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FIRST-MOVER ADVANTAGE AND COMPETITIVE DYNAMICS: A STUDY IN THE AUTOMOTIVE INDUSTRY

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TABLE OF CONTENTS

TABLE OF FIGURES AND TABLES

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ABSTRACT:

Competitive dynamics and previous studies have showed that firms that enter as first in a specific market tend to obtain a dominant position in comparison to the later movers. Researchers have argued on finding a suitable definition of first-mover since an excessively loose definition could be applicable for too many firms making it difficult to properly analyse them. Thus, it is relevant to analyse how car manufacturers are behaving in the automotive industry and if there is still a relevant first-mover advantage or not. Prior studies have analysed first-mover advantage in different industries with the selection of different criteria. The following study will analyse the above-mentioned industry taking into consideration electrification, autonomous driving, connectivity and mobility as a service. This research aims at analysing first-mover advantage and competitive dynamics of the automotive industry under the light of the new radical technologies that are revolutionizing the competitive scenario. The empirical investigation was based on a multiple case study in order to capture similarities and differences among automotive producers of different countries. Primary data was collected through semi-structured interviews with managers of the companies while secondary data through annual reports and analysis of service providers. Furthermore, secondary data was collected in order to increase the credibility of the study by triangulating different sources of data. Findings show that first-mover advantage is considered to be a relevant success factor in the automotive competitive scenario. Notwithstanding, managerial perceptions of pioneering behaviours change depending on the technology considered. The main influential factors of pioneering have been identified in internal factors, particularly the internal innovation orientation. External factors are considered differently depending on strategic position: boosting agents for pioneers and starting agents for followers. Additional significant findings interest the competitive dynamics of the industry with a specific focus on the relevance of coopetition and future cooperation.

KEY WORDS: First-mover advantage, Later mover advantage, Competitive advantage, Competitive dynamics, Automotive industry

1. INTRODUCTION

This chapter aims to introduce the topic of the study. Firstly, the background of the study is introduced. Following, the chapter will introduce the research gap, the research questions and its objectives and delimitations of the study. Lastly, main concepts of the research are highlighted.

1.1. Background of the study

Competitive dynamics and previous studies (Tsuchihashi & Hamada 2014) have showed that firms that enter as first in a specific market tend to obtain a dominant position in comparison to the later movers. However, researchers have argued on finding a suitable definition of first-mover since an excessively loose definition could be applicable for too many firms making it difficult to properly analyse them.

Thus, it is relevant to analyse how car producers are behaving in the automotive industry and whether relevant first-mover advantage is present or not. The following study will analyse the above-mentioned industry focusing on four different technologies: electrification, autonomous driving, connected cars and mobility as a service. By examining the results, it will be possible to explain which are the relevant strategic positions that firms have and, which are the drivers of their entry timing decisions.

First-mover advantage is considered in terms of the ability of a company in generating positive economic profits through its pioneering activities (Lieberman & Montgomery 1988). Based on the industry and competition a company is able to take advantage or disadvantage of its strategic choices. Performance does not solely depend on the firm's individual choices but, more often, it is affected by the other players of the market (Usero & Fernàndez 2009). Pioneering advantages are suitable for different manufacturing industries (Robinson 1988) while they may result weaker in service industries (Song, Di Benedetto & Zhao 1999) because of the lower fixed costs that companies have to face. However, being the first-mover could generate positive returns in terms of brand awareness, mitigating the possible losses given by the high costs that pioneers generate in the first round compared to later movers.

First movers do not always gain substantial advantages but, sometimes, they likewise experience disadvantages. First mover disadvantages are nothing that the advantages of the later movers that could be able to gain benefits in terms of free-rider effect, resolution of technological or market uncertainty, shift in technology or customer needs and incumbent inertia (Lieberman & Montgomery 1988). If well implemented, later mover advantages are able to mitigate, or even vanish, the advantages that pioneering firms have gained.

Both advantages and disadvantages do not guarantee the firms that they will maintain their position into the market throughout the years. Lieberman and Montgomery (1998) have found that the sustainability of the early entrants highly depends on the amount of resources that they are able to capture when there is not fierce competition. Early entrants could be easily overcome by later movers when they can rely on huge amounts of resources. In case of rapid changes towards new generations of products, incumbents can be hindered by their capabilities being unable to adapt (Henderson 1993).

A firm's competitive advantage is driven by the capability of a company to generate and deliver more value compared to the what is proposed by its competitors (Porter 1985). Value creation might depend on the internal level of innovation set by the company. Consequentially, many firms attempt to gain the highest returns by trying to establish their strategic position as technology leaders. However, firms do not compete alone in the market and the environment of their industry deeply affects their results (Adner & Kapoor 2010). The competitive dynamics of the industry affects firms' strategic decisions that are always bounded to the choices of the other competitors of the market.

This study will rely on the above-mentioned theoretical framework to analyse four high-technology markets of the automotive industry:

- Electric and hybrid cars
- Autonomous driving
- Connected cars
- Mobility as a Service

These markets are highly disruptive, and they will possibly revolutionize the industry, not only in terms of car producers but also for dealers, car suppliers, service providers and, finally, consumers.

"*Hybrid electric vehicles (HEVs) use both electric motor(s) and an internal combustion engine for propulsion, whereas pure electric vehicles have no engine. An HEV's external energy supply is fuel for the engine and, in the case of plug-in HEVs, electricity from the grid as well. Battery electric vehicles (BEVs) use electricity from the grid only*" (Pohl & Yarime 2012:1432)

A self-driving car or autonomous car is a vehicle that is able to perceive the surrounding environment and move without human input or with a minimum input. (Thrun 2010).

Connected cars refer to a several different types of connected vehicle systems. Connected cars include a wide variety of platforms using different communication and data standards for a wide range of applications. There are three major categories of applications for connected vehicle systems.

- Safety oriented (road notification, cooperative collision warning, stopped or slow vehicle advisor, emergency brake, automatic call post-crash)
- Convenience oriented (traffic notification, parking availability notification, parking spot locator)
- Commercial Oriented (remote vehicle personalization and diagnostics, commercial services, real-time video) (Hong, Dennis, Wallace & Cregger 2016)

Mobility as a Service (MaaS) is defined as a range of mobility solutions in which a customers' transportation needs are met and satisfied through a unique interface and supplied by a unique service provider (Hietanen 2014). Mobility as a service can be seen as an integration of different services.

First-mover advantage has been deeply studied (Lieberman & Montgomery 1988,1998,2013; Robinson, Kalyanaram & Urban 1994; Suarez & Lanzolla 2007; Szymanski, Troy & Bharadwaj 1995) nonetheless none of them has focused on the

markets which will be analysed in this paper. In order to support the theoretical background of this study material has been collected selecting articles through the use of the followings keywords: first-mover advantage, later mover advantage, pioneering, entry timing, competitive advantage, competitive dynamics, automotive industry, car manufacturing.

The automotive industry is facing a period of undergoing transformation including advancement in propulsions, electronics, software, changing consumer preferences, and adoption of new materials. The investments by automotive companies in research and development of sensors, batteries, software, advanced materials, and artificial intelligence are starting to generate benefits. It is expected that in the next ten years, urban transportation will be dominated by automated, connected, electric, and shared (ACES) vehicles (Modi, Spulber & Jin 2018).

ACES vehicles are defined as:

- Automated vehicles with self-driving capabilities of level 4 or 5
- Vehicles with connectivity capabilities for vehicle-to-vehicle (V2X) communication, over-the-air (OTA) updates, customer service
- Battery electric vehicles (BEVs) and hybrid electric vehicles (HEVs)
- Shared vehicles organised and owned by mobility service providers

In such a revolutionary environment, car producers are making strategic choices in order to capture value and increase their future market share and profits. This study will mainly focus on the dynamics of the industry considering the disruptive innovations above mentioned.

1.2. Research question and objectives

This study aims to analyse the relevance of first-mover advantage with regards of automotive companies' strategic decisions. Specifically, it proposes to examine if firms of the selected industry gain substantial advantage by being the early movers into a specific market or technology. By investigating the industry this research aims to describe

which are the consequences of being an early or a later mover and which are the internal dynamics of the automotive industry. Then, the research question to be answered is: *Do firms of the automotive industry gain advantage of being first mover when entering a new market?*

The objectives of this study can be divided in theoretical objectives:

- Review of the existing literature related to first-mover advantage in order to analyse which are the most relevant determinants that allow firms to exploit it
- Examination of the existing literature on competitive dynamics with a highlight on the automotive industry
- Development of a theoretical framework that is able to suit the existing literature on first-mover advantage and competitive dynamics into the automotive industry

And empirical objectives:

- Analysis of four different high-tech submarkets of the automotive industry under a first-mover advantage perspective:
    - Electrification
    - Autonomous driving
    - Connected cars
    - Mobility as a Service
- Analysis of the determinants of the Competitive Dynamics of the automotive industry

1.3. Delimitations

With the purpose of clarifying the scope of the study for the reader, in the following the delimitations of the study will be introduced. Firstly, to find an answer to the research question proposed "*do firms of the automotive industry gain first-mover advantage when entering a new market?*", this study will refer to the literature on first-mover advantage in order to find common hypothesis to be empirically tested. In the theoretical framework there will be presented both qualitative and quantitative studies to properly understand

the phenomenon proposing a broad picture of it. Although, given the difficulty of measurement of such advantage, the study will analyse it through a qualitative perspective so that the dynamics among competitors can emerge.

The theoretical framework of the Master's Thesis consists of two major parts. The first will focus on first and second mover advantage. A proper literature review will follow, and the main and most used approach will be selected as fundaments for the empirical analysis. First-mover advantage has been deeply studied by scholars during the years in several industries, however, since technology is always developing, it is interesting to analyse whether theory continues to match managerial strategic choices. The second part will concern competitive dynamics. This section will begin by examining the history of the industry taken into consideration in this study, the automotive one. Since it is a mature industry it is compelling to inspect how the dynamics and the relationships between competitors have changed during the years. The automotive industry has passed through different revolutions and each of them has had an impact on the equilibrium among car manufacturers.

Secondly, the study will analyse different markets at different stage of development: already existing or in the process of being. Literature on first-mover advantage and competitive dynamics has always relied on analysis on pre-existing developed markets to find an answer. Given the uncertainty of future development of automotive industry, findings may not be representative to population.

The final delimitation concerns the data collection method that is semi-structured interview. The collection method was used with the aim of gaining in-depth information from the respondents in order to allow a broader analysis (Saunders, Lewis & Thornhill 2009: 320). Notwithstanding, semi-structured interviews' questions are based on secondary data collection and no questionnaires or surveys were used as they are considered to limit the depth of answers of respondents, managers might tend to be biased towards their company's strategic decisions. (Saunders et al. 2009: 144-145, 196).

1.4. Main concepts and definitions

The key concepts utilized in this study are summarized below:

FIRST MOVER ADVANTAGE – “the ability of pioneering firms to earn positive economic profits (i.e. profits in excess of the cost of capital)” (Lieberman & Montgomery 1988)

FIRST MOVER DISADVANTAGE – the disadvantage of being the first and sub sequentially “the advantages enjoyed by later-mover firms” (Lieberman & Montgomery 1988)

EARLY MOVERS – “the union of first movers and followers” (Capone, Malerba & Orsenigo 2013)

LATER MOVERS – “all the other firms entering the industry which are not first movers or followers” (Capone, Malerba & Orsenigo 2013)

1.5. Structure

The structure of the study will be presented as follow:

In the Chapter 1, a background of the topic is provided illustrating previous contribution of this research. The research question and the objectives of the study, both theoretical and empirical are presented.

Chapter 2 introduces first-mover advantage and the review of the existing literature. It is examined literature on both advantage and disadvantage highlighting the factors that drives companies whether to pioneer or follow.

Chapter 3 analyzes competitive dynamics literature and main findings regarding the competition among firms are presented. Furthermore, an overview of competitive dynamics in the automotive industry is presented along with literature on coopetition. Finally, chapter 2 and 3 are summarized in order to develop a theoretical framework specific for the industry taken into consideration by this study.

Chapter 4 is dedicated to the methodology of this study. Primary and secondary data collection, sample size and composition will be described.

Chapter 5 contains the empirical findings of this study and case study analysis. It will begin with a single case analysis on the four companies selected, furthermore an appropriate cross case analysis will be developed addressing ACES, First-Mover Advantage and Competitive Dynamics.

Finally, chapter 6 presents the conclusions of the study, its limitations, possible future research avenues and identifies potential managerial implications of the presented results.

2. FIRST MOVER AND LATER MOVER ADVANTAGE

This chapter aims to conceptualize first and later mover advantages, their determinants and their consequences. Firstly, the concept of first-mover advantage is presented along with its primary mechanisms. Secondly, later-mover advantage is presented, highlighting the principal factors that followers take benefit from mitigating or eroding first-mover advantage. The topic discussed in this chapter created the first pillar of the theoretical background upon with the framework for this research is built.

2.1. First-mover advantage

Lieberman and Montgomery (1988, 1998 & 2013) could be classified as the most relevant scholars in shaping first-mover advantage theory. Furthermore, Suarez and Lanzolla (2007), Capone, Malerba and Orsenigo (2013), Song, Zhao and Di Benedetto (2013). Tsuchihashi and Hamada (2014) have analysed 31 empirical articles regarding first-mover advantage theory, selected through a deep systematic analysis on their empirical and academical relevance.

Suarez and Lanzolla (2007) have discovered that the concept of first-mover advantage emerged from empirical observations made by research of the U.S. Federal Trade Commission in the 1970s. Two markets were analysed: prescription drugs and cigarette products, in both cases the first entrants gained substantial advantage compared to later entrants.

During the 1980s researchers started to study the phenomenon of early entrants in order to understand why they tended to achieve larger market share and being more profitable. Lieberman and Montgomery (1988) have defined first-mover advantage as the ability of pioneering companies to capture positive economic profits (i.e. profits in excess of invested capital). This definition is the most widely used in literature because is, as they stated, considered to be more defendable. Lately, Lieberman and Montgomery (2013:314) offered an alternative definition that is that "*entry timing advantage is defined, ex post, by the market entrant(s) observed to have the highest total profit (or profit rate/market share/survival) at the time the analysis is performed.*" These two definitions are contraposed to another commonly used such as: a company enjoys a first-mover

advantage if early entry into the market is more profitable than later entry undertaken by that firm (or vice versa for follower advantage). This last one underlies that each profitable firm is able to gain first-mover advantage which, in reality, is not applied. Following the definitions given, profit should drive companies to approach strategic entry decisions. Nonetheless, it is not always possible to observe them since not every company is public and, despite the availability of historical data for listed companies few empirical studies have used this measure. The most common measure to study first-mover advantage is market share, followed by survival rate. Notwithstanding, both measures have some flaws: a limited share of the market does not imply that a pioneering firm has not enjoyed first-mover advantage (niche strategy). Regarding survival rate, instead, it is not able to give a clear picture of the company since sometimes a non-survival (e.g. exit) is a success rather than an unsuccess (Lieberman & Montgomery 2013).

One of the most relevant aspects in the concept of first-mover advantage is competitive advantage. Accordingly, a competitive advantage can therefore be captured by taking advantage of knowledge of customers' expectations, necessities and personal behaviour that should create an ongoing company-customer dialogue full of information and insights (Payne 2005).

Strategies are not fixed but dynamic and firms have to take actions both in building and sustaining their competitive advantage as well as corroding competitors' competitive advantage. This type of mechanic generates interdependence: firm's performance does not exclusively depend on internal decisions but also on those made by competitors. This relationship is easily visible between pioneers and followers: follower firms have to contrast pioneer advantage by applying second mover decisions while pioneer firms have to maintain and consolidate their position. The sustainability of first-mover advantage is likely to be dependent on the type of product and industry (Srinivasan, Lilien & Rangaswamy 2004) and the type of actions taken by incumbents (Ferrier, Smith & Grimm 1999). Firms can compete by managing actions related to products, pricing and advertising (Smith, Grimm & Gannon 1992) but also via non-market actions like regulations, litigations and lobbying (Baron 1993). (Usero & Fernandenz 2009). The sustainability of pioneer advantage is higher in manufacturing industries (Robinson 1988; Kalyanaram & Urban 1992; Urban, Carter, Gaskin & Mucha 1986). Furthermore, according to Usero and Fernandez (2009:1140) hypothesis:

1. The more product innovation actions followers take in relation to pioneers, the bigger the erosion of pioneer market share.

2. The more marketing actions followers take in relation to pioneers, the bigger the erosion of pioneer market share.

3. The more legal actions followers take in relation to pioneers, the bigger the erosion of pioneer market share.

However, findings of their study show that even when followers are more innovative than pioneers in relative terms, they are not able to significantly erode first-mover advantage acquired by early entrants.

Pioneers enjoy higher performance advantages such as market share and profitability, and may enjoy cost, differentiation, preemptive, leadership and entry barrier advantages. Early entrants can gain advantage for various reasons: they can obtain the control of key assets, including geographic space, process inputs or, physical resources (e.g. natural resources or high-skilled labour force), but also distribution segments and target market segments (Robinson & Fornell 1985; Lieberman & Montgomery 1988, 1998; Kerin, Peterson & Varadajan 1992). Pioneers can also exploit their technological leadership position into a highly effective competitive advantage: companies may outcompete competitors by exploiting economies of scale and learning curve advantage and by obtaining patent protection (Gorecki 1986; Song & Montoya-Weiss 1998). Pioneering advantage is not risk free, it comes with potential disadvantages: free-rider effects, technology or market uncertainties, changes in customer needs and incumbent inertia. Scholars have investigated how managers perceive signals in order to make their decisions, Porac & Thomas (1990) convey that managers form mental models of the business environment they compete within to make strategic decisions. Since each company has its own culture and each person its own way of thinking, managers may create different mental models and their perception of competitive advantage may differ (Day & Wensley 1988). This results in a diverse spectrum of strategic decisions made by companies. (Song, Zhao & Di Benedetto 2013:1144) "*the mental model literature suggests that managers will form their own perceptions (mental models) of whether*

pioneers will obtain advantages or incur disadvantages by moving first. Literature also suggests that the manager's decision to be a first mover with a pioneering new product into the marketplace will be driven by these perceptions of expected pioneering advantage or disadvantage."

Mental models' literature proposes that when managers take decisions and actions they rely on their personal experience and beliefs. Decision making process is influenced by the perceptions of reality built by managers. Results of the study (Song, Zhao & Di Benedetto 2013) show that perceived advantages of pioneering heavily affect the first-mover decision, at the same time, when perceived uncertainties of pioneering are high, first-mover decisions decrease. Finding are consistent with mental model literature which affirm that personal perceptions of the industry shape strategic decisions and directly affect firm performances (Peteraf & Shanley 1998). A surprising finding of Song, Zhao and Di Benedetto (2013) is that perceived risk disadvantages of pioneering and perceived advantages of pioneering are almost the same in magnitude. In manufacturing industries, firms can more easily follow patenting strategies or legal protection: differentiation advantages are more important.

Song, Zhao and Di Benedetto (2013) hypothesize eight pioneering advantage and disadvantage: overall pioneering performance advantages, risk disadvantages, cost advantages, differentiation advantages, preemptive advantages, leadership advantages, pioneering uncertainty disadvantages, and entry barrier advantages.

Table 1. Hypothesis of perceived pioneering advantage (Adapted from Song, Zhao & Di Benedetto 2013)

	Hypothesis
1	The higher the perceived overall pioneering performance advantages are, the more likely a manger would make first-mover decisions.
2	The higher the perceived pioneering risk disadvantages are, the less likely a manager would make first-mover decisions.

3	The higher the perceived pioneering cost advantages are, the more likely a manager would make first-mover decisions.
4	The higher the perceived pioneering differential advantages are, the more likely a manager would make first-mover decisions.
5	The higher the perceived pioneering preemptive advantages are, the more likely a manager would make first-mover decisions.
6	The higher the perceived pioneering leadership advantages are, the more likely a manager would make first-mover decisions.
7	The higher the perceived pioneering uncertainty disadvantages are, the less likely a manager would make first-mover decisions.
8	The higher the perceived pioneering entry barrier advantages are, the more likely a manager would make first-mover decisions.

Each element has its own risk return ratio, managers decide whether to make first-mover decisions based on their perception. Furthermore, it is possible that other additional variables affect the number of first-mover decisions. For instance, first-mover decisions might be related to the dimension of the firm, profitability, the liquidity of the firm, the growth opportunities in the firm, the financial resources and structure of the firm, and so forth. In addition, other industry external environmental variables (e.g., market conditions, technological shifts, etc.) may also affect the number of first-mover decisions. These additional variables might be correlated with the perceived eight scales of pioneering advantages and disadvantages and that coefficient estimates on the perceived pioneering advantage variables may be biased. (Song, Zhao & Di Benedetto 2013:1149).

Potential pioneering performance advantages consist of increased return on investment and market share, premium price capability and ability to introduce products and services into the most profitable market segments (Fornell, Robinson, & Wernerfelt 1985; Lieberman & Montgomery 1988; Robinson, Fornell & Sullivan 1992). The risk associated to early entering counteract potential advantages. Later entrants can take advantage of the situation by skipping all the work made by pioneers in educating the stakeholders involved. Pioneers may also select a technology that, once they already entered the market, becomes old and outdated. At the same time, first-movers may also fall on uncertainty of the market or target the wrong segment, maybe the less-profitable one. (Glazer 1985; Lieberman & Montgomery 1988; Golder & Tellis 1993; Li & Calantone 1998; Lilien & Yoon 1990). By moving first, pioneers may face higher or low costs depending on the industry and the factors needed for the production or supply of a service. Nonetheless, companies have the possibility to exploit economies of scale and learning curve advantages by entering as first (Song & Montoya-Weiss 1998). Being the first is a considerable opportunity to establish a positive reputation (Calantone & Di Benedetto 1988). First-movers can also gain substantial benefit from the preemptive advantages: companies can acquire the best quality raw materials or, for instance, choose the optimal location for production. This last example is particular suitable for the petroleum industry. The discovery of an important oil field gives an enormous advantage. In certain industries, for instance pharmaceutical one, patenting protection grants advantages that potentially last several years. Pioneers experience longer learning period before being able to generate profits compared to later entrants but, at the same time, they can use this timeframe to erect entry barriers (Kerin et al 1992; Li & Calantone 1998; Song, Zhao & Di Benedetto 2013).

According to Lieberman and Montgomery (1988) first-mover advantage arises from three primary mechanisms: technological leadership, pre-emption of scarce assets and buyer switching costs.

2.1.1. Technological leadership

One way first-movers can gain advantage is through achieving sustainable leadership in technology. In order to achieve technological leadership a firm can pursue two different approaches: gaining advantage through the learning or experience curve or succeeding in

patent or R&D clashes. In the standard learning curve model production cost per unit decreases with cumulative output. This grants to early entrants sustainable cost advantage if learning can be maintained proprietary, generating substantial barriers to entry. Lieberman (1987:450) affirms that "*when learning curve is present, profit maximization requires that firms set marginal revenue equal to current marginal costs, plus an integral reflecting the present value of future profits generated by a unit increase in current output. The components of the integral reveal the structure of the firm's strategic problem. The first term is an investment, the second is a strategic term and reflects the future response of competitors*". Learning curve is a relevant factor contributing to long-term cost and price reduction in different industries. However, the high diffusion rate of process technology has crucial implications for competitive strategy. Rapid diffusion dulls the incentive to gain market share during the initial growth phase of a market, giving possibility to firms to wait before entering (Lieberman, 1989).

Technological leadership can be reached through massive R&D investments and patents. The development of patents grants significant advantages to the owner if well protected. However, imitation cost is highly industry dependent and the relevance of the patents in perceived quality is only partial. (Lieberman & Montgomery, 1988).

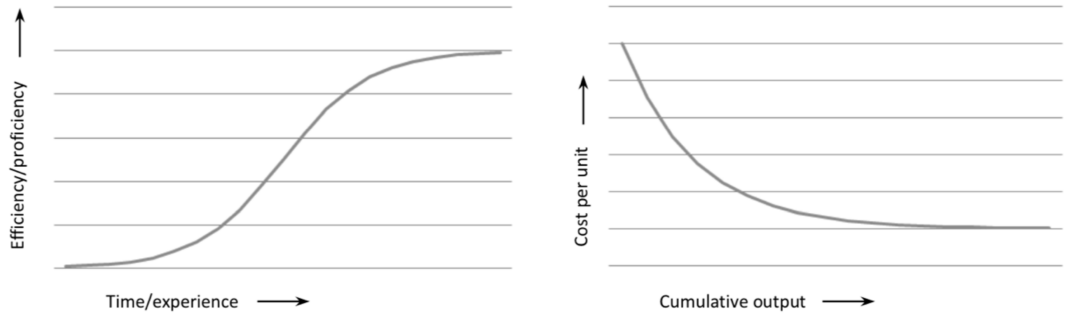


Figure 1. Standard learning curve and economic learning curve

Learning curve-based advantages are not easily maintainable due to the rapid information spread across the industry. In industries with rapid technology diffusion there are no learning-based advantages for first-movers (Lieberman 1989).

The introduction of upgraded technologies into the market is a shared ambition among managers. Outstanding technology leaders, as a result of having overcome their peers into the market, can maintain diminished competition. The persistence in time of this advantage depends on their capability of exploiting windows of opportunities. This ability depends on leader's and on the distribution of challenges across components and complements (Adner & Kapoor 2010). Innovation is generally empowered by shifts in components. Firms and suppliers may encounter noticeable challenges in the development and integration of new components into their market proposal (Fine 1998; Iansiti 1998; Brusoni, Prencipe & Pavitt 2001). A crucial element of first-mover advantage is increasing the firm's experience in production and market knowledge advancing the learning curve (Lieberman 1984, 1989). A study by Dutton and Thomas (1984) has found that in 22 cases of learning curve analysis, greater advantage is linked with greater learning potential. The potential of the learning opportunity heavily influenced by the needs that companies have to modify their current method of problem solving. If no changes are required, there no great opportunities for the firm to learn. On the other hand, when the market is uncertain and complex, the opportunity of learning will definitely be much higher.

Rosenberg (1972) declares that a single innovation is not enough to establish a radical innovation and the opportunities and challenges experienced by costumers are influenced by the level of development of complements. When complements are openly available, they can produce a *spillover effect* of knowledge into the whole industry, on the contrary, if complements are proprietary, knowledge is not shared at the same pace and technological leadership might be stronger. Challenges in the external environment in which companies are competing directly influence competitive advantage. Specifically, the advantages gained by firm through technological leadership increase with component challenges and decrease with complement challenges. Benefit of technological leadership remarkably depends on location and magnitude of uncertainty of the entire ecosystem (Adner & Kapoor 2010).

2.1.2. Preemption of scarce assets

First-movers might be able to gain advantage by impeding or reducing rival firms the possibility to acquire scarce assets. Contrary to the technological leadership, in this case

first-movers achieve benefit by controlling already existing assets rather than creating or improving new ones (Lieberman & Montgomery, 1988).

Three types of preemption are considered: (1) preemption of input factors, (2) preemption of locations in geographic and product characteristics space and (3) preemptive investment in plant and equipment.

Preemption of input factors occurs when the first-mover is able to gather superior information and so, is able to purchase assets needed for the business at a market prices lower than the ones that will prevail later.

Preemption of locations in geographic and product characteristics space instead occurs when first-mover firms are able to select and occupy the most profitable niche of a certain market. After doing so, firms may limit competition by taking strategic actions aimed at maintaining and reinforcing their dominant position. The theory of spatial preemption has been developed by Prescott and Visscher (1977), Schmalensee (1978), Rao and Rutenberg (1979) and Eaton and Lipsey (1979, 1981). Each of them agrees on the fact that first-movers are able to establish a better position in geographic or product space. First-mover firms are described as monopolist firms, trying to capture all the economic value reducing the competition. However, empirical study like Glazer (1985) did not find any difference in survival rates among first and second movers. This may be explained by the markets analysed: newspaper and concrete. The firms of these markets all have similar technologies and entry opportunities, so they all possess the same information, there is no room for knowledge asymmetries. On the opposite, a study on Wal-Mart by Ghemawat (1986b) seems to prove the existence of it. The American retailer focused on small towns located in contiguous regions considered to be irrelevant in terms of profits by its rivals. By combining them together with an incredibly efficient distribution network, Wal-Mart was able to sustain its position earning high profits. Pioneering firms do not have to be considered the ones who study as first a certain market, whether product or geographic. As mentioned by this case study, Wal-Mart acted as a first-mover in developing and designing a winning entry strategy to exploit market potential. By relying on its technological leadership given by the distribution network and combining with the subsequent preemption of scarce assets it achieved the highest profits in the market.

Lastly, another way first-movers can gain advantage is through *preemptive investment in plant and equipment*. Here, the typical role of economies of scale is predominant. In industries where high economies of scale are needed (e.g. automotive, chemicals, steel, etc.), first-movers may be the first to reduce the cost per unit, being able to overcome new entrants not only relying on their already established brand perception but also on lower production costs. Nowadays, thanks to international production systems, the role of economies of scale for non-manufacturing firms is de-emphasized. Companies can rely on several different entry modes, both equity or non-equity: export/import, licensing and franchising, minority holdings, joint ventures and wholly-owned subsidiaries. In several cases, the initial investment is originally taken by the manufacturing firm. (Lieberman & Montgomery 1988).

To summarize, there are several opportunities for firms to gain first-mover advantage: preemptive investments, physical resources, human resources, political resources, spatial preemption, market space and marketing cost asymmetries.

2.1.3. Buyer switching costs

When developing a new product, companies inevitably face high costs. Similarly, customers sustain the same costs when experiencing new products. These costs are both monetary and non-monetary. High customer switching costs may reduce the possibility of switch to competitors' products by consumers. Thanks to brand and retention first-movers can establish high switching costs, impeding followers to attract their customers.

Furthermore, switching costs can highly influence initial transactions costs and investments that the buyer has to make in adapting to the seller's product. Specifically: time and resources used in finding a new supplier, cost of software, time and financial expenses made in order to train personnel. Over time, the buyer shapes its business in relation to the product and so, it is costly to change towards another product or competitor (Lieberman & Montgomery 1988).

Contractual switching cost is the most direct way first movers bind customers: on a contractual basis. As easily conceivable by the name, it is a signed contract between two

parties. Even though a contract is not directly signed, Klemperer (1987) has identified in bonus systems for purchase this kind of switching cost, for instance frequent flyer program and supermarket actions with stamps.

Haller and Schwabe (2014) have identified the mechanism of sunk cost concept when considering a new expense. Human brain tends considerate previous investments when evaluating decisions about future investments. It is unequivocal that this natural tendency may be transformed in a solid asset by companies which are able to enter and capture the market as first.

Customers can only express satisfaction or dissatisfaction about products they have owned or have tried. If they are already fully satisfied, they may stick with the same specific product or service even though competitors present similar products (Schmalensee 1982). So, when approaching purchasing decisions, consumers typically buy to the product they already know or are inspired by the purchasing decision of other consumers (mass consumption).

Another element to be taken into consideration is *network externalities*. This type of switching cost is typical of services. Some services or products' value is directly proportional to the number of buyers (Katz & Shapiro 1985). The more people use a certain platform, the higher value it reaches. Facebook, LinkedIn and other social media platform are able to capture value because of the number of users into the platform. Given so, it is difficult for emerging firms to move users into their newer platforms. The same example can be applied for example to gaming consoles: people will buy the one that shares the largest community (e.g. Xbox 360 overcame PlayStation 3 due to its larger online gaming community).

2.2. Later mover advantage

First-movers do not only enjoy advantages, first movers can also experience disadvantages. First-mover disadvantage can be seen as later mover advantage. Later movers typically take advantage from: ability to free ride on first-mover investments, resolution of technological or market uncertainty, shift in technology or customer preferences and needs and incumbent inertia. These elements can mitigate and in certain

case even eliminate all, or part of, the advantages that pioneers have been able to gather. (Lieberman & Montgomery 1988; 1998).

2.2.1. Free rider effects

Follower firms are able to free ride on pioneers' investments. Generally, in the most expensive areas such as: R&D investments and building of the infrastructure. Imitation cost is lower compared to innovation cost, especially in R&D intensive firms (e.g. automotive, high-tech, pharmaceutical). In fact, as reported by Mansfield, Schwartz and Wagner (1981) an imitation can be made at the 65% of the cost of an innovation. Banks reports in Tufano (1989) have found that imitator firms can lower their investments down to 50% and 75% compared to innovators. Nevertheless, for a certain period of time, depending on the competitive dynamics, pioneers are able to enjoy periods of monopoly. At a later time, when imitator firms are able to enter the market, magnitude and durability of first-movers' profit decrease.

Teece (1986b) declares that the impact of free rider effect depends on the type ownership of assets that are complementary or co-specialized with the firm's innovation. One of the examples given is IBM: the first computer of the American company, the IBM PC, was introduced in 1981 and, instead of building every component from scratch, engineers decided to use existing technology and make a solid product rather than producing a piece of art. This allowed IBM to focus on complementary assets, for instance, its brand and complementary software.

2.2.2. Resolution of technological or market uncertainty

First-movers and early movers operate in a new environment, both in terms of product and geographical market. For this reason, the assumptions they have in technology may completely change after their market proposition. The degree of risk involved in entering a new uncertain market is elevated. This allow followers to enter the market when uncertainty is solved; typically, already big established firms are able to wait until the technology is at a favourable degree of maturity to propose their solution.

In many new product markets, uncertainty is resolved through the emergence of a dominant design. "*The Model T Ford and the DC-3 are examples of dominant designs in the automotive and aircraft industries"* (Lieberman & Montgomery, 1988:48).

As previous literature has demonstrated (Utterback and Abernathy 1975; Anderson & Tushman 1990; Agarwal, Sarkar & Echambadi 2002) the development of dominant design solves technological uncertainty changing the competitive dynamics of the industry.

The dominant design emerges from technological experimentation (Suarez and Utterback 1995), path dependence (Anderson and Tushman 1990), and investments in R&D with subsequent economies of scale (Klepper 1997). "*Unlike the case of novel categories for which practically any recombination of elements of the cognitive space is possible, the materiality of technological designs limits the experimentation preceding a dominant design to what is technologically feasible. For each product class, there is only a limited set of possible technological trajectories that are feasible. Moreover, once a firm decides to invest and progress along a specific trajectory, technological path dependence imposes strong restrictions on what can be done and undone in the design"* (Suarez, Grodal & Gotsopoulos 2015:440).

2.2.3. Shift in technology or customer needs

Technology is crucial in the definition and identification of first-mover advantage. Specifically, in industries in which the impact of technology is significant, early entrants may enjoy considerable disadvantages if their entrance is followed by a major shift or evolution of the underlying technology. However, incumbents may not able to defend their market position because change in technologies and development of old ones are generally simultaneous. (Lieberman & Montgomery 1988).

In addition, even though a company is able to understand that a shift in technology is happening, changing direction may not be feasible because of the possible high R&D costs already faced. R&D is, by definition, expensive. In order to reduce the impact it has on the cost structure, companies have to achieve economies of scale. Companies may be tied by their entry decision, experiencing first mover disadvantage.

Not only technology changes, customer needs change too. Needs are dynamic and give later movers the opportunity of satisfying new markets' requirements and standards. Timing is considered to be the key for successful market entry (Thomas 1985). The capability of estimating the most opportune time to enter a market, given technology development and consumer's needs, is crucial and it can bring significant competitive advantage. Firm's decision to enter a specific market can be attributed to different factors, among these, customer preferences play a relevant role (Lilien & Yoon 1990).

Consumers must choose whether to purchase a certain product in the market and, in case more than one is available, which one. The two most important elements that consumers consider when approaching a buying decision are: price and quality. In various different markets consumers are directly influenced by price and quality when approaching purchasing decisions. A product is not taken into consideration if its quality does not meet the consumer specific requirements. Purchasing decision is affected by past behaviour: sometimes consumers may stick to the old product even if the new one has lower price and higher quality. (Capone, Malerba & Orsenigo 2013).

The resolution of technological uncertainty generates value creation. Adner and Kapoor (2010:314) affirm that "*early in a technology's life cycle, technological uncertainty is at its peak. As development takes place, knowledge is accumulated, and progress becomes more predictable. Although development continues throughout the life cycle, and innovation challenges are always present, within a given trajectory the level of technological uncertainty tends to decrease over time.*"

2.2.4. Incumbent inertia

The advantage of pioneers may be eroded by incumbent inertia. According to Lieberman and Montgomery (1988) the inertia can be explained by several reasons: firms may already have done high R&D investments, they may be afraid of dismantling already existing product lines, or firms may be organizationally inflexible. Martinez Sànchez and Pérez Pérez (2005:681) have found "*positive relation between a superior performance in flexibility capabilities and firm performance, although flexibility dimensions are not equally important for firm performance. On the other hand, the results show that*

companies enhance more the basic flexibility capabilities (at the shop floor level) than aggregate flexibility capabilities (at the customer-supplier level). However, aggregate flexibility capabilities are more positively related to firm performance than basic flexibility capabilities.". All these elements constrain firms from innovation and response to environmental and competitive dynamics changes.

In his study, Tang (1988) presented the model that American firms followed when they have decided to continue their production of steel in open-heart furnace even though basic oxygen furnaces were conquering the market imposing their dominance. A firm that has its cost structure massively unbalanced towards fixed costs may find more convenient to harvest the investment rather than changing strategy.

Monopolist early entrants are considered to be less innovative in the long term compared to later entrants (Arrow 1962). Henry Ford decided to persist in producing the Model T even after it was clear by consumers that new models were required (Abernathy & Wayne 1974).

3. COMPETITIVE DYNAMICS

In order to develop the second pillar of the theoretical background, theory regarding competitive dynamics must be discussed. This chapter focuses on a first brief historical overview of the automotive industry, followed by a literature review of competitive dynamics. Afterwards, competitive dynamics and first-mover advantage are analysed under the automotive industry perspective. Finally, the concept of coopetition is presented.

3.1. Historical overview of the automotive industry

The roots of the modern automotive industry can be linked to Henry Ford, who, thanks to his pioneering ability has been able to build the foundations of the modern mass production techniques. Since then not so many features of the car have been changed: they still have four wheels, generally have petrol or gasoline engine and the chassis is made up of compressed metal elements. Ford enjoyed first-mover advantage but, it was soon overtaken by GM, which, in contraposition to the highly standardized Ford model proposed a decentralised organisational structure in order to fulfil customers' choices and preferences. Ford lost its leader position in market share in 1927. During the 40s, a Japanese car producer, Toyota, developed a new set of techniques that allowed them to increase their productivity and quality standard by reducing at the same time costs. The Toyota Production System (TPS) or lean production. European producers started to adopt this method during the 70s and they focused their efforts in achieving economies of scale, nevertheless they rapidly understood that scale alone does not ensure survival. During the years competitive advantage has always been reduced and minimized by competitors. The next major change in the industry is expected to be generate by a shift in technology with the introduction of new disruptive technologies (Christensen 1997). These radical technologies will be able to reset the industry and the competitive scenario to the first days of the industry, drastically changing practices and current economies (Holweg 2008).

Table 2. Milestones of the automotive industry (Adapted from Cebos website)

	Milestones
1900	*The first Detroit automobile factory* Ransom E. Olds decides to establish an automobile manufacturing factory to Detroit, the so called "Oldsmobile".
1908	*Ford Model T* On the 1st of October 1908 the first Ford Model T is produced. This historical model will be produced for over 19 years, selling 15 million units.
1911	*The electric starter* Charles Kettering and Henry M. Leland invent and develop ann electric starter for cars. Cadillac is the first one to introduce it in production models in 1912.
1913	*Introduction of the automobile assembly line* Ford introduces the innovation in 1913. Thanks to this milestone, mass production begins to be feasible and prices more affordable.
1914	*Introduction of steel* On the 14th of November 1914, Dodge introduces the first car built with a steel body, replacing wood.
1939	*Automatic transmission* In 1939, General Motors introduces the first automatic transmission, "Hydra-Matic". An automatic transmission that allows gears to shift automatically.
1940	*Air conditioning* Air conditioning is introduced by Packard in 1940. Nowadays, almost all the cars sold in the market have it.
1966	*Electronic fuel injection* In 1966 the system is created and in 1967 Volkswagen is the first to introduce it in production models. This system is a key milestone for efficiency, allowing cars to reduce the fuel needed.
1968	*Seat bealts* In 1968 government regulations require car companies the increase vehicles' safety by equipping front seats with belts.

1970s	*Airbags* During the 70s major automotive car makers start to introduce air bags in their vehicles for improving safety.
1990s	*Hybrid and Electric vehicles* Toyota develops the first vehicle (i.e. Prius) with a mixed engine: internal combustion engine and an electric engine. General Motors introduces the first battery vehicle in the market.
2000s	*Connected and smart cars* Technology is introduced into cars: automatic braking system, collision sensors and self-driving capabilities.
2010s	*Self-driving cars and Mobility as a Service* Car manufacturers massively invest in in-car-technology to develop autonomous vehicles. Shift between ownership to sharing.

3.2. Literature review

Companies that are able to capture and deliver more value compared to their competitors, enjoy competitive advantage (Porter 1985; Brandenburger & Stuart 1996). Firms don't playing alone in the market, they are constantly competing among other companies. When a firm is able to innovate in a more successful way compared to competitors, it can gain substantial competitive advantage. However, innovation is not a unique process; rather, it is generally linked on changes of the environment surrounding the firm. Changes in external factors generate diffuse innovation. (Adner 2006).

Firms often operate in industries that are characterized by hyper-competition (Chen, Lin & Michel 2010; Gimeno & Woo 1996), in which they must observe, and capture signals sent by rivals' firms in order to plan their strategy and execute their actions so as to defend their positions. Several empirical studies have proposed evidence that rivals' characteristics such as potential impact, visibility, action volume (Chen & Miller 1994; Smith & Grimm 1992; Derfus, Maggitti, Grimm & Smith 2008), the geographic distance

between rivals and the focal firm (Yu & Cannella 2007) and rivals' competitive success (Hsieh, Tsai & Chen 2015) may determine focal firm's strategic decisions.

Business intelligence plays a relevant role during the development of the strategy. For instance, firms may analyse the financial statements of competitors revealing their resource allocations (Porter 1980). In the case of public companies, as for the case of the industry selected for this study, financial statement is a powerful tool to study competitors' behaviour. Moreover, companies of the automotive industry generate each year highly detailed annual report containing a variety of strategic choices. Cohen and Levinthal (1990) have analysed R&D intensity as an element to explain firms' competitiveness. Competitive advantage is not perpetual and so, to maintain their strategic positions, firms should constantly control the degree of research and development and rivals and act coherently in terms of strategy.

Chen (1996) has conceptualized competition as a dynamic process of firms' actions and responses. Each market could be seen as a battlefield in which companies put in practice their attacks and counterattacks, always trying to advance their position. According to this interdependence between firms Chen (1996) has conceptualized three major elements to explain the driver of competitive decisions: awareness, motivation and capability. Awareness is referred to the ability of a company of understanding competitive signals coming from the market; motivation explains the firm's willingness to take an action; capability expresses the concrete possibilities that a firm has to execute competitive actions and reactions.

Under this perspective, in technology industries in which companies massively invest in innovation developing new products, any competitive advantage may be rapidly reduced by rival firms. As a matter of fact, rivals' decision in terms of exploration and exploitation of new technologies can highly influence the innovativeness of a focal firm, maximizing its efforts in R&D (Katila & Chen 2008).

One important measurement able to illustrate rivals' innovation is R&D intensity. The information provided by the financial statements is relevant for the competitive dynamics. For instance, it may illustrate current performance of the firm, future strategies and resource allocation (Fombrun & Shanley 1990). R&D intensity is defined by Greve

(2003) as the proportion of the rivals' R&D expenditure to its total revenue. R&D intensity can provide awareness and motivation for a firm to challenge its competitors. However, awareness and motivation are not sufficient elements in order to take actions, capability is needed. Moreover, R&D intensity could be measured only in presence of public financial statements, so not every industry's companies are able to rely on this competitive hint. By heavily investing in R&D a rival shows its willingness to develop new advanced products moving forward the competition. At the same time, this strategy, if well implemented, may be able to destroy focal firm' current core competences (Tushman & Anderson 1986). Firm performance and strategic decisions are often interdependent, especially in markets which are made up of highly innovative technological products.

Although R&D intensity can be analysed as a crucial component of firms' awareness, motivation and capability there are other factors influencing strategic choices. Relative firm size has an impact on strategy: in their empirical study, Chen and Hambrick (1995) have identified that smaller firms are generally more willing to change compared to larger ones. Vice versa, larger firms may display inflexibility due to their complex structure. Larger firms might believe that since they have relevant shares of the market and financial stability, they can ignore possible threats coming from smaller rival firms (Miller & Chen 1994). If threats are longer ignored, larger firms may not properly invest in R&D, losing their strategic dominant position in the market. Another influencing factor is relative firm performance. Well performing firms (market share and profitability) tend to reduce their innovativeness, becoming complacent and content with the status quo (Miller & Chen 1994).

As well as relative firm size and relative firm performance, strategic homogeneity affects the choices of firms. Companies can be similar in capabilities and this homogeneity has implication in the strategic formulation (Zhang & Rajapogalan 2003). When firms have homogeneous capabilities, they tend to react more. Vice versa, when rival firms possess a different set of capabilities, they may not be able to counterattack.

Market growth has been considered as a determinant in the relationship among the choice of entry strategy and results achieved in several theoretical and empirical researches (Gomez, Lanzolla, Maicas 2016). Greater market growth gives also late entrants the

possibility to find niches of the market where they can develop their business. (Christensen 1997). For the industry that this Master Thesis is taking into consideration, automotive industry, entry order advantage may be considered as more sustainable since it is a mature, slow-growing market. (Utterback 1994). Nonetheless, automotive industry is highly complex and can be split into smaller markets which have their own different grade of maturity (e.g. HEVs/BEVs vs autonomous driving).

Overall Gomez, Lanzolla and Maicas (2016) find that market growth may erode first-mover advantage, and so market share and profitability. First-mover advantage has been associated to the firm's capability to pre-empt limited market resources. However, when the rate of growth of the market is high, there are more possibilities for new companies to compete (Suarez & Lanzolla 2007).

Market growth can also reduce the advantage of technological leadership. In a fast-developing market the possibility that later entrants are able to achieve economies of scale increases. On the opposite, when market growth is low, first comers can heavily rely on the experience gained by the learning curve.

Finally, market growth can diminish the effect of switching costs. A rapid growth reduces the proportion of old users increasing the importance of new users (Beggs & Klemperer 1992). The effect of market growth depends on the homogeneity or fragmentation of the demand (Capone et al. 2013).

In a fast-pacing world, new companies based on always new technologies are steadily showing. Firms that are dealing with entering into an already existing or new industry are faced with developing a multidimensional entry strategy. The dimensions combine *time of entry, how to enter and how to deal with competitive dynamics* once entered (Day 1986; Green & Ryans 1990). How the company addresses each of the dimension plays a significant role in the building of a relevant position in the market. Several studies have put into relationship timing and subsequent performance of the firm (Robinson & Fornell 1985; Lambkin 1988; Mascarenhas 1992; Brown & Lattin 1994; Huff and Robinson 1994). Mitchell (1989) is considered to be one of the most exhaustive article both theoretically and empirically. The author suggested that specialized assets are the primary causes of whether and when incumbents would enter into a specific industry or market.

Specialized assets are asset that have an idiosyncratic value in the new product proposed or market. Considering that only incumbents would possess these peculiar assets, Mitchell tried to forecast the entry timing into the new market/industry. Strong support was found for: *increased rivalry and threatened core products* lead to earlier entry by incumbents. Only the possession of a direct sales force was significantly related to entry timing. (Schoenecker & Cooper 1998).

Robinson, Fornell and Sullivan (1992) found support for the comparative advantage hypothesis, stating that specific resources and capabilities lead firms to select a different entry timing strategy. The two major factors discovered by the authors are *strong finance skills* and *internal mode of entry*. Surprisingly, massive investment in R&D were not found to influence entry timing but, at the same time, companies that possess strong marketing skills and an already established brand name capital tended to be later entrants. On the other hand, Thomas (1996) focused his analysis on the effect of brand capital on entry order in the cereal industry, discovering that firms with larger stocks of brand capital were more inclined to penetrate a new market segment sooner with a new brand. (Schoenecker & Cooper 1998).

Organizational attributes affect entry timing. These attributes are not correlated to capabilities or proficiencies. They affect entry timing by influencing the velocity of company's decision-making process or through possible incentives that firms may have in entering early. It is expected that there are intra-industry differences in resources and attributes among early and later movers. Furthermore, there are inter-industry differences in the resources necessary to become an early entrant. The relationship between company resources and attributes and entry timing is stronger in industry with evident first-mover advantage. When there are weak reasons to enter as soon as possible into a market, entry timing may not be directly related to firm resources and attributes. The magnitude of resources needed to enter also influence relationship between resources and entry timing (e.g. R&D). (Schoenecker & Cooper 1998).

Firm resources highly influence the capability of entering the marketing and facing competition. Despite the desire of being the first, *physical, intangible* and *financial* resources (Chatterjee & Wernefelt 1991) influence entry timing and competition.

The selection of the perfect timing highly influences companies' performances. Despite the fact scholars have agreed on the importance it has on the establishing of a dominant position, consensus on optimal time for entry is still lacking and a framework has not been established (Suarenz & Lanzolla 2007; Suarez, Grodal & Gotsopoulos 2015).

Schoenecker and Cooper (1998) identified 6 firms' internal resources and organizational attributes that influence entry timing: (1) technological resources, (2) marketing resources, (3) financial resources, (4) commitment to threatened market, (5) size, (6) firm diversity.

1. Considered to be the most immediate factor to explain entry strategy. Technological resources are referred to the commitment firms make to R&D (Mahoney & Pandian 1992). Pioneers generally have to face higher costs of R&D, compared to later entrants. They enter the learning curve at the beginning, and they can't acquire or license technology from other companies.

2. Focus on the possession of a direct sales force. Especially in the case of a complex products and in B2C markets.

3. Two different points of view: from one side, Bowman (1982), Fiegenbaum and Thomas (1986) and Kahneman and Tversky (1979) support the position that companies with poor finance performing are *risk seekers* and are expected to enter the market quickly. On the opposite, Bourgeois (1981) and Moses (1992) acknowledge that the presence of a solid financial basis higher the willingness to experiment of companies. These days, things have drastically changed due to the increase in number and amount of private equity funds.

4. The threat that new products present to firms' current business affect entry timing as advanced products might reduce companies' revenues.

5. Larger companies tend to be later entrants due to their *organizational inflexibility*.

6. Less diversified firms are more willing to pursue opportunity of pioneering.

Schoenecker and Cooper (1998:1132) suppose that "*firms with large R&D intensities, that possess a direct sales force, and that have greater internal financial resources will be earlier entrants in industries with significant opportunities to build first-mover advantages. In industries lacking first mover advantages there will be no systematic relationship between entry timing and resource position*".

Suarez, Grodal and Gotsopoulos (2015:438) introduced the concept of *dominant category*. "*We argue that the emergence of the dominant category demarcates the opening of a window of opportunity for entry into a new industry, because it signals the resolution of socio-cognitive uncertainty. The end point of the opportunity window is, in turn, demarcated by the emergence of the dominant design, which as prior literature has demonstrated, resolves technological uncertainty and fundamentally alters the competitive dynamics of an industry* (Agarwal et al. 2002; Anderson & Tushman 1990; Utterback & Abernathy 1975)".

At the initial phases of their life cycles, new markets and industries are generally confused and not well defined, with loose boundaries. Rao (2008:19) described the dynamics between automotive companies at the beginning of the industry. The automobile was considered by stakeholders *'velocipede,' 'motorcycle,' 'locomobile,' 'electric runabout,' 'electric buggy,' 'horseless carriage,' 'automobile,' and 'quadricycle*. (Suarez et al 2015:438). Uncertainty and ambiguity predominate, and early entrants who try to achieve dominant positions are susceptible of failure.

By introducing new categories, companies may place themselves as cognitive referent for the entire market, influencing new developments (Santos & Eisanhardt 2009). After an initial phase of confusion, a phase of convergence of dominant categories emerge. The chosen ones are the ones that better satisfy customers' needs, the alternative ones are progressively discarded (Kennedy, Lo & Lounsbury 2010). The concept of dominant category is directly linked with the emerging of a dominant technological design. Relationships into the market start to define and the competitive dynamics take place. These first stages could be seen as the building of an arena: companies try to find the right material, brick and dimension of the competitive stage. The ones who are faster to understand which the perfect combination between elements is, will be the first

champions to be challenged. The creation of a dominant category will bring to an introduction of a dominant design.

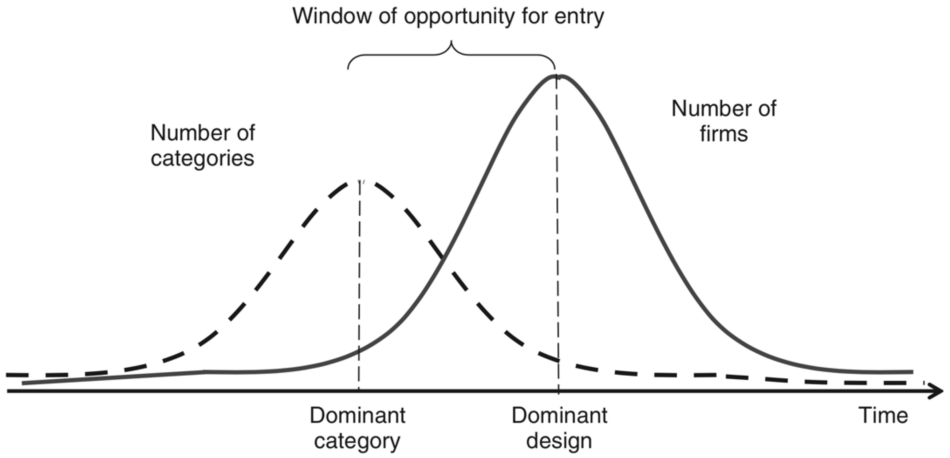


Figure 2. Dominant category and dominant design (Adapted from Suarez, Grodal & Gotsopoulos 2015)

Christensen, Suarez and Utterback (1999:213) claimed that companies that are able to achieve high performance are the ones that entered the market before the emerging of a dominant design. The optimal interval of the window of opportunity is considered to begin with the emerging of dominant category and ending with the emerging subsequent dominant design (Anderson & Tushman, 1990). Notwithstanding the optimal strategic window of opportunity may end with the emergence of a dominant design, it shall not be generalised for every industry. During the industry's lifecycle there could be multiple windows of opportunity, it is not a one-time only interval.

According to Christensen et al. (1999) window of opportunity occurs before the emergence of a dominant design and companies following this approach could be described as first-movers. On the other hand, Markides and Geroski (2005:120) assumed companies that are able to enter the market slightly before the emergence of a dominant design may be considered outstanding second movers. Companies entering a new industry, or a new market have the possibility to create new categories or propose their products to already existing ones. The choice made by each firm both influence company and categories' future, establishing relationships of the competitive scenario. Firms may actively advocate a new category, not only by positioning themselves but also trying to

influence all the stakeholders, this strategy is considered a high-risk but high-return one. Others may instead position their products into different categories waiting for the emergence of the dominant one. (Suarez, Grodal & Gotsopoulos 2015).

3.3. First-mover advantage and competitive dynamics in the automotive industry

Today's automotive scenario can be trace back to the innovation brought by Henry Ford who has been the first to develop and introduce mass production procedures thanks to the interchangeability of factors and the adoption of the moving assembly line. Ford strategic choice completely changed the industry, but its competitive advantage was transitory. It was soon caught up by GM, which, following a different vision influenced by Alfred P. Sloan, developed a decentralised organisational structure offering consumers the opportunity to make a choice among a portfolio of products. Until 1970, Europeans and US car manufactures were able to harvest the post-war period. Afterwards, an increase in competition from Japan arose, because of companies like Toyota were able to build vehicles by at the same time increasing quality, reducing costs and prices for American and European consumers. (Holweg 2008).

Toyota was the first manufacturer to introduce into their production facilities the Toyota Production System (TPS), also known as "lean production". After 1970, all the major car producers adopted this method. Nonetheless, at our days, companies must not rely on production excellence only (Holweg & Pil 2004). During the last decades several countries as Korea for instance, have achieved high level of quality standards at low cost of production.

Howelg (2008) revisits the history of car industry showing how external factors have influenced automotive companies and how they have not always been able to align their strategy to new structural shifts as presented by Lieberman and Montgomery. In 1927 Ford lost its market leadership and competitive advantage due to the introduction of choice brought by GM. Japanese players increased their competitive advantage after the oil crises due to a growing demand for economical cars. Some years later, South Korea motor industry appeared to be as competitive as the Japanese one.

Two distinct main strategies could be spot: lean manufacturing for Eastern manufacturers and high volumes for Western manufacturers. Following the strategy of increasing volumes of car produced in order to achieve higher economies of scale brought companies to establish alliances. Some of these alliances, however, did not solve industry problems and failed (e.g. BMW with Rover, GM with Fiat).

"The competitive realm of the auto industry is dynamic and has been throughout the past century. However, contrary to the past, the strategies adopted by firms are far less distinctly defined than they used to be. Over the last century we have witnessed the evolution from craft production to mass production under Henry Ford, to Sloan's policy of brand and product variety, to lean production, and more recently, to build-to-order initiatives at both volume and luxury vehicle manufacturers. Along the way, most manufacturers have adopted a wide range of mass and lean production tools and techniques, as well as Sloan's concept of a brand portfolio. Thus, today we see elements of all these approaches across manufacturers: the moving assembly line, the product and brand portfolio, model years, and lean production techniques are common at most manufacturers, even at those luxury makers that traditionally were seen to be "craft producers". In the process, the competitive realm has shifted considerably, and the main basis on which companies are competing has changed." (Holweg 2018).

Four main phases of the automotive industry competitive dynamics are identified: cost leadership, variety and choice, diversification and customisation (Parry & Graves 2008). Companies compete at different phase: nowadays most companies are trying to compete at diversification and customisation (ACES), the others at cost leadership and variety levels. Automotive market can be divided into two main groups: premium and non-premium.

Table 3. Premium and non-premium car manufacturers (Adapted from UNRAE)

Premium car manufacturers	**Non-premium car manufacturers**
Alfa Romeo	Chevrolet
Aston Martin	Chrysler
Audi	Citroen

Bentley	Dacia
Cadillac	Daihatsu
Ferrari	DS
Infiniti	Fiat
Jaguar	Honda
Lamborghini	Hyundai
Land Rover	Jeep
Lexus	Kia
Lotus	Lada
Maserati	Lancia
McLaren	Mazda
Mercedes	Mitsubishi
MINI	Nissan
Morgan	Opel
Porsche	Peugeot
Rolls Royce	Renault
Tesla	Seat
Volvo	Skoda
	Smart
	SsangYong
	Subaru
	Suzuki
	Volkswagen

Typically, premium brands compete at diversification and customisation level, non-premium brand at cost leadership and variety and choice level. Notwithstanding the "premiumness" of the brand, competitive dynamics is fluid and so manufacturers compete on different stages.

As an example, in the US, Ford and GM (Chevrolet and Cadillac), have decided to compete in the variety and choice stage focusing on price and range of models. At the same time, BMW, Volkswagen, Toyota, Audi and Renault compete on diversification

and differentiation: brand image, outstanding design, leadership in product technology and manufacturing excellence (Holweg 2008).

Competition in automotive is fierce, each brand competes against other brands in the same share of the market. Keivanpour et al (2016) point that due to lack of information and potential players' irrationality, companies may not be aware of whether their strategy is winning or not. Keivanpour, Mascle and Ait-Kadi (2016) proposed a model based on the evolutionary game theory in order to interpret the competitive scenario of automotive industry. The scholars combined the fuzzy approach with the evolutionary game theory for analysing the behaviour of companies that can be summarized into the following matrix:

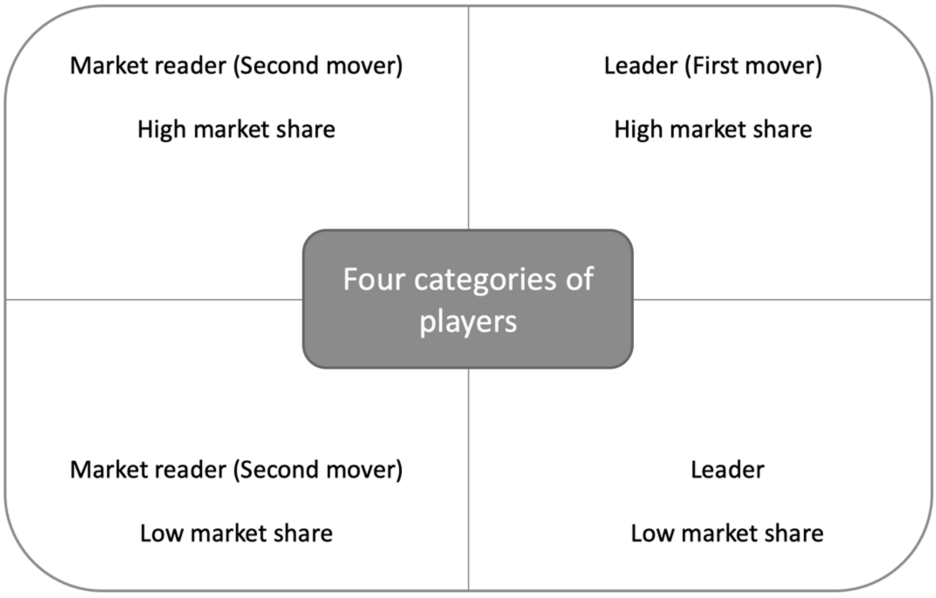


Figure 3. The four group of players (Adapted from Keivanpour et al. 2016)

For the analysis of the game between car producers, two group of companies are considered. Market readers and leaders, two general strategies are applicable in the game: cooperation and competition. Two stages are considered: cooperation in the first stage in selecting new features and competition in adding distinctive features to the product. At the second stage a non-price competition is considered: cooperation may result in

following the same media strategy while competition in modifying it to capture more value.

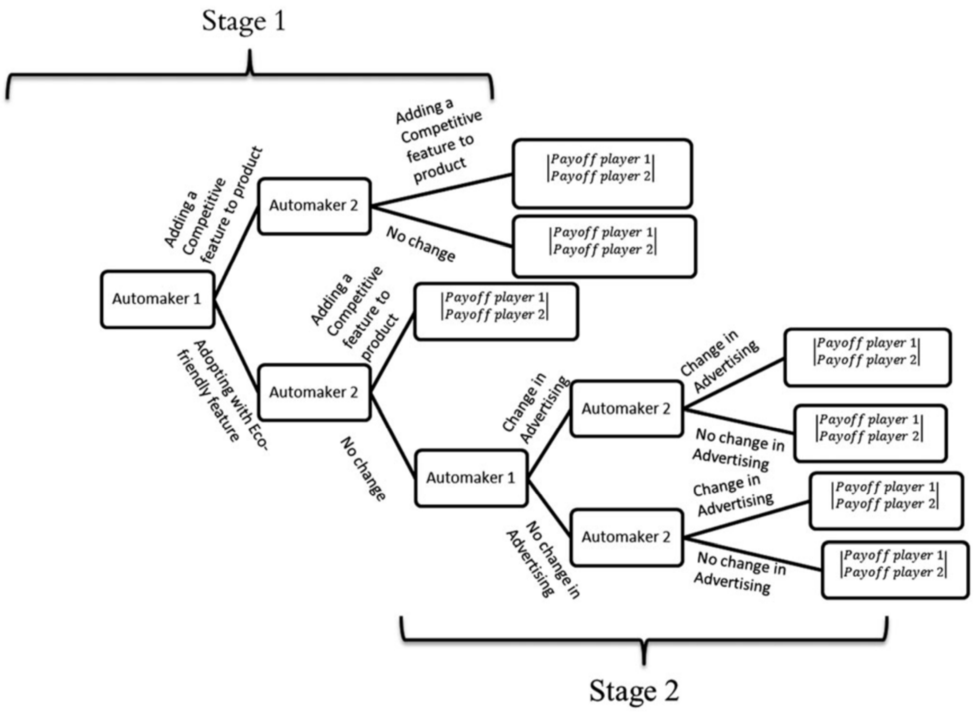


Figure 4. The structure of the game & payoff matrix (Adapted from Keivanpour et al 2016)

In order to be successful on the market and for the consumers product should have a competitive advantage (Halbright 2010). The model explains how environmental changes influence players' results. When market's willingness to pay towards the adoption of new features and technology is high, both profit and share increase.

Salop and Scheffman (1983) introduced the concept of raising rivals' costs. According to the scholars, companies can gain market power by adopting this strategy. In order to increase rivals' costs, companies may use advertising and R&D expenditures as competitive tools.

The vehicle industry is considered to be in a phase where petrol and gasoline fuelled vehicles are not the only feasible solution in the market but there is an increasing number

of alternative fuels and propulsion technologies (Orsato & Wells 2007; Oltra & Saint Jean 2009; Browne, O'Mahony & Caulfield 2012; Calabrese 2012). Still, apart from BEVs vehicles, several other alternative fuel technologies are in a prototype stage (e.g. hydrogen vehicles) and their production and diffusion in the market are limited (Orsato, Dijk, Kemp & Yarime 2012). Wells & Nieuwenhuis (2012) describe the enduring stability of the automotive industry as a *transition failure* which can only be overcome through a rooted analysis of the peculiarities of the competitive scenario. Car companies are considered to be able to establish socio-technical changes but.

Among all the different new technologies alternative to the ICE powertrain, HEVs have been able to establish a strong presence in the market, gaining a significant share thanks to the Japanese company, Toyota. (Dijk & Yarime 2010; Magnusson and Berggren 2011). For several years Toyota has been able to capture a substantial first-mover advantage. In 2018, the cumulative production of hybrid vehicles of Toyota was of 12 million cars sold (Toyota corporate website). During the years, Toyota as continuously worked on its brand perception and still nowadays is perceived as one of the most innovative companies even though new efficient technologies appeared (BEVs and PHEVs).

Manufacturing companies crave to earn a relevant share of the market by exploiting the window of opportunity and adopting first-mover decisions (Carlsson 1997). First-movers may acquire competitive advantage through patenting procedures, economies of scales and by influencing the market by setting standard processes. Furthermore, pioneers are able to increase the quality and reputation of their brand, resulting in loyal customers. Toyota has been taken as an example by several studies in the launch of its HEVs. (Magnusson & Berggren 2011; Pohl & Yarime 2012; Bergek, Berggren, Magnusson & Hobday 2013; Sushandoyo & Magnusson 2014).

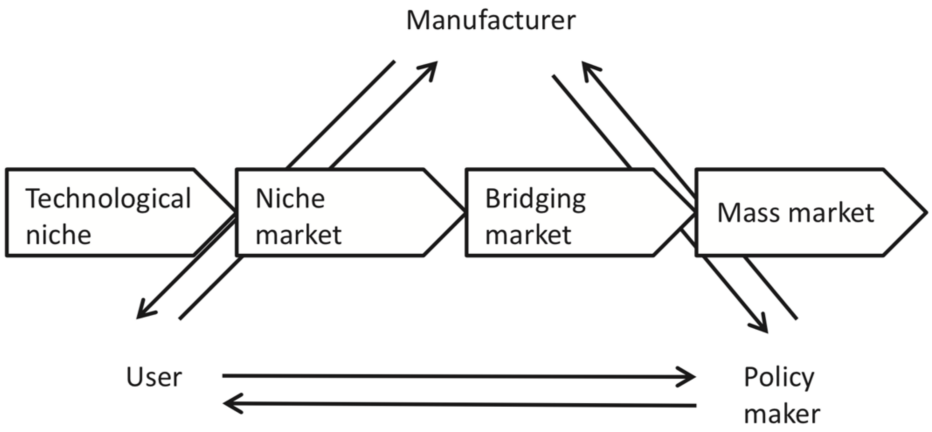


Figure 5. Temporal and structural dimensions of new technology introduction (Adapted from Sushandoyo & Magnusson 2014)

A company that follows a first mover strategy is actively involved in the shaping of the environmental demand, interacting both with users and policy makers, advocating the new technology as the new standard (Magnusson 2003; Heffner, Kurani & Turrentine 2007; Dijk & Yarime 2010). In order to transform prototypes into new market technologies, significant expenses are needed. That is why it is essential for vehicle manufacturers to rationalize them. The acceptance of the market of the new product or technology is fundamental and, entering through niches is a useful strategy (Sushandoyo & Magnusson 2014).

Technological shift is at the same time a considerable opportunity and potential threat for firms. Most of the changes are limited and incremental, when disruptive ones take place all the stakeholders are involved. Leader firms struggle to survive when new technologies that overcome the ones they based their success on are approached. (Pohl & Yarime 2012). The automotive industry is distinguished for its valuable creation of incremental innovation (Altshuler, Anderson, Jones, Roos & Woomack 1984).

Until 2009, 95% of HEVs were produced and sold by the three major Japanese car producers (e.g. Toyota, Honda and Nissan). They have acted as early entrants and maintained their dominant position through the years. One of the crucial elements that allowed Japanese companies to capture this share of the market was a very strong firm-

internal product development capability. Since the automotive industry is an industry that has high entry barriers, the major development and future application of disruptive technologies are likely to take place in the existing industry. The more rapid the innovation is, the higher the possibility for an automotive firm to maintain its dominant position acquired through an early entrant strategy. Furthermore, patenting and deals with policy makers are two important methods to maintain the competitive advantage acquired (Pohl & Yarime 2012).

3.4. Coopetition

Companies may be forced to compete and cooperate with each other. This paradox has become a major challenge for many industries. Theory on relationships between competitors focuses on competition or cooperation. However, firms can be entangled both in competition and cooperation, taking benefit from both of them. The most complex relationship companies can carry out is *coopetition,* such as a relationship in which companies compete and cooperate at the same time. In specific market conditions, it may appear to be the most advantageous one. Competition and cooperation can be divided depending on how proximate to customers the activities are. Competition can be described as the "*direct rivalry that develops between firms due to the dependency that structural conditions within the industry give rise to. Intense rivalry between many firms is argued to be the most beneficial interaction, and cooperation is considered to hamper effective competitive interaction*." (Bengtsson & Kock 2000).

Cooperative relations are complex since they insinuate two different logics of behaviour. From one side, companies are hostile due to the conflict of interest, from the other side, they act in a helpful way due to common interests. In order to make things properly work, these two elements should be separated. Porter (1990) asserts that in existence of various local competitors, the willingness of companies to generate innovation is higher. Near competitors have the possibility to observe and replicate strategic moves. Furthermore, factors as prestige and pride, are considered to be a huge stimulus to innovation. Rivalry is able to sharpen competition. (Bengtsson & Kock 2000).

According to Caves and Porter (1977) competition is less intense within strategic groups compared to the one existent between strategic groups. Companies within a common

strategic group tend to avoid rivalry more. Regarding the industry taken into consideration in this study, car brands of the same group typically tend not to compete each other but to saturate the competitive scenario by approaching different segments and targets of the market (e.g. Volkswagen group). Relationships between competitors are generally clashing. If possible, competitor firms would avoid any kind of relationship while buyers and sellers try to maintain and nurture one (Bengtsson 1998). Notwithstanding, competitors have always knowledge about the moves of their rivals. This knowledge is generally gathered directly or indirectly. Through cooperation firms can gain advantage in production, introduction of newer products, exploiting market potential, etc. (David & Slocom 1992; Mason 1993).

As of companies are made up by human beings, they act similarly to men and women: competitors act by trying to maximize their own interests. However, the reason why companies still pursue coopetition strategies is because it is advantageous. Through mere competition firms may be forced to undertake choices that are not required by their customers, just to catch a better position to their competitors. Through cooperation, companies improve time efficiency, know-how and easier access to resources. The whole process is considered to be more efficient. Coopetion can be seen as the way of handling cooperation and competition. (Bengtsson & Kock 2000).

Under coopetition, the relationship created between rival firms is a concurrent, comprehensive interdependence with competition and cooperation as two separate but interconnected elements. The dependency of the two is carried in the pursuit of global reach, expansion and profit. Companies may compete for inputs (technology, information, human resources, natural resources, suppliers and governmental agreements) and outputs (leads, contracts and market share). Cooperation is not only limited to cooperative alliances such as outsourcing agreements, licensing, franchising, international joint ventures, etc. it is related also to the efforts in improving current infrastructure, protect intellectual property, sharing of common suppliers, creation of clusters for production and development. Coopetition is referred to the simultaneous existence of competition and cooperation among rivals. To coopete is different to cooperate: cooperative alliances between global rivals emphasizes cooperation only. In a coopetition scenario, companies cooperate in some areas and compete in others. "*Functional areas that are more likely to inspire cooperation include primary value chain*

activities (both upstream and downstream), especially long-term out-sourcing or supply agreements, co-production, and co- marketing, and supporting value chain activities, especially R&D, information systems, organizing experience, and managerial expertise. Product areas that are more likely to exhibit cooperation include products that are untested by the market, involve complementary strengths but divergent competing markets or competitive goals, and offer learning opportunities to firms that have limited access to proprietary skills. Geographical areas that are more likely to exhibit cooperation include those markets that are promising but volatile, difficult to access due to tangible and intangible barriers, and superior in location-specific resources possessed only by local rivals". (Luo 2007:130).

Coopetition is able to increase value for both consumers and firms involved. It can deliver improvements to the current offering or create new products and services (Gomes-Casseres 1994; Lado, Boyd & Hanlon 1997; Walley 2007). Coopetition indicates a concurrent competitive and cooperative behaviour of firms. One of the most common form of coopetion is the share of knowledge among competitors. In the case of sharing knowledge, the cooperative aspect is the use of shared know-how in order to increase benefits for all the stakeholders involved. The competitive aspect, instead, refers to the use of the common know-how to overcome and outperform competitors (Khanna, Gulati & Nohria 1998).

When speaking about coopetition, the industry taken into account does matter. Coopetition is more likely to exist in knowledge intensive industries in which rival firms can cooperate to create standards, improve R&D performance and share risks (Duysters, Kok & Vaandrager 1999; Fjelstad, Becerra & Narayanan 2004; Dittrich & Duysters 2007; Gueguen 2009; Mione 2009). Diversely, studies have shown that in industries in which knowledge is less important, coopetition may not be a successful strategy to follow (Nieto & Santamaria 2007; Arranz & Arroyabe 2008). The success of coopetition strategies is not only affected by internal firms' factors or by the alliances created but, mostly, by industry's characteristics and external economic scenario. The reasons why rival firms decide to approach a coopetition strategy can be explained by relying on game theory and resource-based view. Branderbunger and Nalebuff (1996:129) declare that firms cooperate in order to maximize the size of the business cake and then compete to divide it up among them. Coopetition is beneficial and advantageous when rivals are able to

increase the total value of the market and, at the same time, increase the share they are able to capture. The rationale behind coopetition may be also explained through three categories (Ritala 2012):

1. *Increment the size of the market or creating new ones.*
   Specifically in the case of incremental and radical innovations, collaboration between rival firms is able to find means to improve current products or create new ones (Tether 2002; Belderbos, Carree & Lokshin 2004; Quintana-Garcìa & Benavides-Velasco 2004).

2. *Generation of economies of scale through the improvement of resources efficiency.*
   Scale alliances are generally built among competitor firms in order to achieve efficiency and higher economies of scale (Dussauge, Garrette & Mitchell 2000). Competitors share similar resources with the aim of sharing and reducing risks.

3. *Protect the current share of the market and conquer the remaining part.*
   Coopetition influences the competitive dynamics of the industry. By coopeting, firms may co-opt their most relevant rivals, maintain their competitive position by defending their interests and shape future technological developments (Gomes-Casseres 1994; Möller & Rajala 2007; Gnyawali, He & Madhavan 2008).

When market uncertainty is high, coopetition is a strategy firms can follow in order to generate more value for their firm. The automotive industry is currently going through a stage of high uncertain due to unclear customer needs and technologies. Therefore, coopetition has started to be embraced even by fierce rivals of the same market segment.

3.5. Summary

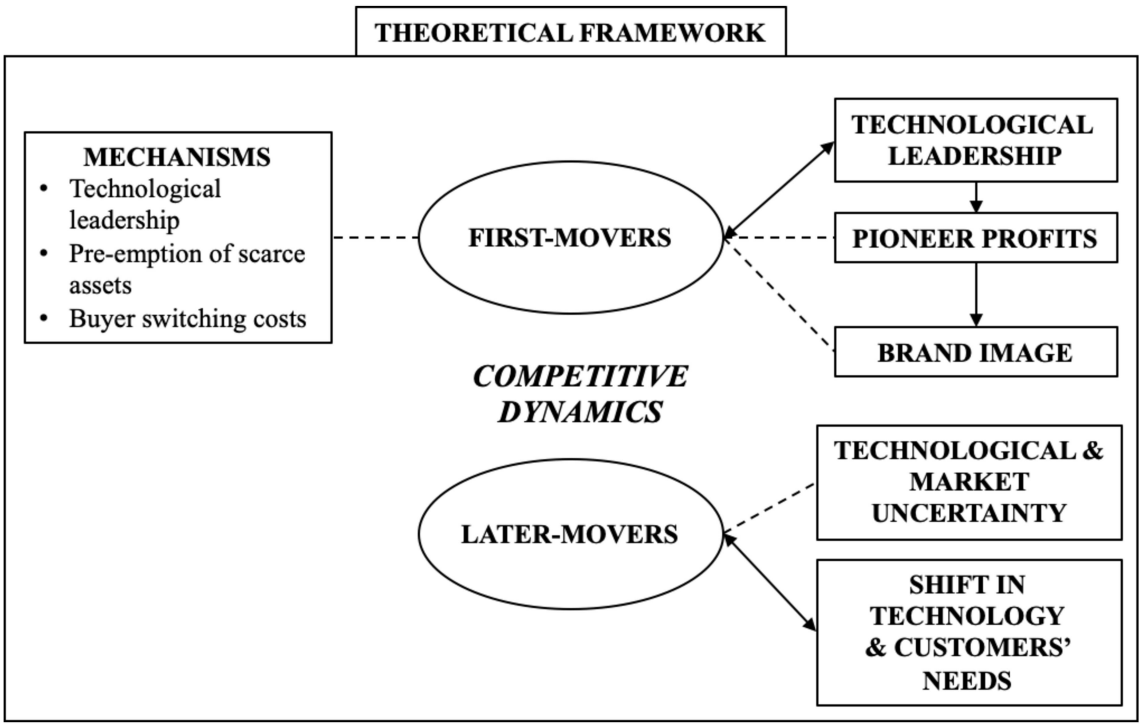
The suggested theoretical frameworks of first-mover advantage and competitive dynamics are highly complex (see Lieberman & Montgomery 1988; 1998; Suarez & Lanzolla 2007; Usero & Fernandez 2009; Capone, Malerba & Orsenigo 2013; Song, Zhao & Di Benedetto 2013) considering the number of variables to be considered in first-mover advantage analysis.

First-mover advantage is considered to arise from three mechanisms: technological leadership, pre-emption of scarce assets and buyer switching costs (Lieberman & Montgomery 1988). Nonetheless, strategic decisions of followers and changing in the external scenario may erode first-mover advantage (Usero & Fernandez 2009). In a defined competitive scenario pioneers enjoy both advantages and disadvantages depending on firms' internal characteristics and external factors (Lieberman & Montgomery 1998; Song, Zhao & Di Benedetto 2013). Notwithstanding the importance of external factors, managerial perceptions are considered to be a driver of first-moving decisions (Song, Zhao & Di Benedetto).

Followers typically enjoy from resolution of uncertainty of consumers' preferences and technologic developments. The emergence of a dominant design is considered to be the watershed between pioneers and followers (Utterback and Abernathy 1975; Anderson & Tushman 1990; Agarwal, Sarkar & Echambadi 2002). The automotive industry has shaped its competitive scenario over the past century and several companies enjoyed first-mover advantages. However, even though size of the companies has influenced the dynamics, the introduction of new technologies is what has allowed companies to reshape the competitive scenario and their relevance in the market.

The aim of this research is to understand if first-mover advantage exists in the automotive industry and how it influences the competitive scenario. The proposed framework combines first-mover and later-movers in a competitive scenario and highlights the consequences and drivers of entry timing.

Figure 6. Theoretical framework


THEORETICAL FRAMEWORK
MECHANISMS
• Technological leadership
• Pre-emption of scarce assets
• Buyer switching costs
FIRST-MOVERS
TECHNOLOGICAL LEADERSHIP
PIONEER PROFITS
BRAND IMAGE
COMPETITIVE DYNAMICS
LATER-MOVERS
TECHNOLOGICAL & MARKET UNCERTAINTY
SHIFT IN TECHNOLOGY & CUSTOMERS' NEEDS

4. METHODOLOGY

This chapter describes the methodological choice used for the Master's Thesis. Research purpose, research approach, research strategy, research choice will be covered. Furthermore, a detailed description of the sample, time horizon, data collection techniques and the interview guide will be illustrated. Validity and credibility will follow.

4.1. Research purpose

Research is considered a process of investigation. It is systematic and methodical, and it contributes to broaden current knowledge (Collis & Hussey 2009). The initial stage of a research is defined by its purpose and objectives. Three categories of studies can be defined: exploratory, descriptive and explanatory. *Exploratory research* is designed to propose an answer to what is happening. Through this type of study, researchers follow new intuitions, ask questions and accesses phenomena proposing new perspectives (Robson 2002:59). Exploratory research can be conducted by: searching the current literature on the subject, interviewing experts or creating focus group interviews. Exploratory studies initially have extensive focus that becomes more precise as the study advances (Saunders et al. 2009). *Descriptive research* delineates the attributes and peculiarities of persons, events or situations (Robson 2002:59). It is pursued to find an answer to the questions who, what, where and how to explain a phenomenon. Findings of descriptive studies are considered to be a means to an end. Finally, *explanatory research* tries to determine cause and effect relationship. It analyses situations in order to explain the dynamic and the reasons. It addresses the subject by providing why and how questions (Saunders et al. 2009). To the purpose of this Master's Thesis the author decided to adopt a mixed approach exploratory and explanatory research. The aim is to study the first-mover advantage phenomenon and competitive dynamics by relying on already existing literature, secondary data and conducting interviews with companies' managers. The objective should be to display at an organisational level the phenomenon at the same way as it could be displayed natural phenomena. Focusing on observable and measurable facts and consistencies, looking for causal relationships in order to define generalisation (Saunders at al. 2009). Existing literature is used to promote, test and demonstrate hypotheses. Notwithstanding, as determined by Saunders et al. (2009:138) "*even a*

researcher adopting a positivist stance exercises choice in the issue to study, the research objectives to pursue and the data to collect."

4.2. Research approach

This section explains the methodological structure adopted for this research. Research requires to be based on assorted methodological decisions, following a procedure defined by different stages. The reader has the possibility to fathom the choices that have been taken in order to address this study. Several tools need to be adopted to find an answer to a definite research question. Three methodological approaches can be followed: deductive, inductive and abductive. In *deduction*, theory is the first source of knowledge, research process starts from the theory, generally through hypothesis to empirical testing (Saunders et al. 2009). In the deductive approach the researcher tests the actual literature framework of a specific research topic. It typically follows five subsequent stages: deducing hypothesis from theory; expressing the hypothesis; testing the presumed relation; analyse the results and, eventually, modifying the theoretical framework with the new findings (Robson 2002; Sanders et al. 2007:117). In *induction*, data are the first source of knowledge. The researcher tries to shape a new theoretical framework relying on data. This research approach advances from empirical research to theoretical results. According to Sanders et al. (2007:119) in the case of inductive research the appropriate choice of the sample might be smaller compared to the deductive approach. *Abduction* merges deductive and inductive approaches. It is aimed at creating new hypothesis and related theoretical framework based on the research evidence. In agreement with Saunders et al. (2007:119), combining deduction and induction is not only possible but, in some cases, it is also advantageous. The study adopts abduction through the continuous synergies between the empirical world empirical data collection and case study analysis and theoretical literature.

The purpose of this research is to examine the competitive dynamics of the automotive industry and identifying possible reasons underneath pioneering behaviour. Moreover, its intent is to understand the First-mover Advantage as an instrument to re-shape the competitive scenario of the whole industry. The research approach selected for this Master's Thesis applies principally on abduction. Its direction is to find new insights and hypothesis on surprising elements. The author started to develop the theoretical

framework based on existing literature; therefore, research issues have been continually revised and put in comparison with the gathered data in order to find a more appropriate and accurate outcome (Dubois & Gadde 2002:554).

4.3. Research strategy

The research strategy characterizes the type of study that the researcher is aiming to conclude. The strategy to be followed is selected depending on: research questions, the scope of the research questions, time and resources feasibility and philosophical direction of the study. One of the most commonly used research strategies is case study. As stated by Robson (2002) case study grants the researcher to study a phenomenon through various sources in order to properly explain it. It is usually used in explanatory and exploratory research. Data can be collected through interviews, observation, documentary analysis and questionnaires. In case studies, there is the need of triangulation of data. Triangulation is defined by Saunders et al. (2007:139) as the use of different data collection techniques in the same study in order to increase the reliability of the paper. Yin (2003) identified single and multiple case study research. The first one is suitable for extreme situations. The multiple case study, as the definition suggests, consist of different cases use within the same research. Multiple cases may be seen as triangulation itself, since it is able to provide more generalisable data. The research strategy selected for this Master's Thesis in order to explain First-Mover Advantage and competitive dynamics in the automotive industry is the multiple case study. Furthermore, according to Yin (1984) there are advantages in using case studies: the analysis of data is generally managed within the context of use, it allows quantitative and qualitative analysis of data and enhance the explanation of situations.

4.4. Data collection

Data collection is defined by two distinct approaches: qualitative and quantitative. Qualitative research methodology uses graphs or tables in order to support the exploration, description and analysis of the data collected (Saunders et al. 2007). On the opposite, the quantitative approach relies on theory and previous studies. It is empirical and its main focus is on the underlying statistical models. Qualitative and quantitative approaches require different types of data to be collected. In qualitative research, the

researcher itself plays a relevant role due to its subjectivity. The goal is to dialogue with the data by deeply understanding the subject. On the opposite, the aim of quantitative research is to analyse data as objective as possible. Results in qualitative research are words and imagine oriented, while in quantitative research are mainly driven by numerical data.

In order to develop this Master's Thesis, the author decided to adopt qualitative research. The choice fits with the research purpose, research questions and objectives. The aim of this Master's Thesis is not to rank companies of the automotive industry in a first-mover perspective. Prior studies on first-mover advantage have relied on quantitative data. Nonetheless, for the purpose of the Master's Thesis of analysing first-mover advantage in the automotive industry under the perspective of ACES vehicles qualitative research has been conducted. Specifically, with regards to emerging technologies, it is difficult to identify parameters able to display such advantage. The purpose is to understand how first-mover advantage is perceived and how influences the competitive dynamics of the industry. Qualitative research was conducted through semi-structured interviews with different companies of the automotive industry. This process granted to assemble various and different point of views from the interviewees' experience and perspective. Moreover, in addition to primary data, secondary data were collected. Secondary data was obtained through the use of annual reports of companies of the automotive industry, consultancy firms reports and service providers' analysis. These papers are produced every year by all the automotive car producers and automotive groups and contain useful information on the strategy followed by the company. Along with the strategy and vision of the firms, reports give the possibility to inspect revenues and sales data. The material collected is useful to be compared with primary data allowing the findings to be place under a broader perspective (Saunders et al. 2007:324). Furthermore, secondary data were used in the interview-guide making process and helpful to be prepared during interviews with managers. In order to ensure research quality and reliability triangulation of data was utilized (Saunders et al. 2007:154).

Previous studies reported in the literature review have analysed first-mover advantage mainly relying on quantitative research. Since results mainly showed a positive correlation between pioneering and advantage and a common approach to empirically analyse first-mover advantage has not been found by the researchers (Lieberman &

Montgomery 2013), the author decided to investigate the reasons and managerial perspectives. This choice can be supported by qualitative research. Furthermore, for the purpose of this research there are not enough data regarding autonomous driving, connectivity and mobility as a service that would serve to display first-mover advantage. The automotive industry has just approached these revolutions and apart from R&D expenditure details and share of the market of BEV/HEVs there are not enough suitable data.

The study is empirically sustained by primary qualitative data gathered through semi-structured interviews with managers of the automotive industry. Semi-structured interviews are useful to obtain more data and deeper explanation by allowing the interviewees to freely build their answers (Saunders et al. 2007:324). Along with qualitative data, quantitative data collection on secondary data (sales revenues, R&D intensity, profitability) will be conducted for this study in order to accurately prepare semi-structured interviews.

4.5. Case selection

This research pursues a theory-based sampling, that is defined by Patton (2001:238) as a process of selecting "*incidents, slices of life, time periods, or people on the basis of their potential manifestation or representation of important theoretical constructs*". In agreement with Glaser and Strauss (1967) the theory-based sampling is a continual sampling process based on emerging theoretical concepts. Furthermore, this type of sampling approach is useful to promote the comprehension of the determinants of a concept through a range of settings and conditions. This method is generally used when the research focus is on theory and concept development and the primary goal is to develop new concepts connected to empirical events and facts. (Cohen & Crabtree 2006). Data collection for this Master's Thesis started in January 2019 in order to collect information about the companies to be studied for the purpose. A first phase was dedicated on internet research of the whole automotive industry, afterwards, a need for a selection criterion emerged. In order to better analyse and explain the phenomena, the following criteria of selection were selected:

(1) The firm should operate at an international level in more than two countries in two different continents
(2) The firm should be unique and have a global market potential
(3) The firm should have approached one of the ACES determinants (autonomous, connected, electric, shared)
(4) The firms should represent different country economies in order to find possible differences and similarities

In accordance with Patton (1990:185), the validity, meaningfulness, and insights generated from qualitative research are primarily driven by the amount and quality of information collected and researcher's capability and not by the size of the sample. Consequently, four companies satisfying the previous criteria were selected and examined in this Master's Thesis. The aim of this study is to expand the findings from the companies selected in the multiple case study to theory and not to population. In accordance with Saunders et al. (2018:1986) the decision of choosing four ventures is based on the fulfilment of data saturation: new data becomes redundant when the researcher begins to hear during interviews the same comments, sign of data saturation. When data saturation is reached it is advised to stop collecting information and analysing what has been gathered. The author decided to select four different companies that represent four different economies and strategic choices. Italy, Germany, France and Japan have played and still play nowadays a determinant role in the automotive market scenario. Table 4 exposes a summary of the selected automotive companies.

Table 4. Summary of Data Sample

No.	Company	Nation	Year of foundation[1]	Size	Global turnover[2]	Interviewee	Length of the interview[3]
1	BMW	Germany	1916	Big	€ 97 B	Marketing Director	40
2	FCA	Italy	2014	Big	€ 110 B	Head of Product	45
3	Renault	France	1898	Big	€ 57 B	Project Manager	35

4	Toyota	Japan	1937	Big	€ 236 B	Project Manager	35

[1] The year of foundation is referred to the Group. FCA's oldest national brand FIAT founded in 1899.

[2] 2018 turnover rounded to the nearest integer.

[3] The length is rounded to the nearest integer.

Table 5. Turnover and R&D evolution 2014-2018 (Source: ACEA and companies' annual reports)

No.	**Company**	**Global turnover 2014[1]**	**R&D expenses 2014[1]**	**% R&D expenses 2014**	**Global turnover 2018[1]**	**R&D expenses 2018[1]**	**% R&D expenses 2018**
1	BMW	€ 80 B	€ 4,5 B	5.6%	€ 97 B	€ 7 B	7.2%
2	FCA	€ 96 B	€ 2,3 B	2.4%	€ 110 B	€ 2,9 B	2.6%
3	Renault	€ 41 B	€ 3 B	7.3%	€ 57 B	€ 3 B	5,3%
4	Toyota	€ 234 B	€ 5 B	2.1%	€ 236 B	€ 9 B	3,8%

[1] 2014 and 2018 turnover and R&D expenses rounded to the nearest integer.

The sample is small and might be non-representative. Nonetheless, the choice of the sample was driven by quality, looking for individuals who were pleased to participate in this research (Malhotra & Birks, 2007: 63). Considering the concept of data saturation previously highlighted, no more active searching for interviewees was done after having organized 4 interviews because the information collected was considered to fulfil the research's objectives.

Gathering data through interviews with management of the firms is a compelling option to have a clear picture of first-mover advantage in the industry and how the competitive dynamics influences companies. Triangulation of data is assured by the use of

comprehensive interviews, analysis of company and group website and plausible sources (Denzin 1978; Paul 1996).

4.6. Interview guide

The development of the interview guide of this study was built according to the model illustrated in the following figure.

Figure 7. Main topics of the semi-structured interviews

Interviews can be the optimal approach to gather information when the number of questions to be answered is high, both complex and open-ended (Saunders et al. 2007). Qualitative data is identified by richness and fullness as it allows the researcher to examine a subject as close to reality as possible (Robson 2002). A total of 4 interviews aiming at analysing first-mover advantage and competitive dynamics have been arranged.

The questions have been structured into the main topics of this research. Due to the nature of the interviews and difference among companies, order may vary from one responding to another. Nonetheless, a preliminary structure has been created to support the researcher during the interview process. To maximise the detail and extension of the answers received, questions have been formed in order to be open-ended (Saunders et al., 2007: 337). The questions have been mainly influenced by the issues raised by Lieberman and Montgomery (1988; 1998 & 2013). The interviews have been organized from April to August 2019. In order to be appreciative and straightforward with respondents, anonymity was allowed.

A preliminary test was conducted with a manager of one of the companies involved in order to reduce issues in asking and answering questions. Additionally, as stated by Saunders et al. (2007) the preliminary test allows the researcher to improve data validity and reliability. The pilot test is not included in the findings, but it has been useful to refine questions and understand if the answers received were suitable for the research question.

The interviews have been conducted face-to-face, via video conference and telephone. The average length has been around 40 minutes. Each interview has been audio-recorded and, as agreed before the interview, has been transcribed and sent to the interviewee for a final check and eventual corrections.

4.7. Data analysis

Qualitative data is mainly correlated with concepts that are ambiguous and flexible, not quantifiable. Data gathered through qualitative research, due to its non-standardized and complex nature, has several implications in its analysis phase. Researcher should avoid the presentation of impressionistic data avoiding the real meaning of the results. To overcome this issue, during the phase of data analysis, data gathered need to be reorganized in order to support the researcher in answering the research question (Saunder et al. 2007:482).

The data gathered for this study has been summarized and categorized according to the objectives of the research and the fundamental issues illustrated in the figure 5. The most

relevant observations collected during the interviews with managers have been quoted in the result analysis in order to provide a broader understanding. According to Saunders et al. (2007:480) this procedure provides a meaningful and effective use of qualitative data. The attention on the research design, as reliability and validity, reduce the possibility of getting the answer wrong. (Saunders et al. 2007)

4.8. Validity and credibility of the study

Validity and reliability characterize the quality of a research project (Saunders et al. 2007). The quality of this research is strengthened through the combined collection of primary and secondary data. This strategy allows the researcher to capture different point of views as regards the research topic, varying the source and providing a comparative context of analysis (Saunders et al. 2007).

4.8.1. Validity

"Validity is the extent to which data collection method or methods accurately measure what they were intended to measure" (Saunders et al. 2016:730). Construct validity is developed by following the methodological triangulation of data, such as the use of different sources of evidence and methods of analysis in order to enhance the study's quality (Denzil 1978; Paul 1996; Yin 2003). Furthermore, the review and validation of the interviewees of the transcript allows to increase validity. The use of a pilot-test before actually doing the interviews is another validity increasing factor. Internal validity is achieved by relying on logical guidelines and a fitting framework meeting the research requirements. It is reinforced by the analysis of previous studies and questions on first-mover advantage and automotive studies. External validity may be an issue in qualitative research, specifically in single case studies with small samples. As previously explained, the goal of this Master's Thesis is not to generalise results to population but to understand what drive automotive companies' strategic decisions.

4.8.2. Credibility

Reliability is the extent to which a scale presents consistent results when being reutilized for the same purpose (Malhotra & Birks, 2007: 313). Reliability aims at demonstrating

that the operations of a research can be repeated, providing the same outcomes (Pandey 2014). Findings should be consistent if the conditions remain the same. Accordingly, Saunders et al. (2016:726) affirm that reliability is "*data collection techniques or techniques will yield consistent findings, similar observations would be made, or conclusions reached by other researchers or there is transparency in how sense was made from the raw data*". Several factors may influence reliability: subject or participant error, subject or participant bias (e.g. protection of sensible information, depending on corporate culture), observer error (e.g. not prepared interviewer) and observer bias (e.g. misinterpretations of the interviewer). (Robson 2002, in Saunders et al. 2009:156-157).

Furthermore, to increase credibility qualitative primary data gathered through semi-structured interviews and quantitative data collected from facts and figures have been triangulated. (Patton 1999). Participant error has been contained by the selection of highly motivated interviewees from different type of automotive companies. Furthermore, interviews have been scheduled according to managers' availability, trying to not interfere with daily business requirements. Several arrangements and reschedules have been done. Participant bias has been limited by ensuring before, during and after the process of data collection, a total respect of the privacy of the respondents. Because competition is an intrinsic characteristic of the automotive industry, honesty and trust was the first element established between the interviewer and the interviewee. In order to properly explain certain concepts, managers may need to refer to sensible data. Even though first-mover advantage may be considered public by its essence by analysing market share and profitability, the strategic choices behind it are not. The purpose of the research is to discuss and understand the reasons behind. Aimed at reducing observer error, as already presented, a structure of the interview has been prepared. The communication between the interviewer and the interviewee tried to be as clear, explicative and straightforward as possible to limit misunderstanding and misinterpretation.

5. ANALYSIS

In the following chapter, the data gathered through the qualitative research approach will be illustrated and analysed in order to provide the basis for the study's conclusions. The first section introduces (1) the case companies selected for the aim of the study. Consequently, the chapter will be developed adopting several sections according to the research question and its objectives. (2) Results regarding each company will be presented following a single case analysis approach. Finally, there will be (3) a cross-case analysis in order to highlight common characteristics and diversities regarding first-mover advantage and competitive dynamics in automotive industry specifically in relation to ACES.

5.1. Case Companies

BMW

Bayerische Motoren Werke AG, commonly known as BMW is a German car and motorcycle producer. The company, at the beginning called Bayerische Flugzeugwerke AG, was found in 1916 as an aircraft motor manufacturer. At the end of the World War I, because of the prohibition on the production of aero-engines, BMW started producing motorcycle engines, railway brakes and inboard engines. In 1923 the company announced its first motorcycle, the R 32. Until then, BMW has only worked as an engine supplier. In 1928, after the acquisition of Fahrzeugfabrik Eisenach it became a car producer. The company produced cars, motorcycles and aircraft engines until World War II when, due to central regulations, the company was forced to focus on aircraft engines to supply German government. In 1951 it built its first post-war car, the BMW 501. However, during the 50's the company faced serious financial troubles that were overcome thanks to the help of Quandt's family, still nowadays the major shareholder of the company. The company established its position in the premium segment of the market since 1960. To increase its market share BMW acquired in 1994 the Rover Group, however, after facing huge financial losses the German car producer decided to sell most of the brands maintaining only Mini and Rolls-Royce. Still nowadays, BMW Group is composed by three car brands: BMW, MINI and Rolls-Royce. During the years, BMW has proposed several innovations that shook the market, for instance the introduction of the first luxury

suv, the X5 in 1999 and the introduction of one of the first electric vehicle, the BMW i3 in 2013. The company is the world's leading manufacturer of premium automobiles. It manufactures vehicles in 15 different countries, proposing its products in the whole global market.

FCA

After having acquired the 100% percent of the Group Chrysler, in October 2014 Fiat Group Automobiles and Chrysler Group merge creating the new entity Fiat Chrysler Automobiles (FCA). The FCA Group is composed of the following car brands: Abarth, Alfa Romeo, Chrysler, Dodge, Fiat, Jeep, Lancia, Maserati and RAM. It operates in more than 140 countries, being a multinational company in the automotive market. Thanks to its broad portfolio of brands it is able to propose its products targeting different market needs. Before forming FCA, Fiat already attempted to merge with another American car producer: General Motors. In 2000 several joint ventures were formed among the two car manufacturers, following the combined purchase of equity stakes. However, in 2005, the two decided to wound back because of complications in the relationship. FCA is one of the world leading manufacturer in terms of volumes. Its products and focus are mainly towards non-premium market and, due to the financial issues overcame, it is acting like a follower in relation to new technologies of the market (i.e. electrification, autonomous driving and connectivity).

Renault

Groupe Renault is a French multinational automobile manufacturer established in 1899. Groupe Renault is formed by the following car brands: Alpine, Dacia, Renault, Renault Samsung Motors and Lada. In 1999, in order to achieve a massive global presence, the French group made a strategic alliance with a Japanese partner, Nissan. Groupe Renault already had massive presence in Europe and South America, by entering the strategic alliance it allowed the company the approach the North American and Asian markets, were Nissan has been able to establish a relevant position. The Renault-Nissan-Mitsubishi alliance is the world's leading automobile seller. Renault's electric model Zoe is the most sold electric car in Europe.

Toyota

Toyota Motor Corporation was founded in 1933 after an intuition of Kiichirō Toyoda, son of the owner Toyoda Sakichi, who decided to transform part of the textile industry in automotive production. In 1936 the first series vehicle was presented, the Toyota AA. Toyota has been for several year the world's leading car manufacturer, it has established its presence all over the world. Toyota revolutionized the automotive industry with the creation of the *Toyota Production System*, also known as *just in time production*. It is the second big industrial revolution after Ford who based its car proposal on a standardized offering. On the contrary, Toyota decided to focus on demand. Its focus its on flexibility and constant product quality improvement, it has been the first step towards lean production style. Toyota is world's leading manufacturer in hybrid vehicles, its model Prius is the most sold hybrid car in the world. During the years, the Japanese company, has worked in refining its full hybrid technology, focusing its effort in educating consumers towards this alternative engine.

5.2. Single Case Analysis

In order to answer the research question and its objectives, there is a fundamental need to investigate and understand if the management of automotive companies consider first-mover advantage an essential factor driving strategic decisions and shaping the competitive dynamics of the industry. Furthermore, which of element they perceive to be more influencing among the ACES elements (autonomous, connected, electric and shared).

5.2.1. BMW

ACES relevance in the Automotive Industry

The Interviewee, Marketing Director of the company has deep knowledge about the topic since the markets involved autonomous, connected, electric and shared mobility are completely reshaping the automotive industry, deeply influencing the previous relationships built during the previous decades. Regarding the most important elements

that successful automotive company should manage in order to be successful the interviewee gave its personal point of view:

> *"… undoubtedly, some years ago success was defined by the ability of selling your products, finding customers able to buy your product, giving an important mark-up in terms of pricing. We have always been price leaders, in the sense of being pricey. At the same time selling or proposing a technological content that justifies this mark-up."*

Price has always been a strategic element to be considered for every company. In this case, specifically related to BMW, price is an element aimed at enhancing the premiumness of the brand. Being the company a premium car manufacturer, one of its main goals is to sell cars at a higher price compared to non-premium competitors. However, the importance of the intangible assets is also crucial. At the beginning BMW was perceived as sport car producer, in the last 30 years it put its efforts in the building of a premium and luxury brand and status. The interviewee considers nowadays success a difficult element to be pointed out, specifically with the huge structural changes that are shaking the industry:

> *"It is clear that success it is not easy to be justified. Regarding ACES, if you have a look to other automotive groups, premium included, they always say the same thing. The car of the future must be connected, and why should not? The world is connected."*

According to the interviewee design has always been a crucial element in the choice of a vehicle. In several studies, design is considered one of the most relevant elements in purchasing decision. Considering the new technologies of the market the interviewee showed its vision putting them in an order of importance. Some of them are considered to be just a brick in the construction of the big wall.

> *"Autonomous driving is the big shift that is now coming with the implementing of 5g technology and new connection with territory. It is what customers have always asked: get on board and do other things while the car is driving."*

Autonomous is considered the biggest revolution and paradigm shift among the new technologies, instead regarding electrification:

> *"…electrification was born from a cultural revolution that the German industry decided to approach several years ago and not everybody decided to follow. If you think about it, it is not a success factor. Everyone is now going towards electrification, but it is not a success factor, customers are not willing to pay that additional mark-up for electric or electrified vehicles. All the electrified production is a relevant them because for us it drives to lower profits.*

Electrification is considered to be the first step towards the revolution of the automotive industry, but it is not considered the most important factor for consumers. Same thing is the perception of shared mobility:

> *"Similar there is the concept of shared mobility that we introduced with ShareNow (previously known as DriveNow before the merge with Daimler's Car2Go). It doesn't drive any profit e doesn't directly affect people's willingness of paying additional mark-up."*

According to BMW future will be connectivity. The interviewee describes affirm that the company has shifted towards a user objective instead of customer objective. Connectivity is considered to be the first big step towards a different idea of the concept of car:

> *"There's a change in the perspective of just selling a product and selling services linked to the use of a product. What will make a huge difference in the next 4 years before autonomous will come is connectivity. Connected cars are the appetizer of autonomous because once a company is able to sell its services, it will be able to do it better during autonomous driving."*

Autonomous driving required huge investments in R&D, and it is considered the most important theme that automotive companies has to face since it will deeply reshape the industrial development. The approach towards these new technologies is considered to be crucial for the future development of the automotive industry. Volkswagen has planned

to invest 40 billion euros in the next years for electrification. According to BMW's forecast analysis, in 10 years, if you won't be electrified you won't be able to survive.

Factors influencing strategic market decisions

The interviewee was asked about which are the most valuable indicators that influence the implementation of new technology, referring to profit, market share, industry maturity and branding. According to the interviewee they are consequences:

> *"For BMW what is clear is giving to customers what other automotive companies are not able to deliver. Positioning the company as the company of premium mobility services of the future".*

The interviewee affirmed that in investment decisions, the element of differentiation is the real driver. For the company is crucial to understand how potential customers will be able to perceive a BMW product different from the others in the market in 5 years. In 5 years, the product should be the optimal answer to the market's needs. Furthermore, a reference to the past is made. In the previous years, the forecast activity was not so strong because the approach followed was to *"niche the market"*. BMW's strategy was to divide the market in small niches and create product for each of them. The interviewee affirms that obviously sometimes it worked and sometimes not. The present strategy is to rationalize product and make investments in shared-platforms and engines, afterwards understanding which services creating around them.

The interviewee highlighted the fact that this was not a user-centric logic:

> *"… our CRM systems started from industrial systems. The customer is identified by the frame number and not the contrary. We are now working in shifting but it is not easy: we are shifting from a product-centric vision towards a customer-centric one. We are not already arrived at a user-centric vision and I am not completely sure that we will ever come to it because of the complex industrial dynamics."*

Beyond customer needs, the interviewee was asked about whether innovation is more driven by internal resources of the firm or external factors, for instance new governmental regulations, new market standards, etc. The interviewee stated that:

> *"Internal, without any doubt. The strong industrial culture of BMW has always brought the company to invest in research and to increase the share of R&D. The company is now going to 5% to 7% so it has always been high for seeking the optimal solution for the market"*

Notwithstanding, the interviewee also makes reference to external factors as boosting agents. Starting from hydrogen vehicles, projects have always started by internal factors and have then developed accordingly to the external factors of the market. This, according to the interviewee depends on the strong culture of always proposing the best solution for the customers and position the company as the best one in the market.

Competitive Dynamics analysis

The interviewee affirms that competition in the automotive industry is fierce and it is really felt by companies. At an headquarter level competition is slightly less perceived because markets are seen and analysed at a higher point of view. Different opinion is towards the distribution:

> *"At a market level, specifically for mass market companies, you live on what others do."*

The focus of the interviewee is on the retail strategy. Competition is there everything that matters and that allows the company to achieve higher results in terms of volumes.

> *"I have always seen competition. At a distribution level what makes the difference is competition because you are evaluated on commercial results, on profit results. Competition on distribution is sometimes related to things that may appear simple as the retail strategy."*

The retail strategy is how you occupy and control the territory with your own sale points. In the automotive industry, vehicles are sold through dealership. A dealer is an entrepreneur who the company has given a contract of mandate. It is more than a franchise agreement; the local entrepreneur is more structured. According to the interviewee competition increments their willingness to *run* and to sell more.

Regarding coopetition the interviewee affirmed that:

> *"In the last years it is clear that big groups are going towards similar solutions. For instance, German car producers are investing into plug-in-hybrid technology, Japanese players instead towards mild-hybrid. There are common tendencies. It is also surprising that companies have found agreements because the culture is mainly related to competition."*

According to the interviewee coopetition is inevitable because of the high costs and complexity that the automotive industry has to face. Furthermore, the cooperative component of coopetition is expected to grow in the following years due to the high uncertainty of the market and the even higher costs of development. However, if we have to analyse the two components of coopetition, competition is perceived to be more influencing and it increases the more you go down towards the customers. Cooperative entry modes may be considered crucial in certain development stages, for instance commercial partnership allow companies to share pioneering costs of educating the market and the interviewee referred to the agreement with Daimler in the shared mobility. Regarding equity agreements:

> *"They are always difficult to carry on: companies have different cultures, specifically when they come from different countries, and it is not easy to merge. We have faced successful acquisitions and not so successful ones. The optimal solution is that one of the companies is more influent than the other and it is able to shape the new common corporate culture"*

As previously explained, competitors play a relevant role in shaping managerial decisions of automotive companies. The interviewee has stated that BMW's decisions always come

from internal factors analysis and are then boosted by external factors. In this sense, competitors deeply influence and affect companies' strategies:

> *"…one of the elements that is creating more disturb and concern and accelerated the process of electrification is Tesla. Until last year, Tesla was considered to be a unique phenomenon that was not able to influence the market and so lightly analysed. Then, when the markets have seen the Model 3 coming and being registered with the number plate they panicked. The KPI of the registered car accelerated all the process of electrification."*

First-Mover Advantage analysis

The interviewee affirmed that first-mover advantage does matter in company's success. BMW has during its history several times acted as a pioneering company in opening new market segments. In 1999 BMW has been the first in proposing to the market a SUV (Sport Utility Vehicle) in the D Segment. Then, the first in the C Segment with the X3. In 2010, it was the first to introduce a premium SUV in the B Segment, the X1, even though the car was not considered perfect it achieved astonishing results in terms of units sold.

> *"Until some years ago we open almost every segment… That created an enormous advantage for us because the cost of distribution was very low, and they have been incredible years. We were also the first to launch certain engines. We achieved extraordinary profits."*

According to the interviewee being the first makes the difference but it has to be grounded to proper needs. The customers must express a demand, or, it has to be perceived in certain ways. Although a need should exist, BMW has also managed to create brand-new urgencies for the customers: the interviewee took as an example the BMW X6, the first coupé SUV to be introduced in the market. It shouldn't make no sense to have a big car with the look of a coupé sacrificing the functionality. However, the design, considered to be the first purchase motivation, made the difference and created a new category of vehicles, the SAV (Sport Activity Vehicles). BMW has also tried to be a pioneer also in electrification, but results are not the ones they desired to achieve.

> *"In 2013 we have been the first to launch the electric mobility with the BMW i3. No one followed us. And here we come on how the industry is approaching electrification even though there is no consumer's request of having electric mobility. There is nothing to do, there's not. We can even push it and push it and push it, but the consumer is not ready yet."*

The interviewee claimed that in 2013 they were the first, between 2013 and 2019 everyone arrived but no one exploited the years when competition was nearly zero. No company has managed to achieve pioneering profits from being the first in electrification. Furthermore, the interviewee stated that regarding electric mobility Tesla is proposing a technology sum into the market. Consumers do not buy the car for its functionalities but for its status: you the maximum of technology development in this moment. Notwithstanding, in the interviewee's perspective these numbers are not relevant at a relevant picture, at least, not in Europe, on the contrary they are in the US.

Lastly, the interviewee gave its opinion on which new technology might show more First-Mover Advantage. In his perspective connectivity is where pioneering makes a huge difference. The interviewee claimed that if the company will be able to manage to create a connected system, that will be a winning move. The capability of analysing drivers' data connected with the world will allow firms to sell other services. Who will manage to have those data will be connected with the consumer, who will not, will not have the possibility to do anything. Then, it will be companies' responsibility to analyse and understand which the most suitable services are to be sold.

> *"At the present moment, our calculations speak about 30 million BMW clients all over the world. 30% of the cars are connected or have connectivity capability. Imagine what you will be able to do with all those clients".*

Table 6. Results of BMW

CASE COMPANY	**BMW**

ACES relevance in Automotive Industry	
Autonomous driving	Perceived to be the biggest shift in automotive industry
Connected cars	The first step towards autonomous vehicles. Easier to reach in the next years.
Electrification	It is not considered to be a success factor even though it is considered to be indispensable.
Shared mobility	It does not allow companies to gain profits.
Factors influencing strategic market decisions	
Internal or external factors	Internal factors drive innovation. External boost the projects.
Indicators that drive the choice of implementation (i.e. market share, profitability, brand, etc.)	They are consequences. BMW objective is giving customers what other players are not able to deliver.
Competitive Dynamics analysis	
Competitors	Influence other companies' strategies.
Coopetition	It is more perceived at an headquarter level. At a distribution level competition is the most relevant component.
First-Mover Advantage analysis	
The importance of pioneering	It has been crucial for companies' capability of gaining higher profits.
Market and technology in which it is more relevant	Connected cars

5.2.2. FCA

ACES relevance in the Automotive Industry

The interviewee of the company FCA, Head of Product, claimed that now the automotive industry is under great pressures due to both the high growth of costs and the change in the engine type. Electrification has deeply changed the dynamics of the industry, according to the interviewee the most important thing automotive companies should manage is handling changes, being organised and flexible.

> *"In the automotive industry huge investments are needed and companies are usually acting like elephants. Before making a change, lot of time is needed. In order to produce a car, you need almost two year just for going from an industrial design to production. You always have to watch far, and so if sometimes happens it is difficult to change route."*

In the present scenario companies must consider the future and they have to plan considering an uncertain future. Being a flexible organization will be the most important pillar for future automotive companies. Companies might experiment, not only at a product level. According to the interviewee automotive firms have become extremely capable in producing cars, during the years they have accumulated a huge know-how. However, they have not changed the way they sell cars.

> *"Automotive companies are bounded to dealers and do not sell their products to the final customers. The boundary between OEM and final consumer is not direct"*

The interviewee stated that the electrification is the radical innovation that will change the whole value chain and it has already changed the industrial equilibrium because most of the raw materials and production of batteries is made in China. Furthermore, electrification will also cars' maintenance. Some materials won't be needed anymore (i.e. motor oil). Notwithstanding, the interviewee stated that internal combustion cars won't disappear. In relation to autonomous driving the interviewee claimed:

> *"I don't know when it will be available, it is very complicated. Development is not so easy as it may appear, especially in relation to infrastructures, regulation and legal fit. There is the need of regulations and vehicles are not able to manage unpredictability. There may be places where costumers may use fully autonomous*

capability, like motorways. At the present moment is a way to improve vehicles' safety"

Connectivity plays a relevant role. As believed by the interviewee the development of software to be used during mobility will shape future opportunities for automotive companies. Cars may be able to integrate the experience you have with your smartphone. The interviewee also claimed that companies must invest in shared mobility, but they are not the only players in the market and maybe they won't be the most successful ones. According to its point of view connectivity and shared mobility may be approached not only by automotive companies but also by other service providers. Not the same thing for autonomous driving and electrification:

"No other player has the interest in investing in electrification and autonomous driving beyond automotive companies. It will be automotive companies' responsibility to try to find an efficient way in terms of costs and economies of scale. Scalability is difficult if you don't mainly focus on hardware as automotive companies are able to do".

Along with investing in electrification and connectivity, the interviewee stated that another important element companies are not considering enough is the new interpretation of the business model. Electrification is undoubtedly the first step, the second one is the reinterpretation of how the company generates money. With the introduction of electrification, autonomous driving, connectivity and shared mobility the classic business model of car manufacturers does not fit anymore. Investments should be evaluated not only in terms of costs, implants, capex but mostly in terms of know-how. Automotive companies will be much more connected with the final customers and so their main objective will be communicating with them and not only with dealers.

Factors influencing strategic market decisions

According to the interviewee the most important driver when analysing a possible investment is profit. When producing a car costs are so much high that companies do not have the possibility to do it for other reasons. Nonetheless, there are some situations in which the parameters considered may be different:

> *"BMW has started investing on on-board connectivity in 1997 and it probably did not have an important return. I don't even know if it went break-even, but that investment allowed the company to develop a know-how before the others and positioned the company as a relevant player. A balance between costs and returns has to be made, the most important investments are always evaluated on the basis of the profit they can generate in the long term.*

The interviewee also stated that brand strategies could bring companies to make different decisions but, in his perspective, profit is still the most important driver. It may not be evaluated in the short-term, but the investment should be evaluated on the profits it is able to generate and the position the company can achieve in 5 to 10 years. The interviewee was asked about whether innovation is more driven by internal resources of the firm or external factors, for instance new governmental regulations, new market standards, etc. The interviewee stated that:

> *"Lately investments are more related to external factors. Once there has been a moment of look-inside, improving what we are doing: performances, products, quality. All the effort was oriented in proposing always better products. With the introduction of disruptive innovations like for instance the electric engine and connectivity is the external that drives the internal."*

The interviewee stressed the point that until some years ago, the external factors were not so relevant in shaping automotive innovation. Now companies are forced to invest for the reduction of emissions. EU has put several limitations to automotive companies and so firms have necessarily started to invest into new ways of reducing pollution. The investments made for the WLTP standard have been huge. According to the interviewee electrification is necessary to achieve CO2 targets. If companies do not achieve the CO2 target imposed by the regulations, they are sentenced to pay fines of approximately 100 euros for each additional gram of CO2 per car. In that way electric vehicles are an instrument to lower the level of CO2 produced and, at the same time, not receive fines. Companies are investing in more efficient engines and hybrid or electric vehicles using the money they would have used for paying fines.

Competitive Dynamics analysis

The juxtaposition of the theory of coopetition to the automotive industry finds the approval of the interviewee. He stated that cooperation is needed, and it is smart in order to reduce costs. The interviewee referred to the agreement between BMW and Daimler for the creation of ShareNow, the acquisition of Tesla's credits from FCA, the attempted merging between FCA and Renault and the combined acquisition of Here maps from Audi, BMW and Mercedes. Costs in the automotive industries are constantly increasing and companies alone are not able anymore to face them. The sharing of costs allow them to create market standards and improve their business models without having to allocate huge resources in R&D.

> *"It is correct and smart that companies share costs… Cooperation is probably the most efficient way because it is able to create standards on which firms can be more efficient. Standardization allows several advantages".*

The interviewee asserted, however, that cooperative modes are always difficult to carry on. They depend on the structure of the companies, how strong is one of the two, the level of liquidity available and the functioning of the companies. Mergers and acquisitions are typically problematic in the automotive industry. Acquisitions might be preferable when one of the two players is dominant and is able to impose its corporate culture. The interviewee claimed that the optimal solution might be the sharing of platforms and costs by not merging.

> *"…acquisitions may be the easier way. M&A are generally very complicated. We have seen it in the past with BMW and Rover with not so much success. Regarding FCA, Fiat and Chrysler are still nowadays two quite different entities, they have different headquarters, one in Detroit and one in Italy…"*

The interviewee of FCA affirmed that decisions of other car manufacturers influence strategic decisions of the companies. Companies are not exclusively influenced by the others, but others' moves allow to think about new possibilities. Especially in this stage of development companies carefully check what competitors do in order to reduce the possible loss of money invested. The interviewee referred to leaders and followers, in his

perspective the electrification run might be accelerated by external factors and not by a real market's requirement. The market is made of leaders and followers: they are not fixed characteristics of the firms, companies may be leaders in proposing certain technologies or approaching certain markets and followers in others. FCA is acting as a follower in electrification and new mobility technologies, on the contrary for instance it has been a first mover in the diesel engine production. Competitive dynamics of the industry is fluid, the choices companies make today influence tomorrow's scenario, but it is not fixed: a wrong investment or a change in external factors can rapidly reset all the relationships in terms of position into the market. Companies that pioneered may not recovered the investment made and companies who are following may benefit from the cost reduction.

> *"Our CEO's announcement is quite clear, maybe it's not us that we are late, are the other that are early".*

First-Mover Advantage analysis

The interviewee claimed that First-Mover advantage is relevant in automotive industry. Pioneering allows the company to establish its position in the market, it increases the brand value and gives you competitive advantage. Pioneering is not the optimal solution for each company and, more specifically, it might not be the best solution for each market or technology to be approached. The problem highlighted is that being the first implies huge investments. Once a company decides to make massive investments has to recover them, that is the risk that pioneers generally have to face. In today's world innovation is crucial and it is one of the most important factors influencing the brand perception. According to the interviewee:

> *"It is important to try to be the first but not too early. If you analyse the case of BMWi, a successful case in my opinion, maybe if they have waited a couple of years, they have saved some money and earning some more. The other companies are very fast in following vanishing your investments so being the first in the right moment is still a good strategy."*

According to the interviewee the market where First-Mover advantage is able to generate more advantage for companies is the electric one along with the connectivity. Being the

first in proposing connectivity allows managers to explore new business opportunities. In relation to the electrification the interviewee referred to Tesla case study, that, even though is constantly losing money the benefit of image and branding they are achieving is very high and it is perceived as the most innovative company of the market. Investing both in electrification and connectivity is the key to be successful, they are considered the pillars of the new mobility. On the contrary, autonomous driving is not contemplated as a pillar. The interviewee claimed that it will be mostly driven by external factors and in order to reach fully autonomous capabilities development in infrastructures, 5g technology and regulations are needed. Of course, autonomous driving will drastically change the automotive industry by allowing drivers to do other things while driving, however it is really far from implementation.

> *"Electrification is the fly-wheel of everything else. If you will have an electric car that has a 400km range that does not cost as much as nowadays, companies will definitely sell it. The same for connected cars. Autonomous driving is different: even though you would have it I am not companies would exploit it because customers are not educated yet: they don't trust, and they have to adapt. Moreover, also regulations are not ready yet."*

Table 7. Results of FCA

CASE COMPANY	FCA
ACES relevance in Automotive Industry	
Autonomous driving	It is heavily influenced ny external regulations and customers are not ready to embrace it.
Connected cars	Their implementation is crucial to explore new business opportunities.
Electrification	It is the fly-wheel of the future of the automotive industry.

Shared mobility	Other players will be present in the market and they might be better than automotive companies.
Factors influencing strategic market decisions	
Internal or external factors	External factors influence investment decisions.
Indicators that drive the choice of implementation (i.e. market share, profitability, brand, etc.)	Profit is the most important driver.
Competitive Dynamics analysis	
Competitors	Influence other companies' strategies.
Coopetition	The cooperative component is crucial especially at this stage of development of new technologies.
First-Mover Advantage analysis	
The importance of pioneering	It has been crucial for companies' capability of gaining higher profits. Companies don't have to enter too in advance.
Market and technology in which it is more relevant	Electrification and connected cars

5.2.3. Renault

ACES relevance in the Automotive Industry

The interviewee stated that tomorrow's mobility is already in motion. Renault along with the Alliance (Renault-Nissan-Mitsubishi) are working not only in building safer and more attractive vehicles for customers but also in creating a new world of services around them. Renaults' main focus is highlighted in their strategic plan, Drive the Future, with the aim of reaching a sustainable and profitable growth, for both customers and the company. Renault together with the Alliance is targeting to connect its entire fleet in the key markets and launching a new range of mobility services.

"... in the future cities will be very different from the ones we live today. They will be smarter, connected and collaborative. Together with owned vehicles you will find shared vehicles. We as Renault want to be prepared for both personal and shared mobility."

According to the interviewee the real winner of the future of the automotive industry will be the driver. It will be difficult for automotive companies since future mobility is deeply influencing and modifying the current know-how developed through years of research.

"By 2022 we target to reach 100% of connected vehicles in our key markets, 15 autonomous driving capable models and new mobility solutions".

The interviewee affirmed that Renault' role in electrification is not only to produce and market different vehicles compared to the old Internal Combustion Engine ones. Renault is putting its effort in forming partnerships and investing in the development of the electric ecosystem, including infrastructures, batteries and charging stations. Electrification creates new challenges for automotive companies. Electric vehicles contribute to the shift between the use of fossil energies towards renewal sources. The interviewee claimed that the company is partner in several projects with the aim of reducing the impact in the creation of energy.

"We are working towards the creation of more efficient renewable sources of energy. Today's sources (i.e. solar, wind, etc.) are inherently intermittent. Our aim is to overcome the issue and increase the production of green energy for our cars."

Connectivity plays a relevant role in tomorrow's automotive industry. According to the interviewee connected vehicles will give drivers the opportunity to live a mobility experience which is smarter, more harmonious and integrated with their already digitalised lives. Furthermore, connected vehicles will increase traffic safety. The OEM itself will benefit from connectivity by relying on accurate data on their customers reducing the dependency that today's business model implies (i.e. dealership).

> *"Connected and autonomous vehicles will progressively allow customers to choose between drive the car or being driven, by allowing us a company to explore a new set of mobility services and new opportunities."*

The interviewee stated that all the technologies of new mobility will merge into autonomous driving. The players who will be able to offer to their customers a complete set of packages will experience advantage when autonomous driving will be fully available. Autonomous driving will allow driving to benefit from time they have never used because occupied. Renault's goal is to give customers the opportunity to exploit this additional time with their tailor-made services.

Factors influencing strategic market decisions

The interviewee was asked about which are the most valuable indicators that influence the implementation of new technology, referring to profit, market share, industry maturity and branding. The interviewee claimed that:

> *"Renault and the Alliance objective is to create the best solution for its customers positioning the company as the best provider of new mobility solutions. The indicators are definitely evaluated but this we are now talking about a revolution".*

According to the interviewee in this stage of development the company should try to develop its solutions so that it will be able to answer to future requests of the market. Notwithstanding, the company is a mass-market car manufacturer, so it has to satisfy its volume targets; in order to maintain a sustainable growth and development the strategy pursued is to collaborate with other stakeholders. The revolution of the new mobility gives automotive companies the possibility to reshape current's market scenario in terms of brand perception. According to the interviewee it would be difficult for a mass- market car manufacturer to be perceived as a luxury manufacturer, however, companies who will be able to propose their solution faster and better will achieve dominant positions.

The interviewee was asked about whether innovation is more driven by internal resources of the firm or external factors, for instance new governmental regulations, new market standards, etc. The interviewee stated that:

> *"External factors surely influence where companies are focusing their efforts, however, it's the internal perspective that makes the difference. External factors give you the starting point but it's the willingness to propose the best solution to the market the real driver of innovation".*

Renault started investing in electrification and new technologies 9 years ago, definitely not following a real need of the market. The interviewee claimed that innovation strongly depends on corporate culture and, especially in this revolution companies are somehow forced to innovate otherwise they will be out of the market. External factors as regulations and customers' needs will establish which players have made the best choices but, in the interviewee's perspective it is also a company's responsibility to influence them.

Competitive Dynamics analysis

The interviewee agreed with the concept of coopetition. Especially in the phase of transition that the automotive industry is going through, the optimal solution is to share costs and at the same time proposing a better answer to customers' needs. Notwithstanding, the component of competition is still present. Automotive companies' culture has always been influenced by competition and it has always been a push to propose better solutions compared to the ones of the rival firms. In order to sustain huge investments needed for the new mobility the company is pursuing strategic partnerships:

> *"… by 2030 it is estimated by the UN that over 60% of the population will live in urban areas. That completely change the experience drivers will have on board. We are pursuing strategic partnerships with several players of the market in order to propose the best solutions to our customers. For instance, "drivers" will have time to read dedicated contents during their journey"*

Furthermore, the interviewee stated that the Chinese market is highly influencing how the company is perceiving local rivals. The Renault Group created a joint venture in 2017 with the Chinese play Dongfeng Motor Group in order to satisfy an increasing demand by capturing a relevant share of the electric world market. Additionally, the interviewee cited the acquisitions of a relevant stake of JMEV, one of the most important Chinese

electric vehicle manufacturers. China's accounts for half of all electric vehicles sold in the world, in that sense Alliance's attention is high.

According to the interviewee cooperative entry modes are necessary for the survival of automotive companies. Renault Groupe almost faced each of them, from M&A to strategic partnerships and joint ventures. The interviewee stated that the Alliance with Nissan (now Renault, Nissan and Mitsubishi) has allowed the company to achieve incredible result that may not have been achieved alone.

> *"The Renault-Nissan-Mitsubishi Alliance achieved a combined sale of almost 11 million vehicles in 2018 in nearly 200 countries. I am not saying that a company alone will not be able to achieve these targets, but it is difficult… Cooperation can bring you far. We are now the largest automotive alliance."*

The interviewee claimed that even though companies are under the same Alliance they still maintain their own identity and will continue producing cars under different brands. Additionally, the Alliance works in producing shared platforms that are used for different models and different brands in order to reduce costs. The interviewee claimed that:

> *"We have started by introducing a shared platform, CMF, for the fifth generation of Clio that will be launched in 2019. Our target is that by 2022, the 70% of the vehicles produced and sold by the Alliance will be developed and produced using the CMF platform. That is an enormous cost reduction."*

Furthermore, the interviewee claimed that cooperative entry modes allowed the company to improve their solutions. The alliance together is able to generate an enormous amount of money for innovation and new mobility paradigm. Renault Nissan and Mitsubishi are combinedly investing not only in engine production but also in the whole infrastructure such as the production of batteries and charging stations.

First-Mover Advantage analysis

According to the interviewee pioneering generates great advantages for companies. Renault considers itself as a first-mover in electric mobility and it is the first company in selling electrified vehicles in Europe with their iconic model Zoe.

> *"…electric vehicles are essential to build to achieve the triple transition towards electric mobility, renewable energies and smart grids."*

The interview claimed that being the first in electric mobility allows the company to correctly address all the other complementary elements such as connectivity, autonomous driving and shared mobility. Furthermore, more and more customers are choosing sharing mobility instead of ownership. Renault is directly involved in the mobility as a service taking a primary role in the development of its own solution. In the interviewee's perspective addressing new technologies as pioneers allow the company to generate profits and capture relevant share of the market.

> *"Everyone is talking about connected vehicles, for us, it is already a thing. We have launched Renault Easy Connect creating a continuous dialogue between our cars and the environment, both in towns and in open roads."*

The interviewee stated that it is difficult to select which technology presents the most relevant first-mover advantage. In his perspective they should be seen as complementary technologies towards a different future of the industry. Each element of the ACES increases its strength and utility if corroborated with the others. The last pillar is considered to be autonomous driving, such as the disruptive revolution which will drastically change the automotive industry. All the efforts put into place by Renault and the Alliance in these years will serve to propose the optimal solution to the market at the earliest possible.

Table 8. Results of Renault

CASE COMPANY	RENAULT
ACES relevance in Automotive Industry	

Autonomous driving	Allows the company to explore new business opportunities.
Connected cars	The first step towards autonomous vehicles. Easier to reach in the next years.
Electrification	Indispensable element and starting point of all the other revolutions.
Shared mobility	It could be another revenue stream for automotive companies.
Factors influencing strategic market decisions	
Internal or external factors	Internal factors drive innovation. External boost the projects.
Indicators that drive the choice of implementation (i.e. market share, profitability, brand, etc.)	Renault objective is to propose the best solution for future mobility. They are generally considered but in the long-term.
Competitive Dynamics analysis	
Competitors	Influence other companies' strategies.
Coopetition	It is crucial at the current stage of development. Competition cannot be escaped, cooperation has to established.
First-Mover Advantage analysis	
The importance of pioneering	It has been crucial for companies' capability of gaining higher profits.
Market and technology in which it is more relevant	They are complementary. The player who will combine better electrification and connectivity might be the dominant in autonomous driving.

5.2.4. Toyota

ACES relevance in the Automotive Industry

According to the interviewee the automotive industry is facing a big revolution that is going to undermine the current scenario.

> *"Over the past century it is estimated that over 15 million horses were replaced by almost the same number of cars in the US. In my perspective we are facing a similar, if not greater. This profound transformation could be a once in a century one"*

Electrification, autonomous driving, connectivity and sharing mobility technological innovations are rapidly advancing. The interviewee stated that this revolution will completely change the rules of competition with not winners and loser but just survivals. Toyota is determined to transform from a car manufacturer into a mobility company even though it doesn't want people to forget that it has always been a car producer inspiring freedom. The interviewee explained the view of the company about the future that is to offer cutting-edge technologies as electrification, autonomous driving and connectivity but at the same time not losing the focus on the mass-market that is now enriched by these new innovations.

> *"We always have to pay attention to our customers' needs regardless we are developing future mobility or just producing current mass-market models. We have built a relationship between us and our customers in several years, I am sure that this will give a unique advantage".*

The interviewee remembered that since the introduction of the Toyota Production System, the company's focus has always been its customers. Toyota is considered the most trustworthy company in the automotive industry because of its ability to build safe, reliable and emotionally appealing. The interviewee claimed that the pillars on which the company has based its past growth and current position on the market are won't guarantee future success. During the past years, Toyota prioritized developed markets over emerging ones and passenger vehicles over commercial ones following a volume and

profit logic. However, due to the ongoing revolution, they are going to be drastically changed.

Electrification is seen as the answer to reduce fossil fuel consumption of the vehicles. Regulations of countries and international organizations have pushed automotive companies to accelerate in the development of electrified vehicles as an answer to a problem they have created. However, according to the interviewee is connectivity the element that will play the most relevant role in shaping future automotive industry. Due to the increasing number of vehicles, new social issues emerged such as tragic congestion and safety.

> *"Our strategy can be represented in three stages: the first one is connecting all the cars, the second one is creating new business models and the last one is the creation of new mobility services."*

The interviewee claimed that once the number of connected cars increases, companies are able to rely on huge data generation. The data can be used to improve products and solutions deliver to customers. Furthermore, the data collected can be used not only by Toyota as a company but also for increasing safety for everyone. The last pillar will be the creation of a mobility service platform. Regarding autonomous driving the company is developing is solution based on two different approached: the Guardian and the Chaffeur. According to Toyota the driver should have the possibility to choose whether to be driven or to drive, even though supported by all the systems in order to reduce danger for him or her and the environment.

Factors influencing strategic market decisions

According to the interviewee the strength of Toyota is the culture it has been able to build since the beginning of its history:

> *"The Toyota way, the Toyota Production System is what drives our choices. We have increased quality, reduced costs, improved productivity in the production of mass-cars at a lower cost. Toyota's dedication in people makes these goals achievable and it is the real source of our competitiveness".*

External factors are considered to be influent in company's choice, however, it is the internal culture of the company the driver of innovation. The creation of a strong team in terms of skills allows the company to respond to every need of the market. The interviewee stated that at Toyota the most important thing is to move forward. If they are not moving forward, they think they are going backward, this culture has brought the company to constantly innovate during the years. The most important influencing factor of innovation is considered to be its human capital.

Competitive Dynamics analysis

Coopetition seems to be the best way to describe Toyota's position referred to the automotive industry. According to the interviewee the automotive industry has always lived of competition: companies have always tried to improve their products and reduce costs in order to increase their market share and profitability. Due to the ongoing revolution however, cooperation cannot be escaped. In order to increase their efficiency companies should cooperate.

> *"In order to face the new challenges implied in the use of new technologies it will be necessary to cooperate with a diverse range of stakeholders."*

Notwithstanding, the interviewee claimed that cooperative entry modes with other automotive companies is difficult. Automotive companies generally have strong corporate cultures and, especially for companies coming from different countries, differences may be difficult to overcome. Acquisitions and strategic partnerships are preferable. Even though the company is massively investing in innovation and new technologies, competition in the mass-market is still fierce, especially at a distribution level. The interviewee stated that mass-market car manufacturer's main target remains the achievement of a higher volume of sales compared to rival firms.

The interviewee highlighted the fact that in Toyota's home market, Japan, conditions will be tougher than ever. The market is contracting due to a sum of social issues such as greying of the population, increase of urbanization and rural depopulation. At the same time, the market is deeply changing because of the introduction of disruptive innovations like IT and AI usage, autonomous driving and increase in competition, especially from

China. Toyota adapted its business in 2016 with the J-ReBORN Plan. It started shifting from a one approach fits all to a more targeted approach based on regions.

First-Mover Advantage analysis

According to the interviewee pioneering allows companies to establish a dominant position into the market by increasing the brand value at the same time. Referring to first-mover:

> *"We were the first to introduce a hybrid vehicle with the Prius in 1997. That car shaped our company and the perception that customers, even nowadays, have for our company. Moreover, we achieved huge profits from pioneering".*

The interviewee claimed that Toyota is approaching the new technologies as a way to improve customers' lives by improving safety and giving them the possibility to be interconnected and at the same time, saving the planet from pollution and the abuse of fossil sources of energy. The major focus is on customers' needs and, according to the interviewee this is the evolution of the Toyota Production System most important component, the Just-in-Time:

> *"What we think is that in this era of radical transformation of the automotive industry, our responsibility is to anticipate customer needs to provide more customized mobility services more directly and in real time. To explain it in different words, we must create a world in which the services that are needed are provided when needed and as needed. This is literally the essence of Just-in-Time."*

According to the interviewee approaching connectivity is the technology which is able to generate more advantage for first movers. The data gathered from the car can be exploited in several applications, both industrial or commercial. Connectivity is considered the pillar on which develop future mobility services and moreover autonomous driving, the real game changer of the entire automotive industry. The interviewee referred to a partnership Toyota did with Uber in 2018 to improve their mobility services.

Table 9. Results of Toyota

CASE COMPANY	TOYOTA
ACES relevance in Automotive Industry	
Autonomous driving	It will give drivers the possibility to drive or to be driven. In both cases enhancing safety.
Connected cars	Most important revolution. It allows companies to gather more data to be used for different applications.
Electrification	It is relevant to reduce CO2 emissions.
Shared mobility	It allows the company to approach a different scenario of the automotive industry.
Factors influencing strategic market decisions	
Internal or external factors	Internal factors drive innovation. External boost the projects.
Indicators that drive the choice of implementation (i.e. market share, profitability, brand, etc.)	Possibility to propose to the customers better products at a lower cost.
Competitive Dynamics analysis	
Competitors	Influence other companies' strategies.
Coopetition	Cooperate with other stakeholders is necessary. Competition cannot be escaped, especially in mass-market.
First-Mover Advantage analysis	
The importance of pioneering	It is important to anticipate future needs.

Market and technology in which it is more relevant	Connected cars.

5.3. Cross Case Analysis

In order to be able to answer to the research question, there is a fundamental need to compare the findings of the interviewed automotive companies in order to analyse the main characteristics of the four companies used as firm cases in the research. Accordingly, a pattern-matching analysis between the automotive companies has been developed through three phases: (1) ACES Analysis, (2) Competitive Dynamics Analysis and (3) First-Mover Advantage Analysis.

5.3.1. ACES

As confirmed by all the interviewees we are at the dawn of a new era that is transforming the idea that people had of the car for over a century. A new revolution is reshaping the idea of a vehicle moving from point A to point B: in the future it will be faster, cheaper, safer, cleaner and more convenient than today. Automotive companies are approaching significant investments in mobility, but they are just a first step and, investments alone, may not be enough. Mobility is seen a "*system of systems"* and disruptive revolution are perceived as a unique opportunity to reduce or eliminate all the negative factors associated with the current automotive industry: accidents, traffic and pollution (Corwin 2017). This transformation will result in winners and losers, or, as stated by Toyota, in survivals. The huge transformation in place is heavily influenced by two main elements: (1) the intrinsic willingness to innovate of companies, generally showed in pioneers and (2) the external factors as government policies and fuel prices. Four major mobility models are expected to exist in the future:

1. Private owned vehicles (traditional ones)
2. Shared vehicles (taxis and car sharing providers)

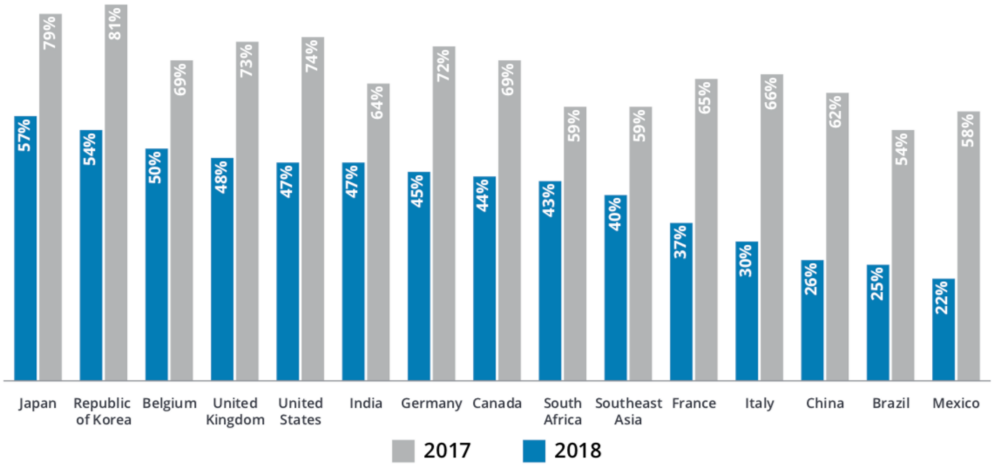
3. Private owned autonomous vehicles
4. Shared autonomous vehicles

Automotive companies are working into developing their product offering following this new change in customers' habits. However, this will increase complexity for automotive industry companies in order to successfully serve these markets. Many companies, including the ones interviewed for the purpose of this research agreed on the fact that current business models do not fit anymore. In that sense, companies are experimenting taking risks for future business model transformation pursuing radical innovation by at the same time, continuing on their current business models. Especially in the mass-market, as confirmed by the interviewees, the pressure of volumes and profitability targets is massive. Automotive companies must face choices of capital allocation and have to choose between investing in new mobility or in their current business. Simplifying, this can be explained by the concept of first-mover versus follower. Furthermore, automotive companies which are pioneering are moving towards a future that will possibly reduce their role in the mobility system, since they might be a part of it. New opportunities will arise and the ones able to capture them will be the winners.

All the stakeholders involved in the automotive industry (manufacturers, suppliers, insurance and tech companies) are massively investing in these technologies. The reasons behind are the ones explained during the interview process: autonomous driving has the possibility to drastically change the whole industry and electrification will allow to reduce pollution. The current pace of investment is defined by Giffi, Bitale, Schiller and Robinson (2017) as "*a game of high-stakes poker where the players are all in, and the outcome is largely undetermined, though unlikely to favour everyone at the table."* The automotive industry has reached over the last century a high level of maturity, creating for the companies a little space for differentiation. Cutting-edge revolutions like electrification and autonomous driving have the possibility to change the competitive dynamics of the industry. However, it is difficult to forecast when they will be fully available and required to the market. A study made by Deloitte in 2018, *Deloitte global automotive consumer study*, suggests that consumers may not consider autonomous technology as safe. As a matter of fact, the interviewee from FCA claimed that even though technology and regulations could be ready, it is such a radical revolution that the

company is not sure about customers' reactions. The study shows a decrease in fear of autonomous driving; however, the data may still retain companies to enter the market.

Figure 8. Percentage of consumers who think fully self-driving vehicles will not be safe (2017 vs. 2018). Source Deloitte



Furthermore, companies won't be able to recover from the investments required with their current business model and customers are not willing to pay any additional money. Same situation is the one related to electric vehicles, as claimed by BMW, even though companies are investing and pushing the technology still todays there is not a real demand by the customers. Customers want to pay the amount of money they are paying for traditional internal combustion engine vehicles, however, electrified vehicles are much more expensive, and this is sensibly reducing profitability, as stated by the first interviewee and confirmed by Deloitte's study. In the last 10 years the global automotive market has irreversibly shrunk in terms of volumes of cars produced and sold. No major increases are expected, and so companies have to prioritize their investments given these tightening global market conditions. Automotive companies still have to face massive fixed costs and it is difficult to justify capital investments with a high level of uncertainty, given the opportunity to late movers of gaining advantage (Lieberman & Montgomery, 1988).

In the meanwhile, consumers are changing their perception towards different mobility options. According to Deloitte (2017), 23% of American consumers said that they have

used ride-hailing or ridesharing services at least once a week and an additional 22% claimed that they have used these services at least once. In other different markets, like for instance India, this already high data becomes enormous, going to an 85% of consumers that have indicated to have used these services. Such statistics highlights the fact that due to progressive urbanization, consumers' behaviours are changing, and the need of a personal owned car will probably proportionally decrease with the increase of the number and quality of shared mobility services. As affirmed during the interview, Toyota is working into integrating all these new technology into new mobility services. BMW, even if stated that mobility as a service does not generate any additional profit is directly involved into the development. FCA and Renault too have their market proposition. Automotive companies have understood that the future won't be dealer-centric as it has been in the last century.

A study by Edmunds figured out that that in the United States the price for new vehicles has increase of 1.5% on a yearly basis. In order to minimize price increase, consumers are moving from ownership to sharing (leasing). As a result, consumers might not consider electrified vehicles equipped with autonomous and connectivity capabilities because of implied higher final price.

Regarding electrification, consumers do not only consider price. Another relevant element in the purchase decision is charging possibility. Batteries have limited kilometric range compared to internal combustion engine and policy makers play a crucial role in building a suitable infrastructure. Companies are working into both creating their own proprietary solution (e.g. Tesla Supercharger) and creating partnership with other service providers.

Figure 9. EU market share of electric chargeable vehicles. Source ACEA

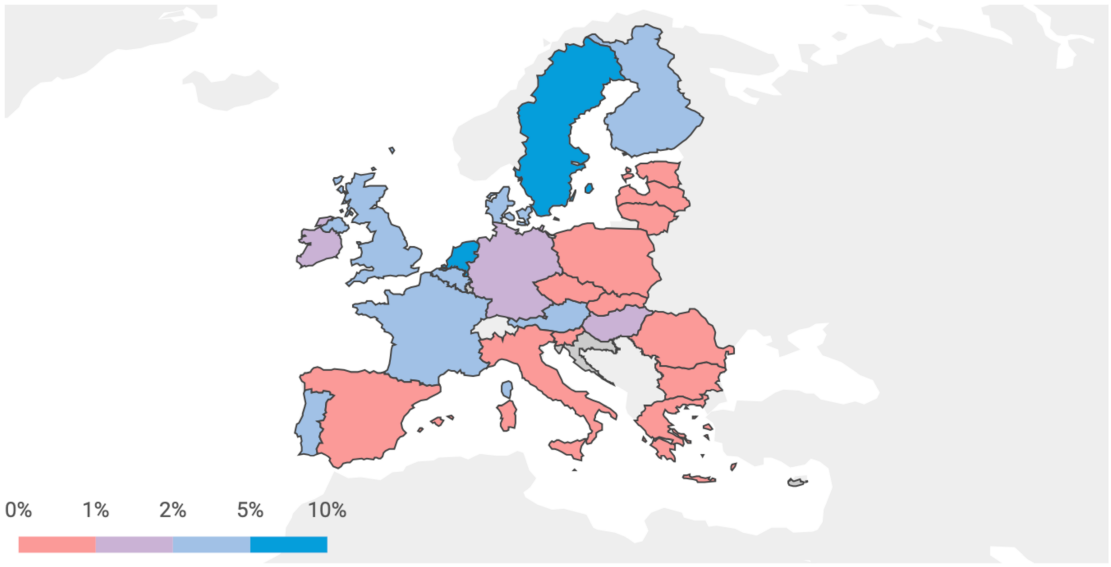
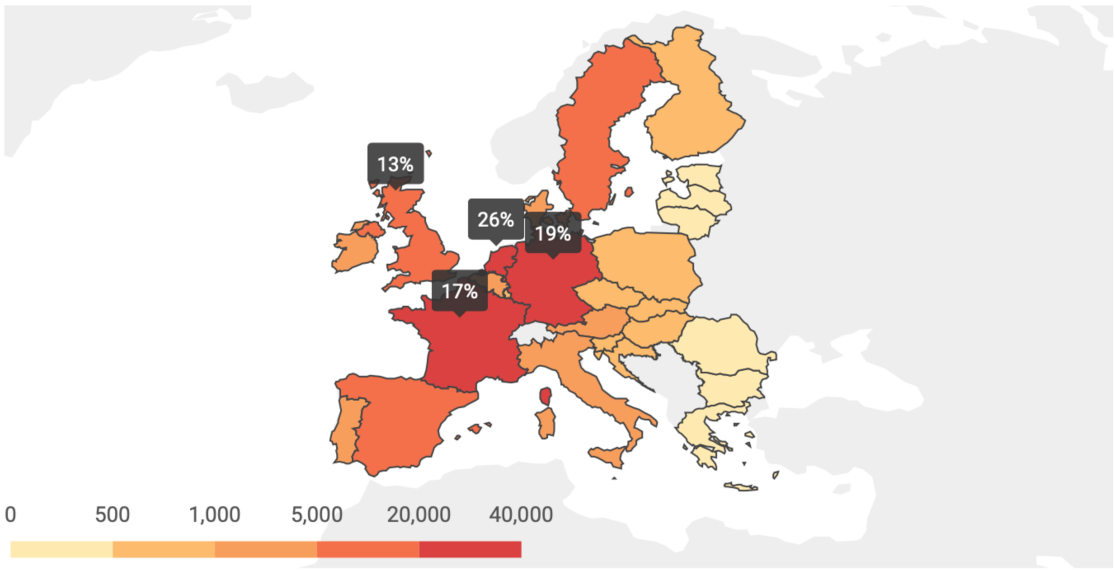


Figure 10. Number of EU charging stations. Source EAFO



The determining factors that drive consumers' choice in adopting these new technologies are external, as figures 9 and 10 imply and internal, for instance safety, brand trust and cost. Study from Deloitte confirms that even though these new technologies give the possibility to other non-traditional automotive players to enter the market proposing their solution, globally consumers favour traditional car manufacturers. The only exceptions are South Korea, India and China who favour existing technology companies over existing car manufacturers. As previously mentioned, safety is a major driver of

purchasing decision when evaluating a new technology. In that sense, consumers seriously question the readiness of technology in the case of connected vehicles and, especially, autonomous driving. First-mover companies are struggling to propose their solution to the market as the best and most efficient one, however, consumers are waiting for the technology to be mature and reliable. Companies might achieve a relevant share of the market by pioneering but, if their products would get involved in car accidents due to the immaturity of technology the advantage will suddenly transform into a disadvantage. Considering the uncertainty of demand companies are finding themselves struggling in deciding where and when to invest. Despite the low willingness to pay additional money, consumers' hunger for new technologies as connected cars, mobility as a service, electrification and autonomous driving remains high.

The most important challenge incumbents of the automotive industry are facing is, as stated, managing duality among development of new capabilities to fulfil future market requirements by ensuring continuity with their current business models' challenges. Autonomous and new mobility models are a future bet, but automotive companies have to understand consumers' needs and expectations in order to transform the customer experience.

This advancement in technology will improve vehicles' overall value and users' lives. However, approaching it while maintaining the current level of profits or increasing it is challenging. For over a century, automotive companies have based their business models almost entirely on vehicles sales, with the arrival of the new mobility services and connectivity, new revenue streams might appear. In the current business model, dealers are the principal customer of automotive companies, who directly manage the relationship with the final consumer. As stated by the interviewee of FCA, future business model will change the role dealers have in the business. Consumers may reduce the amount of fully owned vehicles. Notwithstanding there are different opinions regarding the role dealers will have in the futures: some think that no middle-operator will existing, with companies selling cars directly to end consumers or fleet managers. Others, on the contrary, enhance their importance in the value chain especially in service and maintenance.

Figure 11. Automotive companies' partnerships related to autonomous driving, connectivity and shared mobility (Bailo et al. 2018).

As highlighted by figure 11, automotive companies have understood that in order to be prepared for the big shift that ACES technologies are bringing, they must cooperate with diverse partners. Whether by acquisition, direct investments or partnerships, automotive industry has to find partners in order to increase its know-how.

5.3.2. Competitive Dynamics Analysis

The automotive industry is living a phase of high complexity and uncertainty. Over the past century competition among the automotive industry has been more easily definable between mass automotive manufacturers and premium manufacturers. Due to the introduction of new disruptive technologies like connectivity and electrification into the industry, the landscape has completely changed. According to Boyer et al. (1998), automotive companies have developed and implemented form of work organisation and production systems respecting their national and business culture instead of global perspectives. The statement made by Boyer et al. (1998) has been spot during the interviews with managers of the selected companies: firms generally reflect their country of origin culture. BMW, for instance, as claimed by the interviewee, is characterized by a strong industrial culture, the same can be claimed for Germany. The interviewee from Toyota, instead, referred to the Toyota Production System as the main driver of the firm

for improving product quality and efficiency, two characteristics that are usually associated with Japan.
Notwithstanding, companies are now switching their approach towards a more global one, not only in term of product allocation but in terms of cooperation. Over the last century the industry has seen several mergers and acquisitions and partnerships, some successful and some not. At the end of the 20th century all the Japanese car manufacturers, apart from Honda and Toyota, were partially owned by western automotive companies. In the meanwhile, western automotive companies were joining forces and resources in order to reduce costs and improve efficiency. Competition has always been a relevant part of the industry, however, due to the high fixed costs implied in the mass production, automotive companies are somehow forced into looking for partners. Still up today, production is driven by forecast and cars are sold at dealer stock in order to reduce production cost (Holweg 2008).

Schoenecker and Cooper (1998) identified the 6 internal resources and organizational attributes that influence entry timing: technological resources, marketing resources, financial resources, commitment to threatened market, size, firm diversity. The interviewed companies have referred to some of them, especially the pioneer ones. According to BMW, Toyota and Renault, that can be defined as pioneers in adopting new technologies, these factors deeply influence their strategic choices. FCA, on the contrary, which is approaching new technology with a second-mover strategy, mainly relies on external factors as emergence of dominant categories (Suarez et al. 2015).

Caveas and Porter (1977) claimed that competition is less intense within strategic groups and, on the opposite, is more intense between strategic groups. This has been confirmed during the interview process, automotive companies are cooperative with internal partners (e.g. Renault with the Alliance and BMW with MINI), but at the same time competition between different strategic groups remain fierce. Even though companies are establishing partnership and joint ventures with rivals in order to boost certain technologies, especially in the Mobility as a Service sector, competition remains high. The nearest to the final consumers the more competition increases: specifically, at the distribution level, rivalry is highly perceived and used as a fuel for dealers.

Coopetition is used by automotive companies to increase the size of the current market, create new ones, use fewer resources, use current resources more efficiently, protect the current share of the market and conquer the remaining part (Ritala 2012). Something that has been perceived during the interviews with managers that is not easily to be recognized on secondary data is that if they could, companies would avoid coopetition. However, due the intrinsic complexity of the product, the new technologies involved, the change in business models and impact that R&D has on profits, automotive industry cannot escape from cooperation.

Table 10. Competitive Dynamics analysis. Based on interviewed companies

CASE COMPANY	Competitors	Coopetition
BMW	Influence other companies' strategies.	It is more perceived at an headquarter level. At a distribution level competition is the most relevant component.
FCA	Influence other companies' strategies.	The cooperative component is crucial especially at this stage of development of new technologies.
RENAULT	Influence other companies' strategies.	It is crucial at the current stage of development. Competition cannot be escaped, cooperation has to established.
TOYOTA	Influence other companies' strategies.	Cooperate with other stakeholders is necessary. Competition cannot be escaped, especially in mass-market.

According to all the four interviewed companies, competitors play a relevant role in influencing strategic decisions of the firms. Automotive companies approach the global

market by establishing local subsidiaries in the most relevant markets. Local subsidiaries are generally evaluated on commercial results as stated by the BMW's interviewee. Local subsidiaries' focus is to sell more vehicles compared to the direct competitors. At a headquarter level instead, situation is different since the focus is not distribution but product development. All the companies interviewed asserted that cooperative entry modes will be crucial to sustain the industry towards the future. Notwithstanding, the interviewees claimed that merging different companies with different cultures is not an easy task. As proposed by FCA's interviewee and underlined by BMW, the preferable solution is when one of the two entities is strong enough to impose its business culture.

5.3.3. First-Mover Advantage Analysis

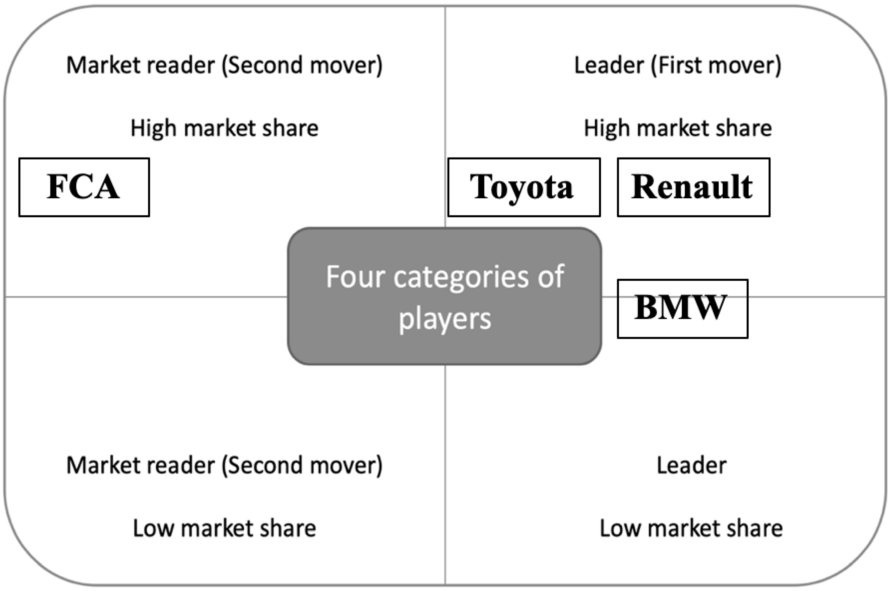
The interviewed managers jointly agreed on the fact the First-Mover Advantage is relevant in shaping companies' success. BMW claimed that opening several new segments of the market allowed the company to gain substantial pioneering profits (Lieberman & Montgomery 1988). Renault claimed that addressing as first electrification gave the company the possibility to better address the other complementary technologies to be approach in future mobility. Most of Toyota's today success is given by the success of the Prius, the first hybrid vehicle of the market. All the companies have in specific moment of their history, pioneered; even FCA's main brand, Fiat, proposed to the market several innovations in the last century.

According to the model presented by Lieberman and Montgomery (1988), first-mover advantage is generated by three main mechanisms: technological leadership, pre-emption of scarce assets and buyer switching costs. In the data analysis has emerged that the most relevant mechanism of first-mover advantage in the automotive industry is *technological leadership*. Firms who are able to produce and market the best technology as first, will be the winners. By evidence, BMW, Renault and Toyota are technology leaders in electric engines, connectivity and mobility services.

Companies that are market readers and followers may enjoy from several factors: ability to free ride on first-mover investments, resolution of technological or market uncertainty, shift in technology or customer preferences and needs and incumbent inertia. Each of them is taken into account when deciding whether to invest or not. The most relevant

factors emerged in the study are technological and market uncertainty, shift in technology and customers' needs and incumbent inertia. Even it has gained a relevant share of the market, BMW claimed that it has not properly benefit from pioneering profits in the electric market. The same was confirmed by the interviewee from FCA who stated that, despite the fact that BMWi is considered a success, the German company should have waited two years for increase its profitability. Following these factors of later mover advantage, automotive companies are pioneering in certain technologies and following in others, waiting for the technologies to mature and customers' needs to emerge.

Figure 12. The revised four group of players (Revisited model from Keivanpour et al. 2016 on the basis of data analysis)



The interviewed companies have been positioned into the matrix of Keivanpour et al. (2016) based on their current strategy towards autonomous driving, connectivity, electrification and mobility as a service and, as well on their market share. FCA is the only company that appeared to act as a market reader or, second-mover, waiting for the technologies to grow and prices to reduce, before entering the markets. Toyota and Renault are both following pioneering strategies in the mass-market. Toyota has been the first to introduce in the mass-market an electrified vehicle and one of the first companies to abandon diesel engines in the favour of green mobility. Hybrid has become the differentiation factor of Toyota that has given the company the possibility to build a

trustworthy brand image. Renault and BMW, even though both automotive companies, they compete for different segment of the market, the French manufacturer in the mass market while the German manufacturer in the premium segment. Their pioneering strategy in market of electric vehicles have gave them the possibility to be the market leader in the respective segment of the market.

Table 11. First-Mover Advantage analysis. Based on data analysis

CASE COMPANY	The importance of pioneering	Market and technology in which it is more relevant
BMW	It has been crucial for companies' capability of gaining higher profits.	Connected cars.
FCA	It has been crucial for companies' capability of gaining higher profits. Companies don't have to enter too in advance.	Electrification and connected cars.
RENAULT	It has been crucial for companies' capability of gaining higher profits.	They are complementary. The player who will combine better electrification and connectivity might be the dominant in autonomous driving.
TOYOTA	It is important to anticipate future needs.	Connected cars.

Automotive companies considerer connectivity as the first market to attack in to order to capture first-mover advantage. Connected cars allow the industry to generate alternative revenue streams that are not directly linked with their current business model. As in other industries, data is considered the new gold and will also help automotive companies in improve the other technologies, autonomous driving as first, and better address consumers' needs and requests.

5.4. Revised Theoretical Model

Accordingly to the previous analysis, a revised theoretical model has been constructed in order to include relevant findings that complement the framework of first-mover advantage and competitive dynamics. As illustrated, automotive industry seems to be characterized by high level of innovation, industrial orientation and willingness to propose consumers the best product in the market by at the same time observing profitability. It has been confirmed that first-movers gain substantial advantage in market share, brand image and profitability. Therefore, in order to be successful companies should pioneer. Nevertheless, several disadvantage may arise from pioneering: followers are generally wait for technologies to be mature and customers' needs to be clear enough. Companies strategic decisions seem to be driven by both internal and external factors, internal factors as fly-wheel and external as boosting agents. Shoenecker and Cooper (1998) entry timing attributes related to technology, marketing resources and financial resources should be taken into account. Consequently, new parts as (1) customers' needs and (2) innovation orientation have been embedded.

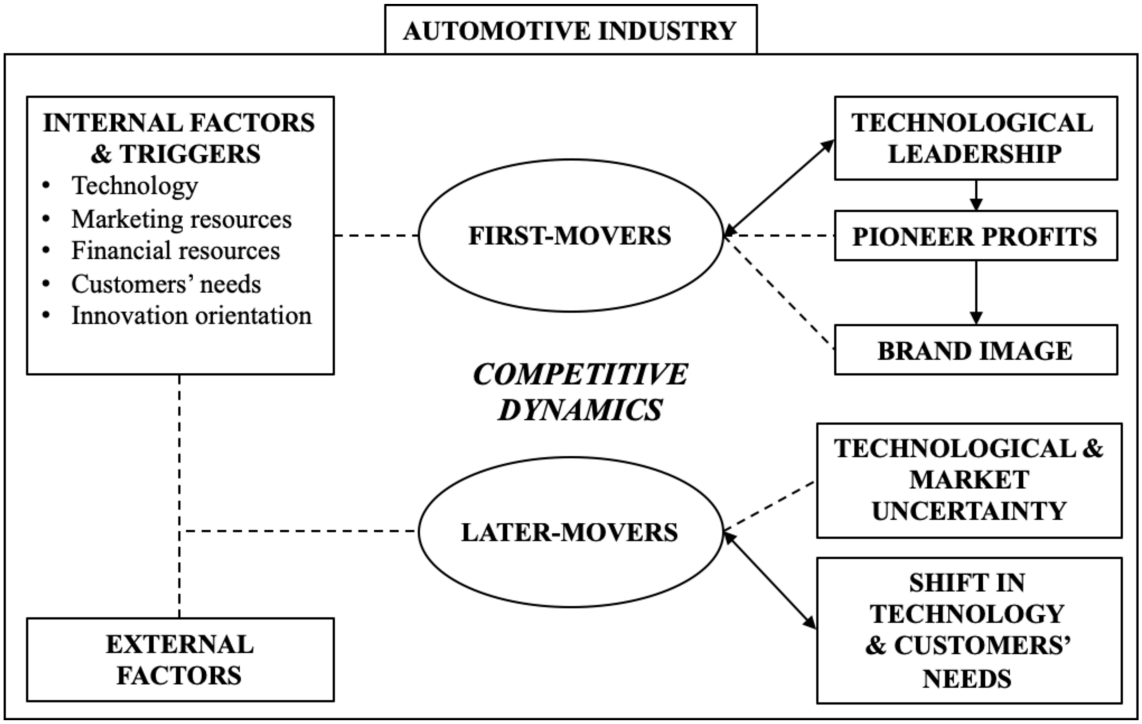


Figure 13. Revised Theoretical Model – The influential model of Competitive Dynamics in the automotive industry based on a First-Mover perspective (own interpretation based on literature review and empirical results).

6. CONCLUSIONS

This last chapter aims to delineate the findings of analysis through the adoption of the conclusive propositions. Furthermore, this chapter proposes managerial implications; limitations of the research are highlighted combined with possible future research avenues in the research field of First-Mover Advantage and Competitive Dynamics regarding automotive industry.

6.1. Conclusive propositions

This study aimed to provide a better understanding of how the first-mover advantage influence automotive companies' strategic decisions. Specifically, it examined the consequences of pioneering and the internal dynamics of the automotive industry. In order to answer the research question, the Master's Thesis focused on ACES and how companies are approaching the radical shift. This study aimed to analyse the competitive scenario and to answer the research question "*Do firms of the automotive industry gain advantage of being first mover when entering a new market?"*

Conclusive proposition 1: *Automotive companies gain competitive advantage when pioneering. Automotive companies gain advantage in terms of profits, market share and brand image.*

Conclusive proposition 1b: *Automotive companies characterised by a corporate culture driven by innovation are more willing to pioneer.*

The empirical results of the research confirmed the findings of previous studies on first-mover advantage (Lieberman & Montgomery 1988; Suarez and Lanzolla 2007; Capone, Malerba & Orsenigo 2013; Song, Zhao & Di Benedetto 2013; Tsuchihashi & Hamada 2014). Automotive companies enjoy competitive advantage by entering as first into a market. Moreover, the interviewed automotive companies focused on the profits pioneer are able to capture when no competition is present. By entering as first, companies are able to establish their own standards and satisfy consumers' emerging needs. For instance, especially in the last century, companies that managed to introduce new solutions to the market gained advantage in terms of profits, market share and lastly, brand image.

Notwithstanding the advantages of being first, companies also face several disadvantages (Lieberman & Montgomery 1998). Automotive companies are actuating different strategies depending on the market and technology taken into account, sometimes being a leader and a follower at the same time. Follower firms are generally waiting for resolution of technological or market uncertainty and shift in technology or customer needs. The analysis has highlighted that the development of a dominant design solves technological uncertainty reshaping the dynamics of the competitive scenario (Utterback & Abernathy 1975; Anderson & Tushman 1990; Agarwal, Sarkar & Echambadi 2002; Adner & Kapoor 2010). In order to find a dominant design, companies have to experiment by proposing their solution to the market facing pioneering risks (Suarez & Utterback 1995).

Despite the fact automotive companies mainly suffer from inflexibility issues, due to the intrinsic structure of the product, findings have shown that an internal innovation culture is generally on the driver of pioneering behaviours. In fact, companies who have showed first-mover attitudes are the ones that put at the centre of their strategy the consumer. Focus is on offering the best product or solution in terms of technological novelty, quality and efficiency. External regulations may push towards propulsion technology development and implementation but is consumer's responsibility to determine the market success of these new technologies. Consumers generally rend to be prudent when presented with new technologies.

Conclusive proposition 2: *New business models are needed in order to support the tremendous increase of costs due to the radical shift of the automotive industry pushed by the adoption of new technologies.*

Empirical results have highlighted that the industry is at the dawn of a revolution that is going to completely reshape its foundations (Sperling 2018). This shift will reset the competitive scenario that companies have established in over a century since the introduction of the Ford Model T. Considering the number of companies that are approaching radical technologies like electrification, connected cars and autonomous driving, not every player is going to succeed. Furthermore, even though costs are arising, consumers' willingness to pay is not. Consumers are only willing to pay relying on current

business model, however, companies will require new business models to capitalize their investments. It is expected that by 2035, depending on the current development of emerging trends, automotive companies could lose the 30% of their revenues unless they introduce new sales methods (Srivastava, Tordjman, Seners & Vigani 2018). Automotive companies should move towards two directions: firstly, improving the efficiency of the current business model based on dealership, secondly, exploring new ventures for new business opportunities.

Along with the introduction of new mobility services, automotive industry's retail scenario will be composed by *traditional players, online-only sellers, e-commerce aggregators and third-party multibrand sellers*. Automotive companies should market test in order to find the efficient solution that does not negatively affects profitability. Even while the industry is making substantial bets on the future of automotive technology and the automotive business more broadly, companies must continue to develop and sell vehicles to make a profit in today's market. The shift towards new mobility services has many implications for the automotive industry. An increase in the use of new mobility services is going to decrease the purchase of car ownership causing losses in sales of new and used vehicles. Notwithstanding the loss car manufacturers might face due to mobility as a service, higher turnover and shorter life is expected for vehicles used by mobility providers. The most relevant impact that electrification, connectivity and autonomous driving will have on the automotive industry will be on the interaction consumers have with vehicles. These new technologies will change the way people use and value privately owned vehicles. Mobility as a service is going to contribute to a change from vehicle ownership to vehicle usership, generating space for new business models that do not involve ownership and associated costs (Spulber, Dennis, Wallace, & Schultz, 2016; Bailo, Dziczek, Smith, Spulber, Chen & Schultz 2018).

Technology to electrify and automate vehicles will probably take decades to proliferate, however, car manufacturers and suppliers have forced to invest if they want to have a share in the future of the automotive industry. Even though profits are not increasing, investments have continued to grow throughout the years. The current pace of investments is not sustainable in the long-term and automotive industry might face a contraction due to external economic factors, delaying the adoption and introduction of ACES vehicles.

Conclusive proposition 3: *Cooperation between stakeholders is perceived as a crucial element for companies' survival.*

The growth of new technologies and the subsequent increase in R&D costs have generated a decrease in companies' profitability. In order to recover from investments made, automotive companies have to cooperate each other. Automotive industry is characterised by hyper competitivity, nonetheless, companies are forced to join forces for improve the efficiency of their investments. This research has highlighted that relationships between different automotive companies are not easily manageable and usually clashing, competitor firms would avoid any kind of relationship (Bengtsson 1998). However, specifically in this stage of development of ACES vehicles, companies can take advantage of cooperation in increase productivity and efficiency of current products, development and introduction of brand-new ones and exploitation of underlined market potential (David & Slocom 1992; Mason 1993). One of the most important aspect of cooperation emerged between competitors is knowledge and the results of the study have confirmed that coopetition is likely to exist in the automotive industry because of the high knowledge requirements (Duysters, Kok & Vaandrager 1999; Fjelstad, Becerra & Narayanan 2004; Dittrich & Duysters 2007; Gueguen 2009; Mione 2009).

6.2. Managerial implications

This research has highlighted several managerial implications for automotive companies especially on how to address new technologies in order to properly exploit competitive advantage. What can be derived as first from this study is that the most important factor to be considered when evaluating entering a new market or adoption of technology is customer need. Requires of consumers should be clear and expressed in order for the company to propose the optimal solution without dissipating capital in improper R&D investments. Consumer knowledge is the most important tool automotive companies should manage before innovating.

Secondly, entry timing plays a crucial role in the success or failure of strategic decisions. As emerged during primary data collection, companies decide whether to entry based on internal and external factors. Internal factors as triggers and external factors as boosters.

An analysis of internal factors of the firm and external factors possibilities should be accurately approached by automotive companies in order to identify the optimal entry timing that increases competitive advantage. Notwithstanding, internal innovation orientation has been identified as one of the most relevant triggers of pioneering behaviour, companies might be forced by their corporate culture to constantly innovate regardless of profitability.

Lastly, companies should decide to focus on direct and internal development of technologies that are considered to be pillars of their strategy and not complementary assets. Automotive companies should externalise the development of certain technologies focusing on value creation for their consumers. In order to properly face the enormous and perpetual increase of R&D and production costs automotive industry's future is expected to be driven by cooperation between manufacturers, suppliers and technology and service providers.

6.3. Limitations and future research avenues

Several limitations to the research should be acknowledged during the investigation and interpretation of the presented results. Firstly, this Master's Thesis focused on automotive companies that are operating at a global level, specifically in relation to ACES. Therefore, generalisations regarding the literature about first-mover advantage (Lieberman & Montgomery 1988; 1998; 2013) and Suarez and Lanzolla (2007), Capone, Malerba and Orsenigo (2013), Song, Zhao and Di Benedetto (2013) should be prudently assessed. Industry selection seems to be particularly relevant in addressing first-mover advantage, later- mover advantage and competitive dynamics (Robinson 1988; Urban, Carter, Gaskin & Mucha 1986; Kalyanaram & Urban 1992; Duysters, Kok & Vaandrager 1999; Fjelstad, Becerra & Narayanan 2004; Dittrich & Duysters 2007; Gueguen 2009; Mione 2009). Furthermore, even though the multiple case study involved companies of four different countries (Germany, Italy, France and Japan) with strategic partners in several different locations, the empirically outcomes should be carefully applied to other companies in completely diverse countries, as for instance, China.

During the empirical primary data collection process conducted through the use of semi-structured interviews, it appeared that some of the information collected might be

influenced by the subjectivity of the managers and the willingness to support company's strategic decisions. Notwithstanding, information gathered through primary sources are coherent with the secondary data available and beforehand collected. When interviewing people, subjectivity is expected, and it may be considered as a coincidental human cognitive bias.

The choice of selecting four automotive companies has been based on the fulfilment of data saturation (Saunders et al. 2018), notwithstanding, multiple case study is not able to assure a representation to a larger population. The goal of this research was to study and analyse first-mover advantage in an industry that is corroborated by a tremendous technological shift and examining the competitive dynamics within it. This research aims at giving its contribution to the current literature about first and later mover advantage as well as competitive dynamics.

This study serves as a first step in the analysis of first-mover advantage and the change in competitive dynamics of the automotive industry under the lens of the new radical technological changes. More research is necessary in order to identify how each specific technology is reshaping the competitive scenario. Furthermore, future studies should examine factors that triggers companies' cooperation and establishment of cooperative entry modes. Finally, despite the selected companies all operate or have part of their headquarters in US (e.g. FCA) and Asia (e.g. Toyota and The Alliance Renault-Nissan-Mitsubishi), futures studies could be also conducted taking into consideration American and Chinese automotive companies. Even though they do not own a relevant share of the market, emerged and emerging companies are heavily investing on the development and implementation of electrification, connectivity, autonomous driving and creation of new mobility services. Furthermore, future will allow researchers to collect more data regarding autonomous driving, connectivity and mobility as a service, analysing which companies have won the new mobility clash.

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APPENDIX 1. INTERVIEW QUESTION OUTLINE

I. Introduction

1. Which are, in your opinion, the most important elements that a successful automotive company should manage in order to be successful?

2. How do you see the automotive industry in the future? Which are the technologies that will change the industry?

II. ACES relevance in the Automotive Industry

1. Regarding these four new markets, which are the ones you consider more important? Electric and hybrid vehicles, autonomous vehicles, connected cars and Mobility as a Service.

2. Do you consider approaching these new innovations crucial for the automotive industry in order to survive? Explain

3. According to the vision of your company, which are the markets your focusing more on and why.

III. Factors that influence strategic market decisions

1. When evaluating a new technology to be introduced, what are the most valuables indicators that drive the choice of implementation? (e.g. profit, market share, industry maturity, brand, etc.)

2. Which are the negative factors that stop a firm to develop in a certain market? What are the consequences to be avoided?

3. Do you think innovation is more driven by internal resources of the firm or by external factors (e.g. new regulations, new market standards, etc.)?

IV. Competitive Dynamics

1. How could you describe the competition in the automotive industry?

2. Have you ever heard about coopetition? Would you describe the automotive industry competitive scenario as so?

3. Which are the difficulties of competing in the automotive industry?

4. Do you think that cooperative entry modes are essential? If yes, which of the following: commercial partnership, joint ventures, M&A.

5. Do you think that competitor firms' choices affect other automotive companies' strategies?

V. First-Mover Advantage

1. Do you believe than entering a market as first could drive to some advantage for an automotive company?

2. Considering the previous question, where do you see first-mover advantage more relevant: electric and hybrid cars, self-driving cars, connected cars, Mobility as a Service.