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Analysis of business models for car sharing

Deliverable D3.1

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ACRONYMS

AV(s)	Autonomous vehicle(s)
CEO	Chief executive officer
D3.1	Deliverable 3.1
EV(s)	Electric vehicle(s)
FMLM	First mile last mile
GPS	Global positioning system
ICE	Internal combustion engine(s)
OEM(s)	Original equipment manufacturer(s)
P2P	Peer-to-peer
PHEV(s)	Plug-in hybrid electric vehicle(s)
SWOT	Strengths, weaknesses, opportunities, threats
WP3	Work package 3

SUMMARY

Car sharing has the power to improve mobility in cities, however its potential has yet to be achieved. The Dutch survey agency TNS Nipo found that despite 20% of respondents being open to the idea of car sharing, only 1% actually use it (van den Berg, 2017). McKinsey&Company (2012) found similar rates in Germany, where only 2.5% of the people living in cities of more than 100,000 inhabitants used car sharing, but 24% of them were considering using it. Furthermore, of those who did use car sharing, nearly one-third of them said that they expected to increase their use of car sharing over the next decade (McKinsey&Company, 2012). This potential growth holds profound changes for cities, both in air quality and urban design, as well as for vehicle manufacturers hoping to survive a rapidly-evolving era where automobile consumption is increasingly influenced by urbanisation, high technology and the sharing economy.

It is within this context that STARS is situated, as it strives to close the gap between current car sharing trends and the potential benefits. Deliverable 3.1, Analysis of Business Models for Car Sharing, helps to achieve this goal by exploring how car sharing organisations and the related automotive industry are currently operating. As such, D3.1 presents a brief analysis of the five archetypical or generic business model frameworks identified in car sharing schemes: 1) free-floating with an operational area; 2) free-floating with pool stations; 3) roundtrip, home-zone based; 4) roundtrip, station-based; and 5) peer-to-peer (P2P). These business model classifications were developed based upon D2.1, combining identified operational characteristics with business model variables.

The deliverable identifies two to four organisations operating under each of the five business models, reflecting on their unique setup and value proposition through the Business Model Canvas. The Business Model Canvas, developed by Alexander Osterwalder and Yves Pigneur (2010), looks at nine building blocks that ultimately influence each business model: key partnerships, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure, and revenues. The organisations corresponding to each business model are then evaluated individually and as a group, allowing for wider trends to emerge.

Building on this, each of the five business model classifications is then examined based upon its specific strengths, weaknesses, opportunities and threats (SWOT). This framework highlights their implementation feasibility, points out the specific markets they currently serve, and sheds light on their potential growth and profitability in the near term. Furthermore, the SWOT analysis allows cities of all sizes to better understand which schemes may be a better fit for their specific situation, as well as in which areas their existing car sharing companies may need greater policy support, should the city want to encourage the uptake of car sharing among citizens.

Finally, the deliverable discusses the implications of car sharing for the overall automotive industry. Changes in mobility patterns are leading to changes in consumption patterns, while changes in technology mean that new players are entering the scene. Traditional vehicle manufacturers are therefore expanding their core business activities to join the car sharing movement, becoming key partners in many car sharing organisations. Their relationship with these organisations and their influence on the business models is thus explored, as are the innovations they are bringing with them.

1 Introduction

Car sharing, which allows a car to be used by multiple drivers throughout the day/night, first made its debut in Europe in the 1980s (Wagner & Katzev, 1996), long before the sharing economy ever emerged. While the popularity of car sharing never took off, it is a different story today, where growing urbanisation—particularly by millennials who are opting to live in cities where the costs of car ownership are high (Muoio, 2017)—is changing mobility patterns and desires. In fact, car sharing in recent years has witnessed double-digit growth, particularly in bigger cities where the costs of owning a car can be more easily offset due to a higher-population density needing to be mobile within the same general area (Monitor Deloitte, 2017). Indeed, sharing a car not only reduces the individual costs of ownership, but it also reduces social costs such as road congestion, energy use, and noise and air pollution (Firnkorn & Müller, 2015). Moreover, as most cars sit idle for most of the day (van den Berg, 2017), car sharing frees up space in the city (McKinsey&Company, 2012; Perboli, Ferrero, Musso & Vesco, 2017). In the city of Bremen, each shared car proved to be the equivalent of taking 15 private cars off the road (Glotz-Richter, 2016).

With an estimated six million car sharing users and 68,000 cars in circulation in Europe's car sharing market in 2016, Europe now accounts for half of the worldwide car sharing market (Monitor Deloitte, 2017). Such a thriving market has led to increased competition and innovative business models, resulting in the emergence of new forms of car sharing, such as those with a P2P business model. Meanwhile, existing organisations are striving to set themselves apart from each other with their various partnerships and membership benefits, offering consumers greater options. For example, it is now common for an organisation to cooperate with local governments so as to enable free city parking or fewer driver restrictions for its members. Many car sharing organisations are also integrating with local public transport, in efforts to minimise the "first mile last mile" (FMLM) problem that many commuters face (van den Berg, 2017). Technology and integrated digital platforms are also ways in which car sharing organisations are trying to make themselves more attractive. Features such as keyless entry, real-time parking options on mobile apps, and up-to-date global positioning system (GPS) maps have a growing presence as car sharing features.

Car sharing organisations are also diversifying to target specific groups. For example, electric vehicles (EVs) that reduce both noise and air pollution are appearing as part of more business models to attract eco-conscious individuals; there are also programmes and marketing campaigns targeting people moving apartments, as well as tourists, parents of young children in need of a car seat, and residents of social housing projects, among others. Such efforts are evident among both, for-profit and not-for-profit organisations, as they all try to cater to a segment of the population and capture that portion of the market.

Prices are another differentiating factor emerging among car sharing business models. Consumers have the option of choosing plans that vary in whether and how much they must pay, be it for a subscription fee, deposit, or rental usage fee, which may be based upon the distance driven or the time a car is used (or both). Differences in pricing also come in the form of fiscal advantages. Some car sharing programmes offer reduced rates during typically low periods of usage (such as for night-time driving), and others provide discounts on unused time for those

drivers who return the car early. For programmes with EVs, it is not rare for drivers to receive bonus minutes for each percent that a battery has been recharged upon its return.

Car sharing organisations can be classified into five general business model frameworks. These five frameworks were developed based upon the work completed in D2.1, combining organisations' operational characteristics with business model variables. They include: 1) free-floating with an operational area; 2) free-floating with pool stations; 3) roundtrip, home-zone based; 4) roundtrip, station-based; 5) P2P. Each business model has its own strengths and weaknesses, as well as opportunities and threats. These factors will be explored, as will how the business models fare in terms of flexibility and distance travelled. It should be noted that there is no one business model that is better than the others. The model that fits a rural area will not be the same one that fits a dense urban area. Likewise, the choice of consumers often depends upon personal preferences. The same goes for local authorities, who may have a preference for one type over the other, depending upon the policy outcomes they want to achieve.

Automotive players, such as original equipment manufacturers (OEMs) and car rental companies, are increasingly involved in the car sharing market (Monitor Deloitte, 2017). Their interest in the market has resulted in multi-element business model strategies that serve to keep cars relevant and branded. OEMs in particular are experiencing a shift from being a hardware provider to being a solution provider (Monitor Deloitte, 2017). Their involvement in car sharing programmes is also encouraging increased mobility at affordable rates, enabling car sharing to become more integrated and widespread. Leading vehicle manufacturers proposing their own car sharing programmes often have four common pillars: 1) connectivity, 2) autonomous, 3) shared programs or services, and 4) electrification and/or alternative propulsion. These four pillars combine technology with consumer demands, and they are pushing car sharing business models to innovate. Car sharing programmes that provide integrated, accessible, flexible and convenient services could very well become a part of the larger mobility network of cities in the near future.

2 Trends in Car Sharing Business Models

2.1 Analysis of Car Sharing Business Models

Today's car sharing organisations can be classified into five main types of business models, based upon their operational characteristics and business model variables identified in D2.1: 1) free-floating with an operational area; 2) free-floating with pool stations; 3) roundtrip, home-zone based; 4) roundtrip, station-based; and 5) P2P. Each has its own distinct characteristics, partner tendencies, and pricing habits, regardless of whether it is for-profit or not-for-profit. These will be explored in more detail, but first it is important to understand the generic concerns plaguing all car sharing organisations.

First, all business models struggle with the problem of peaks in demand relative to supply. For example, the month of August is a time when many households want and need a vehicle to go on a holiday. Another peak time is when there is a large concert or sports event that increases travel demand. While cities and venues often arrange extended public transport options for such events, car sharing remains a necessity for many event goers who are in search of an FMLM solution.

Second, there is some evidence to suggest that the vehicle fleet is bought with specific features in mind, even though most of the time the true potential of the vehicles (in terms of speed, range, carrying capacity, etc.) is neither used nor required. While car sharing schemes may attempt to have a range of vehicles available, it is still likely that the product mix will not be able to match the peaks and troughs in demand. This will become more challenging in the future, as the range of available technologies and vehicle package specifications grows.

Third, there is little understanding of what happens to car sharing service users over time, as car sharing programmes are still relatively new. There is some debate as to whether or not car sharing schemes are a stepping stone to private car ownership. If it is the case that car sharing users (especially non-car owners) do eventually migrate towards individual car ownership, then car sharing programmes will need to continually reinvest in recruiting new members, and they may struggle to keep membership numbers growing if there is a high rate at which existing members leave.

Apart from these business model concerns, critics of the sharing economy have also identified several concerns related to legal compliance, taxation minimisation, labour laws, regulatory frameworks such as for health and safety, and adverse social or economic consequences. The dynamic character of evolving actors in the sharing economy, such as Uber, Airbnb, and others, has tended to outpace regulatory intervention. Such concerns, and indeed benefits, that may arise out of various forms of shared mobility are relevant to both future mobility provision and to the continued viability of car sharing.

The five business models employ a mix of four potential geo-spatial factors. Within those, there are two main divisions: 1) free-floating versus roundtrip, and 2) area/zone-based versus station-based. These factors influence both the demand and supply side aspects of the business models, be it the type of drivers attracted, car rental patterns employed, or organisational costs involved. As these factors can be mismatched with one another, their generic characteristics will

first be explored. A user's perspective will also be presented, taking into account how each factor influences the distance travelled and degree of flexibility offered by a program. The five individual business models will then be explored following that, highlighting any differences that emerge when these factors are combined.

★ **Free-floating versus roundtrip**

Free-floating business models enable members to go from point A to point B, thereby enabling one-way trips and potentially cutting drivers' journey times (and rental costs) in half. As free-floating services are ideal for compact urban areas, they usually offer smaller cars for shorter trips, and charge based on the time travelled rather than the distance (Monitor Deloitte, 2017). Perhaps for this reason, the free-floating organisations presented in this deliverable often counted smaller increments of time (minutes) in their rental usage fees. Sociodemographic data for free-floating business models shows that they tend to attract younger members (33 years old), with roughly 70% of them male; 17% of the overall membership lives in a household with kids, and the attitude towards a car is that, "Driving a car is fun" (Nehrke, 2018).

Roundtrip business models are more traditional, in that they require cars to be returned to the zone or station from which they started. For this reason, they are less flexible than their free-floating counterparts. Roundtrip business models tend to have longer on-average booking times lasting for several hours or a day, and they cater to trips of much longer distances, such as for leaving a city to visit the surrounding rural areas (Nehrke, 2018). Sociodemographic data for roundtrip business models shows that they tend to attract slightly older members (44 years old), with a more equal split along gender lines (56% male, 44% female); 35% of the membership lives in a household with kids, and the attitude towards a car tends to be that, "A car is a means to an end" (Nehrke, 2018).

★ **Area/zone-based versus station-based**

Area/zone-based business models provide users with the option to park wherever they want, within a neighbourhood or designated area. This means that drivers are theoretically able to park closer to their final destination than a station might otherwise permit. Also, as drivers do not have to search for an open parking space at a specific station, they can potentially save time by parking anywhere that is vacant. However, this is highly dependent upon whether or not there are city parking spaces available in the first place—otherwise, drivers may waste their time (and consequently money) searching for an open space. This drawback is not considered a major debilitating factor for area/zone-based business models in terms of flexibility, as it largely depends on a driver's custom itinerary [such as the particular location (s)he is in, and the particular hours/time of day the car is being used]. Many organisations are also starting to offer drivers help in finding and reserving parking spaces to get around such issues.

Area/zone-based organisations do not have to rent city space for pool stations, although they may have to spend money instead on moving cars that get parked outside of the indicated zones. Likewise, if all cars in the zone tend to be parked in one specific area, organisations may have to move the cars around within the zone, so as to keep them visible and equidistant. In the same manner, if a car is obscurely-parked, users and maintenance employees may have a hard time finding it.

Station-based organisations require cars to be picked up and parked at a station. These organisations tend to offer a more reliable service, as customers know where, exactly, to find the cars. However, they tend to offer drivers less flexibility, as the stations may be far from where drivers want to go, thus requiring extra travel time or a multi-modal trip. Similarly, if the stations are full, drivers will have to return their car to another station that is further away. With station-based business models, drivers either hope to find a spot at the closest station, or they must reserve one on a platform in advance.

How the above factors combine to influence the business models will now be explored. A chart (Figure 1) mapping where each business model falls in terms of distance travelled and flexibility provided will then be presented, enabling a general comparison of the business models.

2.1.1 Free-floating with an operational area

In this business model, members of a car sharing organisation choose a car nearby and then return it by leaving it in any valid parking spot within a defined district. This is the most flexible of all business models, providing drivers the freedom of making one-way trips, as well as offering them wide parking options. However, business models falling under this category do not offer drivers a lot of distance, as both the free-floating factor and the area/zone-based aspect are designed more for inner-city travel. As such, this results in drivers being somewhat restricted in the distance they can travel (unless they do not care to terminate the rental period upon arrival).

2.1.2 Free-floating with pool stations

Organisations that operate under this business model are perhaps the rarest on the market. In fact, all three of the organisations presented in section 2.2.2 are owned by the same group (Bolloré). For these organisations, members choose a car from a pool station and return it to either the same pool station, or any of the organisation's other pool stations spread across the city.

As this business model is currently heavily influenced by an EV network in urban areas, the distance travelled is confined to the life of the battery and the charging point locations. For the cars to be able to go their maximum distance, downtime is required for the batteries to sufficiently recharge, and users must wait for them to do so. This limits the degree of flexibility drivers would otherwise have. Likewise, although the free-floating aspect offers some degree of flexibility, providing drivers with the choice of making trips from point A to point B, the station-based aspect means that drivers must go to a set location to park, taking away their flexibility in terms of parking choices.

It should be noted that organisations operating under this business model tend to rely on large fleets. Due to the high fixed costs from the vehicle fleet acquisition and EV network infrastructure, this business model is not currently profitable. An assessment of Autolib's revenues and usage rates in Paris shows that as membership has increased, usage rates have gone down. This business model therefore requires more than just subscription fees and rental usage fees to be financially profitable. Some organisations have started selling advertisements that go on the cars, thus diversifying their revenue. However, not all organisations with this business model operate in a city where they are legally allowed to do so (Louvet & Jacquemain, 2017).

2.1.3 Roundtrip, home-zone based

Roundtrip, home-zone based organisations offer a service where drivers must return the car to the general area from which they started. It might be helpful to think of it as a neighbourhood business model, where the vehicles are often located in residential areas, for use by local residents. While the roundtrip aspect means that drivers do not have the flexibility to take one-way trips, the area/zone-based aspect means that cars can be parked in any valid spot, as long as it is within the same zone or neighbourhood as that of the departure. This business model therefore provides users with some degree of flexibility in terms of where they park the car.

In terms of distance, it is a bit of a mix. While the area/zone-based aspect works best in compact urban areas, the roundtrip aspect means that users can still travel longer distances. Likewise, both the distance and flexibility can vary, depending upon the fleet's specifics. For example, EVs (even those offered by an organisation without its own stations) are typically confined to urban areas, as they are confined to the life of the battery. EV fleets also require downtime for charging, and users lose flexibility in this respect. Nonetheless, most of the organisations operating under this business model do not currently offer EV-only fleets, so this business model offers a bit more in flexibility and is not far off from the centre in terms of distance.

2.1.4 Roundtrip, station-based

Organisations with a roundtrip, station-based business model operate under a more traditional structure: members choose a car from a station and then return it to the same station when they are done. Both the roundtrip and the station-based aspects mean that this model lacks flexibility, as the cars must be returned and parked at the departure station.

In general, [roundtrip] station-based services tend to be for longer, less frequent/mundane drives. The cars therefore get more wear and tear, but are driven by fewer users. They do not have to be located in large, compact cities to be successful, and they often have a wider fleet variety. As this is the more traditional business model, it is not rare to see organisations in this category that are more than 20 years old. Cooperation with partners in various areas is very important for expanding their network (Monitor Deloitte, 2017). Indeed, the organisations presented in this deliverable for this business model all have well-rounded partnerships with a wide variety of players.

2.1.5 Peer-to-Peer (P2P)

P2P organisations operate much like roundtrip organisations, only it's the car owners' own cars that get rented out, rather than an organisation's vehicle fleet. This allows anyone with a car to make money by renting it out when it would otherwise be sitting idle. When drivers are done with the car, they return it by driving it back to the car owner's home or home-zone area. Where they return it will often depend upon the size of the city in which the P2P organisation is operating, as many car owners in big cities may not have private parking spaces, and drivers will therefore park it on public streets nearby (essentially making it area/zone-based).

The value proposition, customer segments, and other key features of P2P organisations result in a very different business model from those of the roundtrip organisations. Likewise, as

each car owner brings his or her own car—and personality—to the group, each organisation's business model within this group performs very differently from the others.

While a hodgepodge of members' cars offers the members great flexibility in driving options, the options will depend on what the car owners offer. The same goes for the time availability of the cars, although there are very successful organisations with this business model that cater to both, short- and long-distance trips. The only downside is that these organisations typically require a physical key to open the cars, and users may find that arranging for the key swap and meeting the car owner is time consuming and less flexible. While many P2P organisations promote the social aspects of getting to know the other members, some are now offering technology platforms that allow drivers to bypass this step, offering them instant chip card or mobile access. For these reasons, the P2P business model offers drivers a medium degree of flexibility overall.

P2P business models tend to be for the longest trips distance-wise. An interview with Jaume Suñol, Drivy's Country Manager for Spain, revealed that P2P business models compete with daily car rental companies, particularly when it comes to tourists and young people (personal communication, March 2018). This sentiment is reflected in the organisation's strategy. Drivy's founder and Chief Executive Officer (CEO) Paulin Dementhon, and Drivy's Chief Development Officer Patrick Foster, commented in a separate interview online that the organisation focuses on trips lasting an average of two days, as ride-hailing services inside cities are more convenient than car sharing services, and therefore too competitive (Dementhon & Foster, 2018). In explaining how its prices are calculated, the French Drivy website lists time spans of one and two days, one week, and even one month (Drivy, n.d.).

As P2P organisations do not have to provide a vehicle fleet or stations, this business model alleviates upfront costs (Hampshire & Gaites, 2014). This also enables lower-density communities, such as suburbs and smaller towns, to partake in car sharing as well (Hampshire & Gaites, 2014; momo, 2009).
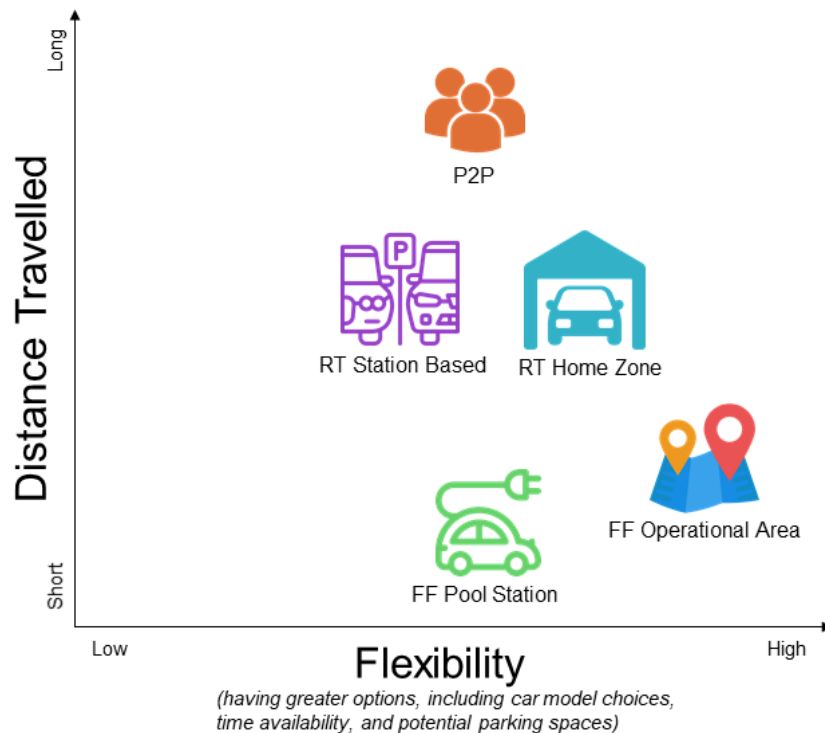
Figure 1: Distance Travelled vs. Flexibility of Business Models

For the chart above, distance travelled considers both how far drivers can theoretically go, as well as how far the average driver travels. Flexibility is defined as having greater options—this includes car model choices, time availability, and potential parking spaces. While there are many dimensions that can provide users "flexibility," often it will ultimately depend upon a driver's individual circumstances and the specific features of an organisation, rather than an organisation's business model classification. For example, an organisation that only offers a mobile app-based system to unlock its cars would be considered less flexible to older drivers who are unaccustomed to using smartphone technology. In such cases, an organisation that offers both smartphone and chip card options would be considered more flexible, as such drivers would benefit from having another option. Such specific instances are many, and are not reflected in the chart above.

In general, there are three main characteristics where each organisation's 'user appeal' will vary. How these characteristics play out in terms of individual business model variables will be explored in section 2.2 of this deliverable.

★ **Membership system rules:** The membership system rules provide for the first defining parameters of the car sharing scheme in question. Lower cost and simplicity may be traded off against flexibility or use, for example. In broad terms, the individual current and expected use patterns will need a degree of 'fit' with the system rules. This observation applies to both, day-to-day activities and for more occasional or unpredictable trips. It should be noted that scheduled public transport services and the mobility offered by private vehicle ownership confer upon the user a relatively high degree of certainty over travel arrangements. Extant research has identified that time constraints, the need to book ahead, and a larger variation in travel times have significant negative effects on people's intention to use a shared-car (Kim et al., 2017a; 2017b). Other 'external' or contextual

factors that might constrain the acceptance of car sharing business models include socio-demographic considerations with younger people more likely to adopt car sharing (Prieto et al., 2017), as is also likely to be the case in households already owning a car (Nijland and van Meerkerk, 2017). While there is a substantial body of research on consumer or user attitudes and actions regarding car sharing (see for example Becker, Ciarai, & Axhausen, 2017; Kent, Dowling, & Maaslen, 2017), as well as some research on the implications for vehicle manufacturers (Bellos et al., 2017), there is little on the business model aspects of the car sharing schemes themselves.

★ **Operational effectiveness of the organisation:** The operational effectiveness of the car sharing scheme is crucial for long-term use and acceptance. Ideally, a car sharing scheme is easy to understand, has clear pathways to join and subsequently to book, use and return cars, and is able to manage the stock of cars in use relative to demand. There may be operational service levels defined (e.g., a car may be guaranteed if booked a certain period in advance). There are multiple dimensions to operational effectiveness, including the functionality of the website or other interface; the resilience of the data management system; the management of the vehicle stock, with all the complications of service intervals, impact damage, vandalism or other abuse; and the acquisition and disposal of stock.

★ **Range and quality of the vehicles available:** The range and quality of vehicles in use for a car sharing scheme can also be significant to the appeal of the scheme. Some car sharing schemes may be tied to a specific manufacturer and even to a single car model. Others may wish to attempt to emulate the overall stock of vehicles in use. There may be deliberate bias (e.g., to offer only EVs or only "city" vehicles). Historically, the market for new cars has been very sensitive to issues of brand value, but individual vehicle manufacturers may regard car sharing schemes quite differently. One manufacturer may consider car sharing schemes as an opportunity to expose potential customers (i.e., those who might buy a new car) to its brand. In this case, the manufacturer might supply highly-specified vehicles to the car sharing scheme, which in turn will grow customer response. Alternatively, a manufacturer may regard such schemes as an opportunity to shift surplus vehicles in stock. Another may even refuse to participate. For the car sharing schemes, the terms on which they obtain, keep and dispose of vehicles can have a significant bearing on the range and quality of vehicles on offer. This can therefore be an important determinant of viability.

2.2 Comparison of Individual Business Models through the Business Model Canvas

Each of the five business models will be explored through illustrative examples of organisations operating with that business model. Moreover, a Business Model Canvas (Osterwalder & Pigneur, 2010) for each organisation will be presented. Each Business Model Canvas includes nine building blocks that help to understand the value of an organisation and how it functions. It is helpful to think of the nine blocks not as separate entities, but as interconnected parts. The nine blocks are:

★ **Key Partnerships:** This block includes business partners, shareholders, or organisations with which the organisation cooperates. For car sharing organisations,

this could be local governments, car rental companies, public transport operators, businesses, car manufacturers, etc.

★ **Key Activities:** This block lists the main functions of the organisation, and the activities which help it reach its customer segments, build revenue and create value. These activities include production, problem solving, and managing platforms or networks. For many car sharing organisations, this block includes fleet maintenance, platform management, and customer service, to name a few.

★ **Key Resources:** This block contains the main resources needed to complete an organisation's key activities, reach its customer segments, build revenue and create value. Key resources can include physical assets, intellectual property, human resources, and financial resources. Each business model will have different key resources, but car sharing organisations often consider their IT platform, vehicle fleet, and member benefits as key resources.

★ **Value Proposition:** This block focuses on the value the organisation brings to its customers, and how it is helping to satisfy customer needs. The value can be quantitative (price, speed of service, etc.) or qualitative (design, customer experience, etc.). This block is highly individualised, based on each organisation's key partners, resources, and channels. Some general examples could be offering car sharing members free parking, providing bonus minutes for bringing cars back with a full tank, or not requiring members to pay a deposit.

★ **Customer Relationships:** This block is concerned with the nature of the relationships an organisation has with each of its customer segments. For example, some car sharing organisations may have an actual shop that customers can visit, others may have a hotline that they can call.

★ **Channels:** The channels block lists how a company communicates with its customer segments, so as to deliver its value proposition. For car sharing organisations, common examples include the website, mobile app, or customer service shop – anything in which customers have the chance to interact with the organisation.

★ **Customer Segments:** The customer segments block includes the target audiences of the organisation. It also includes any groups that are receiving value from the organisation's key activities. Typical car sharing customer segments include eco-conscious individuals, students, and businesses looking to replace company cars.

★ **Cost Structure:** This block includes the large, general costs of the organisation, be it key resources, key activities, or even key partnerships. Examples within a car sharing context include fleet acquisition, chip card technology, and customer service.

★ **Revenues:** The revenues block includes any revenue coming into the organisation, be it from customers or partners. Typical revenues for car sharing organisations include subscription fees and car rental usage fees.

The information for each Business Model Canvas presented below has largely been gathered from the survey responses in WP2. In some cases, the information was supplemented with analysis from additional desktop research. The business models examined are:

★ Free-floating with an operational area: car2go, Zipcar, DriveNow

★ Free-floating with pool stations: Autolib, Bluetorino, Bluecity
★ Roundtrip, home-zone based: Juuve, Partago
★ Roundtrip, station-based: Ubeeqo, Cambio, Greenwheels, Io Guido
★ P2P: Dégage, Drivy, CarAmigo

2.2.1 Free-floating with an operational area

2.2.1.1 car2go

Launched in Germany in 2009, car2go was the world's first free-floating car sharing organisation (Firnkorn & Müller, 2015). With Daimler as a key shareholder, car2go is the world's largest free-floating car sharing organisation, and is based in 26 locations in eight countries around the world (Daimler, n.d.-c).

The free-floating with an operational area business model allows car2go members to take one-way trips and park the cars within specified districts. This includes drivers headed to the airport. As all cars are either Mercedes-Benz or car2go smart models, the car sharing programme attracts customers who want to drive premium car models. Businesses are another key customer segment. The organisation has some electric cars available as well, targeting eco-conscious individuals.

Car2go's real-time reservation system enables people with last-minute plans to book cars just 20 minutes in advance (car2go, n.d.). Its value proposition also provides drivers with free parking in public car lots, and awards them with free minutes for refuelling or recharging cars with low tanks. Customers pay a small subscription fee, plus rates based on both the time and kilometres driven. Deposits are not required.

Table 1: Car2go's Business Model Canvas

2.2.1.2 Zipcar

Avis Budget Group's Zipcar focuses on urban areas and college campuses across Europe and North America (Avis Budget Group, n.d.). The organisation strives to offer something for everyone with a wide selection of cars that serve multiple purposes, including moving apartments or hauling office supplies (Zipcar, n.d.-a).

The company has several partners with which it works, boosting its value proposition. For example, Zipcar works with local authorities to secure free parking on public streets for its members; it works with city councils to set up electrification bays for the EV portion of its fleet; it provides its members with discounts to local businesses that it partners with; and it integrates its network with public transport.

Depending on the package chosen, members may pay a monthly subscription fee. Their trip fees are calculated based upon the length of time they use the car, and overcharge fees (Zipcar, n.d.-b). Deposits are not required.

ZIPCAR BUSINESS MODEL

zipcar — *Business Model Canvas*

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Local authorities - City council (for the electrification of some bays) - Local businesses (for member discounts) - Academic researchers - Key shareholder: Avis Budget Group (a publicly traded company)	- Maintaining fleet - Service provision (unlocking cars remotely) - Platform management	- Discounts to local business partners - Free street parking - Offers electric cars - Fuel, city congestion charges, insurance & 60 miles/day included in membership - No deposit required	- 24/7 roadside assistance & member services hotline - Self service	- "For everybody" - Smartphone users - Businesses - University students - Movers (or haulers of office supplies) - On-the-go people who can book last minute
	Key resources - Vehicles - Chip card technology - Strategic parking on public streets		**Channels** - Website - Smartphone app - Call centre	

Cost structure	Revenue streams
- Purchase & maintenance of fleet - Fuel - Insurance	- Monthly subscription fee (depending on package) - High-risk driver & rule-breaking charges - Usage fee (minute, hourly & daily rates; per km if over 60km)

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Table 2: Zipcar's Business Model Canvas

2.2.1.3 DriveNow

DriveNow, a wholly-owned subsidiary of BMW Group that has a strong partnership with Sixt car rental company (BMW Group, 2018b), launched in Germany in 2011. The organisation offers BMW and MINI models (DriveNow, n.d.-a), competing with car2go for drivers and companies who prefer premium cars. DriveNow's key customer segments are very similar to those of car2go, as it offers the option of cars that are 100% emission free for eco-conscious individuals, and it also enables drivers to go to/from the airport. Furthermore, customers have the option of booking a car with a booster seat, targeting families as well (DriveNow, n.d.-b).

DriveNow's value proposition provides its members with free parking anywhere in the specified zone. Drivers are also allowed to park the cars and "keep" them, without having to end their rental period (DriveNow, n.d.-b). For customers that refuel normal cars or recharge EV cars, they are awarded with 20 bonus minutes (DriveNow, n.d.-c; DriveNow, n.d.-d).

Depending on the city/branch, members may pay a deposit. A one-time subscription fee depends upon the plan members choose, but it is no more than roughly EUR 25. All drivers are charged based on the time they use the car.

Table 3: DriveNow's Business Model Canvas

2.2.2 Free-floating with pool stations

2.2.2.1 Autolib

Owned by Bolloré Group, Autolib started rolling in 2011 and is the first fully-electric car sharing service in Paris (Autolib, n.d.-a). It targets both eco-conscious individuals and urban drivers who need a compact car to get around the city. The free-floating with pool station model allows members to take one-way trips and then park the car at a number of charging stations that have ideal locations around the city.

Autolib offers its members a service that is complementary with public transport, as many of the stations are located at metro stations or bus stops. Users have the option of adding their Autolib account to their existing public transport card, making multi-modal transport easy. Charging stations are often strategically placed near metro stations or key commercial and residential areas. For members who buy an annual pass, they have the opportunity to earn points and access a range of benefits and deals (Whaller, n.d.).

Drivers pay based on the time they use the vehicle (per minute of use after a set fee for the first 20 minutes). They have the option of paying a monthly fee throughout the year, or paying a reservation fee (EUR 1) each time they use the service (Autolib, n.d.-b).

Despite being the world's largest free-floating with pool stations organisation (in terms of vehicle fleet size and the number of subscribers), Autolib continues to postpone its date of financial

profitability. Analysis shows that as membership increases and vehicle availability decreases, users are less likely to choose Autolib for their trips (Louvet & Jacquemain, 2017).

Table 4: Autolib's Business Model Canvas

2.2.2.2 Bluetorino

Owned and operated by the same Bolloré Group as Autolib and Bluecity, Bluetorino was founded in 2016 and is Turin's first fully-electric car sharing service (Févry, 2016). The organisation operates in much the same way as its sister business models, but it has a wider target audience. Bluetorino offers a price package specifically for young people and students, and also reaches out to existing EV owners, allowing them to buy a pass to recharge their own private EV at a Bluetorino charging station (Bluetorino, n.d.).

Like many of its car sharing competitors, Bluetorino offers its members public street parking. There are also reserved parking spaces in typically-controlled areas, such as the old city centre (Févry, 2016). Members have access to a real-time parking reservation system, and maintenance and insurance costs are bundled into the price.

Most users will pay a monthly fee, though this depends upon the package chosen. After that, users pay based upon the time the cars are used, either per minute or per hour (Bluetorino, n.d.).

BLUETORINO BUSINESS MODEL

Business Model Canvas

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Local government - Automotive co.: CECOMP - Car design firm: Pininfarina - Battery co.: batScap - Tyre co.: Michelin - OEMs: PSA Peugeot Citroën & Renault - Key shareholder: Bollorè Group	- Platform maintenance - Fleet maintenance - Customer service **Key resources** - Vehicle fleet - GPS equipment - Charging points - Parking reservation technology - Chip card technology	- 100% EV fleet with complimentary navigation systems - Public street parking & access to old city centre - No deposit - One-way travel - Real-time parking reservation system - No parking, fuel, maintenance or insurance costs - Charging points for drivers of private EV cars	- 24/7 customer service call centre - Automated app services - Connected cars **Channels** - Website - Mobile app - Customer service call centre - Charging points	- Tourists - Students - Families - Drivers needing last-minute reservations - Drivers who wish to make short trips in the city - Drivers of private EV cars needing to plug-in - Eco-conscious individuals in support of local development

Cost structure	Revenue streams
- Fleet maintenance - IT technology & platform maintenance - Personnel costs - Customer service costs	- Monthly or annual subscription fees (no more than €5/month); daily subscriptions for tourists - Usage fees based on minutes driven or hours using charging station; tourists can rent by the day

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Table 5: Bluetorino's Business Model Canvas

2.2.2.3 Bluecity

Another Bolloré Group subsidiary, Bluecity is London's first fully-electric car sharing programme that gets drivers from point to point (Bluecity, n.d.). Launched in 2015 (Spanier, 2015), Bluecity targets much the same crowd as any fully-electric car sharing program. However, it also advertises how its cars are equipped with airbags and isofix, meaning parents can bring their children's car seats and easily install them in the cars. Bluecity also promotes how its cars are connected, offering a GPS, an on-board computer, and 24/7 assistance, all "at the touch of a button" (Bluecity, n.d.).

The organisation cooperates with individual borough councils in London to offer its users no parking fees. Drivers also have access to a real-time reservation system on the IT platform, saving them time when parking at a busy charging station. Membership fees are GBP 5 (EUR 5.72) a month, with usage fees of GBP 0.17 (EUR 0.19) a minute (Bluecity, n.d.).

BLUECITY BUSINESS MODEL

Table 6: Bluecity's Business Model Canvas

2.2.3 Roundtrip, home-zone based

2.2.3.1 Juuve

Founded in 2016 and based in Rotterdam, Juuve is a small organisation with no more than 10 employees (Juuve, n.d.-b). Its business attracts car enthusiasts who want to try driving new models, and a key audience is those who are open to new forms of mobility. One unique aspect of its business model is its partnership with the car leasing company Justlease and car manufacturer Peugeot. In addition to offering car sharing services, Juuve also offers its members the chance to car share while car leasing.

While members do not yet have free city parking, the organisation has arranged with local authorities to provide them with discounted parking. Its value proposition also offers members the opportunity to drive new cars with keyless entry. The car sharing platform enables members to upload photos of the cars they drove after their session, so that they have proof of the condition in which they left them. Keeping with the online theme, members are encouraged to blog about their car sharing experiences, and they get EUR 20 credit for each post they make. Members who lease cars pay by monthly fees starting from EUR 99, while typical car-sharing members pay usage fees that are based on both the kilometre driven and the hours used (Juuve, n.d.-a).

JUUVE BUSINESS MODEL

Business Model Canvas

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Local government - Car leasing company (Justlease) - Car manufacturer (Peugeot)	- Contracts to offer better services to members - Vehicle acquisition & maintenance - Geo-localisation of cars **Key resources** - New & diverse vehicle fleet - Real-time IT platform	- Bloggers get €20 credit for sharing their experiences - No fuel, insurance or maintenance costs - No deposit or subscription fee - New cars with keyless entry - Can also lease car - Discounted city parking - Members upload photos of cars, as proof of condition	- Mobile app - Roadside assistance - Blog where drivers share their experiences **Channels** - Website - Mobile app - Member blog	- People in need of a second car - Drivers looking to make last-minute reservations - Car enthusiasts who want to try new models - Drivers who are open to ridesharing & leasing cars - People in need of a car for the weekend

Cost structure	Revenue streams
- Vehicle fleet & maintenance - IT platform & real-time app - Personnel costs	- Monthly subscription fee for drivers who lease cars (from €99) - Usage fee (by the hour & per km)

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Table 7: Juuve's Business Model Canvas

2.2.3.2 Partago

Partago, a non-profit co-operative based in Ghent, offers a fleet of only EVs to its members. Founded in 2015 (Partago, n.d.-b), the organisation receives discounted prices from car manufacturers on new cars. It tries to serve all city residents, from those in need of a quick replacement for their existing car to those in need of a family-sized vehicle. Businesses who want to provide their employees with cars are also encouraged to join (Partago, n.d.-a).

In addition to free city parking, drivers have reduced rates for night driving, and can receive credit for any unused time if they return the car earlier than planned. They also have minutes added to their cards for every percent that a battery gets recharged. Members receive a comprehensive insurance package, can access cars via a chip card or smartphone, and receive a co-operative newsletter that keeps them updated on the organisation (Partago, n.d.-a).

While insurance is bundled into the price, co-operative members do have to pay an initial deposit of EUR 500. Members purchase pre-paid travel credit packages, based on the hours of driving they would like, though their usage fees are deducted based on the kilometres driven and the minutes used.

PARTAGO BUSINESS MODEL

Business Model Canvas

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Car manufacturers (discounted prices for new cars) - Businesses who want to provide employees with cars	- Fleet maintenance - Insurance contracts - Breakdown assistance - Co-operative services **Key resources** - Chip card/ smartphone technology - Comprehensive insurance package	- 100% electric (& same model, so easy to drive) - No subscription fee - Free city parking - Reduced rates for night driving & unused time (if back early) - Time added to charge card for every % a battery is recharged - Non-profit co-operative - No fuel costs	- Customer service - Smartphone services - Co-operative services (newsletter, etc.) **Channels** - Website - Mobile app - Telephone - Customer service centre - Social media	- Families - Eco-conscious drivers - Smartphone users - People who like to be part of a co-operative - Easy startup for people who need a quick car replacement - Businesses who want to provide employees with cars

Cost structure	Revenue streams
- Personnel costs - Vehicle fleet acquisition & maintenance - Insurance contracts - IT platform management	- Pre-paid travel credit packages, in hours of driving - Usage fees (per km and by the minute) - Deposit of €500

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Table 8: Partago's Business Model Canvas

2.2.4 Roundtrip, station based

2.2.4.1 Ubeeqo

Ubeeqo was founded in Paris in 2008, under the name Carbox (Ubeeqo, n.d.). It has since spread to other major European cities, although it appears to operate on a largely local basis, where partnerships with local governments, public transport operators, businesses, and car manufacturers/distributors vary. Like many of its counterparts, the organisation targets businesses looking for a company car alternative, as well as people in need of a car for mundane tasks that do not require much planning in advance, such as grocery shopping. Inhabitants of social housing are also a key audience, as are tourists at hotels. Ubeeqo focuses on how the service is simple and easy to use.

The value proposition largely depends upon the branch. However, drivers receive street parking, and may have special tariffs on public transport. They can also use their public transport card for Ubeeqo transactions. Ubeeqo offers its customers the chance to lower their insurance risk by up to EUR 500. Subscription fees vary, but in general are less than EUR 10 a month. Drivers pay usage fees based upon the distance (kilometre) and time travelled (hourly and daily rates).

Table 9: Ubeeqo's Business Model Canvas

2.2.4.2 Cambio

With the merger of three existing car sharing companies (StadtteilAuto Aachen, StadtAuto Bremen and StattAuto Koln), Cambio was formed in 2000 (Cambio, n.d.). Today it has a presence in 21 cities in Germany and 39 cities in Belgium, and its reach expands to 300 cities when including its partner companies (Cambio, n.d.). The organisation offers pricing plans that target students and young drivers, occasional drivers, and drivers needing to travel long distances or go on long trips.

Cambio partners with the automotive industry, local governments, public service providers, and public transport operators. One major benefit that members receive is that they can drive the cars in several European countries. Some Cambio branches enable public transport users to have special discounts, as well as use the same key card.

Subscription fees depend upon the branch, ranging from non-existent to EUR 35. The deposit is also conditional, and could be as much as EUR 500. Usage fees are charged based on the kilometres driven as well as time travelled (per hour and every 15 minutes).

CAMBIO BUSINESS MODEL

Business Model Canvas

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Automotive industry - Housing projects - Local government - City council - Public service providers - Public transport operators (for marketing / customer service, digital integration) - Car manufacturers (depending upon the branch)	- Fleet maintenance - Customer service	- Users of public transport have special tariffs, & can use the same key card - Complementary to public transport - No fuel costs - Cars can be driven in multiple European countries - Free city parking - Offers electric cars	- Customer service call centre	- Occasional users - Students & young drivers - Drivers going long distances or on long trips
	Key resources - Vehicle fleet - Platform - Partnerships with local government - Chip card		**Channels** - Website - Mobile app - Customer service call centre	

Cost structure	Revenue streams
- Vehicle fleet acquisition - Personnel costs - Fleet maintenance & cleaning - Platform development & management - Insurance costs	- Subscription fees (depending on branch, €0-€35) - Usage fees (per hour & every 15 minutes, and per km) - Deposit, depending upon the branch (€0-€500)

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Table 10: Cambio's Business Model Canvas

2.2.4.3 Greenwheels

Greenwheels was founded in the Netherlands in 1995, and now also includes Germany in its service range. The organisation targets several customer segments with personalized plans and conditions, be it for occasional users or frequent users, families or eco-conscious individuals.

Greenwheels cooperates with public transport operators for both digital integration of its key cards and customer service/marketing, offering special tariffs for those purchasing public transport subscriptions. The organisation also cooperates with businesses for shuttle services and joint car sharing and housing projects. Local government arrangements have enabled free public street parking. Further, Greenwheels also partners with car manufacturers for the purchase and maintenance of its vehicle fleet, including some electric cars. Its value proposition includes making it easy for members to cancel their plans, and not requiring long-term commitments.

Depending on the plan drivers choose, they may or may not have subscription fees and deposits. They are then charged based upon the distance and time travelled. Those who are late, smoke in the cars, or do not follow other rules are charged fines.

GREENWHEELS BUSINESS MODEL

greenwheels — *Business Model Canvas*

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Public transport operators for digital integration & customer service / marketing - Local governments (depending on the branch) - Businesses (carshing & housing projects, shuttles, etc.) - Car manufacturers (for purchase & maintenance)	- Platform maintenance - Fleet maintenance - Contract development **Key resources** - Chip card technology - Website platform	- Easy cancellation with no long-term commitments - Personalised plans & conditions - 24/7 access - Special tariffs for public transport users, & they can use their key card for public transport - Offers electric cars - Free public street parking	- Customer service call centre **Channels** - Website - Mobile app - Call centre	- Occasional users, to frequent users - Drivers who do not want to pay for maintenance, insurance, road taxes & parking - Families - Eco-conscious individuals - Movers - Businesses - Anyone who needs to run errands or take trips

Cost structure	Revenue streams
- Vehicle fleet acquisition - Insurance contracts - IT platforms - Personnel costs	- Rule-breaking charges - Subscription fees & deposits (branch & plan dependent) - Drivers pay based on distance & time travelled (per km or set of km, & by the minute, hour or day)

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Table 11: Greenwheels' Business Model Canvas

2.2.4.4 Io Guido

Born from the national Iniziativa Car Sharing (ICS) programme in 2000, Io Guido launched operations in Modena in 2003 (Ministero dell'Ambiente e della Tutela del Territorio, 2003). Io Guido has since spread to other cities in Italy, though it takes various names and business models depending upon the city and specific car sharing services offered. Io Guido originally started with roundtrip station-based services and later added free-floating with pool-station services, which allows drivers to take a shared in car in one station and return it in another one (Perboli, Ferrero, Musso & Vesco, 2017).

In addition to working with city councilors, the program also works with social services, businesses, and academic researchers. It is unique in that it links all state-sponsored car sharing services together, so that members of one city programme can use the local car sharing services of another city (Merella, 2008). Another unique aspect about the programme is that it attracts car scrapers, erasing the subscription fee for those who are ready to get rid of their car (Merella, 2008). Additionally, Io Guido offers members fewer driving restrictions, such as having the ability to access certain zones for free, and having the ability to cross yellow lanes (Merella, 2008). The Io Guido app utilizes sophisticated technology, providing users with GPS services, the ability to reserve cars within a short timeframe, and help in finding parked cars (Roma Mobilità, n.d.).

However, despite these many benefits and the strong state and local government support, competition has been fierce as private companies have entered the arena. In fact, Io Guido Turin

shut its doors in 2017 (La Repubblica, 2017). The organisation is a for-profit co-operative that receives government funding. Customers pay an annual membership fee, as well as usage fees that are charged per kilometre and by the hour. The call centre is also a (minor) source of revenue (Roma Mobilità, n.d.).

IO GUIDO BUSINESS MODEL

iO guido	**Business Model Canvas**			
Key partners - Mobility & environment city councillors - Launched by state officials - Social services - Businesses - Academic researchers	**Key activities** - Geo-localisation of cars & car parks - Nationwide reservation - Fleet management **Key resources** - State government support for programme launch & consolidation - App & smartcard technology	**Value Proposition** - No deposit - Short reservation time required - Driving benefits (stopping in certain zones without paying, ability to cross lanes, etc.) - Flexibility to use program in other Italian cities - Offers electric cars - Integrated into public tranpsort - Benefits for car scrappers	**Customer relationships** - Mobile app - Customer service call centre **Channels** - Website - Mobile app - 24-hour call centre	**Customer segments** - Drivers who visit other cities & want to drive there - People who want to support the national programme - People who forget where they parked their car - Drivers ready to scrap their car
Cost structure - Sophisticated technology (based on data transmission, an expensive process) - Customer service - Fleet maintenance		**Revenue streams** - For-profit co-operative with government funding - Annual subscription fee optional, per km & by the hour - Call center revenue		

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Table 12: Io Guido's Business Model Canvas

2.2.5 Peer-to-Peer (P2P)

2.2.5.1 Dégage

Dégage, a non-profit association founded in 1998 in Ghent, tailors itself to individuals who like or need to drive on occasion. Its customer segments include environmentally-conscious urban residents who also bike or take public transport, as well as those who need a car for longer trips. Community-engaged individuals who like to know their neighbours and contribute to a safe neighbourhood constitute a core part of the organisation, and information sessions are held at the homes of volunteers.

The organisation partners with the city council to provide parking permits for its members. As it is a P2P organisation, car owners can earn money when they are not using their cars by renting it out to the other members. They are reimbursed based on the percentage of kilometres their cars have been driven by others during that period. Another value proposition is that members are charged low usage fees based only on the distance driven, rather than distance and time.

Membership requires a refundable deposit of EUR 75 and a subscription fee of EUR 35. Cancelling a membership is easy to do.

Table 13: Dégage's Business Model Canvas

2.2.5.2 Drivy

Drivy is a for-profit company founded in 2010 in Marseille, and it has since spread to several European countries. Unlike its counterparts, Drivy does not try to capture drivers who need to take short trips inside a city – it focuses instead on having repeat customers, and drivers who are in need of a car for longer trips (Dementhon & Foster, 2018). The organisation has several public-private shareholders, such as Nokia Growth Partner, Cathay Innovation, Index Ventures, Via ID, and BPI France. It also cooperates with local governments and Allianz Insurance.

One value proposition is that the company offers is that new members are offered training on how to get started. Car owners can rent their car out to other members, setting their own price. Drivy will also install a box that provides a GPS and makes the car connected. Car owners get to keep 80% of the rental amount, while Drivy keeps 13% and 7% goes to Allianz for insurance costs. There is no subscription fee, and a deposit is not required. At the end of their trip, drivers can leave reviews of their experience, helping to ensure members are honest and fair.

DRIVY BUSINESS MODEL

drivy — *Business Model Canvas*

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Local governments - Allianz Insurance - Key shareholders: Nokia Growth Partner, Cathay Innovation, Index Ventures, Via ID, BPI France	- Service provision (unlocking cars remotely & installing boxes) - Platform management - Insurance coverage	- Quick car rental - No deposit required - No subscription fee - Car owners can earn money by renting out their vehicles - Car owners set the price - Drivers can leave reviews - New members get training on how to get started	- Dedicated customer service team - Follow-up on all users' reports - New member help - Box installation	- Drivers going outside cities, on longer trips - Young drivers - Repeat customers
	Key resources - Network of car rentals - Platform - Insurance coverage - Drivy Open technology (box installed in cars)		**Channels** - Website - Mobile app - Phone	

Cost structure	Revenue streams
- IT systems - IT operations and maintenance - Marketing activities - Personnel costs	- For-profit: 13% commission on rental transactions (80% goes to car owner; 7% goes to insurance costs) - Drivers pay by distance & time travelled (daily, weekly, monthly, and per km)

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Table 14: Drivy's Business Model Canvas

2.2.5.3 CarAmigo

Founded in 2014, CarAmigo was Belgium's first P2P car sharing organisation (Roux, 2014). It targets socially-minded and eco-conscious individuals, and requires drivers to have verified profiles. It strives to have a multitude of cars on offer, including cars equipped with car seats for children, as well as other car specifications. While all car owners are welcome to join, CarAmigo partners with Ford, where Ford buyers are actively encouraged to join CarAmigo (CarAmigo, n.d.). CarAmigo also partners with local businesses so as to promote car sharing and provide services. It cooperates with local governments, and depending upon the branch, academic researchers.

One major value proposition of the organisation is that it has arranged for the earnings its members make from renting out their cars to not be counted as taxable income (Ambani, 2015). Drivers must pay a deposit of EUR 500, and are then charged based on the distance and time traveled. CarAmigo keeps 35% of the fees for customer services and website maintenance. Fuel is not included in the offering, so drivers must pay for that separately.

CARAMIGO BUSINESS MODEL

CARAMIGO — *Business Model Canvas*

Key partners	Key activities	Value Proposition	Customer relationships	Customer segments
- Local government (members have tax deductions based on transactions) - Businesses to promote carsharing & provide services - Car manufacturer (Ford) to encourage Ford owners to join - Academic researchers (some branches)	- Contracts with other businesses - Setting up tax reductions for drivers **Key resources** - Variety of cars from members, including wheelchair-friendly - Driver feedback board - Website platform	- Members can rent their own cars out - No subscription fee - Tax deductions for members based on trip transactions - Members leave reviews of each experience - Drivers must have verified profiles	- Roadside assistance - Member-to-member relationships **Channels** - Website - Mobile app	- Parents in need of a carseat for their child (or other specification) - Socially-minded & eco-conscious individuals - Drivers who want to get tax reductions for car sharing

Cost structure	Revenue streams
- Personnel costs - Customer services (insurance, roadside assistance) - Marketing - Website maintenance	- For-profit: ~35% of car sharing fees go to the company - Drivers pay by distance & time travelled (per km or set of km, & by day) - Drivers pay €500 deposit & for fuel costs

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Table 15: CarAmigo's Business Model Canvas

While it is helpful to understand how each organisation's business model works, it is also helpful to compare them. The table below is a snapshot of several general trends for car sharing organisations. The presence (or lack) of organisations for each category highlights where there may be differences among business model types, and where competition may be fiercer for certain business models. It is important to note that the chart does not—and cannot—include all key factors unique to car sharing business models; rather, it is a conglomeration of the most common characteristics that may divide or unite the business models. Likewise, as the car sharing market is evolving at a rapid pace, there are some aspects that will soon be outdated. For example, just days before this deliverable was due, a 50-50 joint venture was announced between car2go and DriveNow (Sachgau & Rauwald, 2018). As the deal has yet to be approved by the regulators, the two organisations are treated separately for the purposes of this deliverable.

To boost their adaptive capacity, several organisations are starting to diversify elements of their business model. For example, Ubeeqo and Cambio (both roundtrip, station-based), have allowed their city branches to take on different features, giving the specific branches the freedom to form their own partnerships, choose the cars they offer, and set their own pricing packages. For Io Guido (roundtrip, station-based), some cities' branches are now operating under a different business model altogether, as they are starting to offer free-floating with pool station services in addition to the roundtrip, station-based services (Perboli, Ferrero, Musso & Vesco, 2017). Then

there are organisations such as Juuve (roundtrip, home-zone based), which are offering non-car sharing services such as car leasing.

Increased competition is also leading some organisations to set themselves apart from others, offering a variety of advantages to their members. Dégage (P2P) offers certificates of accident-free driving for insurance purposes to its members upon leaving. Partago (roundtrip, home-zone based) offers reduced rates for night driving, and also returns some of the charge if the drivers come back earlier than planned. Partago also credits drivers with minutes for each percent that the battery of a car is returned recharged. DriveNow (free-floating operational area) also offers bonus minutes for its charged EVs, and it extends this offer to drivers of non-EVs by offering bonus minutes for its refuelled cars. Zipcar (free-floating with an operational area) partners with local businesses to offer members discounts, and Autolib (free-floating with pool stations) offers similar benefits and deals for its club-level members, enticing them to pay a bit more.

The trends in car sharing business models and the value propositions of organisations are evolving. Based on the 15 organisations reviewed, key takeaways of the current state of the market include:

★ **Partnerships with local governments:** Most car sharing organisations, regardless of business model, cooperate with local government(s). This often comes in the form of allowing organisations' members to have free public parking of some sort, be it street parking or lot parking. It can also come through the electrification of some EV station bays, or through tax reductions for members. Only two organisations, Partago (roundtrip, home-zone based) and Drivy (P2P), do not cooperate with local governments.

★ **Partnerships with public transport operators:** Cooperation with public transport operators is a key value proposition for some organisations. This is often for digital integration purposes, but also for customer service or marketing purposes. Three of the four roundtrip, station-based business models reviewed in this deliverable cooperate with public transport operators (Ubeeqo, Cambio and Greenwheels).

★ **Partnerships with OEMs:** Several business models partner with OEMs. Three of the four roundtrip, station-based organisations (Ubeeqo, Cambio and Greenwheels) have partnerships with OEMs. This could be due to competition, or it could be that these business models tend to be a bit older and are therefore more established. The three organisations that are free-floating with pool stations (Autolib, Bluetorino, Bluecity), for example, started out with car design firm Pininfarina as a partner, but have now formed partnerships with both PSA Peugeot Citroën and Renault (Egloff, 2015). It is also interesting to note that CarAmigo, a P2P organisation, has a partnership with an OEM. Here, the two have signed an agreement so that when a customer purchases a new vehicle or goes in for maintenance, Ford will encourage the car owners to join CarAmigo (CarAmigo, n.d.). This innovative aspect of the business model could soon spread to other P2P organisations. Looking at the organisations missing from the list also provides clues into how the business models operate. Zipcar (free-floating with an operational area), for example, is not there as it has chosen to partner with a car rental company instead. Car2go and DriveNow (also free-floating with an operational area) originally started out in the same manner, though were later bought by OEMs (Sachgau & Rauwald, 2018).

- ★ **Offers of electric cars:** For the organisations that are free-floating with pool stations (Autolib, Bluetorino, Bluecity), as well as for Partago (roundtrip, home-zone based), EVs account for 100% of the fleet. As regulations to restrict air pollution are becoming more important, offering an electric car is becoming a growing part of the business model for many organisations. Still, it is not a defining feature of most, as the offerings are but a small percentage of the entire fleet, and charging stations can be quite expensive to build. Likewise, while some P2P organisations may have members with EVs, it is not a significant portion and is currently irrelevant to their value proposition. The ability of the P2P business models to adapt and feature EVs as part of their business model in the future will inevitably depend upon the customer segments they target.

- ★ **Multi-modal flexibility:** If car sharing organisations want to continue to expand their members, offering multi-modal transport options is key. This is not only logical, it is strategic. For example, Autolib (free-floating with pool stations) has integrated its payment platform with public transport, enabling drivers to use their metro and bus card. Similarly, three roundtrip, station-based organisations (Ubeeqo, Cambio and Greenwheels) have key cards that are either the same card used for public transport, or that will work with public transport. Other organisations, such as car2go (free-floating with operational area), DriveNow (free-floating with operational area), Cambio and Greenwheels, all partner with public transport operators for digital integration of some sort, thereby facilitating multi-modal transport. Organisations are also securing reserved parking spots at metro stations and airports. Autolib and Bluecity (free-floating with pool stations), as well as Io Guido (roundtrip station-based), and Cambio all promote that they are either complementary to, or integrated with, public transport. This trend will inevitably grow stronger as competition for millennials heats up and growing urbanisation results in greater traffic and air pollution.

- ★ **Parking and driving benefits:** Most organisations offer parking and/or driving benefits, though this takes different shapes, such as whether a car can have free parking anywhere within a zone, only within public parking lots, or on a first-come-first-served basis for areas that are typically restricted to vehicles. Some organisations, such as Io Guido (roundtrip, station-based) offer driving privileges such as allowing drivers to stop in certain zones without paying, or having the ability to cross yellow lanes. As Io Guido has strong national-level support, other organisations may not be able to offer their members such privileges. However, its success could also influence local authorities in other countries and cities to start doing the same. Of the 15 organisations reviewed, only two organisations (Drivy and CarAmigo, both P2P) did not offer either, parking or driving benefits.

- ★ **For-profit:** Most business models reviewed are for-profit in nature. This includes the co-operative Io Guido (roundtrip, station-based), which was launched by state officials. The two that are not-for-profit include Partago (roundtrip, home-zone based)—also a co-operative by legal status—and Dégage (P2P), which is an unincorporated association by legal status. Both of these organisations focus on social and environmental aspects in addition to car sharing. In the case of Partago, it is about having a 100% EV fleet, while in the case of Dégage, it is about building community relationships.

- ★ **Subscription fee:** Several organisations charge monthly, annual, or one-time subscription fees. However, many of these organisations, such as Zipcar (free-floating operational area),

Autolib (free-floating with pool stations) and Greenwheels (roundtrip, station-based), also offer packages that do not require a subscription fee. As members have the option to choose between packages, these organisations were excluded from the chart. For some of the organisations listed, including DriveNow (free-floating operational area) and three of the four roundtrip, station-based organisations (Ubeeqo, Cambio and Io Guido), the subscription fee is required only at certain branches. As such fees are therefore a part of the business models for these branches, they were included in the chart.

★ **Deposit:** Similar to the subscription fee, there are many variations in whether or not a deposit is required. Bluecity (free-floating with pool stations) requires a deposit based on one's rental history and payment record. As it does not appear to be an option for certain members, it is included in the chart. Some organisations, such as Partago (roundtrip, home-zone based) and CarAmigo (P2P), require hefty deposits of EUR 500 from all members. Dégage (P2P) also requires a deposit, but it is much smaller, at EUR 75. Still others allow their individual branches to choose whether or not to require a deposit. Often these required deposits are inexpensive, but they can vary. For example, some branches of DriveNow (free-floating operational area) charge GBP 12 (EUR 13.74), some branches of Greenwheels (roundtrip, station-based) charge EUR 25, and some branches of Cambio (roundtrip, station-based) charge anywhere from EUR 150-500. The deposits are often refunded in full or in part when a member decides to leave an organisation. Another route that some organisations are offering their potential members is to not require a deposit, but a credit card number. Car2go (free-floating operational area) is one such example, and some branches of DriveNow (free-floating operational area) are doing the same. Greenwheels (roundtrip, station-based) is also offering the no-deposit-but-a-credit-card-number option at some branches, although it seems to be dependent upon the specific rates and conditions that apply to each customer.

★ **Pricing by time:** Most car sharing organisations reviewed for this deliverable include time as a factor in determining their rental or usage fees. Only Dégage (P2P) does not. For the business models that are free-floating with pool stations (Autolib, Bluetorino and Bluecity), time is the only factor included. Their charges are based on minutes or hours driven, and sometimes include a set of 20 or so minutes for each rental period. Partago (roundtrip, home-zone based) also charges by the minute, a factor that seems to be indicative of EV fleets that cannot travel too far. Although other organisations may charge by the minute or hour, they tend to offer longer options as well, such as daily, weekly and even monthly rates.

★ **Pricing by distance:** All organisations apart from those that are free-floating with pool stations (Autolib, Bluetorino and Bluecity) include distance as a factor in determining the usage fee they charge their members. Most other organisations charge per kilometre or set of kilometres. Zipcar (free-floating operational area) only starts to charge per kilometre after a driver has surpassed 60 kilometres, and DriveNow (free-floating operational area), starts to charge after 200 kilometres.

★ **Fuel costs:** Most organisations reviewed for this deliverable include the cost of fuel in their prices. Some organisations, however, require that their members pay for fuel themselves.

These include some branches of Greenwheels (roundtrip, station-based), Drivy (P2P) and CarAmigo (P2P). In general, a common approach is for organisations to bundle their fuel costs (as well as maintenance fees, vehicle depreciation costs, insurance costs, etc.) into their membership prices.

Business Model Characteristics											
Key Partners			**Value Proposition**			**Revenue Structure**			**Pricing**		
Local governments			Electric cars available			For-profit structure			By time		
Free-Floating Operational Area	car2go	zipcar	DriveNow	car2go	zipcar	DriveNow	car2go	zipcar	DriveNow	car2go	zipcar	DriveNow
Free-Floating Pool Station	autolib'	bluetorino	bluecity	autolib'	bluetorino	bluecity	autolib'	bluetorino	bluecity	autolib'	bluetorino	bluecity
Roundtrip Home-Zone Based	Juuve					↑	Juuve			Juuve		↑
Roundtrip Station-Based	UBEEQO		greenwheels · iGuido	UBEEQO		iGuido	UBEEQO		greenwheels · iGuido	UBEEQO		greenwheels · iGuido
Peer-to-Peer	Dégage!		CARAMIGO					drivy	CARAMIGO		drivy	CARAMIGO
Public transport operators			Multi-modal flexibility			Subscription fee required			By distance		
Free-Floating Operational Area	car2go		DriveNow	car2go		DriveNow	car2go		DriveNow	car2go	zipcar	DriveNow
Free-Floating Pool Station	autolib'			autolib'		bluecity		bluetorino	bluecity			
Roundtrip Home-Zone Based										Juuve		↑
Roundtrip Station-Based	UBEEQO		greenwheels	UBEEQO		greenwheels · iGuido	UBEEQO		iGuido	UBEEQO		greenwheels · iGuido
Peer-to-Peer							Dégage!			Dégage!	drivy	CARAMIGO
OEMs			Parking & driving benefits			Deposit required			Fuel costs extra		
Free-Floating Operational Area	car2go		DriveNow	car2go	zipcar	DriveNow	car2go		DriveNow			
Free-Floating Pool Station	autolib'	bluetorino	bluecity	autolib'	bluetorino	bluecity			bluecity			
Roundtrip Home-Zone Based	Juuve		↑	Juuve		↑			↑			
Roundtrip Station-Based	UBEEQO		greenwheels	UBEEQO		greenwheels · iGuido			greenwheels			greenwheels
Peer-to-Peer			CARAMIGO	Dégage!			Dégage!		CARAMIGO		drivy	CARAMIGO

Table 16: Business Model Characteristics of Selected Car Sharing Organisations (based on survey responses and desktop research; see descriptions above for detailed explanations)

3 SWOT Analysis of Business Models in Car Sharing

3.1 Free-floating with an operational area

Strengths	Weaknesses	Opportunities	Threats
• Flexible for users (see section 2.1) • One-way trips allowed • Does not require dedicated parking facility • Reduced investment needed, as there are no stations • Can build a presence incrementally by starting with a small area • Operational area can be extended easily	• Capital intensive • May require a lot of repositioning of vehicles • May be susceptible to parking issues (e.g., nowhere to park) • Vehicle damage may result from lack of protected parking • Inaccessible vehicles may result from lack of dedicated parking locations • May result in users wasting time looking for vehicles • Not suited to long-distance car sharing (e.g., between urban areas) • Own-brand schemes from manufacturers may restrict consumer choices	• Area expansion by pushing out the boundaries of the area served • 'Deepening' of presence quite simple by increasing the number of vehicles per area	• May be displaced by ride-hailing systems • May be substituted by station-based systems or combined systems • Lack of scale can render this model unprofitable • Ride-sharing schemes may capture one-way trip market share • Large schemes run by vehicle manufacturers may cannibalize their own sales of new cars

Table 17: Free-floating with operational area SWOT

In this model the vehicles may be picked-up and left at any suitable point within a defined geographic area (typically a city, sometimes a zone or street within a larger urban area). Vehicles must ideally be tracked in order that their precise location is known. A key issue with this type of model is the distribution of vehicles within the operational area. Where unsuitable clustering of vehicles occurs, it will be necessary to invest resources in repositioning those vehicles. Extra management issues may arise over vehicles parked illegally, especially where wheel-clamping is adopted. The density of vehicles in an area may be restricted in this model by the availability of

parking spaces, in some instances this restriction necessitates that the car sharing operation has an agreement with the local government authority – for example to ensure that car sharing vehicles have the right to park in the area. At present a free-floating with an operational area business model is unable to support a fleet of battery EVs due to the lack of suitable public charging points in most locations. Long-range (wide area) schemes are more difficult to manage, particularly in instances where journeys are for one direction only. Again, this may require considerable investment in repositioning vehicles.

The best-known of these schemes are large and well-resourced, with sophisticated fleet management systems. Examples include car2go, Zipcar, and DriveNow. Of these, DriveNow was established by BMW in association with Sixt (the German car rental company). Car2go was similarly established by Mercedes (Daimler). It is notable that these premium brands felt enabled to enter the car sharing market on a substantial scale, while Audi did not. This illustrates the diversity of views on the scope of such schemes (Krommes and Schmidt, 2017).

3.2 Free-floating with pool stations

Strengths	Weaknesses	Opportunities	Threats
• Easier to manage and protect the stock of cars in use • Can be suited to high-density of demand locations • Users know where the cars will be • Visibility in a marketing sense • Suited to EVs • Suitable for one-way use and longer trips	• Results in the need for repositioning of vehicles • May result in a lot of extra capacity in station facilities that are under-used in order to cope with peak loads • Stations reduce the convenience of coverage • Stations may incur additional maintenance costs	• Co-branding with local government authority as part of integrated transport solution • Replication of model on a city-by-city basis • Stations can be distributed according to demand (e.g., along car-share highways) • Stations can be situated at high-demand locations (e.g., airports)	• May be substituted by ride-hailing systems • May be substituted by car rental services • May be substituted by public transport systems (rail and bus) depending upon trip type

Table 18: Free-floating with pool stations SWOT

Free-floating with pool station systems may be easier to use for battery EVs, because the stations can be equipped to charge vehicles, as in the Paris Autolib scheme. Indeed, the best-known and largest examples of this sort of car sharing involve Bolloré, the company behind the original Paris concept. On the other hand, as He et al., (2017) note, a one-way car sharing scheme poses greater operational challenges if the scheme operates over large areas, a problem that is exacerbated when considering the use of EVs. There are interesting possibilities in terms of

integration with the public transport system, as stations can be co-located with transport hubs. In practice, the free-floating with pool station business models also need to define an operational area beyond which the drivers cannot terminate their rental. All free-floating systems raise the possibility of having to invest resources in repositioning vehicles, although with pool stations the task of gathering such vehicles is at least reduced. A further consideration is the investment needed in stations, and whether that needs to be dedicated or can be supported by existing infrastructures such as car parks. An interesting future possibility is for chains of pool stations on longitudinal routes and highways, akin to the use of staging posts in the horse-drawn era of postal services.

3.3 Roundtrip, home-zone based

Strengths	Weaknesses	Opportunities	Threats
• Easier management of the fleet with lower repositioning demands • Suitable for incremental and low-investment growth strategy • May create clusters of users willing to support the service (such as with co-operatives), and therefore offer a lower per-km cost of service	• Spatial restrictions, as drivers cannot end their transaction out of the designated area • Requires sufficient local density of demand within the home zone • Can be difficult to establish a growth path • EVs require sufficient public charging points	• Can be replicated on a neighbourhood-by-neighbourhood basis • If sufficiently embedded, could reduce demand for parking spaces and hence offer wider benefits to locals	• Users may readily migrate to owning their own car because this usage pattern is most similar to owning a vehicle • May be substituted by more sophisticated, lower-cost business propositions • May be substituted by rental offers

Table 19: Roundtrip, home-zone based SWOT

This scheme is interesting because it is possible to start small and relatively simply, and still achieve a longer-term growth path that enables more sophistication and scale (e.g., Partago in Ghent, Belgium). It is suited therefore to those 'grassroots' initiatives whereby interested individuals and groups instigate mobility solutions that meet environmental, social and other objectives. As such, these small-scale schemes are unlikely to redefine urban mobility in a meaningful sense unless further support is achieved. For example, embryonic attempts at car sharing may be offered 'protected' status for car parking in a defined area by the local government authority. They also offer important 'demonstrator' effects to show that sharing, and/or alternative technologies such as battery electric powertrain, can indeed be practical and useful (Hildermeier, 2016; Roy et al., 2016). Small fleets are inevitably vulnerable to operational disruption. If the fleet of cars available is only three in number, and one is out of service, it represents a 33% loss of capacity.

3.4 Roundtrip, station-based

Strengths	Weaknesses	Opportunities	Threats
• Comparatively easy to manage the stock of vehicles • Suitable for EVs and fuel cell vehicles where infrastructure is not widely available • Potential for great variety of vehicles on offer	• Pool stations may not be conveniently located for users • Area served may be restricted by pool station availability or scale • Vehicle rental cannot be terminated outside of designated area	• May be suited for exploitation of tourism markets • Could be served out of existing facilities (e.g., car parks, car rental stock locations, dealerships)	• Limited flexibility may make this model vulnerable to competition from ride-hailing organisations (for short term trips) or car rental companies (for longer-term projects)

Table 20: Roundtrip, station-based SWOT

It is interesting that some of the most developed examples of this sort of business model, such as Greenwheels in the Netherlands, have sought to emphasise a flexible range of offers to encourage a diverse customer base for car sharing. Greenwheels, for example, offers three basic packages depending upon how frequent the usage is expected to be. Some of these schemes, such as the BeeZero fuel cell vehicle scheme run by Linde in Bavaria, will automatically calculate the best time and distance package out of the four available for the trip drivers have taken (Anon, 2016). When aimed at tourist markets, this sort of scheme needs low initial registration costs, and ideally no annual or monthly fee. Where the scheme serves local users, regular membership fees are less of a concern and may underpin a better level of service overall.

Larger schemes of this type have some choices to make about the sort of vehicles they offer, and how they are sourced. It may be the case that with sufficient annual new car purchases, the larger schemes can obtain discounts from a manufacturer or their dealership. However, single-source purchasing may result in an inadequate fleet mix.

3.5 P2P and community schemes

Strengths	Weaknesses	Opportunities	Threats
• Can be tied into, for example, urban transport planning policies through housing policies • Can serve closed markets • Relatively low set-up costs (no vehicles or stations required) • Offers various types of shared vehicles • Option (if drivers prefer) to de-personalise the transaction via remote (app enabled) renting and car opening • Vehicles of variable types	• The concept may stand or fall on the quality of the app used • Care needed in verifying drivers • Return requirements may be a bit restrictive (e.g., same place, and/or same fuel level) • Users may not feel comfortable driving models with which they are unfamiliar • Users are uncertain as to whether vehicles will be available and when	• Fits with the 'on-demand' mentality of the era • Low costs for vehicle owners and those renting the shared vehicles means that market expansion is possible	• Users may migrate to a more 'assured' or stable system • Management of 'incidents' may be excessive. • Vehicle owners will probably have this income taxed • May be a backlash with regards to car safety issues and other regulatory concerns

Table 21: P2P and community schemes SWOT

A significant consideration for P2P car sharing is that there has to be sufficient people with assets (i.e., cars) who are also willing to share those assets (Wilhelms et al., 2017). The recruitment of vehicle owners is therefore crucial. Thereafter, sharing patterns need to be matched asymmetrically against personal use patterns.

Schemes like Drivy act as intermediaries between car owners and members who would like to use a car. This is similar in principle to Airbnb for example, with the intermediary taking a service charge fee. Hence a high proportion of the budget is likely to be taken by advertising to recruit cars and member drivers. These systems absolutely rely upon the robustness of all the support systems that surround vehicle use, such as vehicle licensing, insurance, driver licensing, roadworthiness testing and related issues.

A 'low-tech' version of peer-to-peer car sharing, without the use of an app for example, is possible on an informal and small scale, but in general these are limited in scope. The most obvious examples are in closed communities, such as those in a specific housing development or area in which private car ownership is not allowed. These have come to represent a form of a 'closed market'. Other closed markets might be institutional, based on a company, or other institution which then sets up an 'internal' car sharing scheme. More generally, the direct commitment of

urban authorities can also be crucial, as in the instance of Bremen with a target of 20,000 shared vehicles to remove at least 6,000 private vehicles from the streets of the city (Glotz-Richter, 2016). In schemes that are supported by a local community, the use of car sharing schemes may be directly linked to other strategies and policies at the local government level, designed to improve the quality of life for residents. Hence the promotion of car sharing alongside, for example, improved public transport or the decentralisation of social services (schools, medical care, etc.), can in combination result in a less transport-dependent locality with the associated benefits of reduced pollution, reduced noise, and so-called 'liveable cities'.

4 Innovation in Business Model Strategies

4.1 Car Sharing Schemes and Vehicle Manufacturers

Major vehicle manufacturers have relied upon an established business model for decades, in which their focus is on design, production of key parts such as the body and the engine, and final assembly. Levels of backward integration into component production vary, but over time the tendency has been to increase outsourcing. Levels of forward integration into distribution, retail and post-retail activities also vary, but are largely outsourced. However, some manufacturers retain significant retail operations of their own in parallel with franchised dealers. Most manufacturers have captive finance operations that supply dealer (stock) finance along with fleet and retail finance.

For vehicle manufacturers, the significance of car sharing schemes will depend upon two key issues: the 'fit' of car sharing schemes into the extant practice of marketing and re-marketing vehicles, and the compound impact of car sharing activities alongside major transformations in the industry associated with the adoption of EVs, connectivity, and autonomous driving. In respect of both issues, there is a dynamic element to the potential significance of car sharing over time.

The supply of vehicles into car sharing schemes (whether captive or independent) is but one of multiple routes to market, each of which may involve differential rates of discount and operational advantages in terms of duration of 'ownership', finance, availability, fit into a re-marketing scheme ('approved used'), and so on. A large, full-range manufacturer will normally include the following routes to market:

- ★ Vehicles supplied to staff (and often family members)
- ★ Vehicles supplied to sister companies and affiliates
- ★ Vehicles supplied to components and materials suppliers
- ★ Large fleet deals to captive or independent daily rental companies
- ★ Large fleet deals to independent companies
- ★ Other fleet, rental and corporate deals including PR/marketing vehicles for the press, cars supplied to ride-hailing operations, etc.
- ★ Vehicles supplied to car sharing schemes
- ★ Vehicles supplied to dealerships as demonstrators, service replacement cars, etc.
- ★ Vehicles sold to retail customers via discount offers and finance schemes
- ★ Full retail price vehicles

It can be observed that in terms of the product life cycle, a vehicle model in the initial phases of production should have strong demand and therefore command full retail price in the market (a current example would be the Tesla S). No discounts are available, and customers must wait for delivery. At the other end of the spectrum, many models become more difficult to sell towards the end of their production period, which in turn means greater recourse to market routes where discounts are higher and profits are lower. In addition, where a manufacturer seeks to run a production system with a high degree of customer specification and 'order to delivery', the volatility in retail demand can be smoothed by the insertion of vehicles with non-retail routes to market. The daily rental industry has traditionally functioned as a capacity-absorbing facility within

the larger automotive system. It is possible, even probable, that for the larger vehicle manufacturer-owned car sharing schemes, there is an element of capacity absorption.

Furthermore, a crucial consideration for the vehicle manufacturers is that of re-marketing of vehicles. Re-marketing is the process whereby used vehicles of various ages and conditions are brought back into the retail and distribution system to be sold as so-called 'approved used'. Careful management of re-marketing is important because it assists with bolstering resale values, which in turn means that the rate of depreciation on new cars is lower. Given that depreciation is the largest single cost element in a new car acquisition over three years, there is much marketing value in maintaining vehicle values. Moreover, re-marketing is an important source of revenue for franchised dealerships and therefore key to maintaining the viability of the network coverage. The value of vehicles coming into the re-marketing system will depend upon the model in question, then age, distance driven, and condition along with details of specification (e.g., colours such as yellow have a higher depreciation rate). Dealer demonstrators, for example, tend to be around six months to 12 months old, with less than 6,000 km and in good condition. An ex-company car may be 36 or 48 months old, with 60,000 km and showing more obvious wear. It is likely that most car sharing schemes of substantial scale fall between these extremes.

Overall, it is likely that for the industry as a whole, and for most manufacturers, car sharing schemes represent a minor element of the routes to market. Moreover, car sharing schemes are not generally disruptive to the overall business model of the vehicle manufacturers. One interesting aspect of car sharing schemes is the possible impact on the intensity of vehicle use, and the subsequent pull-through of new vehicle sales. That is, it is possible that manufacturers can capture markets that would otherwise be out of reach (i.e., consumers who cannot afford or do not wish to own a new car) and by combining sufficient fractions of usage, can get greater usage rates (more kilometres driven) than would otherwise be the case. In turn, vehicles are effectively used up more quickly before being sold into the used car market. In this regard, different forms of car sharing represent more fine-grained market segmentation (Kopp et al., 2015).

Where some manufacturers have themselves engaged in the creation of car sharing schemes, it is evident that either the new capabilities (such as in fleet management) need to be developed inside the company, or a partnership with an organisation that has the desired capabilities needs to be formed (Tietze et al., 2013). This has happened in the past, when some vehicle manufacturers have owned captive car rental operations. Thus, car sharing schemes are a form of extension of the business model, but not a radical redesign.

In terms of major transformations in the industry associated with the adoption of EVs, connectivity, and autonomous driving, there are longer-term structural changes in the industry as a whole and the position of vehicle manufacturers within it. These structural shifts are likely to be associated with wider developments around the quest for a circular economy, the separation of economic growth from ecological burdens, and the re-orientation of production and consumption to a service model rather than an ownership model (Pallaro et al., 2015). Clearly the specific instance of car sharing can be seen as contributory to the structural changes in the automotive industry associated with the above-mentioned wider developments. Whether consumers are prepared to participate in the sharing of cars, at least in sufficient scale to disrupt the industry, is not yet certain. Neither is it certain that car sharing will reduce social exclusion (Clark and Curl, 2016). Many households that suffer 'transport poverty' will similarly not be able to access a shared

vehicle due to factors such as the lack of a driving license, the lack of funds, or even the lack of a bank account (Wells, 2012). As a consequence, such households may also be excluded from other social activities and benefits, or have to pay disproportionately more in order to access them.

The position of the vehicle manufacturers and the future of the industry as a whole are not reducible to technological imperative or strategic desire. These are deeply contested outcomes (Schwanen, 2016). Indeed, one key element of this contestation is the struggle for control over the entire value creation and capture system for personal automobility (Weiller et al., 2015). There has been a plethora of new entrants both large and small as the monolithic industry has fragmented around new technologies and applications. The so-called 'tech' companies, like Apple, Baidu and Google, have brought significant financial resources to bear on future autonomous cars, while Tesla is the most high-profile of new entrants seeking to capitalise on the opportunities presented by EVs (Heike and Fojcik, 2015; Donada and Lepoutre, 2016).

It is in the intersection of these emergent issues of autonomous driving, shared vehicles, electric vehicles and interconnectivity, that there is the real potential for significant structural change (Kompalla et al., 2017). For example, EVs with a high initial purchase cost but lower running and maintenance costs, are suited to shared usage and charging stations. Such vehicles are also best located, rented and returned via apps that can identify charging points or the availability of vehicles. Moreover, autonomous technologies would greatly enhance the utility of shared vehicles by broadening the potential customer base. The autonomous technologies would further reduce loss of service for the fleet by reducing impact damage, which would in turn also improve the longevity of service life and/or the retail value upon re-marketing. In other words, there are potential synergies in the co-evolution of these aspects of the contemporary automotive industry into an automobility industry (Viviani, 2016). The business model of the automobility industry is thus likely to be premised on sale of the service of personal private mobility, with revenues derived from that service rather than the sale of actual vehicles.

4.2 Avoiding Commodification: From Vehicle Ownership to Vehicle Usership

The focus of this section is to evaluate how major vehicle manufacturers are integrating their car sharing programs in larger mobility plans. OEMs are transforming their mid-term business strategies into more connected and digitised business models. The production of vehicles might not be the core business in the near future: it could be augmented by connected, shared (such as car sharing), and multi-modal services, such as Moovel by Daimler.

The shift from a traditional car manufacturer business model to a service provider model is a long process, in particular considering that OEMs need to rethink and have enough time to get used to these new businesses and trends.

Leading vehicle manufacturers are now proposing car sharing programs (owned or in partnership) as a first step in the integration of larger strategies that have four main common pillars:

1. Connectivity
2. Autonomous
3. Shared programs or services

4. Electrification and/or alternative propulsion

From a strategic point of view, several OEMs are using the above-mentioned four pillars. Starting with Daimler's CASE Strategy (Daimler, n.d.-a), OEM strategies and how they are structured/defined are compared. Even though there is still no unified outlook on how the automotive industry will look in 10 years, the aim of this section is to demonstrate the interconnection among the four pillars, and how multi-element business models appear to be a strategy to avoid commodification.

4.2.1 Connectivity

Connectivity can have a double perspective. The "connectivity" within the organization, such as the digitisation of manufacturing processes, a connected and smarter supply chain, and the 'vehicle connectivity'. This report focuses on vehicle connectivity (even if some internal manufacturer connectivity aspects are reported in the appendix)—the so-called Vehicle-to-Everything (V2X) or Car-to-X. Several OEMs have invested in and developed proprietary connectivity software. Some examples are reported below:

Vehicle Manufacturer	Connectivity
BMW	ConnectedDrive
FORD	SYNC3
GM	OnStar
HONDA	MyHonda
TOYOTA	Mobility Teammate Concept, ITS Connect, T-Connect App
VOLVO	Volvo Sensus
VW	Audi Connect & Sedric Connectivity project

Table 22: Examples of Connectivity Software Used by OEMs

The connected car is now seen as a new business frontier in which OEMs can retain their customers and generate profits. Several PWC reports suggest that revenues of connected car services will increase to EUR 156 billion by 2030 (Viereckl, Assmann, & Raduge, 2014; Viereckl et al., 2016). In term of units, reports estimate that there will be 50-60 million connected vehicles worldwide by 2018 (Statista, n.d.; Gissler, 2015). For connected vehicles, OEMs have the possibility to propose to their customers several categories of distinct products, such as:

★ **Safety:** emergency functions, collision protection, etc.
★ **Driver assistance:** autopilot in highway, parking assistance, etc.
★ **Well-being:** fatigue detections, medical assistance, ability and fitness to drive, shopping network, etc.
★ **Infotainment:** music, internet, social media, smartphone interface with the cockpit, mobile office solutions for business fleets, etc.
★ **Vehicle management:** service and maintenance, remote control, optimized drive performances, etc.
★ **Mobility services:** traffic and weather real-time information, HD-maps, etc.

★ **Home/infrastructure integration:** the car will be connected to the customer's home(s) and/or to the external infrastructure network

The success in this new 'connected' ecosystem depends on OEMs' capabilities to carry out their strategies, as well as their ability to transform traditional production culture in pre-digital and connected service models. It is the perspective of this deliverable that car sharing (and ride-sharing) services will be driven in large part by the dramatic reductions in transportation costs: connectivity services can provide enough financial margins to make those businesses sustainable for OEMs.

4.2.2 Autonomous

All OEMs have signed strategic alliances or partnerships with other OEMs or specialized organisations in developing (and testing) autonomous vehicles (AVs). BMW, Daimler and VW have invested in HERE company, which is specialised in HD-maps and autonomous technologies (HERE, n.d.); other partnerships and alliances have been signed with Intel, NVIDIA, and Mobileye; FCA has joined the partnership of BMW, Intel, and Mobileye; Daimler has signed a strong collaboration with Bosch (Daimler, n.d.-b; Bosch, 2017). Several acquisitions have also taken place: for instance, GM acquired Cruise and Strobe in 2016 and 2017 respectively, and Ford invested USD 1B in Argo (Ford, 2017).

It is illustrative that Daimler CEO Dieter Zetsche said, "Google and Apple want to provide system software for cars and bring this entire ecosystem around Apple and Google into the vehicle. That can be interesting for both sides... [but] we don't want to become contractors who have no direct content with customers anymore and supply hardware to third parties" (Cremer, 2015).

Volvo has stated the intention to produce AVs for the luxury market (Naughton, 2016), with the 'autopilot' system adding USD 10,000 to the cost of the car. According to Hakan Samuelsson, CEO at Volvo Cars, "To make a car even more premium, one of the most interesting things is a full autopilot...Not a supervised version, but really the one that you can sit back and watch a movie or whatever. That will make the premium car even more premium" (Naughton, 2016).

To underline the concern with commodification, it is also clear that for Samuelsson at Volvo Cars, the potential of autonomous car technologies is clear. "If you're only providing transportation from A to B, you're heading into trouble...You still need to have a car that is not just fulfilling the transportation need, but also giving our customers an emotional value, a premium car" (Naughton, 2016).

The spectrum of possible models that OEMs are developing is not focusing on autonomous cars exclusively; we can identify three main options:

★ **Autonomous private vehicles:** These include electric and hybrid powertrain vehicles. Private AVs could also contribute to safe roads thanks to embedded connectivity technologies.

★ **Autonomous taxis:** These AVs will pick up passengers from a designated point to a designated destination[1]. Uber, Lyft, and DiDi (the leading worldwide ride-sharing

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[1] NuTonomy—an MIT spinoff technology company and partner in the Boston pilot program—has launched a prototype autonomous taxi. The company launched the world's first trial program involving autonomous taxis in Singapore in August 2016 (NuTonomy, s.d.)

providers) are investing in no-driver services to cut down their rates and increase profitability.

★ **Autonomous shuttle buses:** More and more vehicle manufacturers are looking at electrically-powered autonomous shuttle buses as a crucial building block of future urban mobility. Several manufacturers, including Toyota (Toyota, 2018), France-based Navya (Navya, n.d.), and US-based Local Motors (Localmotors, n.d.), are building and deploying such buses today on predefined routes or in defined geographical areas. The Toyota concept is a cross-pillar project: it touches on connectivity, autonomous, electrification and urban mobility services (in alliance with Amazon, DiDi, Mazda, Pizza Hut and Uber).

Currently, several vehicle manufacturers propose advanced driver assistant technology on their premium models: Volvo XC90, Nissan X-Trail, BMW 7 series and trucks, Intelligent Driver controller on Mercedes-Benz segments, and Toyota on its Lexus brand. On the other hand, there are several market barriers to the adoption of automated driving, in particular regarding reliability and security. Connectivity software can be the key to a robust, automated driving system, and cybersecurity for these connected vehicles has become a top priority for any AV player. Most OEMs are actively developing and testing in real traffic automation technologies at levels 4 and 5[2]—even though it is estimated that level 5 systems (a full AV where the steering wheel will be optional) won't be a reality before the mid-2020s, in a very positive prognostication.

For some in the automotive industry, the reduction of cars to mere transport would be a disaster. It is perhaps for this reason that, according to Roberts (2015), Ford has claimed it is "almost impossible" to sell self-driving cars. Ford CEO Mark Fields noted that, "Nobody can predict whether these fully autonomous vehicles will work under all environmental conditions. The Google cars have an issue with heavy rain and snow. Very low sunlight is also very bad because the cameras don't see anything, so you need to have some sort of controlled environment" (Roberts, 2015).

For others, it seems there is a sense of opportunity. Hence the industry is perhaps searching for a pathway that embraces the 'inevitability' of autonomous cars, but does so in a manner that also allows for brand transition. A good example is that of BMW. In broad terms, the approach is as stated by BMW Design Chief Adrian van Hooydonk, "We are moving from the Ultimate Driving Machine to the Ultimate Driver, where technology is making any driver a better driver" (Ciferri, 2016).

4.2.3 Shared programs and Services

Most OEMs have already launched their own car sharing programs, signed a partnership, or acquired an existing provider.

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[2] There are five different levels of autonomous driving in terms of human involvement: Level 0 "no automation": the driver performs all tasks; Level 1 "driver assistance required": early warning systems such as cruise control or speed assistant; Level 2 "partial automation options available": the car can assist with steering or line detection, congestion assistant; Level 3 "conditional automation": the vehicle monitors the environment and auto-pilot assistant available on cars (ex: highway pilot, hands-off parking); Level 4 "high automation": the vehicle is capable of steering, braking, accelerating as well as responding to events, changing lanes, turning, and using signals, though the driver may have the option to control the vehicle; and Level 5 "full automation": driver and steering wheel are optional (ex: robotic taxis or shuttles).

Vehicle Manufacturer	Car Sharing	Ride Sharing	Multi-Modal service	Other services
BMW	DriveNow			ChargeNow ParkNow
DAIMLER	car2go	Blacklane	Moovel	MyTaxi Via Mercedes Flexperience
FORD				Chariot
GM	Maven[3]	Partnership with Lyft		Book by Cadillac Express Drive with Lyft
PSA	CarUnity		Free2Move	
TOYOTA	Yuko			Ha:mo rides
VOLVO	Sunfleet[4]			Care by Volvo
VW	Respiro	Partnership with GETT	Moia	Audi on Demand Porsche Passport

Table 23: Examples of Shared Programs & Mobility Services

On the other hand, as can be seen in Table 23, some OEMs are also proposing different mobility services: from ride hailing services to shuttle services, P2P services to multi-modal platforms (such as Moovel, MOIA and Free2Move). All of these mobility services and programs are an opportunity to:

★ Gather information about customers, their needs, their mobility habits, peak hours of use/requests, and understand how to manage a fleet in a free-floating and/or station-based program

★ Test the technology embedded in a shared fleet

★ Promote B2B models: partner with taxis and ride-sharing services (such as MyTaxi, Uber, Lyft and DiDi), or propose business fleet management

★ Promote new categories of services and increase profitability

As customers are modifying their habits and perceptions towards cars/vehicles (from a pure mechanical choice to a new 'on-demand' and instant mobility need), car sharing providers are giving the possibility to enhance users' options in terms of mobility. A turning point is that providers' platforms are now talking to both, users and car owners. From a user's perspective, the advantage is an increased number of mobility options at affordable rates (which typically include fuel, parking, insurance and maintenance), and the possibility to use time differently during commutes or moves. From a vehicle manufacturer's perspective, instead of a one-off selling connection to the customers, service-based business models could offer longer-lasting relationships. The user becomes less vehicle-driven, while more connected and more mobility-service oriented. In highly-populated cities[5], vehicle ownership would be replaced by vehicle usership; the key to success would be integration into a connected and networked environment. Cars/vehicles will become more flexible, upgradable, and updatable according to users' mobility needs. Understanding the needs and impacts of shared mobility can enable OEMs to leverage new

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[3] Currently only in the US.

[4] Currently only in Sweden.

[5] In highly-populated areas, the scarcity of parking spaces and the cost of owning a car that only gets used for 5% to 10% of the car's life, is pushing customers to rethink their approach to cars and mobility in general.

profitable services to retain customers. It is not surprising that new urban mobility offers have been born in the last few years, and some OEMs are already thinking about an integrated and multi-modal offer, a unique Mobility-on-Demand (MOD) or Transportation-as-a-service (TaaS) platform leveraging on internal platforms, such as: MOIA by VW, Moovel by Daimler, and Free2Move by PSA, just to cite a few. Users will be able to calculate, book and pay their preferred mobility solution selecting one or more options (car sharing, ride-sharing, bike sharing, walking, taxi, shuttles or using public transport). In this scenario, car sharing programs will be seen as one option in an integrated, accessible, flexible and convenient mobility service.

4.2.4 Electrification and alternative propulsion

This pillar is linked to the AV section: AVs are based on either EVs or plug-in-hybrid electric vehicles (PHEVs). Another factor that has pushed all OEMs to the electrification of their models is the increased legal and regulatory governmental analysis over pollution levels produced by diesel-engine vehicles. To avoid a total ban, carmakers started the 'hybridification' of their engines (both gasoline and diesel). Several cities around the world have already launched their battle for a car-free city center or for lower CO_2 emissions[6]. There are also countries that aim to ban internal combustion engines (ICE) from their cities: Scotland plans to ban petrol and diesel cars by 2032 (Khan, 2017), while Norway's national ban will go into effect by 2025. However, if Toyota and BMW have announced to drop diesel models from their European market, VW CEO Matthias Müller "predict(ed) renaissance for embattled diesel cars" (Behrmann & Miller, 2018).

On the other hand, 100% EVs have drawbacks: from the travelling distance (or range) to charging; from EV/PHEV retail prices (these vehicles are quite expensive compared to a traditional engine car) to battery management; from a fragmented recharging network to the impact of this electrification process on OEMs' suppliers, with the risk of out-of-stock volumes of components as Daimler Group warned in February 2018 (Taylor, 2018).

Autonomous competition, pollution pressure, long-range battery development and new EV-PHEV technologies pushed carmakers to share EV platforms or to sign partnerships keeping costs under control and creating synergies. Some examples: GM with LG Chem; GM and Honda for long-range fuel cell EVs; Daimler, VW, BMW and Ford with their IONITY project for 400 high-power-charging stations in Europe by 2020; Mazda and Toyota with the aim to share EV technology and to build a USD 1.6 billion assembly plant. In terms of alternative propulsion, there are several hydrogen cars available on market, and even a hydrogen car sharing program (BeeZero by Hyundai) in Germany[7].

Despite the AV scenario, EVs are already available on market. The tendency, as shown in all OEM strategy tables, is a massive electrification of almost all models and all segments (city cars, compact, SUV, sedan, etc.), with longer distances covered and faster recharging systems (e.g., the Porsche Mission E to recharge 400km autonomously in 20 minutes, and the 2017 Ionity high-power charging station project) (IONITY, n.d.).

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[6] Cities such as Oslo, Copenhagen, Berlin, Hannover, Madrid, Chengdu, Bogotá, Mexico City, and San Francisco, among others, have announced their plans against car pollution and for car-free city centers (Garfield, 2018).

[7] On March 11th, 2018, the BeeZero website announced that the München hydrogen program will close on July 1, 2018 (BeeZero, 2018).

Vehicle Manufacturer	Current Electric, Plug-in or Hybrid Vehicles	Hydrogen propulsion
BMW	Bmw i3 and i8 Hybrid plug-in on series 2, 3, 5 and 7	
DAIMLER	Smart EV Hybrid offers on Mercedes-Benz segment	GLC F-cell
FCA	Chrysler Pacifica Hybrid Fiat 500EV	
GM	Chevy Bolt (EV) and Volt (plug-in)	
HYUNDAI-KIA	Hyundai Ioniq (in EV, plug-in, hybrid version) Kia Niro (hybrid and plug-in)	ix35 and Tucson
JAGUAR LAND ROVER	E-Pace and I-Pace Land Rover Plug-in Hybrid	
PSA	Peugeot iOn, TepeeEV, Partner EV Citroen C-Zero, E-Mehari	
RENAULT-NISSAN-MITSUBISHI ALLIANCE	Renault Zoe, Twizy, Kangoo EV and SM3 Nissan Leaf, E-NV200 Mitsubishi iMIEV, Outlander PHEV	
TOYOTA	Hybrid Prius, Rav4 etc	Mirai
VW	e-Golf (EV) Golf and Passat GT-E (hybrid)	

Table 24: Examples of Electric and Hydrogen Vehicles

The advantage in having a car sharing program is to test new cars/vehicles and/or new EVs before launching on the market. In addition, plug-in and/or full EV car sharing programs can be integrated with local public transport systems and the connectivity ecosystem, according to user preferences and past rentals. Another opportunity is to connect EVs to the external infrastructure network, managing the peak of EVs and infrastructure needs. For example, the Toyota electrification program aims to create a network including cars, homes, recharging stations, smartphones, and city infrastructure (Toyota Connected, n.d.). Similarly, Mercedes-Benz with its 'energy storage home' in California, has created a modular system empowering renewable energy usage (Mercedes-Benz, n.d.).

5 Conclusion

The rise of car sharing programs in recent years is part of a greater mobility evolution, a bigger and long-term evolution of transportation preferences, and a multimodal system that is less car-centric. Car sharing therefore has the potential to disrupt the way in which cities currently operate. Not only does it offer a new mode of transport, but it pollutes the air less and leaves cities with more liveable space. While many people are open to the idea of car sharing, only a small percentage actually use it. This leaves a gap, meaning that cities are unable to reap the full benefits of car sharing. Within this context, D3.1 of the STARS project analyses the business models of current car sharing organisations. It explores the trends of current business models, conducts a SWOT analysis, and investigates the role of vehicle manufacturers as business model innovators.

Using the Business Model Canvas developed by Alexander Osterwalder and Yves Pigneur (2010), D3.1 describes how 15 different car sharing organisations operate. These organisations are classified by the five main types of business models in the car sharing sector, based upon their operational characteristics and business model variables identified in D2.1: 1) free-floating with an operational area; 2) free-floating with pool stations; 3) roundtrip, home-zone based; 4) roundtrip, station-based; and 5) P2P. Studying the business models individually, by group, and as a whole enables both global trends and unique selling points to emerge. As the industry continues to evolve at a rapid pace, not least due to the strong role of technology in the sector, the business models provide only a snapshot of the market. Furthermore, many organisations have adapted as they have expanded to other cities and countries, taking more of a 'glocal' approach, in which they use a global brand but tailor their business case to a local context. As such, many organisations offer very different pricing and benefit packages to their members in various cities. While this makes it difficult to compare brands as a single entity, it makes for smart business, inevitably prolonging the life of the car sharing organisation.

Each business model also proved to have a very distinct set of strengths, weaknesses, opportunities and threats. While these characteristics are distinct for each organisation, they are also highly influenced by factors such as whether an organisation offers its members free-floating or roundtrip services and are area/zone-based or station-based. Other influential factors include whether or not a business model depends upon an electric fleet (changing the distance and flexibility of the cars, but offering a unique value proposition), and whether or not an organisation is P2P (focusing on social aspects and resting the organisation's fleet offer upon the members' individual cars and their availability).

Regardless of the business model, developments in technology are leading to the emergence of new players throughout the automotive value chain (bringing new business models with them), and changes in mobility patterns are also resulting in changes in consumption on the market. These changes present a growing challenge to the business models of OEMs and all entities along the traditional value chain. Forced to adapt and innovate, both OEMs and car rental companies are now increasingly involved as key stakeholders in car sharing programmes. Many are bringing top-of-the-line features to their car sharing programs.

As the interaction between providers and users will be more frequent than in the past, one key to success will be to help users by serving them as trusted, digital and connected advisers—

ranging from where to go, how to get there, and what to do while moving. Car sharing programs can thus be seen as integrated elements of larger strategies: a piece of a puzzle in which connectivity, autonomous, shared programs, and electrification pillars are constantly interconnected and interdependent. Inevitably, these new trends will have an impact on both the automotive market and the automotive industry. How they are affected will be explored in D3.2 and D3.3, respectively.

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Appendix: OEM Strategies Reflecting the "CASE" Pillars

BMW Group Strategy By 2025 all brands model electrified or plug-in hybrid			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
"CURRENT: - industry 4.0: smart logistics, innovative automation, additive manufacturing - BMW APP: comfort safety & Entertainment - BMW ConnectedDrive: a technology packet full of services and APPs from the iDrive car touch screen FUTURE: - Artificial intelligence programs with Mobileye	CURRENT: - Semi-automated assistance for intelligent driving on BMW 7 series - semi or total Driverless cars/trucks - Cooperation for autonomous platform with Intel, FCA, APTIV, Continental, Magna PARTNERSHIP: - with Here, Bosch, Audi, Mercedes for HD-Map technology platform - with Intel and Mobileye for AV development	CAR SHARING: - DriveNow OTHER SERVICES: - ChargeNow - ParkNow - Ko:HAF: co-operative highly-automated driving program - COVERGE: optimizing future traffic management and vehicle safety systems - UR:BAN: partnership for Human factor in traffic - WHYBUY by Mini as usage offering initiative	CURRENT: - i3 and i8; - BMW series 2, 3, 5, 7 and X5: hybrid plug-in FUTURE: - Ionity Project: to launch 400 High-Power-Charging stations by 2020 in Europe (with Daimler, VW and FORD) - Hydrogen car engines on BMW 5 Series GT - Mini PHEV and BEV in production by 2019 - X3 BEV by 2020 - BMW iVISION by 2021/22: car such as Tesla with 600km range - Collaboration with SGL Carbon SE for carbon fibre solutions to be used in EV production

Table 25: BMW Group Strategy Overview

Sources: Own representation based on corporate sources (BMW Group, n.d.; BMW Group, 2018a)

Daimler Group Strategy By 2022			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - New cockpit: voice control and holistic touch-control system - COMAND Online: new version of this 2013 connectivity service. Music streaming, could, car-to-x communication, traffic information in real time, ect... via Hotspot connection. FUTURE: - Industry 4.0: digitalized, robotized and networked industry with smart logistics - Car-to-X: a completely new form of information exchange. It ensures more safety, comfort and been reached - Network on board: traffic information, collision prevention assistant, parking pilot, precise maps and real-time data	CURRENT: - Automated valet parking: pilot project with Bosch (only in Stuttgart) - Highway pilot for trucks - Intelligent Drive Controller: localization, signal processing, sensor data fusion, planning and control PARTNERSHIP: - Intelligent driving: starting in Germany, then China, Australia, South Africa and, at last, USA (test vehicle on the basis of a semi-automated S-Class) - Daimler & Bosch agreement to bring fully automated (Level 4) and driverless (Level 5) driving to urban roads by beginning 2020s - with Here, Bosch, Audi, BMW for HD-Map technology platform	CAR SHARING: - Car2go -Turo P2P: - Flinc: door-to-door sharing service - Croove: private car sharing SHUTTLE: - Via or On-Demand-ridesharing: with Mercedes Van - OminPlus - FlexPilot (test in Stuttgart) MULTI-MODAL: - Moovel: aggregator platform OTHER SERVICES: - MyTaxi - EQ APP: app to manage EV cars, Home energy, infotainment - Mercedes Flexperience - MercedesMe: connecting all services around the car	CURRENT: - Electric bus and transporter will enter the market in 2018 - Smart EV, Smart EV Cabrio - GLC F-Cell: Hydrogen SUV supported by plug-in technology due to scarcity of Hydrogen station structures FUTURE: - Ionity Project: to launch 400 High-Power-Charging stations by 2020 in Europe (with BMW, VW and FORD) - EQ Basics: joint development with ACCUMOTIVE: a battery, storage and plug-in specialized company - By 2022, new EV: class C, E, S, GLC, GLC, Denza, eVito, Fuso eCanter and eTrucks - Concept EQ EQA: on Class GLC and class A two EV concept cars

Table 26: Daimler Group Strategy Overview

Sources: Own representation based on corporate sources (Daimler, n.d.-b; Daimler, 2017)

FCA Group Strategy By 2022			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Blueconnect - 3D printing/additive manufacturing - Siriusxm Guardian: on board connectivity and safety service via both smartphone and car - Uconnect Access: 3G data coverage and roaming with unlimited onboard 3G WI-FI hotspot for managing your car and been connected in the car	CURRENT: - Cooperation for autonomous platform with Intel, FCA, APTIV, Continental, Magna, Mobileye PARTNERSHIP: - Collaboration with WAYMO for AV; - with BMW, Intel and Mobileye for AV platform	CAR SHARING: - partnership with Enjoy (Italy)	CURRENT: - Chrysler Pacifica Hybrid (US market) - Fiat 500EV FUTURE: - Mild Hybrid -48V by 2018 - PHEV

Table 27: FCA Group Strategy Overview

Sources: Own representation based on corporate sources (FCA, n.d.)

Ford Group Strategy By 2022/3			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Ford SYNC3: touch screen and access the services by voice commands Ford SYNC3: touch screen and access the services by voice commands - MyView (on F-150 truck) FUTURE: - By 2019, 100% of Ford's new U.S. vehicles will be built with connectivity; - By 2020, 90% of Ford's new global vehicles will feature connectivity - Collaboration with Qualcomm on C-V2x Global Initiative: Cellular Vehicle-to-Everything to Help Cities Around the World Create Safer, More Capable Infrastructure and Connect Vehicles to a Larger Communications System	A fully autonomous vehicle **by 2021** PARTNERSHIP: - relationship with Lyft to work towards commercialization and a collaboration with Domino's Pizza - advanced algorithms, 3-D mapping, radar technology and camera sensors with Velodyne, SAIPS, Nirenberg Neuroscience LLC and Civil Maps - Ford invested $1B in Argo AI: Drive for Autonomous Vehicle Leadership	SHUTTLE: - Chariot MULTI-MODAL: OTHER SERVICES: - FordPass App - Ford GoBike e-bike program	CURRENT: - sold +500K electrified vehicles in the U.S., including hybrid, plug-in hybrid FUTURE: - by 2023 investment of $5B for 13 new EV models-cars - Ionity Project: to launch 400 High-Power-Charging stations by 2020 in Europe (with BMW and Daimler) - exploring a strategic alliance with Zoyte for a low-cost all-electric passenger vehicles in China

Table 28: Ford Group Strategy Overview

Sources: Own representation based on corporate sources (Ford, n.d.; Ford, 2017; Hackett, 2017)

| GM Group Strategy |||||
| By 2025 |||||
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - OnStar: connectivity and advisory service - Urban Mobility connectivity - More than 3ml vehicles with 4G LTE connection FUTURE: - Connectivity Strategy 2025 with SAIC-GM joint venture - 5G connection on all models by 2025 - Between 2021 and 2025, SAIC-GM plans to link fully autonomous driving with the connectivity ecosystem	CURRENT: Acquisition of Cruise Automation for AV development Acquisition of Strobe for lidar sensors (fold into Cruise) PARTNERSHIP: - with Mobileye and IBM form AV technologies development - AV cars to be ready form ride-sharing in 2019	CAR SHARING: - Maven RIDESHARING: - partnership with LYFT OTHER SERVICES: - Book by Cadillac - Express Drive: short-term rental program to Lyft driver at affordable rates	CURRENT: - Chevy Bolt (EV) and Volt (plug-in) - Battery cell partnership with LG Chem - Since 2017, JV with Honda for fuel cell battery and to be on market on 2020 FUTURE: - By 2023, 20 new EV models - Partnership with Honda to develop longer-range fuel cell EV

Table 29: GM Group Strategy Overview

Sources: Own representation based on corporate sources (GM, 2017)

Hyundai-Kia Strategy By 2025			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - KIA new HMI cockpit: world's first in-vehicle 5G connection. FUTURE: - Hyundai will connect car-to-home by 2019 - KIA: Full range of connected cars by 2030 - Industry 4.0: Hyundai is developing its first EV platform to produce multiple model with longer driving range - Freedom in Mobility with "Project IONIQ": mobility access whenever and wherever	new Advanced Driver Assistance System (ADAS): an investment of $2 billion by 2018 All-new Kia fuel-cell EV due to launch in 2020; Kia aims to have AV cars in cities by 2021, and fully-autonomous to be ready by 2030 PARTNERSHIP: - IONIQ project: starting from EV and PHEV Ioniq car to a fully A&EV; - partnership with Aurora for AV by 2021	CAR SHARING: - Beezero: hydrogen car sharing program - Wible: car sharing by KIA & Repsol in Madrid with EV and PHEV cars - Ioniq: 100% EV car sharing in Amsterdam OTHER SERVICES: - Project IONIQ for mobility: create a more relaxed lifestyle by converging movement and life together	CURRENT: - Hydrogen propulsions with ix35 and Tucson series - Hyundai Ioniq: Hybrid, Plug-in and EV FUTURE: - 34 electrified vehicles by 2025 (18 models Hyundai, 16 models Kia) - By 2021 a 500km sedan under Genesis brand - Introduction of Hyundai Kona EV: 380km range - by 2025, next EV driving range up to 800km

Table 30: Hyundai-Kia Strategy Overview

Sources: Own representation based on corporate sources (Kia, 2018; Hyundai, n.d.)

Honda Group Strategy By 2025			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - MyHonda: connected car platform with CISCO Jasper - HondaLink: "link your vehicle to your life". In-Vehicle collection 4G LTE Wi-Fi (with AT&T in US and Canada) FUTURE: - AI technology and HANA: Honda Automated Network Assistant. An artificial intelligence assistant that utilizes an "emotion engine" making new choices, recommendations and suggestions - next phase in Honda connected cars at 5G speed	By 2025 autonomous self-driving car (but more focused on expanding its assisted driving features in its current vehicles rather than pushing for full autonomy) PARTNERSHIP: - partnership with Waymo for AV - partnership with SenseTime's AI Chinese start-up: hardware into Honda's vehicle control system to create a self-driving solution for urban areas	CAR SHARING: - Investment of $9m (10%) in ReachDa Car sharing (china) platform -Neusoft Group	CURRENT: - Clarity Electric vehicle expected to offer 80km range - Clarity and Accord PHEV - Since 2017, JV with Honda for fuel cell battery and to be on market on 2020 - Since February 2018: joint partner of Japan H2 Mobility, LLC to accelerate deployment of hydrogen stations in Japan (with Toyota and Nissan) FUTURE: - NeuV (pronounced "new-v"), which stands for New Electric Urban Vehicle, is a concept EV - Working on a battery scooter to be launched in Japan - 2/3 of Honda cars will have some form of electrification by 2030

Table 31: Honda Group Strategy Overview

Sources: Own representation based on corporate sources (Honda, 2017; Honda, n.d.)

Jaguar Land Rover Group Strategy By early 2020s			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - InMotion Ventures: investment in Wluper (intelligent personal assistant for navigation and transportation), Zeelo (AI to predict and identify routes, solving inconvenient...) - new pre-paid connected car unlimited data plan with AT&T (only in US) via the InControl Wi-Fi FUTURE: - in-car connected partnerships with Qualcomm: the aim is high-speed 4G LTE connectivity based on Qualcomm's 820Am Automotive Platform - Sayer concept is the first voice-activated artificial-intelligence steering wheel capable of carrying out hundreds of tasks	CURRENT: - Advanced Driver Assistance Systems with Roadwork assist, safe pullaway and "over the horizon warning" technologies - invested $3 million in self-driving taxi service start-up Voyage - Autonomous Urban Drive: tested Level 4 on Range Rover Sport PARTNERSHIP: - partnership with Intel	CARSHARING (via InMotion Venture): - Cove: residential and closed community luxury car sharing in Asia RIDESHARING: - $25ml invested in Lyft CARPOOLING: - GoKid: Closed community ride-share platform for schools, sports leagues, and families SHUTTLE: - Sheprd: on-demand micro-transit solution for children (modern school bus ventured by InMotion) OTHER SERVICES: - By Miles: pay-per-mile car insurance. Rather than buy a traditional annual policy, sign up for a fixed monthly subscription and pay on a flexible per-journey basis	CURRENT: - Jaguar E-type - Jaguar I-PACE - Competing in FIA Formula E Championship with I-TYPE2 racecar FUTURE: - every Jaguar and Land Rover launched from 2020 will be electrified - visionary FUTURE-TYPE virtual concept imagines autonomous, connected, electric and shared mobility for 2040 and beyond

Table 32: JLR Group Strategy Overview

Sources: Own representation based on corporate sources (Jaguar Land Rover, 2017)

Mazda Strategy			
By 2030			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Standardization of i-ACTIVESENSE advanced safety features (blind spot, radar cruise control, smart city connection, etc.) - Mazda Connect: Communication, Entertainment and Usability FUTURE: - by 2020, testing Mazda Co-Pilot Concept for AV technologies; make the system standard by 2025 - Using current Connectivity technologies to support people in depopulated areas or who have difficulty getting around	CURRENT: - Mazda Co-Pilot Concept: by the year 2025, Mazda plans to make Co-Pilot standard across the model lineup - Still "traditional" engine development: SKYACTIV-X would be 20 to 30% more efficient than its current (gasoline & diesel) engines PARTNERSHIP: Collaboration with Toyota on vehicle planning and application for AV technologies	CAR SHARING: - Mazda Mobile in Cologne	FUTURE: - i-ELOOP is a unique regenerative braking system that creates electricity from wasted energy when you slow down - From 2019, introduction of EV and other Electric drive technologies in regions that use a high ratio of clean energy - partnership with Toyota to share EV technology and built a $1.6B US assembly plant

Table 33: Mazda Strategy Overview

Sources: Own representation based on corporate sources (Mazda, n.d.)

PSA Group Strategy By 2025			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Free2Move connect Fleet: real-time transmission of data, Geolocation and Adive for Eco-driving FUTURE: - strategic platform with Huawei - Pacific International Lines (PIL), and IBM Singapore have agreed a joint venture into the trial and exploration of blockchain technology innovations (Car eWallet)	AVA "Autonomous Vehicle for All": by 2020 "Eyes-off" autonomous driving – level 3- car will be available PARTNERSHIP: - with NuTonomy team for autonomous technologies development: focused on software (on 3008 series)	CAR SHARING: - CarUnity: on 2017 it joined TAMYCA platform -private car sharing MULTI-MODAL: - Free2Move OTHER SERVICES: - Carventura.com, a start-up created by Groupe PSA, will offer new services such as financing, insurance and maintenance - MisterAuto.com, online sales of spare parts and accessories since 2015	CURRENT: - Citroen C-Zero, E-Mehari - Peugeot EV-Hybrid offer: iOn, TepeeEV, Partner EV, 508 Hybrid FUTURE: - e-CMP platform: long range (around 450km/230miles) all-electric cars: 1 EV by 2019, 4 EV by 2021 - EMP2 platform: new plug-in hybrid cars on 3008 model

Table 34: PSA Group Strategy Overview

Sources: Own representation based on corporate sources (PSA, n.d.)

Renault-Nissan-Mitsubishi Alliance Strategy			
By 2022			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - on 2016 created the Alliance Connected and Mobility Services (A-CMS) for connected mobility solutions - ProPILOT, a self-driving feature that lets cars drive autonomously on highways FUTURE: - Alliance Connected Cloud and SYLPHEO partnership for connected services - Partnership with Microsoft: design and deploy the Connected Vehicles Platform component of the Alliance Connected Cloud	CURRENT: - Nissan launched advanced driver assistance technology; on Serena in 2016, on X-Trail and Leaf on 2017 - SYMBIOZ Demo: concept AV from Renault PARTNERSHIP: - Robotic technology: development of AI with Sileane and Liris 1) Project ANDY was launched: it permits robots to actively and safely share a common workplace with humans 2) ROBOTT-Net: a platform for developing new robotics idea (a hub based in Sunderland)	CAR SHARING: - Zity: car sharing program in Madrid with Ferrovial (fleet: 380 Renault Zoe Z.E. 40) - Intelligent Get: car sharing and P2P programs OTHER SERVICES: - explore a new EV car sharing program with Didi - GoMicra: leasing program - GLIDE powered by RCI Mobility: RCI Mobility's strong partnership with the Renault Nissan Alliance. An employees' car booking service - Four Mobility & Connectivity projects in which Renault Group is interested in: Persistant Studios (interaction among vehicle, external environment and passengers), Toucan Toco & Dalberg Data Insights (developing EV platform) and Logiroad (real-time traffic info) - Robo-taxi service by the end of 2022	CURRENT: - Renault Zoe, Twizy, Kangoo EV, and SM3 Z.E; - Nissan Leaf, E-NV200 - Mitsubishi iMIEV, Outlander PHEV - Since February 2018: joint partner ofJapan H2 Mobility, LLC to accelerate deployment of hydrogen stations in Japan (with Toyota and Nissan) FUTURE: - By the end 2022: 12 new electric vehicles will be launched; the range expected to exceed 600 km (IMx Kuro futuristic Concept) - to provide a range of 230 km per 15-minute charge - EZ-GO: Renault to show a new concept focused on shared urban mobility in Geneva motor show

Table 35: Renault-Nissan-Mitsubishi Alliance Strategy Overview

Sources: Own representation based on corporate sources (Renault-Nissan-Mitsubishi Alliance, n.d.; Audebert, 2018)

Toyota Strategy			
By early 2020s			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Artificial intelligence (AI) technology: Toyota invests $1 billion over the coming 5 years FUTURE: - Mobility Teammate Concept: linking Cars, Homes and People - ITS Connect: Intelligent Transport Systems with the aim of completely eliminating traffic accidents - T-Connect App: a high-performance navigation system for smartphone - G-BOOK / G-Link / GAZOO: allows users to link smartphone and G-equipped cars –currently in Japan	CURRENT: On 2017: Lexus CoDrive advance driving assistance - By 2020: Automated driving on highways "Highway Teammate" to be launched - By early 2020s: autonomous self-driving car "Urban Teammate" to be launched - TOYOTA CONCEPT-i: the car will learn from driver past experiences and provide opportunities for new experiences PARTNERSHIP: - Partnership with Mazda to share EV technology for AV - Partnership with Luminar for LINAR sensors on a more accurate object detection technology and mapping	CAR SHARING: - Yuko: full hybrid car sharing P2P: - GetAround: partnership for P2P car sharing program –only in US OTHER SERVICES: - Toyota E-Palette: project in mobility and delivery services (self-driving boxes roaming through cities, delivering people, packages, and pizza) - Ha:mo RIDE: "Harmonious Mobility" network, an ultra-compact sharing service. Optimal connection between personal transportation modes and public transportation	CURRENT: - Toyota MIRAI: hydrogen car - Since February 2018: joint partner of Japan H2 Mobility, LLC to accelerate deployment of hydrogen stations in Japan (with Toyota and Nissan) FUTURE: - Ha:mo rides and E-palette projects - Hybrid and plug-in technology to leverage for 100% EVs - EV Vehicles: i-Road, iQ-EV (ultra compact category)

Table 36: Toyota Strategy Overview

Sources: Own representation based on corporate sources (Toyota, n.d.)

Volvo Group Strategy By 2025			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Volvo Sensus: connectivity pack on Volvo vehicles such as infotainment, Internet connection, high-connectivity GPS system, and Volvo on Call service (to manage your car or get helped from the car) - in US: Wi-Fi wireless Hotspot with connectivity provided by AT&T FUTURE: -"connectivity as a great means to transform the in-car and ownership experiences for our customers"	CURRENT: - On 2012, SARTRE program completed on 2012: autonomous platooning Volvo cars on open roads - On 2013, autonomous parking concept demonstrated: driverless self-parking controlled by mobile phone - On 2014, Pilot Assist & Auto-brake programs started - On 2017, the Drive Me trial in Gothenburg has started: autonomous technology test program on XC90 model PARTNERSHIP: - with NVIDIA, Microsoft, TomTom, and Uber for AV development and technologies	CAR SHARING: - Sunfleet (only in Sweden) OTHER SERVICES: - Care by Volvo: customer "full-optional" service at a monthly fee (tires, maintenance, pick-up & delivery, warranty and insurances...) - Implementing an autonomous ride-hailing service: to be launched in 2021 - Volvo In-car Delivery makes shopping more convenient and saves you time by allowing you to have online orders delivered directly to your car	CURRENT: - Drive-E offer: plug-in Hybrid diesel, and Twin Engine Hybrid gasoline - Developing mild hybrid engine with 48V technology - Renault Electric Trucks to be started selling on 2019 - Volvo EV buses already on Gothenburg (route 55) FUTURE: - Volvo CE EX2: 100% electric compact excavator prototype - By 2025: 1 million BEV or PHEV cars/vehicles on the road

Table 37: Volvo Group Strategy Overview

Sources: Own representation based on corporate sources (Volvo, n.d.)

Volkswagen Group Strategy By 2025			
Connectivity	**Autonomous**	**Shared Programs and Services**	**Electrification / Alternative Propulsion**
CURRENT: - Audi Connect Pack: infotainment; mobility info and traffic with Live Map, security and safety assistant - in US, Audi and AT&T propose "connectivity pack services" via an in-vehicle 4G LTE with 3 different packages (CARE, PRIME, and PLUS) FUTURE: - Industry 4.0: digital transformation with modular plant architecture to cut costs by 30% by 2025 - Sedric Connectivity: innovative functions such as looking parking space, collect shopping, pick-up visitors and a son from sports training	By 2025 autonomous self-driving car CURRENT: - Sedric project: internal platform for autonomous driving in VW Group PARTNERSHIP: - with HERE for HD-Map and other connected services - partnership with AURORA for AV technologies and also new MaaS with AV (shuttles) - partnership with Mobileye and NVIDIA	CAR SHARING: - Seat bought RESPIRO car sharing provider RIDESHARING: - Partnership with GETT P2P: -Zpiwagen: partnership with Zipcar MULTI-MODAL: - MOIA: develop and extent on-demand mobility services OTHER SERVICES: - Porsche Passport - Audi on Demand & Audi at Home - Future e-van ride-sharing with MOIA	CURRENT: - e-Golf - e-UP - Hybrid offer based on MEB platform: Golf and Passat GT-E FUTURE: - Ionity Project: to launch 400 High-Power-Charging stations by 2020 in Europe (with Daimler, BMW and FORD) - By 2025 more than 30 new electric vehicles - By 2019/20 the ID Crozz concept EV will become the VW's first standalone EV - By 2025, at least 1ml VW BEVs worldwide - Battery technology as a core competency with global order value of $+50B to tender - Porsche Mission E concept: 500km range, and 400km recharged in 20min - ID Vizzion Robotic concept car (for 2030)

Table 38: VW Group Strategy Overview

Sources: Own representation based on corporate sources (Volkswagen, n.d.; Volkswagen, 2017)