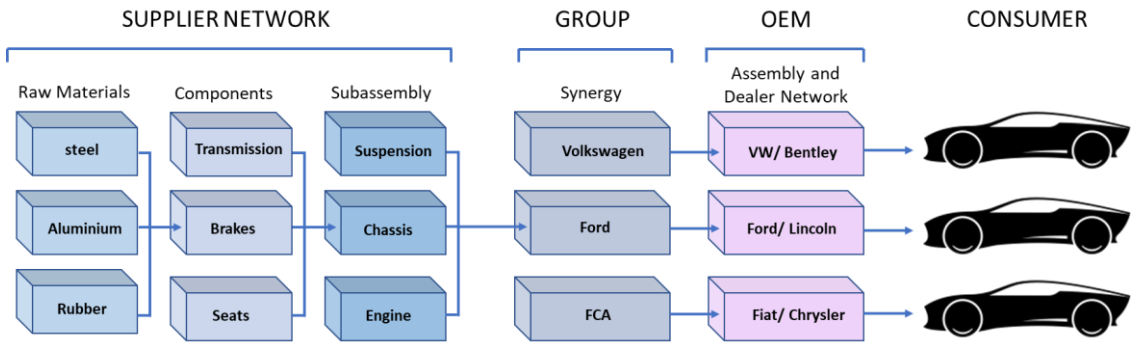


Figure 12 Example of an Automotive Supply Chain

The selection and management of the supply network can give a competitive edge and reduce costs significantly. In 2004, Lotus working with 200 suppliers, revised its supply network by using Value Stream Mapping which resulted in a 50% improvement in their delivery time. [5]

Additionally, in order to reduce the complexities in the supply network, starting in the 1990s, companies like Volkswagen opted to order parts from their suppliers in "*Modules*" - for instance, buying the whole seating system; to reduce the costs even more VW requires that the Modules be assembled on the final assembly line directly by the supplier. Modular supply will be discussed further in detail.

2.2.3 Automotive Industry in Italy

There were 1.91 million newly registered passenger cars in Italy in 2018, making it the fourth-largest market in Europe after Germany, United Kingdom, and France. Compared to last year sales dropped around 3% and it is expected to fall off another 3% in 2019. This is caused by the promotion of non-polluting while expensive new models. In terms of powertrain, there were 51.2% diesel, 35.5% gasoline, and 13.3% powered by alternative fuels, 6.5% LPG, 4.5% hybrid, 2% CNG, 0.3% electric cars sold in 2018. On the other hand, Italy is one of the biggest European markets for mopeds and motorcycles there are nearly 7 million units of mopeds, bikes, and scooters in Italy, a 7% increase from 2017.

Just before the global financial crisis in 2007, the sales of passenger and light commercial vehicles in Italy peaked at 2.7 million units. After that, the market encountered a decline in sales for 6 consecutive years reaching 1.4 million units in 2012 but in post-crisis, in 2015 and 2016 the market recovered with a 7% growth in 2017, but a slight decline in 2018 reaching 1.91 million units. Sales of light commercial vehicles (LCVs) were around 8% of the total sales at almost 185,000 units in 2018.

Foreign brands have a strong presence in the Italian market which constitutes 73% of the market. PSA and VW groups have the biggest shares with respectively, 15.15% and 14.46% of the market.

Italian brands take up 26.4% of the market. FCA group had 26.1% of the market thanks to its affordable models such as Panda and Ypsilon. FCA's divisions market shares are as follows: Fiat with 16.93%, Jeep, 4.43%, Lancia/Chrysler, 2.54%, and Alfa Romeo with 2.26%. FCAs cars are mainly produced in Italy with a portion of them coming from Poland and Turkey.

Other most important Italian car manufacturers are Maserati, Ferrari, Lamborghini, and Italian Chinese Joint Venture DR. Maserati and Ferrari's shares of the market are 0.14% and 0.02% respectively. While Lamborghini is owned by German group Volkswagen.

Looking at the car production in Italy, 671,000 units are made in Italy in 2018, 10% less than the previous year, and 57% exported. The Italian automotive industry is concentrated in Turin and Piedmont region, where FIAT originated from [6].

Component Manufacturing in Italy

Component manufacturers worth half of the entire automotive sector at €46.5 billion Based on the data released by ANFIA (Italian Association of the Automotive Industry) and by ISTAT (Italian National Institute of Statistics), the amount of auto parts exports worth $24 billion worldwide with Germany as the most important destination, while Italy imported $18 billion of automotive components from around the world. The most important multinational parts manufacturers from Italy are Magneti Marelli, Sogefi, Brembo, TRW, SKF [6], [7].

The map below shows the distribution of Italian component manufacturers:

Figure 13 Distribution of component suppliers by region of the company's registered office

Source: Osservatorio sulla componentistica automotive italiana 2018

2.2.4 Globalization

During the 1990s, the global automotive industry experienced a massive rush in the production and sales mainly as a result of the inclusion of emerging markets to the scene (China, India, Eastern Europe). these countries required manufacturers to establish production sites in the host country in the context of import-substitution industrialization (Humphrey and Memedovic, 2003), while they could offer new market reach and cheap labor to the company. Licensing agreements, tax avoidance and a reduction in logistics costs were also some of the advantages that came with it.

While foreign regions might have had the capabilities to develop simple components locally, OEMs preferred to make orders to their original suppliers for the more technically demanding components that they have co-developed with. This both pressured suppliers to follow their customers and also to expand their global presence(Humphrey and Memedovic, 2003). Fig. 14 illustrates an interesting map from www.czechinvest.org which shows the heavy presence of foreign auto component makers in the Czech Republic:

Figure 14 Foreign automotive component manufacturers in the Czech Republic

Since suppliers are in close ties with the OEM in the processes of design, development, and assembly as well as manufacturing components, they are increasing their share of the value chain and becoming indispensable partners. Thus, OEMs now try to focus more on the design, distribution, sales and after-sales services.

Moreover, suppliers in order to remain competitive, acquire new technologies and achieve economies of scale through Mergers and Acquisitions in both horizontal and vertical dimensions.

2.2.5 Supplier-manufacturer relationship

In the 1960s, suppliers and manufacturers had defined boundaries, manufacturers designed nearly all the car parts and manufactured most of it. There were components that suppliers could leverage economies of scale to offer lower prices. They prepared the technical drawings and related requirements, and since the parts were simpler back then, many local suppliers were inclined to manufacture them. Making them compete over the contract (Humphrey and Memedovic, 2003). This type of practice is known as "follow-design" (Sturm, 2017).

But since the past two decades, suppliers' role in the design process became more prominent. On one hand, the components evolved into more technically complex systems, on the other, suppliers became more competitive in terms of know-how and scale of operations, this resulted in suppliers and OEMs in much more cooperation in the design and also assembly processes (i.e.co-design).

Today many parts of automobiles are designed in collaboration with tier-1 suppliers. As an example, Robert Bosch the biggest parts supplier to OEMs, designs and makes many important vehicular systems such as powertrain solutions (i.e. technologies related to combustion engines, fuel supply modules, ignition systems, etc.), Chassis Systems Control (e.g. brakes, ABS), electronics, infotainment systems, among many others, thus increasing their share of the pie of the value chain. This close collaboration with the OEM makes experts refer to these global suppliers as tier-0.5 suppliers (Humphrey and Memedovic, 2003).

Thus, in parallel with the internationalization of manufacturers, the suppliers also had to expand their reach as mentioned earlier. This partnership between a supplier and manufacturer is known as "follow-sourcing" (Humphrey and Memedovic, 2003).

Today, the value chain of a typical automaker looks like Fig. 15. For the design of the components, the supplier and OEM work in collaboration (vertical double-headed arrow). Then it is the responsibility of the manufacturer of the part to transfer the designs to its partners (subsidiary, licensee or affiliate) in other regions (horizontal arrows). The allocation of contract follows almost similar pattern except that the contract is allocated by the assembler (hence the one-sided arrow). Finally, for the supply of components to manufacturing plants, each plant is supplied by its nearest supplier with the possibility of countries/ regions supplying other regions.

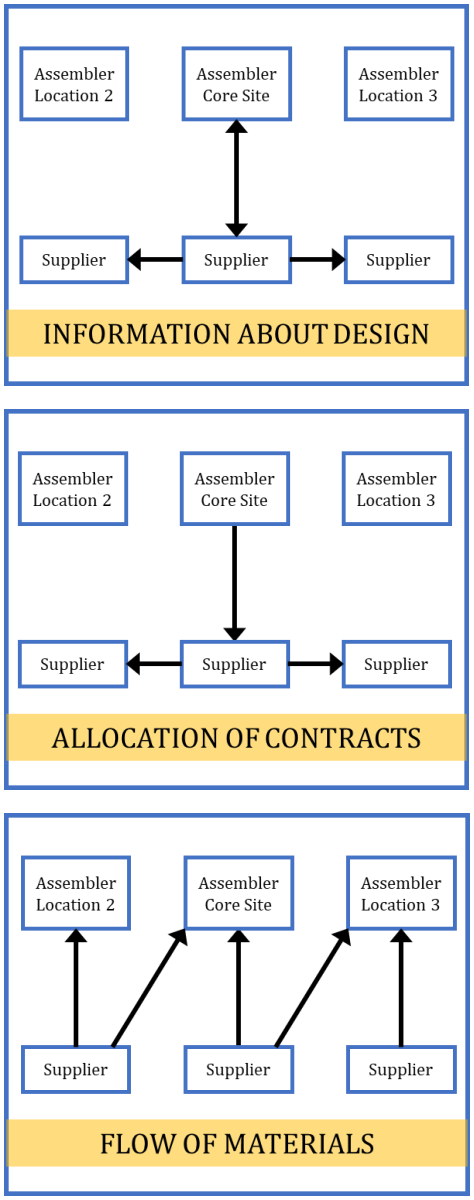


Figure 15 The auto industry value chain

Source: (Humphrey and Memedovic, 2003)

Assemblers want fewer suppliers

In the 1990s, the suppliers in order to be able to serve various clients in different parts of the world opted for more standardized components applicable by many OEMs. The standardisation of components made others join in. This made suppliers try to offer more value than their counterparts. On the other hand, OEMs having too many suppliers decided to force their direct suppliers to consolidate in order to reduce the complexities in their supply network and to leverage on having long-lasting collaborative partnerships (Collins et al., 1997). Capturing similar tier-1 suppliers and competitors caused a surge

in the number of Mergers and Acquisitions between suppliers of first, second and third-tier to become the first-tier supplier.

Additionally, large car manufacturers contributed to the M&A trend by spinning-off their parts divisions. For example, Ford and GM served this trend by spinning off their internal parts divisions to be renamed respectively as Delphi and Visteon, becoming two of the largest global suppliers.

Further consolidations occurred, prompting first-tier suppliers to increase their added value to manufacturers by having a consolidation of their own to eventually become "*suppliers of Modules*"(Collins et al., 1997).

Modular Supply

McKinsey defines a module as a "*physical subassembly*" while Mercer (1995, (Collins et al., 1997)) defines a system as "a functional aggregate of components not necessarily delivered as one physical unit". Based on these definitions a Module's examples could be "seats, dashboard/cockpit and front-end assemblies" and a system could be a braking system.

Thus, there exist first-tier suppliers that consolidate other first-tier suppliers. Some suppliers become module suppliers and some losing this capability becoming suppliers of module suppliers. For example, a seat module supplier integrates different technologies from different suppliers such as the electronic control unit, sensors, mechanisms, airbags into one final product. It then will be assembled by the module supplier on the assembly line.

VW is known to be very efficient in implementing this practice. For instance, in 1996 together with seven select module suppliers, they established a new manufacturing plant in Brazil. Reducing their supply base from 400 to only seven, yielded huge impact on the operational output, reducing the assembly time by 10% and their production costs by 20% (Collins et al., 1997).

2.2.6 The Rise of global "Mega-suppliers"

Rapid globalization and increasing outsourcing are the two main reasons that led the suppliers to engage in a series of mergers and acquisitions until this day to become global and remain competitive. Leading to suppliers becoming bigger in terms of size both in horizontal and vertical dimensions turning into "global suppliers".

Fig. 16 shows the trend of sales of suppliers relative to OEMs and how important the suppliers have become. The growth is exemplified in the figure during 1991 up to 2005 in North America compared with the world from 1999 onward (Sturgeon et al., 2008).

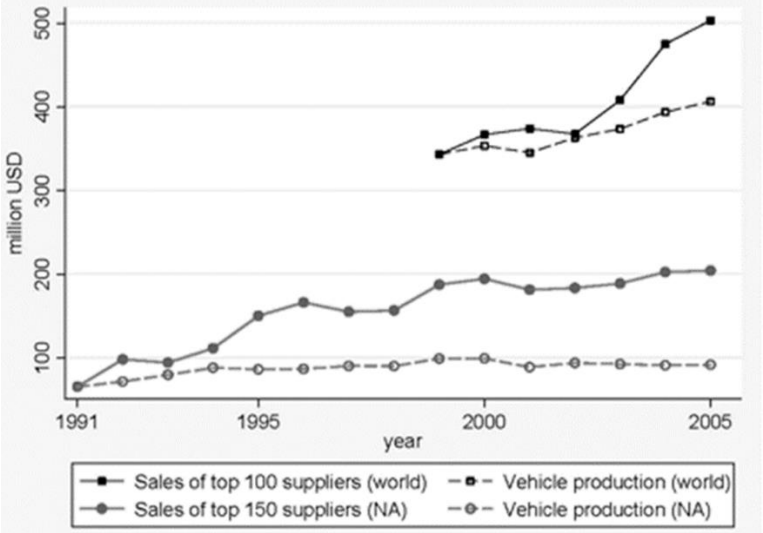


Figure 16 Sales of suppliers relative to OEMs

Source: Information for the top suppliers is taken from Automotive News (various years). Information on vehicle production is from Ward's Automotive yearbook (2006).

Notes: The scale is for the sales numbers in millions of the time's US dollars. The vehicle production series has been scaled to coincide with the relevant sales number in the initial year.

"Mega-supplier" is a term coined by PwC describing the 20 biggest auto suppliers derived from the list of the top 100 global suppliers ranked annually by Automotive News. Global mega-suppliers are also referred to as "Tier-0.5" suppliers since they establish closer ties with assemblers than Tier-1 suppliers. What they offer to their clients are known as "black-box" solutions since they are made with their own technologies and innovations that are new to their clients (Humphrey and Memedovic, 2003). Table 4, below, presents the first 20 suppliers ranked by sales in 2018:

Table 3 the first 20 suppliers ranked by sales in 2018

2018 Rank	Company	Country	Total Global OEM Automotive Parts Sales (dollars in millions) 2018	Percent Europe	Products
1	**Robert Bosch**	Germany	$49,525	17	Powertrain solutions; chassis systems controls; electrical drives, car multimedia, electronics, steering systems & battery technology
2	**Denso Corp.**	Japan	42,793	23	Thermal, powertrain control, electronic & electric systems; small motors, telecommunications
3	**Magna International Inc.**	Canada	40,827	50	Body exteriors & structures; power & vision technologies; seating systems & complete vehicle solutions
4	**Continental**	Germany	37,803	28	Advanced driver assistance systems, electronic brakes; stability management, tires, foundation brakes, chassis systems, safety electronics telematics, powertrain electronics, injection systems & turbochargers
5	**ZF Friedrichshafen**	Germany	36,929	28	Transmissions, chassis components & systems, steering systems braking systems, clutches, dampers, active & passive safety systems, driver assist systems including camera, radar & lidar
6	**Aisin Seiki Co.**	Japan	34,999	17	Body, brake & chassis systems, electronics, drivetrain& engine components
7	**Hyundai Mobis**	Korea	25,624	12	Automotive electronics, infotainment, ADAS, EV systems, module systems, lighting, airbags & brakes
8	**Lear Corp.**	USA	21,149	36	Seating & electrical systems (E-Systems)
9	**Faurecia**	France	20,667	25	Faurecia seating & interiors; Faurecia Clarion Electronics & Faurecia clean mobility
10	**Valeo**	France	19,683	20	Micro hybrid systems, electrical & electronic systems, thermal systems, transmissions, wiper systems, camera/sensor technology, security systems, interior controls
11	**Yazaki Corp.**	Japan	17,500	31	Wiring harnesses, connectors, junction boxes, power distribution boxes, instrumentation & high voltage systems
12	**Panasonic Automotive Systems Co.**	Japan	17,466	34	Premium audio systems, navigation systems, compressors, batteries, motors, monitors, sensors; switches & HUDs
13	**Adient**	USA	17,400	30	Seating & seating systems & components
14	**Sumitomo Electric Industries**	Japan	15,402	24	Electrical distribution systems, electronics & connection systems
15	**Yanfeng**	China	14,506	19	Interiors, exteriors, electronics, seating & safety
16	**Thyssenkrupp**	Germany	14,438	25	Steering, dampers, springs & stabilizers, camshafts, forged machined, components, bearings, undercarriage components, axles, forged crankshafts, drivetrain components, high-strength lightweight steels & electrical steel
17	**Mahle**	Germany	14,405	27	Piston systems, cylinders, valvetrains, alternators, air & liquid, management systems, vehicle climatization, engine & powertrain, cooling, battery cooling, actuators, electric drives & starters
18	**JTEKT Corp.**	Japan	13,078	19	Bearings, steering systems, driveline systems & machine tools
19	**BASF**	Germany	12,931	26	Coatings, catalysts, engineering plastics, polyurethanes, coolants, brake fluids, lubricants, battery materials
20	**Aptiv**	Ireland	12,869	38	Electrical & wiring products, body controls, infotainment, safety & autonomous driving technologies

Source: Autonews.com

As stated by PwC, the total value of mergers and acquisitions among suppliers has tripled in the past decade. It averaged around $20 billion per year for ten years. From 2014 to 2017 it reached an average of $50 billion to $60 billion per year and then set the record in 2018 to $97.5 billion. There were 903 mergers and acquisitions in the year 2018, each deal with an average value of $286.8 million with 20 deals worth more than $1 billion.

Acquiring New Technology

According to PwC, acquiring new technology is the driving force of the recent wave of M&As. Electric vehicles, connected cars, and autonomous driving are the new hot topics of auto industry triggering suppliers to acquire companies and start-ups in the field of software and electronics although the Return on Investment in these technologies is uncertain as the car makers are still developing and testing their platforms.

PwC states that these five trends will transform face of mobility and vehicles of the future until 2030:

- Electrification: although it is not a totally new concept, the production of electric-drive vehicles has gained momentum in the past decade KPMG in their 2019 report, surveyed top managers and experts in auto industry worldwide and identified that till 2040 a fair share of BEVs (30 %), Hybrids (25 %), FCEVs (23 %) and ICEs (23 %) will co-exist as the drivetrain technologies of the future.
- Autonomous driving: still a work in progress technology, it is expected that until 2030 (PwC, 2018), certain areas of the cities, as well as highways mainly in Europe, will be restricted to only vehicles equipped with autonomous driving technologies.
- Shared cars: car sharing is gaining popularity every year. Younger individuals are less willing to own a car and are the main customers of this new practice. In 2017, the number of users worldwide is estimated to rise to 338 million [Statista (2017): eTravel: Mobility Services, [9]
- Connectivity: in order to implement technologies like autonomous driving and shared mobility cars must be enabled by connectivity technologies. They are constantly connected to the internet, share and analyse information. Examples include proximity sensors and high-speed internet like 5G networks to avoid any buffering.
- yearly updated: every year newer and newer software and hardware technologies are being developed. technologies like connectivity and autonomous driving must be updated annually. Instead, cars are expected to have a lifecycle of five to six years. in order to still be functional and of value to customers, they must be enabled with platforms that can be integrated with the new technologies.

Chapter 3: Research Methodology

3.1 Overview of Research methodology:

In the first part of this chapter the methodology I went through to conduct my research will be described. In order to realize the role and influence of the suppliers in the luxury car industry I scanned through the previous studies on research publication websites such as "*Scopus"* and "*ResearchGate",* among others, to check if there exists any previous knowledge under the topics of luxury automotive industry, luxury industry and automotive industry, in general, to better understand the problem. In parallel, I delved into the automotive and consulting and marketing websites of related fields. Then with the consultation of my Supervisor, Prof. Brun, the objectives and Research Questions were defined.

The data collected in this thesis is mostly extracted from the internet including the automotive industry experts' websites, publications in academia, consulting firms' annual reports, websites and annual financial & sustainability reports of the companies and suppliers, etc.

The data used to illustrate suppliers' map are taken from "*AutomotiveNews*" website and "*Marklines.com*". The latter Japanese website contains abundant information regarding the supply chain of various automotive companies. Its annual subscription fee starts from €4200 but fortunately it offers a trial signup service that gives access to all the information for 10 days.

In the following, the purpose of writing this thesis will be explained. Next, the literature gap in academia will be pointed out to better define the Research Questions. After that the steps to provide the framework to find the answers will be defined.

3.2 Purpose of writing this thesis

The focus of the thesis is the luxury car manufacturers. They are established on a small scale to serve a niche market, which is High Net Worth Individuals who are capable to spend money and are willing to do so for different reasons. In the literature review the criteria that a luxury product must possess to be considered luxury and customers' expectations from such a product will be identified.

The luxury car makers due to their small scale are very much linked with the economic outlook. Such that customers' decision in times of turmoil will be affected and the company as well will be touched by it. History in the past decade has seen numerous small luxury auto manufacturers that had to be dissolved due to not being profitable enough to sustain their businesses. Low production volume and high Research and Development costs are only two of the main reasons. The cost of developing new technology made these companies opt for outsourcing. In today's world, even a successful company in R&D development such as Ferrari cannot be able to develop all the required technology. Since

globalization of automotive industry, parts suppliers evolved in both scale and know-how, and nowadays buying strategic components from third parties has become a norm for any car maker.

These were the motivations of conducting this thesis to see how internationalized the suppliers for some selected brands are, to see how various countries contribute to the supply network specifically in luxury car segment.

3.3 Literature Gap

The literature review consisted of two main parts. First, we examined the literature around the luxury industry and then, the works done in the field of Supply Chain Management. There we covered topics such as outsourcing and supplier-manufacturer relationship, globalisation and automotive supply chain.

Thus, the main gaps in the literature are as follows:

a) what a luxury car is? Each manufacturer has their own definition of a luxury car. Premium carmakers claim that their products are luxury but in reality, they are not, one of the reasons is that one criterion of a luxury product is its exclusivity that premium car makers do not possess this quality since they are abundant. Moreover, luxury cars and performance cars are considered into one segment. But the experience a customer gains from having a ride in a luxury car like Rolls-Royce is supposedly distinct from a performance car like Ferrari. A performance car is intended for the joy of ride, top speed, handling and acceleration (Kapferer, 1997) whereas a luxury ride is to deliver a versatile, smooth, comfortable ride. In industry they refer to this segment by many different names such as "*High Luxury Car Segment*" or "*Luxury Performance Car Segment*" and in the end they suggest one market segment.

b) Regarding supply chain, in academia there is not a solid publication that examines the issues a small car manufacturer deal with vis-à-vis their supply chain in today's industry. How a small car manufacturer differs from a large manufacturer in their supply chain network. What advantages or disadvantages a large manufacturer has in terms of their negotiating power to procure what they need. What are the benefits of having an extensive dealer network. How synergies help subsidiaries in achieving their goals. These are the possible questions that require answer. No doubt that this information has been obtained by the marketing departments of car makers or gathered by consulting and marketing firms.

3.4 Research Questions:

As discussed in section 4.2 and 4.3, the academic literature lacks a solid framework regarding a standardised classification of cars and differentiation between a luxury car and a high-performance car. On the other hand, there is no publication regarding the issues surrounding the supply chain of a small car manufacturer as in a luxury performance car manufacturer. Moreover, the literature lacks investigations that identify different aspects of a synergy induced between a small-scale luxury car manufacturer and a big company. As mentioned before, in today's globalized and specialized industry, every car manufacturer acquires components from suppliers who develop and make the components and technologies more efficiently. Thus, the question will be:

RQ: What are the biggest suppliers of a luxury car maker?

In this thesis, we want to point out which component manufacturer supplies which car manufacturer (i.e. OEM) and to present this information on a map for some selected companies. It is interesting to realize how different countries contribute to different car manufacturers.

3.5 Steps taken to provide an answer

In order to identify the suppliers for luxury car manufacturers, 8 of the biggest and most popular companies were selected as the basis of the research.

Ferrari, Lamborghini, and Maserati represent Italy. Ferrari and Lamborghini both offer high-performance cars but for the purpose of this thesis they are considered as High Luxury cars. While Maserati's products are placed somewhere between Premium segment and the Luxury segment. Ferrari is an interesting case since it operates as a stand-alone company alongside Aston Martin, while the other six companies belong to a large automotive group.

Aston Martin, Bentley and Rolls-Royce represent the U.K. and they perfectly fit into the definition of a luxury car. From Germany, Porsche is included in the research while its premium products are not exactly fitted into the definition of a High Luxury car unless we consider its high-end model 911 GT3.

Finally, Bugatti originated in France. this company is a peculiar case, although situated in France, is revived and owned and financially and technologically backed by Volkswagen, thus can be considered as an international brand. Additionally, the models are at the extreme end of the luxury spectrum. This car is made to display the technological advancements achieved in the automotive industry and in particular by Volkswagen.

A high Luxury car Segment incorporates these criteria [by Aston Martin]:

- Power above 500 horsepower as an indicator of superior technical performance
- Retail price above Euro 150,000 (including VAT)

Based on this and as discussed earlier, Maserati and Porsche will not be considered in the High Luxury car segment but for the purposes of this thesis and as a comparison and in order to have a representative from Germany they are included.

One other element that is often linked to a super sports car is the position of the engine though not a universal trait of all the super sports cars. The mid-engine layout is the most popular engine position for track-capable super sports or hypercar. Notable examples are Lamborghini, Bugatti, Pagani, Koenigsegg that are at the higher end of the luxuriousness spectrum. Rear engine and front engine types are also very popular for example Ferrari uses mostly front-engine layout for its range models and Porsche places their engines at the rear end.

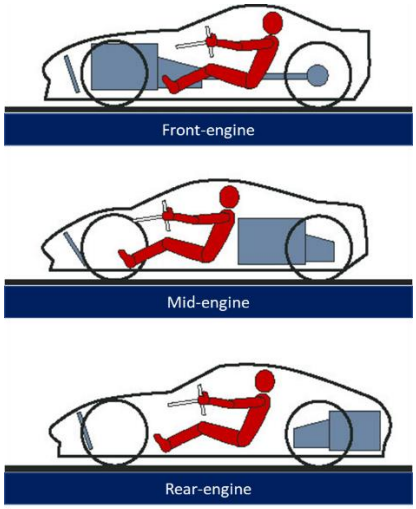


Figure 17 Position of the engine; mid-engine associated with super sports cars

Source: https://autostyling.wordpress.com/car-design-guides/the-basics-of-car-design/

For each case study a brief context about the company history, its main strategies, the main features of their products and its product portfolio are pointed out. Next a SWOT analysis of the companies are collected and in the end, the suppliers' map for each company and the main result of this thesis is illustrated.

In a nutshell, each case study is composed of these parts:

- Companies' Background
- Product Portfolio
- Suppliers' map
- Companies' SWOT Analysis

Chapter 4: Case Studies

4.1 Aston Martin Lagonda

Aston Martin Background

Established in 1913 by Lionel Martin and Robert Bamford in the pursuit of making high-quality cars that are joyful to ride while appreciated for their beauty. Martin used to compete in hill climb races at Aston Clinton hence the name of Aston Martin. In 1947 Aston Martin and Lagonda came under the same roof when Sir David Brown purchased them together. Recently the company changed its leadership style when they hired British "Dr. Andy Palmer" former senior manager of Nissan. The company revised its strategy known as Second Century Plan that increased the sales of Aston Martin and reintroducing Lagonda brand to be the world's first 100% emissions-free luxury car. The company is also listed on London Stock Exchange.

The company attends motorsports and High Net Worth Individuals Motoring Events (such as Le Mans 24-hour race, Goodwood Festival of Speed, Goodwood Revival and Pebble Beach Concours d'Elegance) also take part in Geneva, Shanghai and Beijing Motor Shows as part of their marketing activities.

Current Product Portfolio

Table 4 Aston Martin's portfolio

Model	DB11	DBS Superleggera	Vantage	Rapide E
Year	2017	2019	2019	2020
Base Price	€190,000	€250,000	€155,000	€280,000
Vehicle Layout	4-pass, 2-door coupe (2+2), Front-engine, RWD	Luxury Super GT, Front-engine	Luxury GT, front-engine	4-door sports saloon, front-engine
Engine	5.2L/600-hp/516-lb-ft twin-turbo DOHC 48-valve V-12	5.2-litre twin-turbo V12, 725hp	4-litre twin-turbo V8 engine	800V Battery 5600 lithium-ion 18650 format cylindrical cells 610 hp
Notes		Engine produced in Germany by AM engineers		First EV model, 155 units

Suppliers' Map

In order to see the suppliers of Aston Martin, its DB11 model from 2016 is considered as the reference. According to Automotive News, as indicated on the map, most of the suppliers are from Germany notably ZF Friedrichshafen the supplier of transmissions and MAHLE which delivers mostly piston systems, and engine & powertrain cooling technologies. This is followed by the US and Spain as the main suppliers. DOW Automotive of US supplies adhesives for the company and GRUPO ANTOLIN from Spain supplier of interior systems provides window regulators.

From Italy Brembo, Industrialesud and Saleri contribute to the production of the car with braking systems, headliner and water pumps respectively.

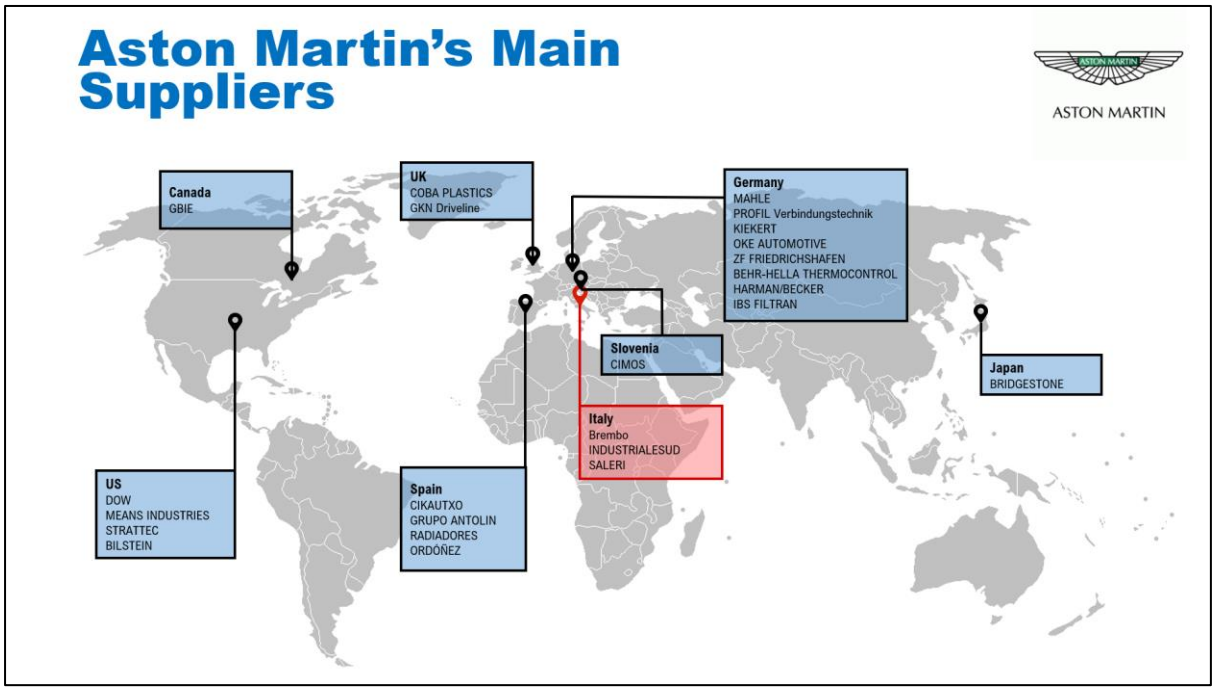


Figure 18 Aston Martin suppliers' map

Aston Martin Strengths

- **Brand and heritage**: two of the main characteristics of a luxury brand, for a presence of more than a century in both the luxury and auto industry Aston Martin is considered one of the most respected brands in history. Much of its popularity is owed to the James Bond movie franchise that associates the brand with elegance and high performance.
- **Focus on aesthetics and quality**: Lionel Martin and Robert Bamford founded the company with this purpose in mind to always produce the best-looking cars in the world and this is the company's main objective to this day. By implementing "Right first time" lean engineering the company adopts a no-scrap policy to increase efficiency in production line and to offer best quality.

- **Licencing and offering luxury experiences through partnerships**: development of luxurious properties within the residential, aviation and marine markets through collaborations to create seamless luxury experiences. For example, in partnership with G&G Business Developments, they have developed a luxury building in Miami, US.
- **High Pricing Power**: by introducing new core models and enhanced versions of existing models between 2007 to 2018 the company was able to increase its average price by 100%.
- **Increase in sales by introducing new core models**: part of the agenda of the Second Century Plan the company decided to expand its portfolio to increase sales while keeping its exclusivity. Seven completely new models including mid-engine and SUV cars as well as limited editions will be introduced in seven-year time span. Also relaunching Lagonda brand to enter the luxury sedan segment to compete brands like Rolls-Royce and Bentley.

Aston Martin Weaknesses:

- **Limited access to funding**: this has a huge impact on the company's R&D investments. Aston Martin's main competitors in the industry like Bentley and Rolls-Royce are subsidiaries of bigger companies like Volkswagen and BMW that give access to their free cash flow.
- **No synergies**: Being an independent company, AM compared to its competitors can have limited access to innovative technology, know-how, and market reach, shared in a synergy between a conglomerate and its subsidiaries. This is costly to the company and raises the average selling price.
- **Limited range of products**: currently the company offers luxury GT and luxury sports cars. However, this will change soon as the company enter SUV, mid-engine and sedan segments

Aston Martin's Opportunities:

- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles
- Entering mid-engine, luxury sedan, and luxury SUV segments

Aston Martin's Threats:

- Keeping up with the latest technologies
- Brexit's impact on Supply Chain, financial position and people
- Social acceptance regarding luxury products
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 5 Aston Martin's SWOT

4.2 Ferrari

Ferrari Background

Enzo Ferrari started his career at Alfa Romeo as one of the team's race car drivers, in 1929 he launched his own racing team with the name Scuderia Ferrari racing mostly with Alfa Romeo cars that then became part of Alfa Romeo racing. But due to legal agreement surrounding the use of the name of Ferrari it was only by 1947 that Ferrari launched its own race car with the Ferrari name. In late 1940s Luigi Chinetti proposed Ferrari the idea of designing Ferrari cars for the public. And in early 1950s Chinetti opened its first dealership in the US [10]. Through the years Ferrari builds its empire based on their racing finesse and gained reputation for their performance luxury cars. Ferrari is known to successfully transfer their racing technologies to their road cars embedding track performance in an everyday car. Ferrari is famous for its symbol, Cavallino Rampante ("prancing horse") a black prancing stallion on a yellow shield and additionally famous for its red colour known as Rosso Corsa. Ferrari has a strong presence in racing especially Formula 1 contributing to brand's image.

Licensing and franchising have been a marketing strategy for Ferrari. Clothing, watch, perfumes are a few to name. The company opened a theme park in Abu Dhabi in 2010 known as Ferrari World, it features the fastest roller coaster in the world.

Ferrari is very sensitive about how their cars are designed. When a design does not appeal to customers, the brand and sales will deteriorate. The designs will be updated until the last moments of release since changes are expected as new trends in design, technology and luxury industry can break through and change customers' preferences.

Company's product range currently consists of three GT models and three sports models in addition to two special-series. But the company plans to introduce 15 new models until 2022.

At their Maranello facility, the engines are designed and manufactured in-house. The assembly line is also located there. Ferrari is also the supplier of engines to Maserati, so some of its revenues depend on the sales of Maserati. It manufactures its chassis in Modena factory. In order to be competitive through innovation the company emphasizes investments in R&D as part of their strategic pillars.

Ferrari fears that production in Italy might become infeasible in the near future due to changes in law, regulations and the economic conditions. Meanwhile, the company after its separation from FIAT went to corporate restructuring and moved its Headquarters to Netherlands. The company also went public in 2015.

Current Product Portfolio

Table 6 Ferrari's product portfolio

Model	F8 Tributo	812 Superfast	Portofino	GTC4Lusso	SF90 Stradale
Year	2020	2018	2018	2017	2020
Base Price (MSRP)	€240,000	€300,000	€180,000	€260,000	€1,000,000
Vehicle Layout	Super sport	Super sport	RWD 2+2 GT	4 Seater Super sport	4WD hybrid Super sport
Engine	V8, 720hp	800hp, 12-cylinders	600hp V8 turbo	V12, 680hp	V8 turbo 780hp engine, 162 kW electric motors
Notes					Hybrid, most powerful series-production

Suppliers' Map

Ferrari 488 (2015) is considered for the supplier analysis based on the data provided by Automotive News. Germany again comes first in terms of having the most mega suppliers on the list. ZF Friedrichshafen, Continental, MAHLE, Schaeffler from Germany deliver their latest technologies to Ferrari. The company's homeland comes second among the suppliers Magneti Marelli, SPAL Automotive and Brembo providing the company with variety of technologies. It is notable to mention Magna from Canada offering 7 Speed Dual Clutch Transmission and Federal-Mogul and Dow from US providing engine parts and adhesives respectively.

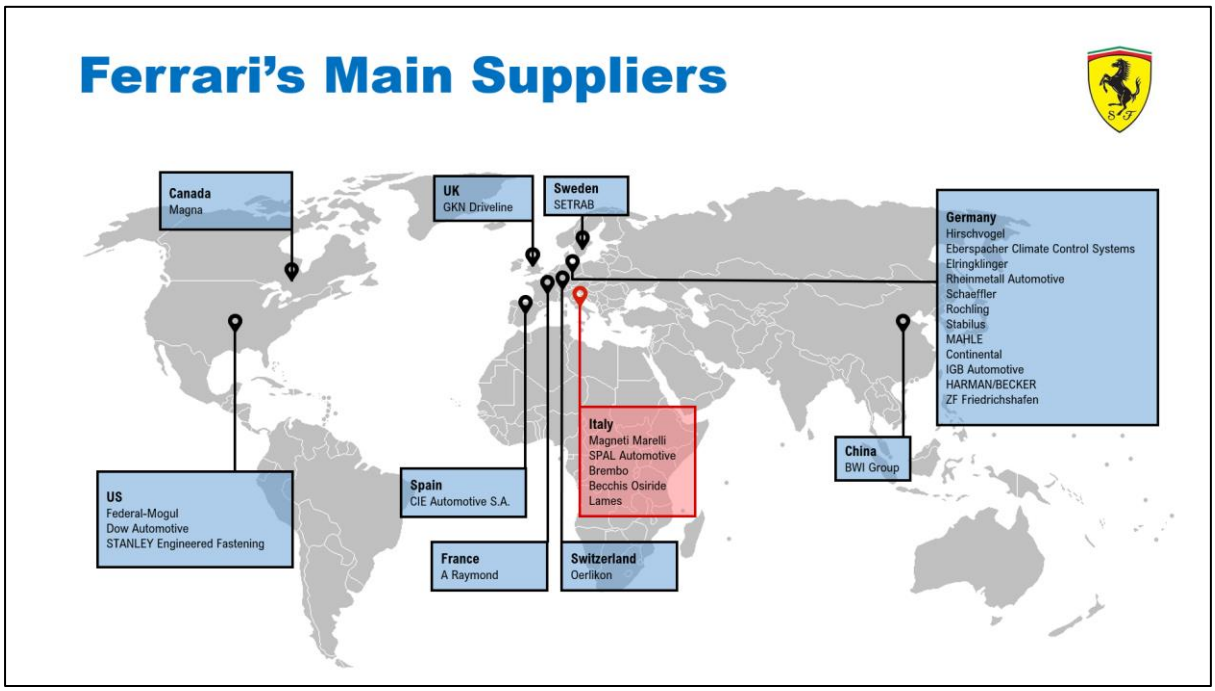


Figure 19 Ferrari suppliers' map

Ferrari's Strengths:

- **Strong Brand Image:** Ferrari's top-of-mind logo is popular enough to remind customers of a luxury product that is associated with speed and performance. the design, quality, and performance of the cars are the main factors that help Ferrari not only attract new customers but make them into enthusiasts and collectors of its cars. The company owes much of its image to achievements in motorsport especially Formula 1. Many customers of Ferrari are aficionados of these events.
- **Exciting Recognisable Designs**: Ferrari is famous for using curves in the exterior silhouette, and unique interior design that resembles an F1 car. The red colour is

also another feature that the company associated with itself - resembles a fired cannonball.

- **Licensing and Franchising:** as part of their marketing strategy Ferrari gives licenses to third parties. It offers a range of franchised products from clothing, watches, and perfumes to theme parks.
- **Technological innovations:** Ferrari heavily invests in R&D as its corporate strategy, it develops its own technology compared to its competitors that are part of a larger automotive group and benefit from the related synergies. Ferrari transfers many of its technologies from their racing division to squeeze track level performance in a road car as an added value.

Ferrari's Weaknesses:

- **Limited distribution network**: the company is dependent on its dealerships as sales and communication channels.
- **Dependence on third parties for key components**: as a performance car company Ferrari prefers to develop its key components, such as its transmission which is made by Magna. As stated by Ferrari they are also limited in monitoring the financial stability of their suppliers.

Ferrari's Opportunities:

- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles
- Entering luxury sedan and luxury SUV segments

Ferrari's Threats:

- Keeping up with the latest technologies
- Social acceptance regarding luxury products
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 7 Ferrari's SWOT

4.3 Maserati

Maserati Background

Brothers Alfieri, Ettore, and Ernesto Maserati founded the company in 1914 in Bologna, Italy. Spark plugs were the company's first major product [11]. Maserati's logo is a trident inspired by Neptune's trident from the statue placed in Bologna's Piazza Maggiore. From that time the company's name has been associated with racing. Now headquartered in Modena the company is part of FCA Group (Fiat Chrysler Automobiles) from 1993. It mainly produces Luxury GTs, sedans and recently SUVs. Though marketed as a luxury brand its main competitors are from the premium category like BMW and Mercedes-Benz, on the other hand, its heritage and high technical performance make it a stand-out. All the models are priced below €150,000 makes it accessible to many however the annual production output is artificially capped at 70,000 units [12]. As a result, Maserati is regarded as an Aspirational Luxury.

According to CEO Harald Wester, Maserati does not participate in any major Motorsport activities and their main channel of marketing is through advertising in media [13].

One of Maserati's most important suppliers is Ferrari. They provide the engines for the company. This collaboration between the two companies started when Maserati became the luxury division of Ferrari. The two companies were once part of the FCA group until Ferrari spun-off from the multinational group to be a stand-alone company. Now, Maserati benefits from the synergies within the FCA Group.

Current Product Portfolio:

Table 8 Maserati's product portfolio

Model	Quattroporte	GranTurismo	Ghibli	Levante
Year	2019	2019	2019	2019
Base Price	90,000	115,000	65,000	65,000
Vehicle Layout	Luxury Sports sedan	4-seater GT	Sports sedan	SUV
Engine	V6/V8, 350hp	4.7-litre V8, 460hp	V6, 350hp	V6/V8, 350hp
Notes		Engines manufactured by Ferrari, first release 2008	First release 2014	First release 2017

Suppliers' Map

Based on available data from Automotive News, Maserati Quattroporte is supplied from Germany by Mega suppliers such as ZF Friedrichshafen, Thyssenkrupp, Mahle, and Draexlmaier.

Borgwarner delivering timing systems and Federal-Mogul providing cylinder head gaskets are among the biggest suppliers of the US.

AEC, Brembo, Cultraro, Magneti Marelli, Sole SPA and Zanini Industries are the Italian suppliers of Maserati.

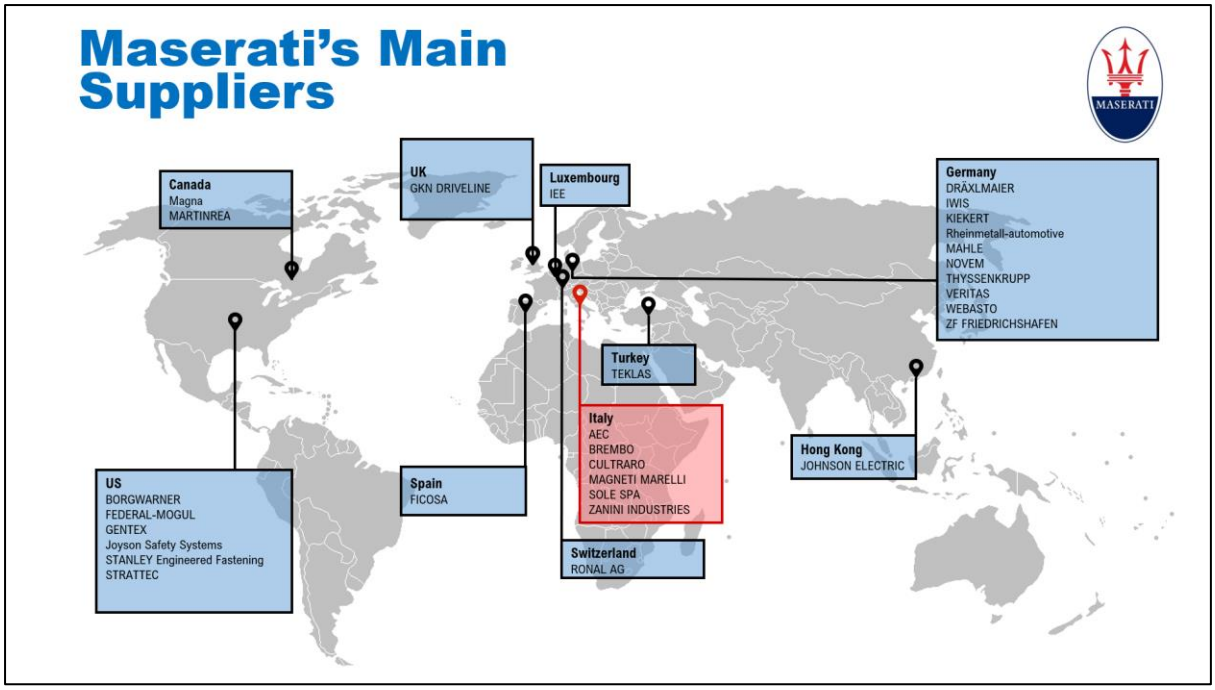


Figure 20 Maserati suppliers' map

Maserati's Strengths:

- **Brand Value and Heritage of Craftsmanship**: Maserati is one of the oldest car manufacturers in history. It's been associated with race cars
- **Technical Performance**: Sports cars produced by Maserati have superior performance compared to premium segment which are the company's main competitors (e.g. Acura) but when compared to the high luxury segment (i.e. Absolute Luxury) the products may lag behind brands like Ferrari and Lamborghini.
- **Impressive Designs**: throughout its history, Maserati used skillful and innovative designs and many of its production models and concept models have been recorded in the pages of automotive history and became classics like 3500GT model. As the head designer Lorenzo Ramaciotti put it: "*We will not have a Maserati that is squared off and blocky. It will have, always, a very flowing, simple and clean and more slimmed-down design.* [14]"
- **Part of a Larger Group**: Being part of a larger automotive group the company shares resources with FCA. This will ultimately reduce costs of R&D, efficiency and effectiveness in the supply chain among other benefits.

Maserati's Weaknesses:

- **Sales Volume**: although being a profitable company [15] since its acquisition by FCA, Maserati's market positioning is highly risky. Since it is threatened by high-quality German premium cars. The annual production volume is currently at 35000-50000 units. Any number higher than 70,000 units brand will lose its

exclusivity and any lower than this the brand will become unprofitable for that price range.

- **Drop of second-hand prices:** By checking websites selling used cars, one will notice that Maserati despite the value of its brand and its long history lose value very quickly. By sweeping online threads, it seems like customers are not satisfied with the quality and high maintenance costs [16] since customers due to its price often consider Maserati a premium brand and expect it to have lower maintenance costs. In comparison Porsche offers lower total cost of ownership.

Maserati's Opportunities:

- Increase product exclusivity by increasing quality, performance and price while reducing production volume
- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles
- Entering the mid-engine segment

Maserati's Threats:

- Premium brands such as BMW and Mercedes
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 9 Maserati's SWOT

4.4 Porsche

Porsche Background

Ferdinand Porsche was one of the most popular faces of the auto industry in the twentieth century. He founded his company in 1931 in Stuttgart, Germany. Porsche is a company with a long history, but it was 1948 that the first car bearing the name Porsche was created [17]. In 1964 the company launched its iconic model, the 911. Porsche's products oscillate between Premium and luxury (masstige) since it has all the features of a luxury car except that the production volumes are high, which results in lower price range striking another critical success factor of a luxury brand. Porsche is famous for its premium quality and investing heavily in Research and Development. The brand is associated with sportiness since its first mass-produced sports car, the 911. In 2002 the company expanded its portfolio by releasing its first SUV, Cayenne and then in 2009 by its sports sedan Panamera. In their current generation, the SUV and sedan models share platforms developed by Porsche's parent company Volkswagen.

Current Product Portfolio:

Table 10 Porsche's product portfolio

Model	718	911 [911 GT3 RS]	Panamera	Macan	Cayenne	Mission-E
Year	2019	2019	2019	2019	2019	2020
Base Price	60,000	125,000 [200,000]	100,000	65,000	80,000	N.A.
Vehicle Layout	mid-engined two-seater sports car	Rear engine Sports car	Sports Sedan	Luxury crossover SUV	Mid-size luxury SUV	Electric Sports sedan
Engine	300hp	450hp [520hp]	330hp	245hp	340hp	600hp/440kW
Notes				Best seller in Italy		

Suppliers' Map

Porsche being a German company is almost saturated with German technology. ZF, Robert Bosch, Schaeffler, Thyssenkrupp, Mahle, Vibracoustic and many others add value to each 911 that comes out of the factory.

In the next position stands US with suppliers including Dow, Federal-Mogul, and TRW which is recently acquired by German ZF Friedrichshafen.

Brembo, Pirelli, and SPAL Automotive represent Italy in the final assembly of 911.

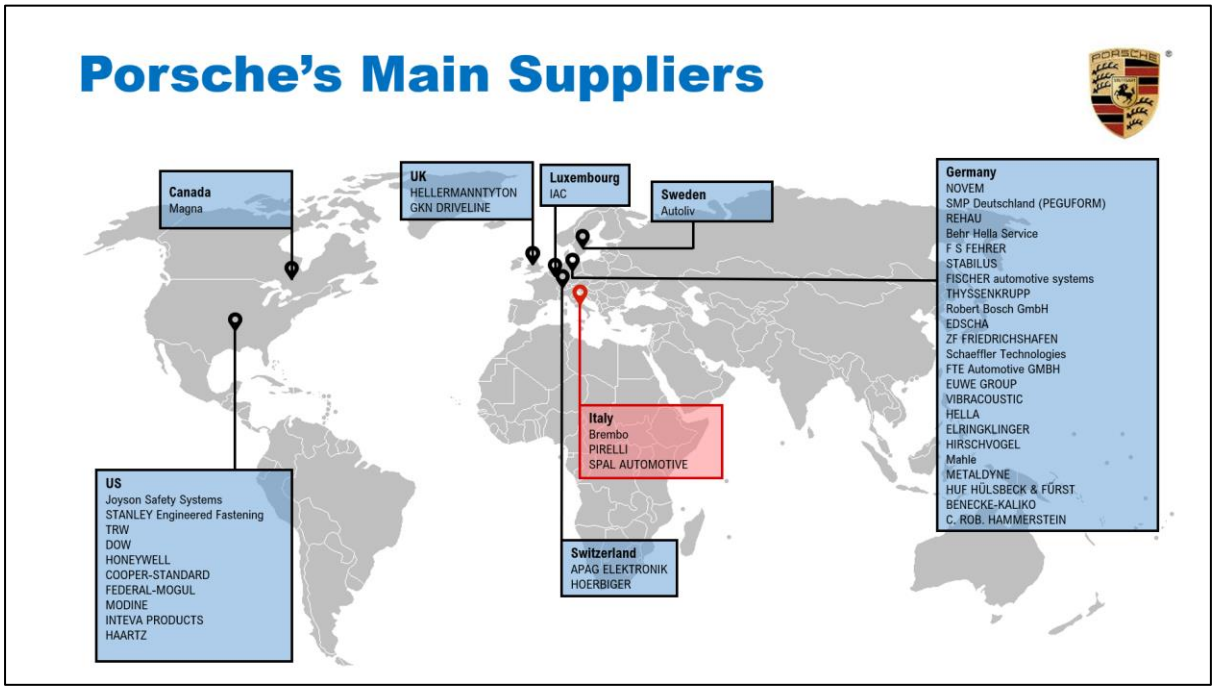


Figure 21 Porsche suppliers' map

Porsche's Strengths:

- **Premium quality**: continuity in delivering the best quality in terms of manufacturing processes and attention to detail for such a mass-produced luxury product has been the brand's and Germany's order-winning criterion.
- **Technical Performance**: Porsche heavily invests in R&D to develop and enhance its technologies. One of its popular recent innovations is the enhancement and implementation of PDK (Doppelkupplungsgetriebe) or better known as 7-speed Dual-clutch transmission co-developed with ZF Friedrichshafen AG which in simple terms yields faster shifts among gears thus increasing handling.

- **Recognisable design**: All models follow the same pattern. Porsche's distinctive exterior is recognised as having a curved sports silhouette with only two headlights often in the shape of a circle or something close to it.
- **Customer Loyalty**: Based on their success formula Porsche has built upon the same foundation through the years without one step backward. They not only have gained the respect of the professionals of the industry but also gained the most important of all, the customers' loyalty.
- **Sponsoring and Franchising**: Company's other ventures include Porsche Tennis Grand Prix and sponsoring other sporting, social and cultural events. Also designing sunglasses, watches, and shoes (e.g. collaborations with Adidas) among others can offer the all-round Porsche luxury experience.
- **Part of a large group**: Being part of the Volkswagen Group, Porsche benefits from synergies created by a large group. Porsche's strong sales numbers make it financially strong, but in terms of sharing know-how and technology, human resources and supplier and dealer network the company shares resources with its parent company. This ultimately results in efficiency and effectiveness.

Porsche's Weaknesses:

- **Lack of Exclusivity**: Porsche's high production volume damages its exclusiveness. Though being exclusive and something that only a few can afford is not the company's strategic pillars and in a bigger context is not part of German philosophy, having traces of socialism.

Porsche's Opportunities:

- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles
- Launching limited editions

Porsche's Threats:

- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 11 Porsche's SWOT

4.5 Lamborghini

Lamborghini Background

Ferruccio Lamborghini started his career in making tractors from the surplus of military machinery from the second World War. After facing problems with his Ferrari, he decided to make his own supercar. In 1963 he established Automobili Lamborghini in Sant'Agata Bolognese, Italy. Debuting their first car the same year, the Lamborghini 350 GTV. The brand quickly rose to prominence after unveiling its iconic model, Miura (named after breeder of fighting bulls Don Eduardo Miura).

Fascinated with bullfighting and being a Taurus himself (i.e. his zodiac sign) he chose a raging bull as the emblem of his company. Lamborghini continues the tradition of choosing names related to bullfighting for their models.

In late 1990s during the wave of Mergers and Acquisitions in the auto industry, Volkswagen purchased Lamborghini through its subsidiary Audi. Audi decided to change the company from a traditional hand-made car manufacturer to an advanced company with automated assembly lines while keeping the brand exclusive. This way the company increased its production volume, quality and market reach and turned profitable.

Since its acquisition by Volkswagen the company's product range involves two models until recently that they added a sports luxury SUV. One model considered for the high-end of the performance luxury segment and one model less promising in terms of technical performance, more economical and environment-friendly and more suitable for daily activities.

Lamborghini is known to have a mid-engine layout. 10 out of 17 models [18] to this day had engines behind the driver's seat and in front of the rear axle. Lamborghini uses the same design language across its models and known to use "*sharp edges and [aggressive] styling elements [19]".*

Current Product Portfolio:

Table 12 Lamborghini's product portfolio

Model	Aventador S (2018)	Huracan (2018)	Urus
Year	2012	2015	2019
Base Price	€370,000	€180,000	€175,000
Vehicle Layout	Super sport, 4WD	Super sport, 4WD	Super Sport SUV
Engine	V12, 730hp	V10, 610hp	Twin-Turbo V8, 640hp
Notes			

Suppliers' Map:

It is certain that Lamborghini, being a subsidiary of Volkswagen is provided with many of the technologies developed in-house. As stated before, sharing platforms in the group has become the norm. As an example, the chassis that Gallardo and now Huracan models use can be seen in Audi R8.

Considering outsourcing there are many suppliers form Germany, the US, Italy, UK, Switzerland among others.

Notably, Italian Brembo offering Braking systems, Harman from Germany provides Infotainment and navigation systems, Canadian Magna for body stampings and Thyssenkrupp adds steering column to 2018 Huracan.

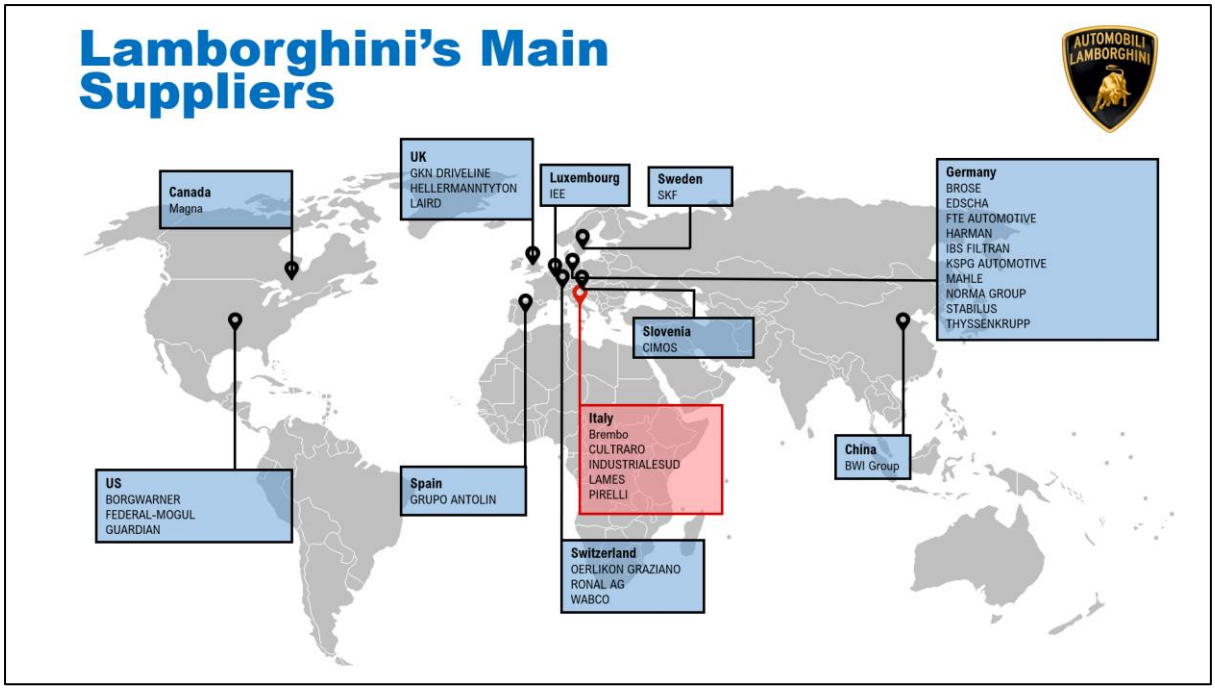


Figure 22 Lamborghini suppliers' map

Lamborghini's Strengths:

- **Heritage of Craftsmanship**: from 1963 Lamborghini used best skills in the industry to deliver performance and aesthetics to its customers
- **Brand Image and Value**: 2nd most powerful auto brand only behind Ferrari according to Brand Finance's 2019 version of its annual report on the world's most valuable automobile brands. The top-of-mind recall power of the brand linked to high performance and its distinct design has made it an obsession for younger car enthusiasts.
- **Unique style**: since 1974 with the debut of Lamborghini Countach, the cars follow the same design pattern. Featuring aggressive silhouette accompanied by sharp edges.
- **High Performance**: delivering utmost power, high speed, handling, and technical performance has been the company's strategy since day one. Delivering the best performance is one of the critical success factors of a luxury product (Brun et al., 2013).
- **Part of a Large Group**: Being part of Volkswagen and under the leadership of Audi the company leverages on the synergies involved such as financial support, know-how, using the extensive supplier and dealer network.

Lamborghini's weaknesses:

- **Fuel Consumption:** this is the case of high-performance supercars and in case of Lamborghini its V12 engine has been criticized for its high fuel consumption. In some cases, it can reach up to 30 litres per 100 km.

- **Hard-to-Sell:** The cars have become under scrutiny for polluting environment and loud noise. Thus, an environmental conscience customer may reconsider their purchase. The cars are also affected by tax and regulatory laws. In some countries like Singapore the prices can reach almost $1.4 million and, in some others, they are not street legal.

Lamborghini's Opportunities:

- Addition of core models to the product portfolio
- Entering the luxury sedan segment
- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles

Lamborghini's Threats:

- Social acceptance regarding luxury products
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 13 Lamborghini's SWOT

4.6 Bentley

Bentley Background

"To build a fast car, a good car, the best in its class."

(W.O. Bentley, Founder)

Famous for its winged "B" logo, W.O. Bentley founded the company in 1919 with the aim of producing cars with high performance blended with the finest craftsmanship. In its early beginnings the company competed in Le Mans 24-hour events. Since 1998 the company is a subsidiary of Volkswagen company with two production plants, one in Crewe, England where it is headquartered and the other in Dresden, Germany. [20]

Bentley is known for its luxury sedans and luxury GTs, and more recently the company launched its first SUV model Benteyga. Compared to its competitors its flagship model Continental GT has a lower starting price but in order to keep its exclusiveness, the company put a limit on the annual production at around 2000 units. The company manages to keep the total production level at around 10,000 units per year. its main market is Europe followed by Asia Pacific. The company has also entered the hybrid segment in 2018 and plans to use electric drive technologies in future models.

Making cars is not Bentley's only venture. They also have a division for designing exclusive clothing, luggage, gift items, toys, golf accessories and such known as Bentley Collection to offer an all-round luxury experience.

Being part of a larger automotive group Bentley has a wide supplier network. According to the company, Bentley has more than 700 suppliers from 31 countries and 81 of them are in the same area as the main factory to procure 18,000 parts for the company.

Current Product Portfolio:

Table 14 Bentley's product portfolio

Model	Continental GT	Mulsanne	Bentayga
Year	2018	2018	2018
Base Price	180,000	€270,000	€170,000
Vehicle Layout	Luxury GT, 2+2	Luxury sedan	Luxury SUV
Engine	620hp, 6.0-liter twin-turbocharged W12	500hp, twin-turbocharged 6.8-liter V8	600hp, 12-cylinder

Suppliers' Map:

Bentley shares platforms with other products in the Volkswagen group. As an example, Bentayga shares platform with Lamborghini Urus and Porsche Macan.

Bentley Bentayga's well-known global suppliers are mostly from Germany. This includes companies like ZF for providing Transmissions, Thyssenkrupp for camshaft, Schaeffler for the primary drive and Continental for heating/cooling hoses.

From Bentley's home country GKN automotive which ranked 43rd among global parts suppliers in terms of sales brings driveshafts to the final assembly.

Italian companies contribute to this British luxury car as well. Including Industrialesud, Prima Sole and Saleri.

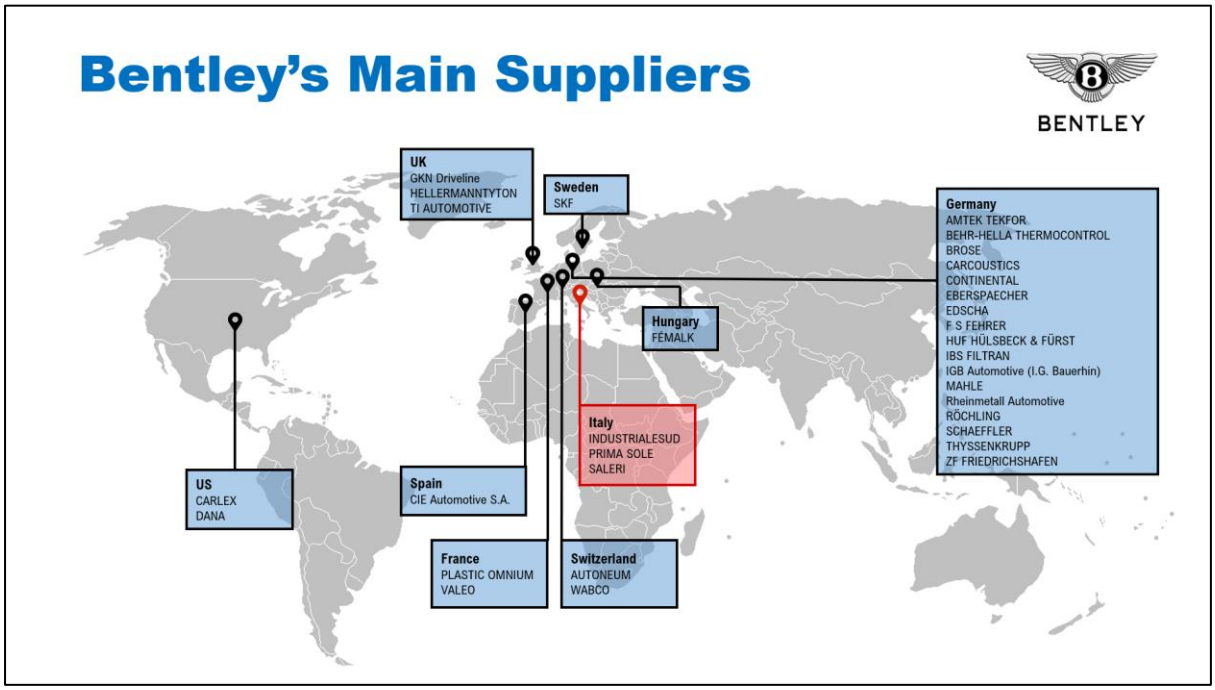


Figure 23 Bentley suppliers' map

Bentley's Strengths

- **Brand and heritage:** Founded in 1919, Bentley is one of the oldest and most successful car brands for nearly a century. From then the brand associated itself with luxury and performance.
- **Elegant recognisable designs with best materials:** using muscular sculptural surfaces for the exterior combined with latest metal-forming techniques to create curved lines with sharp edges only to be seen in when close. The cars feature a signature design with a large grill and four circle-shaped headlights in the front for all its models
- **Premium quality and craftsmanship**: premium quality is one of the luxury's prior. The interior uses natural materials using woods and expensive metals like

chrome. More specifically the natural leather is supplied from Germany, Italy supplies its Alcantara and Koa wood comes from Hawaii. While the interior comes with Naim sound system and a swiss display clock.

- **Supported by a big automaker**: being part of a much larger automotive group, VW, the company benefits from the synergies. Financial support, shared technologies and platforms and using the shared supplier and dealer network all help the company to reduce development costs and delivery time.

Bentley's Weaknesses:

- **Senior customer segment Limited Brand Awareness**: Bentley has associated itself with the elite community and has lower visibility to younger generations when compared to brands like Ferrari with a much larger fan base across generations. Targeted towards senior citizen.
- **Niche Customer Segment:** the classic design may not appeal to younger customers
- **Classic interior:** compared to other brands, the interior reminds the driver of a classic car rather than a sportscar
- **models are close to Premium Products:** the brands with premium products pose a challenge to Bentley

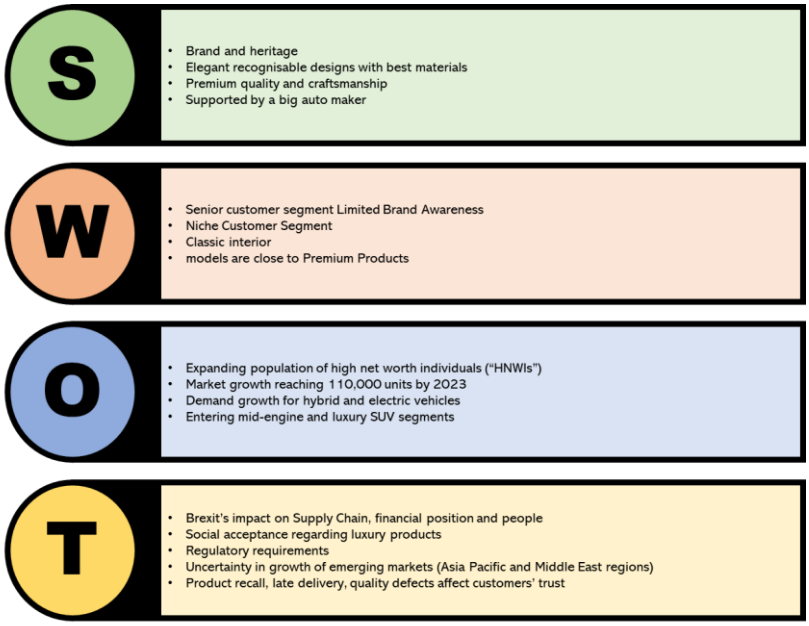
Bentley's Opportunities:

- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles
- Entering mid-engine and luxury SUV segments

Bentley's Threats:

- Brexit's impact on Supply Chain, financial position and people
- Social acceptance regarding luxury products
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 15 Bentley's SWOT



4.7. Rolls-Royce

Rolls-Royce Background

Founded in 1904, Charles Rolls and Henry Royce began manufacturing "the best car in the world". The brand is the purest representation of luxury. The British company is known for its luxury sedans for more than a century. Its exclusivity makes it a status symbol, a creation that only the elites of society, influential people such as political leaders, athletes, singers, and movie stars could afford. Rolls-Royce has been associated with the British Royal family since 1950s.

In World War I the company began making aero engines, entering the aviation industry. According to Bloomberg it is the second-largest producer of aircraft engines [21]. In addition to aerospace the Rolls-Royce parent company- Rolls-Royce Holdings plc - operates in marine propulsion technologies and in energy sectors.

In the 1990s, BMW bought the rights to Rolls-Royce Motor company – the automotive division - and it officially became a subsidiary of BMW. Together they built a new production facility at Goodwood, England. The cars are marketed as hand-built. The company offers a wide range of personalisation options "from engraved lettering on treadplates to personal embroidery on your glove box". As an example, customers can choose between 44,000 different colour pallets for the exterior.

The cars are recognised as having a large rectangular grill in the front and The Spirit of Ecstasy which is the cars' hood ornament sculpture. One other feature that is less seen in other manufacturers' models is a Coolbox that can hold two champagne bottles (in

Phantom models) as well as other accessories for picnics. Other luxury accessories like leather bags also can be purchased.

Current Product Portfolio:

Table 16 RR's product portfolio

	Phantom	Cullinan	Ghost	Wraith
Year	2018	2019	2015	2018
Base Price	370,000	300,000	300,000	300,000
Vehicle Layout	Luxury sedan	Luxury SUV	Luxury sports sedan	Luxury 4-seater sports car
Engine	Twin-Turbo V12, 560 hp	Twin-Turbo V12, 560hp	Twin-Turbo V12, 560 hp	Twin-Turbo V12, 620hp
Notes	First release 2003	44,000 colours for exterior to choose from	First release 2010, Same platform as BMW 7series, BMW iDrive infotainment system	First release 2014

Suppliers' Map:

The technical specifications of Rolls-Royce cars are headed by BMW, its parent company. The cars share the same platform in the group. For example, RR Phantom shares the same platform with BMW 7 Series [22].

The company tries to use as much the same components within the group as possible, to leverage on economies of scale both for the components developed in-house and for parts coming from partnered suppliers [23].

In the global scene, German and American suppliers contribute the most. Among them are many Mega Suppliers including Magna, Bosch, ZF, Continental, Federal-Mogul and Swedish Autoliv.

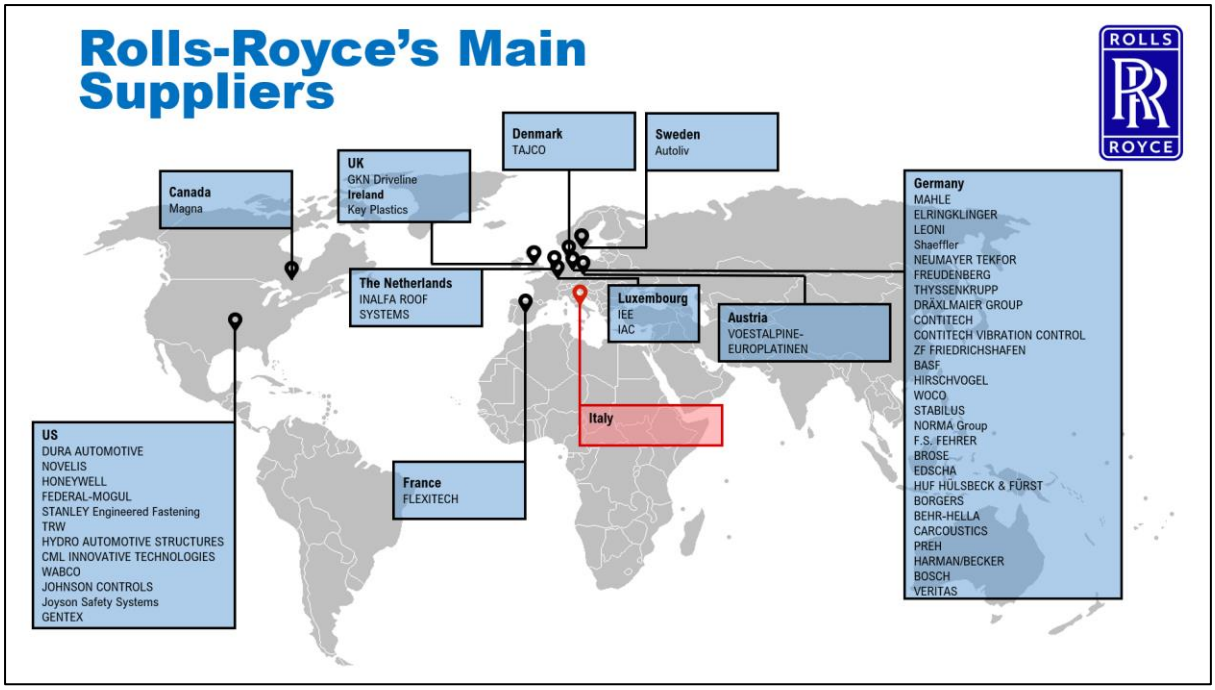


Figure 24 RR's suppliers' map

RR's Strengths

- **Brand Image and Heritage**: with more than a century of history Rolls-Royce has established itself as the pinnacle of luxuriousness and comfort in the minds of people around the world. The richest and most influential individuals such as world leaders and movie stars have always been the main customers of the brand.
- **True Sense of Luxury**: if luxury had a definition Rolls-Royce could be it. From heritage and craftsmanship to technical performance the company offers the best. As said by Sir Henry Royce: "Strive for perfection in everything you do. Take the best that exists and make it better. When it doesn't exist, design it."
- **Recognisable design**: one of the critical success factors of a luxury product is a design that can be recognised instantly ((Brun et al., 2013), Catry, 2003; Hanna, 2004); all Rolls-Royce models have a big rectangular grill in front while the body silhouette is inspired by the previous models.
- **Superior Quality and Personalisation**: premium quality is a priori of a luxury product and since the establishment of the brand, the quality was on the company's objectives list. Also, a wide range of personalisation options is what makes Rolls-Royce one step ahead of its competitors. Customers can give the company any design they want, and Rolls-Royce will place them wherever they are desired; like on the glove box or door panels.
- **Part of a bigger company**: As of 1998 RR has been a part of BMW alongside its British counterpart MINI. Financial support, sharing of know-how and technology, skills and the vast supplier network of BMW are a few of the benefits that synergies create.
- **Crafted by Hand**: According to the company, the cars are crafted by hand. This adds to exclusiveness of each car and one of the main reasons that the production

volume is limited. Other brands like Bentley with the production output at least twice the Rolls-Royce's are more automatized in parts of their production line.

RR's Weaknesses

- **Too expensive**: though a criterion for many customers, the base price may seem to some as unnecessarily too expensive. Customers may find cheaper brands as just exclusive and luxurious. As a day to day car, its uniqueness could exasperate the driver since it catches the eye and causes pedestrians to look too much.
- **Model Designs seem repetitive and obsolete**: A recognisable design is an advantage for any brand but in the case of Rolls-Royce it seems the exterior design at least, does not benefit from modern design elements as seen in competitors like Bentley. The exterior is almost the same as the model that first came out in 2003.
- **More appealing to older customers**: Although the models feature advanced technologies like rotatable LCD screen, the classic design makes it more desirable to older customers. Younger customers may opt for more sporty brands like Aston Martin.
- **Low Production Volume**: As part of the company's strategy the production output is artificially limited to remain exclusivity but at the same time the company may lose the demand.
- **Limited Product Range**: Currently the company offers only three models. Sedan, Coupe and an SUV and their variations. The company is missing on the opportunity of making limited editions and one-offs that are drastically distanced in terms of design language and platform.

RR's Opportunities:

- Expanding population of high net worth individuals ("HNWIs")
- Market growth reaching 110,000 units by 2023
- Demand growth for hybrid and electric vehicles
- Entering the mid-engine segment
- Additions to the product portfolio

RR's Threats:

- Brexit's impact on Supply Chain, financial position and people
- Social acceptance regarding luxury products
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 17 RR's SWOT

4.8 Bugatti

Bugatti Background

Founded in 1909 by Ettore Bugatti in Molsheim, France, Bugatti started making cars that feature high performance and aesthetics. The company quickly gained prominence for achieving second place in the 1911 French Grand Prix [24].

In its early years, the cars featured an egg-shaped grill in the front. Ettore inspired this shape based on his father's idea of an egg being the most perfect shape in nature. As the chassis in future models got lower the grill turned into a horseshoe becoming Bugatti's signature until this day. One of company's masterpieces is the legendary Type 57SC Atlantic known to be the first-ever supercar.

The company's factory was ruined following the devastations brought by World War II. This coincided with Ettore's passing, failing the brand. Revival attempts were made when Romano Artioli bought the rights to the brand and debuting model EB110 in 1991. Due to low sales the company went bankrupt and then in 1998, Volkswagen in their series of acquisitions bought the rights to Bugatti reviving the brand.

Under the direction of Ferdinand Piëch, CEO of Volkswagen, the company launched its first Bugatti, Veyron 16.4, as the fastest, most powerful, and most luxurious car ever made, setting the bar higher for its competitors. Only 300 of this model were made in addition to another 150 roadster editions. Based on the success of this model the Veyron

succeeded by Chiron. The company also releases limited editions and one-offs. One one-off model, La Voiture Noire inspired from Type 57SC Atlantic is priced at €16 million.

Current Product Portfolio:

Table 18 Bugatti's product portfolio

Model	Chiron	Divo
Year	2017	2019
Base Price	€2,400,000	€5,000,000
Vehicle Layout	Hyper car	Hyper car
Engine	W16, 1500hp	W16, 1500hp
Notes	Limited to 500 units	Limited to 40 units

Suppliers' Map:

Being the ultimate luxury brand, Bugatti tries its best to leverage on secrecy to increase its value perceived by customers.

Only With the help of a larger auto group like Volkswagen, Bugatti's business is sustainable. But even in this case, Volkswagen cannot provide all the latest technologies needed. The data for Bugatti Chiron's suppliers is extracted from Marklines.com. From Germany companies like Continental, Robert Bosch, Schaeffler AG, Vibracoustic Gmbh, and ZF contribute the most. Also, TE Connectivity from Switzerland and Valeo group supplier of automotive lamps are identified as Chiron's suppliers.

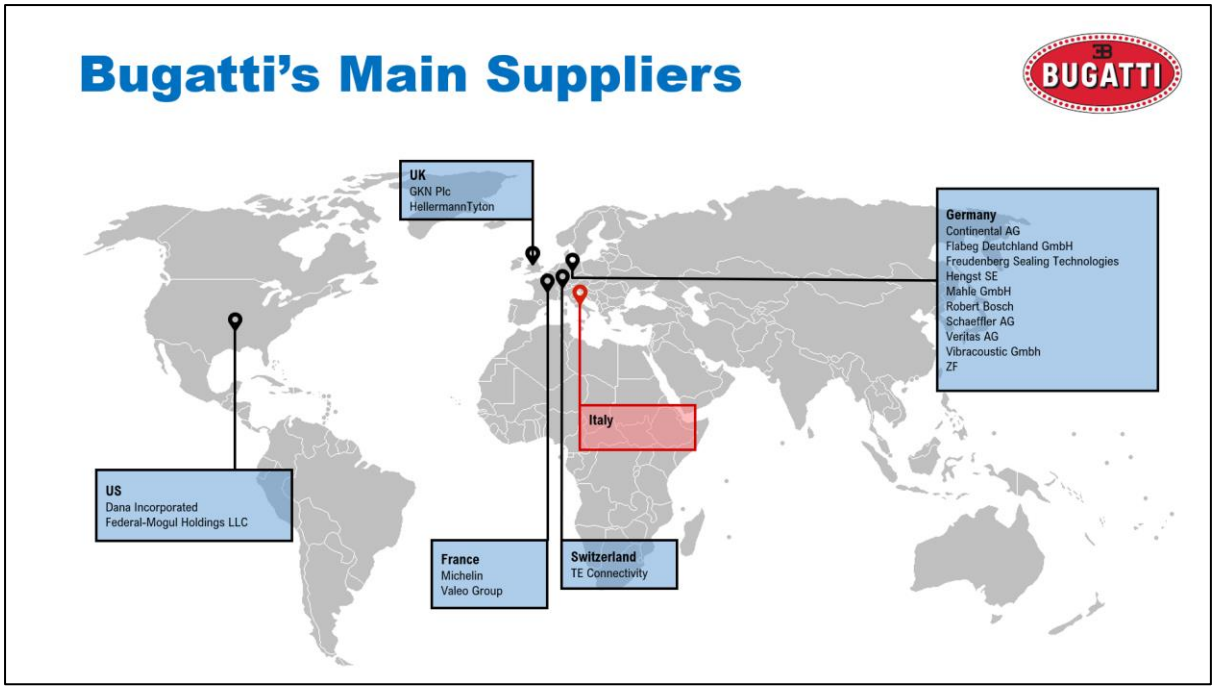


Figure 25 Bugatti's suppliers' map

Bugatti's Strengths:

- **Absolute Luxury:** any criterion one can think of to describe their idea of a luxury product Bugatti has it all. From the heritage of craftsmanship to superior technical performance to a recognisable design to …, the list goes on.
- **Part of a large group:** from 1998 the company is owned and managed by Volkswagen thus benefiting from its technological and financial support.

Bugatti's Weaknesses:

- **High maintenance:** changing tires and even breaks discs after a certain mileage, high fuel consumption, are some of the costs of having a Bugatti car.
- **Price tag:** for a price of at least €2 million the brand is targeted at very rich individuals, for whom spending a colossal amount of money is not an issue to add one more car to their collections. This makes the cars more of a collector's item.
- **Low sales:** company's limited production volume coupled with high R&D costs, Product development costs, testing costs makes the business highly unsustainable. Without the support of a large parent company like Volkswagen, the company could not survive.

Bugatti's Opportunities:

- Expanding population of high net worth individuals ("HNWIs")
- Demand growth for hybrid and electric vehicles
- Entering luxury sedan and luxury SUV segments

Bugatti's Threats:

- keeping world records such as the fastest road car
- Social acceptance regarding luxury products
- Regulatory requirements
- Uncertainty in the growth of emerging markets (Asia Pacific and Middle East regions)
- Product recall, late delivery, quality defects affect customers' trust

Table 19 Bugatti's SWOT

Chapter 5: Results Analysis and Discussion

To conduct this thesis, we started by introducing the luxury segment of the automotive industry and what it means to be considered a luxury product or experience. Then we explained how the supply chain works in the broader picture of automotive industry. For this purpose, eight luxury performance car manufacturers have been chosen. The overall features and strategic plans of each brand are identified, among them their supplier network.

In this section, the supply side of the supply chain of the luxury performance car makers will be examined more precisely and comparisons are to be made. Furthermore, main points and issues regarding the supply from third parties will be discussed.

Leading Countries and Top Suppliers

After identifying the main suppliers for eight European luxury performance car company and clustering them by country, it turned out what countries contribute the most to be the suppliers to OEMs.

Consequently, these top 10 companies contribute the most to the supply of parts to the eight OEMs studied in this thesis:

Table 20 Leading Countries and Top 10 Suppliers

2018 Rank	Company	Country	Total Global OEM Automotive Parts Sales (dollars in millions) 2018	Products
1	Robert Bosch	Germany	$49,525	Powertrain solutions; chassis systems controls; electrical drives, car multimedia, electronics, steering systems & battery technology
3	Magna International Inc.	Canada	40,827	Body exteriors & structures; power & vision technologies; seating systems & complete vehicle solutions
4	Continental	Germany	37,803	Advanced driver assistance systems, electronic brakes; stability management, tires, foundation brakes, chassis systems, safety electronics telematics, powertrain electronics, injection systems & turbochargers
5	ZF Friedrichshafen	Germany	36,929	Transmissions, chassis components & systems, steering systemsbraking systems, clutches, dampers, active & passive safety systems, driver assist systems including camera, radar & lidar
16	Thyssenkrupp	Germany	14,438	Steering, dampers, springs & stabilizers, camshafts, forged machined, components, bearings, undercarriage components, axles, forged crankshafts, drivetrain components, high-strength lightweight steels & electrical steel
17	Mahle	Germany	14,405	Piston systems, cylinders, valvetrains, alternators, air & liquid, management systems, vehicle climatization, engine & powertrain, cooling, battery cooling, actuators, electric drives & starters
28	Magneti Marelli	Italy	8,702	Lighting, powertrain, electronics, suspensions systems, shock, absorbers, exhaust systems & plastic parts
43	GKN Automotive	UK	6,450	Driveline halfshafts, driveshafts, e-drive & awd systems
63	Federal-Mogul	USA	3,786	Pistons, rings, cylinder liners, spark plugs, bearings, valvetrain products, gaskets, seals, heat shields, brake materials, wipers, fuel pumps
-	Brembo	Italy	2,915	Brake discs and callipers

The positions above are based on the AutomotiveNews' annual Top 100 global OEM parts suppliers ranked by their sales of original equipment parts in 2018. Accordingly, Germany with five companies leads the supply of components to luxury performance car

makers. Then in terms of iteration Italy appears with Magneti Marelli and Brembo and the giants of the industry Magna from Canada, British GKN Automotive, and Federal-Mogul from USA. These rankings are purely observational and based on tallying the number of times a supplier is seen on the supplier list of the OEMs. Unquestionably, there could be involved more companies supplying parts to these OEMs, but due to the nature of the industry the supplier information is considered confidential and is not accessible to public even to stakeholders as a means of keeping the competitiveness inside the supply chain. This undisclosed information could be the "*suppliers*" *themselves*, "*the type of parts they supply*", "*the product they supply to*" or "*the number of units*" they deliver.

Co-design and Co-development

Another important point of the investigation is the fact that suppliers and manufacturers work hand in hand to design and make the systems. That is the relationship between a supplier and manufacturer is not at arms-length anymore. Take a luxury car maker such as Pagani. It is a small-scale company selling only 40 units each year. Robert Bosch [25] supplies Braking control system for Pagani since its not a technology that a small company has the resources to develop on their own. Bosch by leveraging on their know-how and economies of scale and scope, developed this kind of technology as a standardized feature that can be tailored according to the required specifications for any company and Pagani is one of them. The system is implemented and tested by Bosch's engineers alongside the engineering team of Pagani.

Synergies

There are two main elements to a luxury car company that belongs to a large group:

- Sharing Platforms: synergies make sharing a platform among different models happen. Companies like Volkswagen having many brands under their umbrella try to design systems, modules, and platforms that can be used for different brands. That is the skeleton is very much the same while the surface exhibits a different brand. Engineers across different divisions come together to design a platform for the group. As an example, Porsche, Bentley, and Volkswagen share the same platform known as MSB platform for their Panamera, Continental and Phaeton models respectively. But this does not make them the same. Although sharing the same blood each brand has its own unique character since each brand has a different strategy in mind, having its own history and serving different market segment.
- Support from the group: achieving greater performance and value by combining two or more firms known as synergies is one of the main reasons to partake in Mergers & Acquisitions. M&As - especially in automotive industry - make synergies possible in two main areas; in finance and operations, such as transferring cash within the group, leveraging on economies of scale, transfer of technology and know-how, sharing the supplier and dealer network, to name but a few. As mentioned earlier the best example is Volkswagen.

Impact of Product Recalls on Suppliers

Vehicle recalls occur when a product does not meet minimum safety requirements and the manufacturer has to call on the owners to return their products. Minor simple defects happen, and they usually are taken care of during routine maintenance visits. But the more serious the safety risk the greater the pressure for the company. This causes a higher number of reports of incidents and greater media coverage that diminishes customers perception of the brand. One of the major recalls in the past decade concerning a third-party supplier is the Japanese company Takata [26], a global supplier of airbags. The safety issue in the airbags made them inflate with more force than usual that injures or could even cause death for the passengers. NHTSA reports airbags caused at least 24 deaths and 300 injuries worldwide. This safety issue affected 19 various automakers including sports car maker Ferrari. In our case, Takata safety issues affected Ferrari's models produced between 2010 and 2017. This prompted Ferrari to notify its customers about the issue and to offer replacements free of charge.

In this case, Ferrari and other manufacturers were barely affected by the recalls and the customers' perception of the brand did not change. But this enforced Takata to file for bankruptcy and subsequently, it is acquired by Key Safety Systems a Chinese owned and U.S. based company.

Regulations and New Technologies

Automotive industry experiences constant updates to laws and regulations. These include corporate governance, tax, data, employment, employee and customer safety, product safety, competition, trademarks, and emissions. Companies must be alert to any changes to regulations and practice zero-tolerance.

Vehicle emissions targets are becoming stricter in general. This coupled with raised consumers environmental awareness and saving fuel for cost-effective reasons is changing the shape of the industry making automakers to consider investing in electric and hybrid powertrain solutions. As of now, all the luxury performance car makers have put these alternate solutions in their agenda with an aim to implement them sooner or later. Some of them like Ferrari have already tried and tested these technologies to capture a better realization of customers' expectations since hybrid and electric drivetrains will give a different driving experience when compared to combustion engines. But industry's experts suggest that companies will opt for Omni-drivetrain solutions to an almost equal share between different technologies, BEVs (30 %), Hybrids (25 %), FCEVs (23 %) and ICEs (23 %) by 2040." (Global Automotive Executive Survey 2019)

Chapter 6: Conclusion

The final chapter of the thesis summarizes the main findings and results of this study, make final considerations, provides implications for academics and practitioners of this topic, addresses the limitations of the research, and provides the backbone for future research development.

Summary of the Results

The thesis intended to see how different countries contribute to the supply of automotive components to carmakers of other countries by focusing on the luxury-performance brands. In addition, the peculiarities of this industry are highlighted. Thus, the main results are as follows:

- ***Leading Countries and Top Suppliers***: as was expected, the main suppliers to brands that make products with superior technical performance are the global mega suppliers, and most of them are from Germany with numerous internationally recognised companies like Robert Bosch. Also, Italy, the US, Canada, and the UK are among the main contributors to luxury-performance carmakers. These are all tier-1 suppliers that mainly develop advanced automotive systems and tier-2 and 3 are not recognised for the thesis.
- *Co-design and Co-development*: OEMs establish a tighter relationship with their suppliers. In most cases, newly developed technology is standardised and then tailor-made into the specifications of the buyer. The systems are implemented and tested by engineers from both sides of this transaction.
- *Synergies*: for small-time companies like luxury brands, belonging to a group can be beneficial. Luxury performance carmakers can leverage the operational (e.g. transfer of technologies) and financial synergies created within groups
- *Impact of Product Recalls on Suppliers*: product recalls can negatively impact how customers perceive the brand. However, luxury performance carmakers have managed successfully to mitigate this effect since most of the recalls stem from suppliers not meeting minimum safety requirements.
- *Regulations and New Technologies*: carmakers need to be constantly updating their products to meet the ever-changing regulations (e.g. safety, emissions, tax) targeted toward manufacturers of cars.

Final Considerations

As mentioned earlier, luxury-performance car manufacturers are small companies that maintaining the exclusivity of their products is their main strategy. To achieve this end, they cap the production output, but lower sales mean lower chance to invest in R&D since delivering superior technical performance is the main critical success factor for a luxury performance carmaker. Additionally, the competence of suppliers of automotive systems makes the buying decision, an attractive option for the OEM since time to market is of high importance. These are all reasons to opt for outsourcing as we see in today's industry.

Usefulness of the study

Theoretical Implications:

The thesis can be used as a reference for academics working on issues regarding the luxury industry and automotive supply chain and in particular, for whom interested to contribute to the knowledge surrounding the supply chain of luxury-performance automotive brands. The theoretical part of the thesis tried to gather and analyse the works by academia and consultancy firms that are especially useful for studies regarding the luxury-performance car brands covering these points:

- Latest data about the luxury industry
- Definition of luxury
- Managing a luxury brand
- Various classifications of luxury brands and products
- The characteristics of a luxury and/or performance automobile

Managerial Implications:

Managers of luxury brands and professionals concerned with the value chain of luxury-performance cars may find this study useful. The study tried to illustrate the climate of outsourcing of auto parts for HLS cars and the main concerns of managing a luxury car brand by covering these points:

- Retaining exclusivity
- Supply-side of automotive supply chain
- Make or buy decision for luxury car brands
- The influence of large automotive groups on their luxury divisions

Limitations of the study and future research development

There are so many unanswered questions, and an unlimited amount of data with respect to the supply chain in general. And outsourcing in the automotive industry as we've seen from the 1990s has made us wonder about the possible effects each element of the supply chain can have on others and as a result in the whole value chain. Thus, this study although gives us a notion of the suppliers' role on luxury car manufacturers, due to lack of full access to data of suppliers, couldn't illustrate a thorough map of suppliers for each brand.

Moreover, the synergies within groups that make the sharing of platforms and components possible needs to be investigated in the form of a case study for example as part of an internship or a Ph.D. work from these companies.

Also, there are many SME suppliers and tier-2 and -3 suppliers that are not inspected for this topic. For example, companies that provide natural leather or woods for luxury cars.

Finally, China. As the largest market for luxury cars, it needs to be integrated in luxury studies. Also, there are many emerging suppliers from China that needs to be monitored because soon they will take over giants of the industry.

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