STARS

Shared mobility opporTunities And challenges foR European citieS

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Car sharing business models' investigation report: strategies assessment, recommendations and impacts on Public Transport

Deliverable D6.2

Version n° 02

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Acronyms

CS	Car Sharing	**FFOA**	Free Floating with operational area
ENA	Enquête Nationale sur l'Autopartage	**FFPS**	Free Floating with pool stations
ENTD	Enquête Nationale Transports et Déplacements	**P2P**	Peer-to-peer
FF	Free Floating	**MaaS**	Mobility-as-a-Service
PT	Public Transport	**MoD**	Mobility on Demand
PPP	Public-private partnerships	**A3S**	Automobility-as-a-Service
PTA	Public Transit Autority(ies)	**WP**	Work Package
AI	Artificial intelligence	**RTSB**	Roundtrip station based
RTHB	Roundtrip home zone based	**OEM**	Original Equipment Manufacturer

SUMMARY

The objective of this deliverable, final result of Task 6.2 (Latent impacts of economic activities beyond the automotive sector) and Task 6.3 (Identification of new business models) within WP6 (Future Industrial impacts), is to review relevant existing trends, research results, business cases and projects to identify if car sharing service has an impact on public transit and taxi. Furthermore, the consortium has also to determine which could be the best business model under specific operating conditions.

This deliverable leverages findings and outputs from previous STARS Deliverables, in particular WP3 and WP4. In addition, there is a close link with STARS Deliverable 5.1 (Mobility scenarios of car sharing: gap analysis and impacts in the cities of tomorrow) focused on business as usual versus rupture scenarios of car sharing diffusion.

Is car sharing able to create synergies with public transit and taxi or it is a threat? Does public-private partnership (PPP) a viable solution to both city traffic relief and car sharing higher utilization rate? These and other questions remain, regarding the nature and magnitude of the future impacts of car sharing, especially given its expected convergence with MaaS, facilitated by technological progress. Given the enormous impacts of motor vehicles, and with the use of car sharing potentially growing, it is of critical importance to clarify questions related to the expected future impact of these changes in car-based mobility, and how it can be integrated with current mobility options.

We present here an analysis of the relation between car sharing and public transport networks (busses, trains and metros) starting from the evaluation of what a public-private partnership is, car sharing models and their interactions with public transport followed by some case studies, and finally the relation with taxi service.

After this, in a second part of the document, we have carried out a comparative assessment of car sharing business models (identified in WP3) using three main categories of innovation: configuration of the company, service offering, and service experience.

The report concludes with several recommendations for both car sharing operators and cities/public authorities in order to maximise the success and impact of sharing mobility not only in city centres, but also in their sub-urban areas. The current impression is that car sharing can help cities in reducing traffic and freeing new public spaces, but it needs to be integrated within cities' infrastructures and mobility policies. The trend is Mobility-as-a-Service (MaaS) as also underlined in several case studies described: car sharing operators should not only propose a diversity of service (free-floating roundtrip, station based, P2P, and so on), but also to be ready to be integrated in (smart) city mobility solutions enlarging reliable solutions for citizens.

Introduction

Car sharing -in all business models- is changing how people move and impacting mobility trends. This report will extend the analysis to understand how the diffusion of CS has impacted or will influence other mobility solutions (in particular public transit and taxi), and also how CS business model has been changed. D3.1 STARS report (Wells, Tart, Beccaria, & Sanvicente, 2018) presents an analysis, developed upon D2.1 STARS report(Rodenbach, Mathijs, Chicco, Diana, & Nehrke, 2018), of the five archetypical 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).

As stated, each business model also proved to have a very distinct set of strengths, weaknesses, opportunities and threats. However, 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 all entities along the traditional value chain.

In this context, car sharing programs can be seen as integrated elements of larger strategies in which connectivity, autonomous, shared programs, and electrification pillars (CASE[1]) are constantly interconnected and interdependent. To reach this target, a cooperation with public entities or public-private partnerships can play a fundamental role. The effectiveness of a multimodal system depends on the adequacy and complementarity between different transport modes, which can only be organized by public authorities.

The findings of the previous STARS deliverables show that car sharing can make a substantial contribution to sustainable urban development which will be necessary to create the 'city of tomorrow', with more green space, less pollution and less costs. Car sharing helps to regain street space through reducing the amount of traffic and parked cars. It is the basis for building new developments with less provision for cars; this is less costly and should lead to better urban design.

However, so far, the involvement of Public Authorities in car sharing services is extremely diversified among EU nations, but also into a country itself, generating a very fragmented pattern, quite challenging to analyse.

A recent IDDRI-led study[2] on collaborative mobility shows that local authorities have contrasting positions regarding car sharing practices. Some are interested in their solutions but struggle to

[1] CASE Strategy has been discussed in STARS D3.3 report - section 3
[2] "Collaborative mobility: public authorities have a role to play!" https://www.iddri.org/en/publications-and-events/blog-post/collaborative-mobility-public-authorities-have-role-play

envisage ways to link these solutions with their existing mobility provision. Others are more reluctant to deal with these collaborative mobility actors who may appear intimidating, as do Uber and Airbnb for example, the figureheads of the collaborative economy.

It is certain that CS can allow public entities to reach new audiences and broaden the dissemination of such practices to new territories, even if development constraints remain strong in sparsely populated territories. Cooperation among different actors will be fundamental for low-densely populated and rural areas: PPP can lead to a value added even though not at the same level it can lead in urban and highly densely populated areas.

In addition, the challenge of sustainable mobility consists in going beyond the choice between private car/public transport, to offer a range of transportation modes that enable the recreation of the convenience and freedom offered by the private car, or from well-networked public transport.

Experimentation seems essential to test new solutions and organize their complementarity with other modes of transport, but it faces in reality the difficulties of collaboration between start-ups and local authorities and the financial "hesitancy" of the latter. Integrated mobility solutions (namely MaaS) can potentially overcome all barriers even though the development of Mobility as a Service in West Sweden revealed how stakeholders involved in the project perceived internal and external barriers differently (Göran Smith, 2018).

Methodology

This deliverable is the second (and last) report of Work Package 6 (WP6) that consists in the "Future industrial impacts". This work package has a role in the STARS project to explore the impact of car sharing services towards public transit and taxi services as well as car sharing business model evolution.

In addition, the methodology used for this WP6 deliverable and its findings was used and also adopted for the completion of the first deliverable (D6.1) due at M26.

Different methodologies have been used to collect data:

- General Motors, Cardiff University and LGI have conducted interviews, in order to collect data. More than 20 interviews have been done from the three partners.
- Politecnico of Turin designed a mobility survey, aimed at understanding the impacts of car sharing on mobility habits in the cities of Turin and Milan (Italy); similar data has been collected by bcs on the city of Frankfurt am Main (please see D5.1 STARS report for more details).
- Autodelen conducted also a series of interviews: 4 car sharing operators + 1 Public transport company from Belgium.

Regarding cities, PT and car sharing operators, the focus of the interviews (see Appendix 1 for main questions asked) was given to any form of synergy and cooperation among mobility providers or if any collaboration has been foreseen by 2024-2025. We also asked what the possible scenarios for car sharing are and business models' evolution.

Concerning innovation tactics in car sharing, different CS business models have been compared and evaluated using an analytics framework "ten type of innovation" as described in section 2. Business model innovation can support the creation of disruptive innovation that generally asks for new competitive approaches, for example, to lower prices or reduce the risks and costs of ownership for customers. In times of instability and crisis, companies generally reinvent themselves, rather than fostering incremental innovation or deploying defensive or reactive tactics in the market (Lindgardt Z. et al, 2009).

Value creation is at the heart of any business model (Baierl et al., 2019). The target of the value proposition is to fulfil the customer's needs. By innovating the value of a product or service, the business model of a company moves towards a more sustainability performance. The innovation refers to the development of a novel activity that can be achieved by changing the configuration, offering, or experience of the business system as depicted in section 2.2.

1 Alternatives to WP3 Business Models (BMs): Cooperation with public authorities, public transport and taxi services as a long-term strategy.

1.1 Effects of public-private partnerships

1.1.1 Definition and consequences of PPPs in WP3 Business Models

Already back in 2013, the European Commission published its Communication "Public-private Partnerships in Horizon 2020: A powerful tool to deliver on innovation and growth in Europe" in which it is stated that Europe must invest more and better in research and innovation. A key element of Horizon 2020 is to join forces with the private sector and with Member States, to achieve results that one country or company is less likely to achieve alone.

PPP can be defined as a "cooperation between public and private actors with a durable character in which actors develop mutual products and/or services and in which risk, costs, and benefits are shared" (Erik-Hans Klijn, 2002). In an ideal PPP, the traditional distinction between public and private is dissolved. So, while interaction between the two spheres has been going on for decades, cooperation has recently become more focused on mutual development and the realisation of products.

The European Commission has been investing heavily in PPPs (Public Private Partnerships) to enable a long-term, strategic approach to research and innovation and reduce uncertainties by allowing for long-term commitments, for example to improve the quality and efficiency of rail services in Europe: The Public Private Partnership Shift2Rail is working with a total investment of EUR 920 million to drastically improve the quality and efficiency of rail services in Europe by accelerating the uptake of innovative solutions. The initiative pools the resources and expertise of all key players to increase reliability and punctuality of rail services by as much as 50%, to double railway capacity and thereby reduce congestion and CO2 emissions, to cut the costs of infrastructure and rolling stock by up to half, and to retain Europe's leadership in the global rail market. These objectives can only be achieved if all actors in the rail sector work in partnership.

In 2016, the European Commission reinforced the role of Public Private Partnerships, and more than EUR 20 billion are planned to be invested in the coming years in the context of the Digital Single Market. Partnering-up for smart mobility is valuable but needs to be used very carefully and with a complete understanding. PPPs, for example, aren't the only way to do large projects, but innovations have the potential to tackle the societal challenges of today and become key contributors to the achievement of the European Union's 2020 objectives.

In addition to maximizing efficiencies and innovations, and to foster a more sustainable mobility, partnerships, may they be formal or informal, can provide much needed capital to finance programs and projects, thereby freeing public funds for core economic and social programs.

Public-private partnerships (PPP) have been much discussed throughout Europe, but does the practice match the idea of cooperating actors who achieve added value together and share risks? Actors have difficulties in achieving actual joint decision-making and organisation and tend to organise their interactions in a traditional way: by contracting out and by separating responsibilities (Erik-Hans Klijn, 2002)

Building PPP is not an easy exercise. Traditionally, PTA have longer, and heavier processes compared to more agile and lean private start-up: the decision-making process is very short and quick (MaaS Alliance, 2019) . Furthermore, there are differences also in term of vision and approach to mobility.

Looking to the future, technology can help in overcoming private-public differences enabling viable partnerships and collaborations among different (mobility) partners. PT has the possibility to leverage new innovative technologies, real-time data, AI and blockchain to improve users' experience, but also to improve the quality of the service, enhance operation and reduce processes costs. As a PT undertakes a huge transformation, it may be helpful to consider a few guidelines to concretize **innovative transit strategies** (Susan Shaheen, 2018):

- Support different pilots or small case studies with private operators in other that PT can enjoy new specialized resources (from private sector) that would have required a significant quantity of both time and (financial) commitment if developed internally. PPP is a tool that PTA and/or PT operators can leverage to improve access to transit, respond to users' needs, be more reactive in replying when natural or manmade hazards impact daily transportation, and enlarge transit network to low-densely populated zones.
- PT(A) should be the owner of all collected data and being the data repository. The development of interconnected and interoperable mobility service will rely heavily on access to data and ticketing, and open APIs (Application Programming Interfaces). In addition to access to data, an imperative requirement is the high quality of data being exchanged. Data can be exchanged at: voluntary based, in collaboration, in reciprocity, based on commercial contracts or to regulatory obligation (MaaS Alliance, 2018). Data sharing and data exchange may be a major barrier, while often it is a more local issue due to structural lack of technical knowledge, lack of trust among stakeholders and slowness in regulating the matter.
- The focus of the partnership should on the accessibility and equitability of transportation. PT has the widest "customer" base compared to any private mobility operator. In addition, PT serves all categories of users (young, commuters, elderly, low-income, reduced-mobility people, etc…): PT should always put the societal justice at the centre of its service reinventing itself (thanks to new technology) as an affordable, customer-focused, and on-demand alternative to private vehicles.

As stated above, Public-private partnerships (PPPs) may be an increasingly effective strategy. It can draw together the resources and know-how that are needed to expand and improve car sharing

business models for ensuring that States progress in their digital readiness. As a matter of the fact, the market has responded quite strongly to this approach.

As PPPs enable a long-term, strategic approach to research and innovation and reduce uncertainties by allowing for long-term commitments, the digitizing industry has adopted such scheme in diverse sectors, from physical infrastructure such as broadband connectivity and cloud services, to immaterial infrastructure and enabling digital services[3]. Recent MaaS project (UbiGo[4] and Whim[5] in Europe) are other examples were PPPs may enable long-term strategic collaboration.

PPPs have been used as a model to foster the engagement of the private sector in the infrastructural and software development for the benefit of the public good, with an intention to have stronger economies and research and development investment thus enabling a more dynamical and sustainable investment model in the tech sector.

The relationship between car sharing and public transportation networks can in principle be considered within the larger and emergent concept of Mobility as a Service (MaaS). However, as is discussed in this report, it is not a foregone conclusion that car sharing will be beneficial to public transport or to overall improved mobility. Neither is it a foregone conclusion that car sharing will enable the delivery of MaaS. Furthermore, a more critical perspective would ask whether MaaS itself offers a pathway to the reduction of private car ownership and use (Storme et al., 2019).

In principle, different approaches to automobility provision could be combined along with public transport to create integrated 'mobility as a service' (Ambrosino et al., 2016). The concept of mobility as a service (MaaS) is well established (Kamargianni and Matyas, 2017). It is all-embracing in that it combines multiple possible modes of travel with public and private provision. MaaS is often seen from a transport planning perspective as having the potential to disrupt the current automobility system of private car ownership towards a more sustainable 'post-car' system (Audouin and Finger, 2018). The following is a definition of MaaS from the MaaS Alliance[6].

[3] In order to support the implementation of federated projects able to empower the interoperability of public and private services and the realization of a Digital Single Market, also through a focus on emerging technologies, the European Union has been heavily investing in PPPs in the innovation field. PPPs have been launched to build cybersecurity solutions in the energy, health, transport and finance sectors; to foster key enabling technologies linked to photonics; to develop the next generation of High Performance Computing technologies; to provide a platform for the industrial and academic community to develop a common roadmap for robotics in Europe to support Future Internet-enhanced applications of public and social relevance; to maintain semiconductor and smart systems manufacturing capability in Europe and help it grow; and to strengthen Europe's industrial competitiveness and sustainability in the future.

[4] https://www.ubigo.me/

[5] https://whimapp.com/about-us/

[6] See https://maas-alliance.eu/homepage/what-is-maas/

"Mobility as a Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi or car rental/lease, or a combination thereof. For the user, MaaS can offer added value through use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations. For its users, MaaS should be the best value proposition, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys as well as the entire system of mobility services.

A successful MaaS service also brings new business models and ways to organise and operate the various transport options, with advantages for transport operators including access to improved user and demand information and new opportunities to serve unmet demand. The aim of MaaS is to provide an alternative to the use of the private car that may be as convenient, more sustainable, help to reduce congestion and constraints in transport capacity, and can be even cheaper."

This idealised view of MaaS is still a vision rather than a practical reality. However, proponents of MaaS and of public transport generally have to consider how far, and in what ways, car ownership and use fits into this future vision. In principle, car sharing offers an 'intermediate' form of car ownership and use that could bridge between the separate private and public provision of transport or mobility solutions (Jonuschat et al., 2015). These mobility solutions could be constructed from 'packages' to suit specific contextual settings and consumer needs (Esztergár-Kiss and Kerényi, 2019). In this respect, MaaS embraces (at least potentially) all modes of mobility including all forms of traditional public transport, ride hailing, ride sharing and taxi services, car sharing, and sub-car mobility provision via bicycle sharing as Cycling as a Service (see Petzer et al., 2019).

Car sharing has a range of potential impacts. It may simply increase the amount of travel or mobility with no direct impact on public transport. Very light modes of mobility sharing such as scooters are likely to displace walking as much as anything. Car sharing, however, can enable some to access cars when they could not otherwise do so, and / or to undertake trips that would not otherwise have been taken. In so far as there is more traffic generated there is potential to increase congestion and reduce the utility of public transport.

Car sharing, alternatively, might be synergistic with MaaS in that the whole system of mobility becomes more optimal at the city level (Jonuschat et al., 2015). Mounce and Nelson (2019) argue that one-way electric car sharing services can integrate between public urban transport modes (i.e. providing an inter-modality service) that allows for cohesive multi-modal trips.

Car sharing might be partially synergistic MaaS in that some of the negative externalities of private car ownership and use are reduced. Car sharing can ease parking and congestion in urban areas, thereby contributing to improved traffic flow for public transport modes.

Alternatively, car sharing and 'Automobility as a Service' might be destructive by allowing the erosion of the viability of public transport. There is no necessity to integrate car sharing with public transport for many of the operators. Car sharing might also be deployed in high demand areas, leaving public transport operators to cope with lower density demand routes at more marginal economic viability. If mass transit routes are undermined there is a greater cost in terms of congestion and the use of road space, particularly when the occupancy rates of shared cars are low. As Becker et al. (2019) note: 'Efficiency gains may be higher if shared modes were used as a substitute for public transport in lower-density areas'.

Not all these impacts are purely the product of car sharing and MaaS, because factors such as the technologies of the vehicles may be important in reducing some negative externalities such as carbon emissions, noise or toxic pollution (Ding et al., 2019).

The evaluation of CS with public transport may depend upon 'traditional' factors such as the occupancy rate, and whether CS users are drawn from cars, public transport or generating new trips. Also dependent upon motivations from users. According to qualitative research from Jain et al., (2020) car sharing in Australia enabled and facilitated changes in travel behaviour but did not cause them. Reconsideration of car ownership was usually triggered by key life events or long-term mobility decisions rather than the availability of car sharing. The significance of specific contexts (physical environment; weather; etc.) and lifestyle choices (including stages of life) have also been emphasised elsewhere in research into the uptake of car sharing (Priya Uteng et al., 2019).

Table 1 provides an overview of car sharing business models and their potential interactions with public transport. Some of the schemes (such as round-trip, station-based) may have cooperative agreements with public transport providers, including digital integration of some services. Mostly, however, cooperation with public authorities is focused around the provision of parking for car sharing schemes. Several car sharing business models are trying to integrate their payment platforms with public transport cards, and are securing their parking spots at metro stations and airports.

Car sharing model[7]	Positive	Neutral	Negative

[7] FF OA = Free-floating, with an operational area. Car sharing organisations that operate under a business model that is free-floating with an operational area provide one-way trips for members, allowing them to park the cars in any space within a defined district.

FFOA	Can provide near on-demand linkages to public transport systems; can collaborate with public authorities over parking places	May be provided independent of the public transport network; do not compete with public transport	More likely to compete with ride hailing and taxi services; Zone parking may mean vehicles are not proximate to public transport services
FFPS	Can have strong connections with local city governments and strive to integrate their services with public transport; useful model to introduce electric cars	May draw users from both public and private transport modes; stations may or may not be co-located with public transport	Incorrect station location can result in sub-optimal trips or trip proliferation
P2P	No clear benefit from or link to public transport; some synergies possible with parking space reduction	May reduce ownership levels for some users but retain them for some 'suppliers' of cars.	Likely to deter users from public transport; increases the number of cars in circulation on the roads
RTSB	Can forge partnerships with other organisations to create travel plans; can offer discounts to public transport users	Trips often longer range, outside urban areas, so less contribution to city transport issues	May compete with the daily rental industry with less net benefit to urban mobility; an alternative to company cars

FF PS = Free-floating, with pool stations. These provide one-way services, but drivers must instead park their cars at designated stations spread out around the city. (Note: Only application of significance was Autolib, which has since failed).

P2P = Peer-to-Peer (P2P) These organisations operate much like roundtrip, home-zone based organisations, only it's the car owners' own cars that get rented out rather than a separate vehicle fleet.

RT SB = Roundtrip, station basedOrganisations with a roundtrip station-based business model lack flexibility of their home-zone based counterparts, but offer a quicker service, as customers know exactly where to find the cars. Much like a traditional car rental service, users must return the cars to the same location.

RT HB = Roundtrip, home zone based. These organisations offer a service where drivers must return to the general area from which they started.

RT HB	Can collaborate with public authorities over parking places; can have stronger community support	May be a way for users to try new cars; retains car ownership and use as a central feature of transportation	Not useful for regular commuting trips; More likely to compete with ride hailing and taxi services

Table 1: Car sharing models and (potential) interactions with public transport: an overview

As Table 1 suggests, car sharing schemes may compete with ride hailing and taxi companies, as well as some elements of public transport. Much depends upon the specific application and the specific contextual setting, including the policy stance of the local (urban) authority in question (Dowling and Kent, 2015). Notwithstanding the specific business model, the decision to use (or re-use) car sharing services is not reducible to a logical calculus of travel optimisation in time or cost terms. Rather, subjective norms and attitudes can be significant motivators both to use or avoid car sharing (Mattia et al., 2019).

With respect to ride hailing and ride sharing, there is even less of an evidence base in the public domain about the relationship with car sharing services and public transport. In principle, again, there could be either positive synergies or negative consequences for public transport. According to Mulley and Kronsell (2018), available opinion is divided. Some consider that of ride hailing or ride sharing might lead to new ways of creating flexible, on-demand urban bus services. Others consider that ride hailing and ride sharing would the way public transport is organized and financed ultimately be disrupted so that what is viable in terms of competition, contracts and governance would need to be reconsidered. However, in neither case is the influence of car sharing evident. It is possible therefore to envisage an urban mobility solution (MaaS) in which the majority of provision is privatised, car-based, and distributed with a high on-demand element combining car sharing with ride hailing as the predominant modes. Alternatively, the mobility solution might be to combine more flexible public transport provision with the 'lubricant' of car sharing at the urban scale, and with micro-mobility (scooters; bicycles) at the more local scale -see case studies in section 1.1.2. In turn this means that the future of MaaS and the role of car sharing within MaaS is very much a matter of governance and contestation at the urban scale, with incumbent operators having a powerful but not always determinate voice on future outcomes (Hirschhorn et al., 2019).

Therefore, we may conclude that the domain of MaaS means that transport planning at the urban scale can result in a great diversity of solutions, and a great diversity of car sharing applications, depending upon local context, historical precedent, and ongoing technological and organisational innovations.

1.1.2 Integration with Public Transport as a viable solution?

As previously described in STARS deliverables, it has been demonstrated that CS members use more PT than non-CS users. The analysis done by STARS surveys of public transport seasonal ticket/pass ownership shows different results between (non-)CS users across Europe, in particular in Germany, Italy and Sweden, but the same trend.

In STARS Deliverable 4.3 (Ramos et al, 2019) several data have been presented related to PT daily usage within CS users: 4 (+1) profiles[8] have been compared among Germany, Italy and Sweden as presented in Table 2 below.

<table>
<tr><th colspan="4">User profile: FFOA</th></tr>
<tr><th>Germany</th><th>Italy</th><th colspan="2">Sweden</th></tr>
<tr><td>PT season ticket (47.4%)

Daily use of PT (26.3%), car (18.5%) & bike (17.4%)</td><td>PT season ticket (--)

Daily use of car (25.1%) and walk (37.6%)</td><td colspan="2">PT season ticket (--)

Daily use of PT (26.5%) and walk (61.8%)</td></tr>
<tr><th colspan="4">User profile: FFPS</th></tr>
<tr><th colspan="2">Italy</th><th colspan="2">Sweden</th></tr>
<tr><td colspan="2">PT season ticket (--)

Daily use of PT (28%) and walk (53.8%)</td><td colspan="2">PT season ticket (--)

Daily use of PT (25%) and walk (53.8%) and bike (23.1%)</td></tr>
<tr><th>Combined*</th><th colspan="3">User profile: MultiOC</th></tr>
<tr><th>Germany</th><th>Germany</th><th>Italy</th><th>Sweden</th></tr>
<tr><td>PT season ticket (55.4%)

Daily use of bike (47.1%) & PT (25.5%)</td><td>PT season ticket (62.5%)</td><td>PT season ticket (--)

Daily use of PT (25%) and walk (50.5%)</td><td>PT season ticket (--)

Daily use of walk (76%), PT (48%) and bike (20%)</td></tr>
</table>

[8] The 4 user profiles that have been compared in D4.3 (paragraph 3.1.1.2 "Car sharing user profiles within each operational scheme"):

- FFOA, the user profile constituted by people uniquely registered to free floating with operational area car sharing services;
- FFPS, the user profile constituted by people uniquely registered to free floating with pool stations car sharing services;
- MultiOC, the user profile constituted by people registered to multiple car sharing services with different operational characteristics in parallel; *Combined group next to the MultiOC group for Germany are users of one car sharing offering different CS schemes (e.g. FFOA + RTSB)
- RTSB, the user profile constituted by people uniquely registered to round trip station-based car sharing services;

User profile: RTSB		
Germany	**Italy**	**Sweden**
PT season ticket (68%) Daily use of PT (35.3%) and bike (29.7%)	PT season ticket (--) Daily use of car (47.4%) and walk (31.6%)	PT season ticket (--) Daily use of walk (59.1%), PT (31.7%) and bike (24.5%)

Table 2: User profiles comparison adapted from Tables 9, 10, 11, 12 D4.3 STARS

Further surveys conducted in STARS Deliverable 5.1 confirm these trends. The majority of car sharers in the cities of Turin and Milan own a PT seasonal ticket (61.3% in Turin, 69.7% in Milan) higher compared to non-CS members (38% and 47.4% respectively). Regarding Frankfurt am Main, bcs surveys underlined how buses and trains are used intensively by car sharers in Frankfurt[9]: between 60% to 70% of all CS group respondents use PT at least once a week, and daily usage within groups is between 36.2% and 57%. In addition, for commuting to work or to vocational training in Frankfurt am Main, between 40% to 55% of those surveyed by bcs use buses and training (with the exception of free-floating users).

POLITO and bcs studies demonstrate what has been already established in previous STARS studies: the high affinity of car sharing users for public transport.

To better stressed this point, STARS Deliverable 4.3 (Ramos et al., 2019) provided also some information about two clusters of non-CS users. The two clusters used in Table 3 below have been defined in STARS Deliverable 4.2[10]:

[9] The car sharer groups identified by bcs are the following: roundtrip, combined, free-floating, roundtrip + combined, roundtrip + free-floating, combined + free-floating, and roundtrip + combined + free-floating. For more details, please see section 2.3.2 of D5.1 STARS report.

[10] Two clusters definition from D4.2 STARS page 16:

- Mobility style 4, *Car-focused Ambivalent (Car-f Amb*): This group has strong car habits. They use a car for their daily travel 1 to 3 times a week. They have a rather large share of travel by public transport and active travel modes mobility style. Their attitudes towards car sharing services are the lowest of all groups, they have also the second lowest environmental awareness and the weakest personal norms. They do not see themselves as green on a very green to not at all green political scale and they would consider themselves in a central political affiliation on a right to left wing scale.
- Mobility style 5, *Car-flexible Green (Car-flex Green*): This group has weaker car habits and use the car less for their daily travels than the Car-f Amb group. Overall this group travels less with all modes compared to the other non-user group. The motor based travels are less frequent than the other mobility style and their travels by public transport are less frequent. They are more positive to car sharing services, they have very high environmental awareness and strong personal norms to reduce the negative impact of their travels on the natural environment. Politically, they can be characterized as more green and as having a more left wing affiliation

Non-User profile: Cluster 4	
Italy	**Sweden**
Daily use of car as a driver (41.2%) and walk (30.9%)	Daily use of car as a driver (31.3%), PT (10.4%) and walk (38.8%)
Non-User profile: Cluster 5	
Italy	**Sweden**
Daily use of car as a driver (19.3%), PT (9.8%) and walk (52.5%)	Daily use of walk (59.6%), PT (31.8%) and bike (17.2%)

Table 3: Non-user cluster profiles comparison adapted from Tables 13 & 14 D4.3 STARS

Considering Cluster 4, both Italian and Swedish non-users belonging to this cluster have the closest values to those evaluated in RTSB users' group, but PT usage has lower percentages than CS members. Daily usage of many modes indicated by the majority of cluster 5 non-users in both countries indicates a more multimodal group. In Italy only FFPS and MultiOC users' groups indicated a daily use of PT together with walking. A match was identified even in the Swedish cluster 5, where the daily use of PT (31.7%), walk (59.1%) and bike (24.5%) of non-users is closer to the RTSB users daily use of the same transport means.

The fact is that **car sharing is rather complement to PT, not cannibalising it**. However, public transport (PT) might not be able to sufficiently solve the full spectrum of people' transport needs. As suggested by the international PT Association UITP[11] (UITP, 2016):

> '*It is the offer of an integrated combination of sustainable urban mobility services that most effectively challenges the flexibility and convenience of the private car.*'

On the same idea are experts interviewed by GM & CU in 2019. By 2025 the CS can be one of the solutions for cities traffic and congestion, but with a PT operator; such a combination/integration can really transform the way people travel and reduce car ownership. CS has an important role into the mobility revolution: if well connected and integrated -in a platform or MaaS- its impact can be "revolutionary", but interviewed cities behave differently towards the creation of a PPP. These differences depend also on how the city government is structure and the relation with PT agency:

- The city of Turin (Italy) is aware that CS and local PT operator (Gruppo Torinese dei Trasporti – GTT) have to work together, but internal divergences avoid a proper collaboration. Synergies are possible and also viable for both operators and citizens: for instance, in the hilly part of the city of Turin, buses should be removed in favor of e-bikes and CS services. CS and e-bikes will become a kind of on-demand (public access) service, while GTT vehicles can reinforce overcrowded lines during peak hours.
- The city of Warsaw (Poland) manages the local PT service, investing around 1 EUR billion every year to improve its transport network with new busses, metros and tram lines. There

[11] UITP: Union Internationale des Transports Publics; In English: International Association of Public Transport.

are currently no cooperation or synergies with CS, while the city is supporting a bike sharing program (powered by Nextbike).

- The city of Cluj-Napoca (Romania) is also owner of local PT operator, plus a bike sharing program. Currently, there aren't partnership or synergies with the only CS operator in the city, while bike sharing stations have been located in function of PT stops. One of the major problems of the city is that shared mobility is not discussed yet at national level, and the city can do little with its own financial resources.
- AMAT – a public company owned by the city of Milan (Italy)- has a different approach to CS and how it should be integrated within other forms of transport, such as PT. The city is developing and testing its own MaaS platform, and also creating "mobility hubs" as Mobipunt in Belgium of Jelbi in Berlin (Germany). These new mobility hubs will be located close to PT stations (metro, bus or train stops) in order to force CS operators to expand not only their operational areas, but also to propose different CS business models such as roundtrip or one-way.

Besides the above experiences, we can find different examples in which the PT operator had an active role in supporting or creating PPP with a CS operator, or even investing in a car sharing service. We present here a limited number of examples from Europe and one case from Canada.

SBB and Mobility car sharing

This partnership is an example of synergies and cooperation among different partners: the PT operator SBB (the Switzerland railway operator) and Mobility car sharing (private company).

Mobility is a car sharing operator offering 4 types of car sharing service across Switzerland: roundtrip, one-way, free-floating and carpool (as ride sharing service), and also 200 scooters in free-floating in the city of Zurich.

Mobility and SBB propose a variety of mobility solutions together: *Mobility Click & Drive* (1'150 vehicles in 400 SBB stations for occasional usage), *Mobility Carsharing, Mobility-Go* (booking any available car via smartphone) and *Mobility Scooter* (200 electric scooters in Zurich as previously underlined)[12].

Behinds all these partnerships, there is clear vision and strategy:

> "*SBB is the backbone of the Swiss public transport system, and day-to-day rail operations are the basis of what we do. SBB has been transporting people and freight for more than 100 years. By doing so, we are making an important contribution to the quality of life and competitiveness in Switzerland. We want to continue this success story, even in times when the entire economy and society, including the mobility industry, are undergoing profound*

[12] https://www.sbb.ch/en/station-services/auto-velo/parking.html

changes. We will therefore continue to fulfil our responsibility towards public transport and Switzerland in future"

To achieve such strategy, SBB operates in a tight connection with cities and municipalities leveraging their infrastructures as a strong partner in order to offer a networked mobility. If the aim of SBB is an integrated and sustainable mobility (helping cities to become "smart"), in practice **SBB is transforming their stations into flexible mobility hubs integrating different mobility operators** (see Mobility for car Sharing and many others) to form a system of mobility network. For instance, SBB has signed different partnerships also with other (mobility) providers launching several pilot projects: with IBION and Walber Urban Electrsc for electro-scooters in Basel, and also with Bitcon (blockchain company) at the ticket machine with SweePay[13].

SBB and CIRC (electric kickscooter operators) signed a partnership for SBB passengers last June 2019: the partnership foresaw the creation of dedicated parking zones in strategic areas in SBB railway stations in order to create a door-to-door and seamless mobility solutions[14].

Communauto and PT integration in Québec (Canada)

The second case study is another case of profitable synergy between the private car sharing operator Communauto[15] and the local PT company Réseau de transport de la Capitale[16]" (RTC) in Québec (Canada). The new partnership signed on 2019 reinforced a collaboration started on March 2017 (Communauto, 2017).

The 2019 partnership foresees that parking spaces will be reserved for Communauto shared vehicles in local and regional POBs (Park-O-Bus). This is one more step towards integrated mobility, an objective precisely defined in the RTC's Strategic Plan 2018-2027 (Communauto, 2019).

The **main point of the agreement** is the **integration of Communauto's data into the real-time RTC Nomade app**, the mobile application of the RTC which allows the viewing of real-time schedules

[13] Full details about pilot projects on https://company.sbb.ch/en/sbb-as-business-partner/services/sbb-startup/success-stories.html

[14] https://emob-italia.it/e_mob-2019/gli-espositori/circ/

[15] Communauto is a car sharing operator proposing 2 different services: Round-trip and one-way carsharing. Present on two continents in 14 cities (Edmonton, Toronto, Kitchener / Waterloo, Hamilton, Guelph, London, Kingston, Ottawa, Gatineau, the regions of Montreal and Québec, Sherbrooke, Halifax and Paris in France) with a fleet of 3000 vehicles, it is one of the few operators in the world able to offer its customers access to vehicles available with or without reservation. Studies conducted in recent years show that each carsharing car replaces, on average, ten private vehicles in Québec. (http://www.communauto.com/en/how-it-works.html)

[16] The *Réseau de transport de la Capitale* (RTC) transports more than 155,000 people every month in the Greater Quebec City area. It has nearly 600 buses, several of which are hybrid, 134 routes and serve more than 4,500 stops. It employs more than 1,600 people in its two operation centres and offers real-time schedules on all its routes thanks to the range of real-time RTC Nomade tools. Transportation tickets are available in nearly 170 outlets throughout the agglomeration of Quebec City (https://www.rtcquebec.ca/propos/lentreprise)

and the creation of itineraries. The user will be able to locate Communauto stations as well as free-floating vehicles (FLEX cars) on the map of the mobile app. Booking will also be possible from the application's interface by winter 2020.

To support this new partnership, RTC will offer an "*integrated package*" that will include a monthly general RTC ticket for a given month and 10 FLEX Communauto trips of 30 minutes or less. It will be available by spring 2020, at the cost of CAD$99.

Finally, Communauto improves the DUO Auto + Bus by adding the free late return[17]. The DUO Auto + Bus already allows members to have the RTC L'abonne BUS and the subscription to an advantageous Communauto car sharing plan.

SNCF from train, to mobility assistant looking at new MaaS.

The French national railway operator SNCF (Société Nationale des Chemins de Fer Français) has started a new mobility approach a few years ago (on 2011) opening "*Ecomobilité Venture*": an investment funds focused on mobility opportunity in partnership with Orange (French TLC operator), PSA Group and Total. On 2015, SNCF launched its own venture: SNCF Digital Ventures[18] with the aim of identifying new innovative opportunities for SNCF Group and investing in start-ups such as LuckyLoc.com car sharing platform (now HiFlow after the merger between LuckyLoc and Expedicar[19]), or on the energy management with Deepki to optimise real estate (energy) performance, driven by data insights (https://www.deepki.com/en/about-us/). By the end of 2020, the French operator is planning to invest (third wave) €160 million in start-ups specialized in mobility via its 574 Invest fund. By 2020, 574 Invest will become the sole SNCF Group fund integrating all funds for mobility (Certes, 2019).

On the other side, some transfer of companies have been registered in the last 12-18 months. Keolis (the internal branch managing public transit) has sold LeCab (private driver service) to SnapCar e-hailing operator (Cambon Partners, 2019). At the end of 2018, SNCF asked Rohschild bank to look for potential investors interested in Ouicar (car sharing among privates), Allocab (hailing service), and IdVroom (car sharing). The latter has been sold to Klaxit on mid-2019 (Klaxit le blog, 2019) considering also the partnership signed with BlaBlaCar, avoiding a direct competition on car pooling market. On November 2018, BlaBlaCar acquired OuiBus from SNCF (Dillet, 2018) underlying the **tight partnership between SNCF and BlaBlaCar**.

[17] In order to facilitate certain trips for members, the free late return will allow them to keep the car at night at no additional cost (11 p.m. to 7 a.m.).
[18] https://www.digital.sncf.com/actualites/sncf-digital-ventures-vecteur-de-transformation-numerique
[19] Further details on https://www.hiflow.com/qui-sommes-nous

SNCF and BlaBlaCar will investigate an intermodal travel solution in France, crossing carpooling and buses together with trains. Guillaume Pepy, who was the President of SNCF at that time, added:

> *"We are convinced that to offer more trains, we need to offer more than trains. We need to be able to offer our travellers the possibility to go from departure point to destination, by combining sustainable modes of transport with a railway backbone. This joint project aims to make our customers' journeys easier, and reduce the single occupancy- of cars on the road."*

SNCF is creating its own MaaS integrating different forms of mobility on its "*Assistant SNCF*" APP: train (local, regional and high-speed trains), car pooling & sharing (short and long distances with Blablacar & BlaBalLines, and Ouicar), long-distance coaches (BlablaBus), and parking (Onepark). Since mid-2019 (Maas Alliance, 2019b), the SNCF app is also integrating Jump bike sharing service (powered by Uber).

Deutsche Bahn (DB) and their car (& bike) sharing programs.

Flinkster -originally called DB carsharing- is the name of the car sharing operations of the Deutsche Bahn (DB), the German national railway company. According to (Deutsche Bahn Connect, s.d.) website, Flinkester has more than 4'500 vehicles in more than 400 cities + a network of several car sharing partners such as: book-n-drive, Drive CarSharing, Ford CarShaing, Mazda Carsharing, but also OBB Rail&Drive in Austria, and Car Sharing Trentino & Carsharing South Tirol in Italy[20].

DB is also proposing to its customers/users other mobility services: bike sharing (Call a Bike) and long-distance coaches (Arriva a DB Company). In addition, DB has invested in new smart mobility solutions also outside Europe acquiring stakes in Ridecell and GoKid, two start-ups in USA (DB Press, 2018).

DB is now **creating its own MaaS platform with Deutsche Bahn Connect** solution. All modes of transport, in particular train, car (with Flinkster & partners), and bike sharing. The platform has three main "customers": private, public (namely cities) and business[21].

Case study Maas in Sweden (UbiGo)

A final example that hits a wrong note is the MaaS project in Sweden (UbiGO). This case study is interesting as it underlined the difficulties of public-private collaborations and approaches over the same project in the early stages a MaaS development in West Sweden (UbiGO MaaS). Several barriers have been identified and solutions proposed:

[20] Full list of CS partners here: https://anmeldung.flinkster.de/de/kooperationspartner;
[21] Further details available at: https://www.deutschebahnconnect.com/en/;

Barriers:

- ★ 5 main PPP barriers underlined during the UbiGo project were: objectives and interest, time horizons, risk behaviours, incentives for participation and expected rewards, and innovation understanding (Munksgaard et al 2012).
- ★ Another barrier was national and local level in what and at which degree a PT (and PTA) can be involved in such a project in term of responsibilities, rights and what they should and can do, and -finally- if it can cooperate with private firms. According to some interpretation of Sweden regulations and laws, a public actor is not allowed to distort and influence market competition, and long-lasting PPPs are believed to be difficult.
- ★ PTA used a public procurement process to drive MaaS development, while the lack of appropriate cross-border procurement methods have been criticized to increasing costs and reducing efficiency. In addition, PTA has been recognized as one of the central reasons for current lack of innovation
- ★ Regarding innovation, this lack of innovation approach and effort was recognized at both inter and intra-organizational level within PTA from private actors involved in the MaaS project development.

A list of solutions proposed for this specific case were:

- ✓ A first step would be to enlarge the definition of PT, its responsibilities and rights to encompass a wider range of shared travelling services;
- ✓ Regarding procurement, a "*virtual network*" approach can be a potential solution. This approach pushes different actors to collaborate: they are characterized by non-hierarchical collaboration, high levels of flexibility, informal relations and they give the possibility to investigate new forms of contracts.
- ✓ This new procurement approach will also encourage innovation collaboration taking inspiration from the "prototyping" approach/logic. Smith et al. suggest that more trials and pilots are needed. In addition, pilots/trials would contribute to market creation, network formation and technical co-development. They finally "*request* [to] *public actors to invest in joint knowledge building through collaborative experimentation and piloting*" (Göran Smith, 2018).
- ✓ Even though PTA and private sector have different goals and different organizational settings, their motivations can still be compatible. New PPP can focus on common goals and how to achieve (collaborating) these goals.

1.1.3 Views of Belgian stakeholders on future of car sharing and integration with other mobility modes

In this section we will shine a light on how a number of Belgian car sharing and public transport operators look at the future of car sharing and how both worlds (will) relate to each other. We interviewed four car sharing operators with activities in Belgium and the public bus and tram operator for the Flanders region, namely De Lijn. Among the car sharing operators, one interviewee represents a roundtrip station-based car sharing scheme and one a roundtrip homezone-based car sharing

operator. The other two respondents work for car sharing platforms supporting private car sharing. One represents a peer-to-peer sharing platform and one a scheme facilitating community car sharing with private cars. For more detailed information on the different car sharing schemes, see STARS Deliverable 2.1 (Rodenbach, Mathijs, Chicco, Diana, & Nehrke, 2018).

At the end of this section we zoom in on one interesting case of cooperation between public transport and car sharing in Belgium. In 2000, Taxistop together with car sharing operator Cambio Germany launched the Cambio services in Belgium, and got support from VAB and Belgian railway operator NMBS. In the following four years three other public transport operators joined forces and the Cambio services were deployed in the three different regions of Belgium. We will zoom in on the case of cooperation between Cambio and De Lijn in the Flanders region.

Conversion to zero-emission transport

Before diving into the topic of integration of car sharing with other mobility modes, we asked the car sharing operators how they are confronted with the conversion to zero emission transport and how they react to this.

Unanimously, all car sharing operators state they don't see any direct effect coming from the global strikes and protests for more climate awareness taking place in 2019. They all support the concerns of the (young) protestors and feel an increasing amount of citizens are behaving more consciously, but they don't think it has a big impact on their growth of customers. Most of the car sharing operators assume other reasons to start with car sharing are more decisive than climate awareness. They also assume the most convinced 'ecologists' are already using car sharing, so one operator put it very aptly: "the main question now is, how to convince people that are not ideologically "green"? In that sense it is important to work on 'passive social support'. We need to achieve that non-car sharers become more pro car sharing, without doing it themselves, in order to convince their peers to start with car sharing".

The car sharing schemes are confronted with emerging Low Emission Zones (LEZ) in several cities, and all act slightly different. One of the roundtrip car sharing operators has a full zero emission fleet and is thus in line with new regulations of cities, but doesn't consider the new LEZ rules as a big opportunity for its business. They see more potential in community building and putting emphasis on ambassadors of car sharing, than new restricting policies in fostering cleaner cities.

The other roundtrip operator has a partly electric fleet and experiences some hesitance among their customers to use full electric cars. They assume car sharing and electric driving are two burdens for current non-users, which is for some people currently one burden too much. The car sharing operator supports the LEZ policies as this further increases awareness about car use, but nowadays they lack

investments of local authorities in charging infrastructure for electric shared cars. Sufficient charging points are essential in a transition towards shared zero-emission transport.

Among the platforms supporting private car sharing, very different approaches are used. The peer-to-peer operator doesn't actively communicate to its users about (new) city policies on the permitted emissions of cars. It is the responsibility of the car owner to check if he or she is in line with new regulations. The platform for community car sharing with privately owned cars however informed all users that would be affected by new LEZ regulations in the city they live and organise special citizen information sessions on this topic. They also stimulate their members to get rid of a polluting car and start using a more emission friendly car of other members of the platform.

Although the speed of adaptation to and the internal communication on new technologies differs depending on the providers, we notice they are all preparing for a zero-emission future. Thus, the fleet of shared cars in Belgium is relatively composed by more zero-emission cars than the fleet of non-shared cars.

Cooperation/synergies with local authorities

We asked the car sharing platforms if they are looking for active support from the cities they operate in. At least they all try to have good contacts with city administration and politicians. According to the operators, local authorities have an important role as facilitator for car sharing and other sustainable modes in shaping policies, building infrastructure and incentivizing citizens.

Three out of four car sharing operators stated to be occasionally contacted by cities and municipalities and asked to run their car sharing platform in these localities. All stress out that in order to start their business in a new city, they need to be sure they will find a large enough market of potential users. Some of them ask for financial backing from the local government in cases where there are doubts about the financial viability of the car sharing project. Others only start their services in a new municipality if they receive sufficient communicative support from the authorities.

Integration of car sharing with other mobility modes

In addition to agreements with local authorities, we also asked the car sharing organisations about their ideas on collaborations with public transport operators and other mobility providers. Their very first concern is unanimous: they fear the weakening of public transport operators and their offer to citizens. The public operator of busses and trams in the Flanders regions, De Lijn, faced some savings the last years, which resulted in less customer satisfaction and fewer customers transported. All car sharing operators agree a strong and performant public transport offer is of high importance for car

sharing, since car sharing users rely on collective transport for a higher percentage of their trips than non-users (see STARS Deliverables 4.1 and 5.1).

All car sharing organisations are not actively looking for new partnerships with public transport operators or other mobility providers (e.g. shared bike or scooter services). They do closely follow the developments in the field of Mobility as a Service (MaaS), but almost all have the feeling there are currently no major advantages for them to find there. In their opinion MaaS-platforms should first grow more and fully integrate public transport operators, before car sharing organisations can follow. There are also some concerns about the business model of MaaS-platforms and how this will affect the prioritization of modes in the applications. The car sharing operators don't want to compete with public transport or active modes of transport, but are afraid MaaS-applications could direct users in that direction. Overall, the car sharing organisations currently lack some guidance and policy framework from local, regional and national authorities on this topic.

Case study: cooperation between Cambio and De Lijn in Flanders (Belgium)

Cambio, the oldest roundtrip station-based car sharing operator in Belgium, has a clear connection with public transport operators. Four principal shareholders started cooperating with Cambio Belgium in the beginning of the 2000's, among them Cambio Germany, national railway operator NMBS, Taxistop and VAB (for more information on the shareholders, see the box below). Cambio Belgium does not operate any car sharing services itself but is shareholder of three subsidiary companies: Cambio Wallonia, Cambio Brussels and Cambio Flanders, one for every region in Belgium. Since the founders wanted a clear connection between the car sharing company and public transport operators, and since the operation of public busses, trams and metros is the responsibility of the regional governments in Belgium, they decided to establish three separate divisions. In that way the respective public transport operators could be integrated as shareholders for the subsidiary companies. In the Flanders region for example, Cambio Belgium together with De Lijn, are the shareholders of Cambio Flanders.

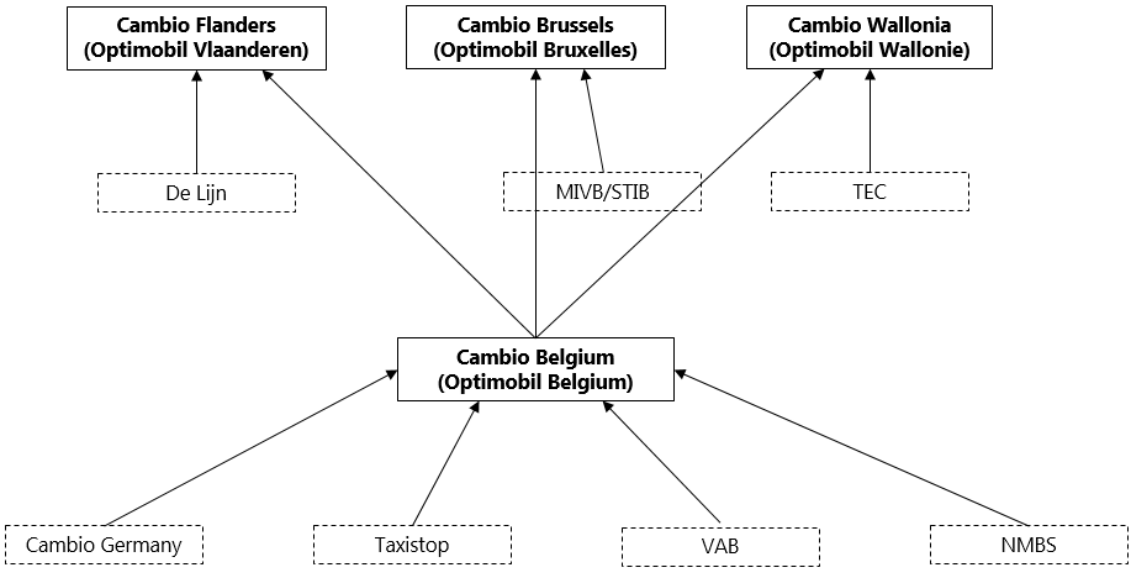

Figure 1: Shareholder structure of Cambio Belgium, Flanders, Brussels and Wallonia.

In this case study we take a closer look at Cambio Flanders, which is the biggest of the three entities. The Cambio branch for Flanders was launched in 2004 and backed by Cambio Belgium and regional public transport operator De Lijn. The latter contributed 170,000 euro and gained almost two thirds of all shares. Since that first contribution in 2004, De Lijn made no further capital injections.

For customers of Cambio and De Lijn the ties between both companies are maybe not very visible, however they enjoy some benefits because of the connection between both partners. Customers of De Lijn for example get on-year free membership with Cambio. Furthermore, customers of regional public transport operators De Lijn, TEC and MIVB-STIB and customers of NMBS, the national railway operator and shareholder of Cambio Belgium, can use their electronic MOBIB-card as entrance card to open the shared cars of Cambio. These are exclusive advantages, which are (for the moment) not available for other Belgian car sharing operators.

It is interesting to notice De Lijn is also principal shareholder of Blue-Mobility, the company deploying the shared bike service Blue Bike. A shared Blue Bikes can be found near all biggest Belgian railway stations, and De Lijn is planning to implement the service also near the largest bus/tram/metro stations in the Flanders region. De Lijn sees both forms of shared mobility (Cambio and Blue Bike) as an extension of their core business services and as an ideal last-mile solution.

Case study Box: Cambio Flanders

Parent company: Cambio Belgium (Optimobil Belgium)
Shareholders: Taxistop, NMBS, VAB and Cambio Germany

→ **Taxistop**: not for profit organisation working on the optimisation of use of personal goods, both with regard to mobility and home ownership[22].

→ **NMBS**: national railway operator in Belgium, organising train traffic in Belgium and maintaining trains and over 550 stations[23].

→ **VAB**: membership organisation for motorists, offering roadside assistance, driving courses and car diagnosis centres[24].

Car sharing operator: Cambio Flanders (Optimobil Vlaanderen)

Shareholders: De Lijn and Cambio Belgium

→ **De Lijn**: public transport operator in the Flanders region in Belgium. They manage all public busses, trams and metros in this region (including public transport in cities like Antwerp, Ghent and Leuven) and are an external independent agency within the regional Flanders government[25].

Founded in: 2004

Active in: 40 cities and municipalities (December 2019)[26]

Number of customers: more than 21,000 (December 2019)[27]

Number of shared cars: more than 720 (December 2019)

De Lijn believes more hybrid mobility solutions will be needed to meet all current needs. According to the operator, in rural areas we will have to look at peer-to-peer car sharing as a more viable solution than shared cars of a car sharing company. Furthermore experiments with mergers between classic shared cars and collective (voluntary) taxi services and carpool concepts should be considered. At last, during our interview with De Lijn they made clear to be in touch with other (micro) mobility providers in order to look for synergies and possible ways to cooperate.

1.2 Relation with Taxi services: Coopetition or competition?

Traditional taxi services constitute a key part of the urban transportation ecosystem and for centuries, they represented the only alternative to people lacking personal vehicles with specific needs or standards that couldn't find a satisfactory solution in public transports' offer.

Over the last 10 years the emergence and success of ride-sourcing and ridesharing platforms put the activity of traditional taxis under fierce competitive pressure leading to physical and economic conflicts between the two parties. At the origin of the tensions was the absence of a clear regulatory

[22] https://www.taxistop.be/en/about-taxistop/about/

[23] https://www.belgiantrain.be/nl/about-sncb/enterprise/management-structure

[24] https://www.vab.be/

[25] https://www.delijn.be/nl/overdelijn/organisatie/organisatie/

[26] https://www.cambio.be/nl-vla/in-je-buurt

[27] https://www.cambio.be/nl-vla/onze-impact

framework which ride sharing companies have been able to benefit from to develop their services, raising new questions for regulators and competition law enforcers.

Car sharing, while practiced for a long time, has benefited from a recent rise in popularity with the ease of communication allowed by the internet and digital media. As such, car sharing largely differs from taxis and ridesharing, not only in its business model but also in the role allocation of the customer/passenger/driver. However, as both services represent an alternative to car ownership, its offer could represent a potential competition to taxi companies.

Facing these considerations, one can ask what consequences can car sharing have on taxi companies' activities. Is it a fierce competition or can potential synergies unfold and benefit both solutions? The following section attempts at addressing this question by drawing conclusions from findings on modal shares data, existing case studies, and economic trends occurring in the transport industry.

1.1.4 Defining taxis, ridesharing and car sharing services

Traditional Taxis

Taxis' activities have historically been depending on the limited emission, by local or national governments, of licenses required for the legal practice of taxi drivers. Once the taxi license obtained, usually for a significant fee for which he/she often contracts a loan, the driver can join a company or a cooperative and start working after having passed a certain number of training, medical exams and administrative procedures. The company either collects a commission fee after every trip or a monthly fee transferred by the driver. Depending on the location, the driver may be the owner of the vehicle or may rent it from the cooperative.

Three major factors have recently affected traditional taxi companies: (1) the technological revolution brought by smartphones enabling the instant geolocation of customers and drivers and direct data transmission, (2) the emergence of the network economy companies (such as Google, Amazon, Facebook, and Apple) of which the products and services are unavoidable to reach an extensive customer base, (3) the development of the venture capital economy within which one company can raise funds to develop a project with the sole objective of selling it to a bigger player, excluding medium-term profitability considerations (Darbéra, 2017).

We have compiled information about the business model of a typical traditional taxi service in Figure 2.

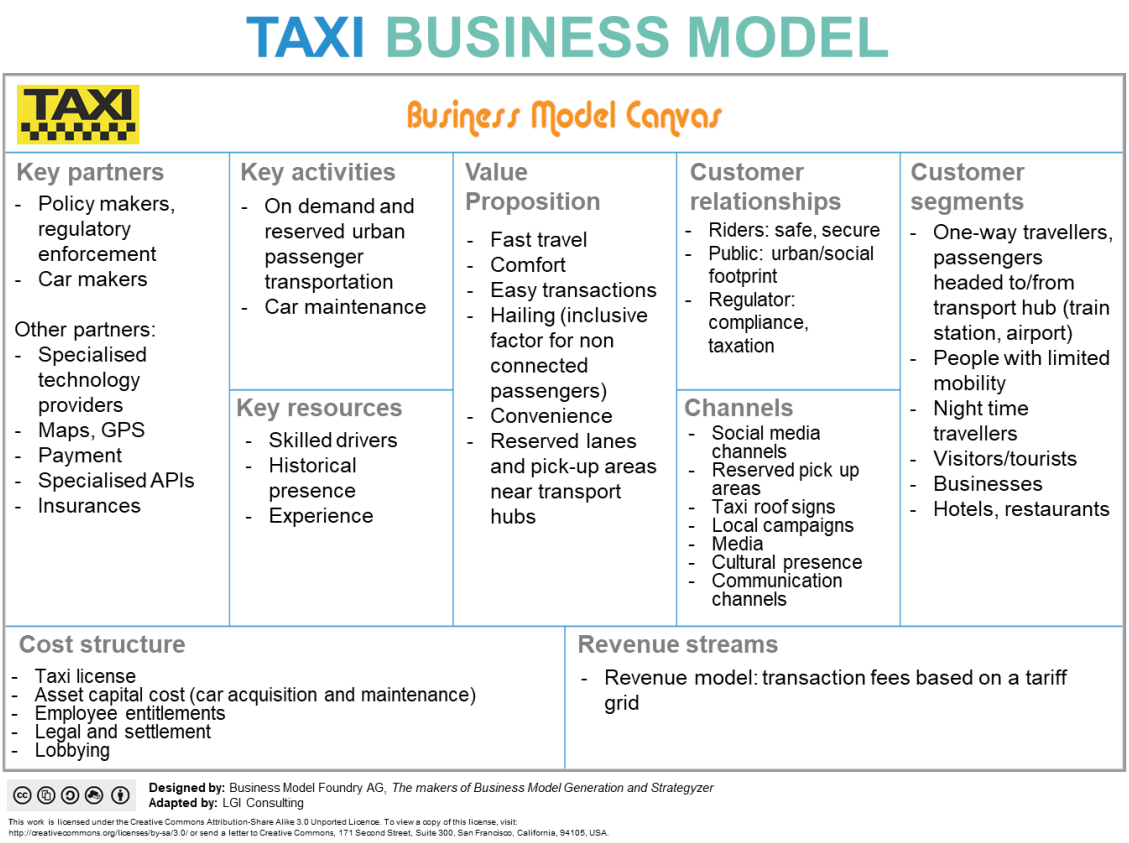

Figure 2: Traditional taxis business model canvas

A taxi company's main activity is to offer fast, comfortable, reliable one-way transportation to passengers in exchange of a fee. This fee is calculated on the basis of a tariff grid usually regulated by a local public authority, a key partner which also emits and delivers taxis' practicing licenses. Significant practicing costs include the acquisition of a taxi license and the ownership and maintenance of a vehicle.

Taxis appeal one-way travellers, but their comfort, non-stop accessibility and efficiency make them a preferable choice among people with limited mobility, travelling professionals, tourists and night time travellers. Customer channels rely on their historical presence in the urban environment but also on reserved pick-up areas. Under the impulse of the competition with ridesharing companies, Taxi cooperatives have been digitalising their services by allowing customers to book or call a driver through an app in various cities, which explains the presence of actors of the digital industry in the Taxi business model canvas of Figure 2.

Ridesharing

In the past decade, newly created ridesharing platform companies have capitalised on the above mentioned three revolutions by exploiting the technological removal of entrance barriers and by taking advantage of legal loopholes, which consequently short-circuited traditional taxis' businesses

who were not able to keep up with the pace. The ways through which ridesharing platform companies were able to innovate include the following:

- The platform character of the service, connecting drivers to passenger and taking a fee from the transaction, meant **an absence of owned physical capital** and an emancipation from purchasing and maintenance costs;
- **Ridesharing drivers' contact with passengers** is provided via a simple smartphone connected to the internet and with the ridesharing app installed
- The **treatment of the data** transiting through these smartphones allows for an instant knowledge of supply and demand which ridesharing apps companies exploit to dynamically adjust their prices, optimizing margins and setting fares well below the ones asked by taxis;
- The venture capital economy revolution enables taxis' new competitors to be **free of short-term profitability constraints**. Motivated by a "winner takes all strategy", their objective is a global monopoly on the taxi market which later would allow them to raise prices and become economically viable. Additionally, the platform of the ridesharing company, a simple smartphone app, allows it to be instantly scalable to other markets across the country and the world;
- The **legal framework** in which ridesharing companies operate vary immensely from one location to another but common elements distinguishing them from traditional taxis can be highlighted. For example, the cost of ridesharing license is relatively inexpensive, if needed at all. In most places, drivers have to attend a training program prior to working and cannot benefit from certain favours hold by taxis such as reserved parking spaces, reserved lanes, or being able to answer to a spontaneous hail in the street.

The appeal for ridesharing is also based on a real demand, especially from a younger demographics, for flexible, safe and efficient night-time transport service covering less transport-dense areas (6-t, 2018). As such, ridesharing's ability to offer initially better and more accessible services for a lower fare than taxis fuelled their success.

We have chosen to take Uber as an example to illustrate ridesharing companies. Its business model is detailed in Figure 3. Founded in 2009 in San Francisco, USA, Uber is present in 63 countries, 785 metropolitan areas and is estimated to have 110 million worldwide monthly users (Statista, 2019), making it the world-leading company on this market. This rise has been made possible by Uber's mediatisation and its online advertising presence.

Uber's principal activity is to serve as a broker between passengers and car drivers for a one-way trip. The drivers are most often non-traditional taxi drivers to whom Uber allows for more visibility and a way to work in the absence of supervision. Passengers' profiles vary but their common characteristic is to be one-way travellers looking for a solution with a fast pick-up time. Both parties' trust in Uber's choice relies on a rating system.

In order to pay their trips, passengers transfer money to Uber which in turn redistributes it to the drivers after collecting a transaction fee. Since May 2019, the company is a public company via an initial public offering after a growing period relying on venture capital. Although these financing

instruments are its key resources, Uber has not, so far, been able to generate net benefits due to its main costs sources of technology development and marketing.

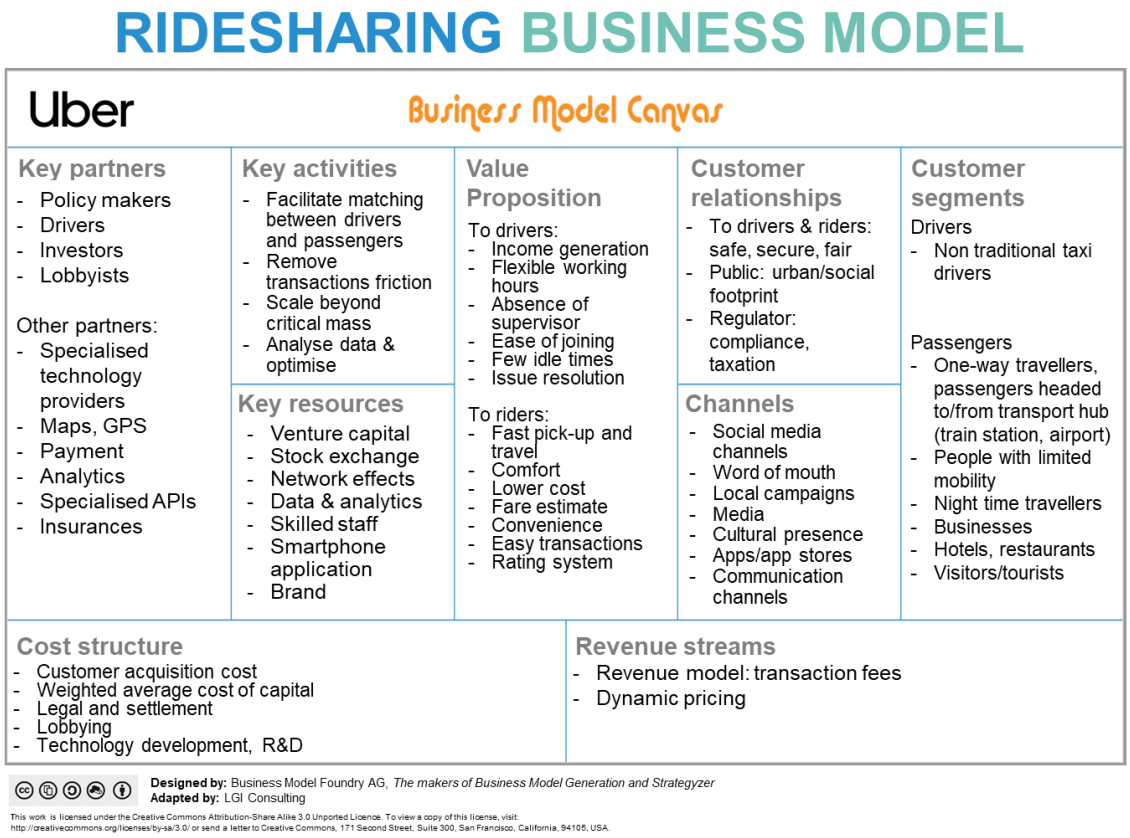

Figure 3: Ridesharing companies' (Uber) business model canvas

Car Sharing

Car sharing business models and its variants have tediously been addressed in previous deliverables (Tart et al., 2018). Here, we will only recall that car sharing services around the world adopt one of the three main categories of business models with a total of five variants:

- Free-floating
  - Within an operational area or;
  - Determined by pool stations.
- Roundtrip
  - Home-zone based or,
  - Station-based.
- Peer-to-peer.

Free-floating services are the variants of car sharing with the most competition potential against taxis as they allow to make one-way trips and as such, have a very similar customer segment. It is why free-floating car sharing is the main focus of this section. To illustrate the operations of a free-floating car sharing service, we can here take the example of Car2Go. Its business model is analysed in Figure 4. Launched in Germany in 2009, Car2Go was the world's first free-floating car sharing organisation (Firnkorn & Müller, 2015). With Daimler and BMW as key shareholders, Car2Go is the world's largest

free-floating car sharing organisation, and is based in 26 locations in eight countries around the world (Daimler).

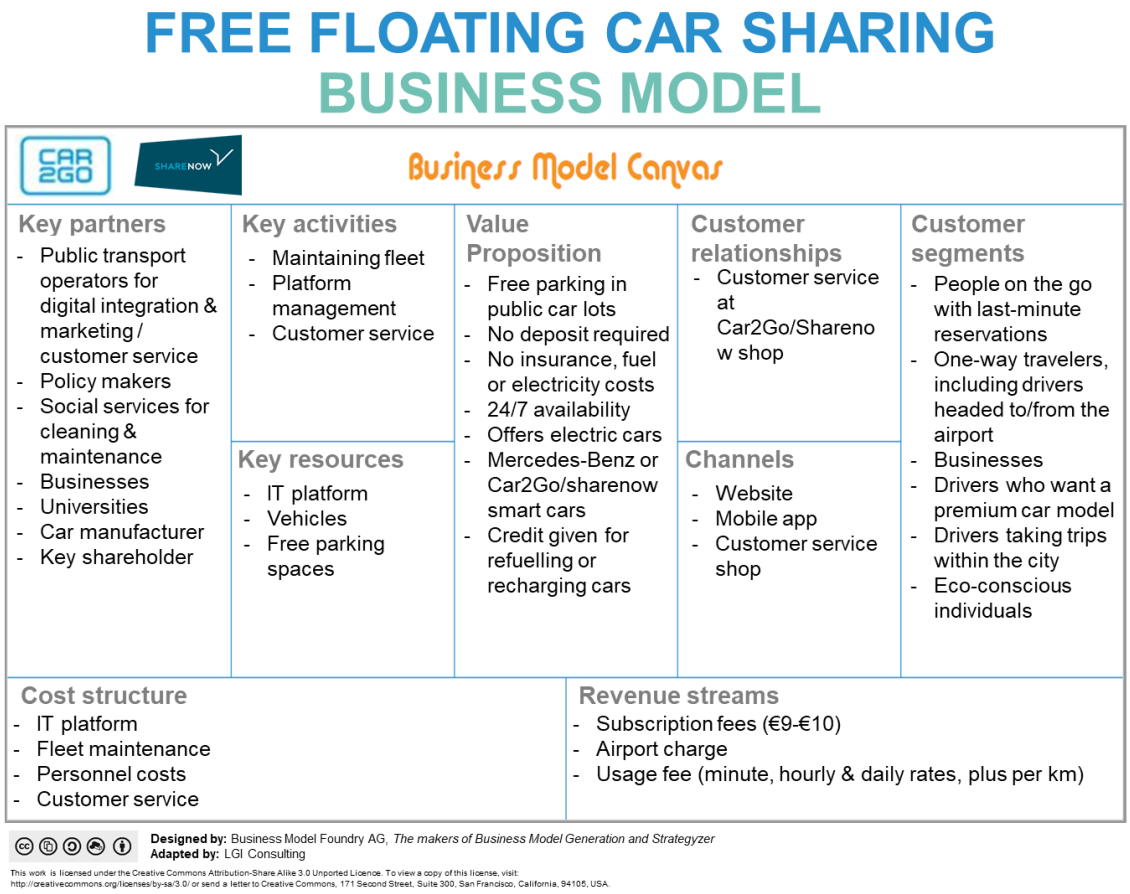

Figure 4: Car2Go/ShareNow business model canvas

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). 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.

1.1.5 Competition

As both taxis and car sharing services are often part of the wider range of mobility solutions in many cities around the world, they are competing against each other in the acquisition of customers. This competition is articulated and dependent on several dimensions: the nature of their services, the

behaviour of inhabitants, as well as national and local policies. These dimensions will be the topic of the following paragraphs before concluding on an attempt to nuance the competitive nature of their relations.

Nature of the services

A comparison specifically addressing the relations between Taxis/ridesharing and car sharing has not been the object of a wide scientific literature however, a few works on multimodality and on mobility span over the two services by investigating in a certain population's transport preferences, needs, and behaviours (6-t, 2018; 6-t & ADEME, 2015; Drápela, 2015; Le Vine & Polak, 2019). At first glance, the competition with taxis/ridesharing seem to concern first and foremost the free-floating variant of car sharing systems as the use is similar: getting from an origin to a destination without the necessity of making the reverse trip. As mentioned above, this explains why we focus the following section on free-floating systems, excluding roundtrip and peer-to-peer ones.

The division of actions needed to fulfil the travel process can be an interesting entry point in such comparison. Indeed, it can help us highlight the two transport solutions' key characteristics and see what their strengths and weaknesses are from the perspective of passenger. Figure 5 and Figure 6 are visualisations of the trips legs made respectively by taxi/ridesharing and by free-floating car sharing.

Figure 5: Trip description of a taxi/ridesharing service. Source: (Cuevas et al., 2016)

In the trip made by a taxi/ridesharing service (Figure 5), there are three phases: access time (A), access waiting time (AW) and in-vehicle travel time (IV). These legs' time performance is conditioned by factors such as drivers' availability and proximity as well as traffic conditions but, from the passenger's perspective, the taxi/ridesharing system is a quite efficient one.

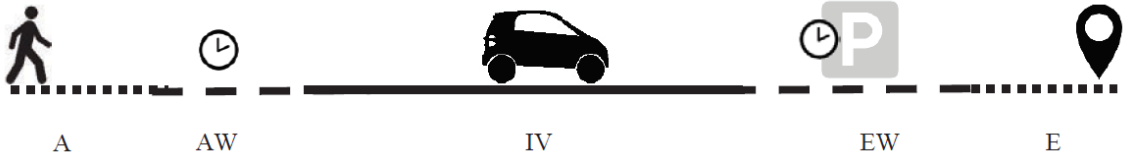

Figure 6: Trip description for a free-floating car sharing service. Source: (Cuevas et al., 2016)

Within a trip made via a free-floating car sharing service (Figure 6) there are five distinct trip legs: access time (A), access waiting time (AW), in-vehicle travel time (IV), egress waiting time (EW) and

finally, egress time (E). In the case of car sharing, the access waiting time and the egress waiting time are two crucial factors in the performance of the service (Cuevas, 2016). This element raises the importance **of vehicles distribution density and parking availability** for such a system to be attractive to customers: these key success criteria are at the centre of free-floating car sharing services relying on pool stations, as the appeal for a taxi/rideshare is high when free-floating car sharing is either too far, non-existent, too constraining, or if it is impossible to park in the vicinity of the destination.

By comparison, taxi/ridesharing services have a **flexibility advantage** over free-floating car sharing. Moreover, this flexibility is further augmented with digital hailing apps' ability to significantly **shorten the access time** and the **access waiting time to taxi services**.

Let's now make a price comparison of the three services. In order to compare the average price for a trip made either by taxi, ridesharing, or by car sharing, we based our analysis on the case of Paris (Table 4).

Company	Fare	Average price for a 30min trip (7.5km if making 15km/h) on a weekday outside of peak traffic period
Car2Go2/Sharenow	0.34€/min (Smart EQ fortwo)	10.2€
Free2Move	0.39€/min + 1€ insurance (Peugeot iOn and Citroën C-Zero)	12.7€
Moovin.paris	0.29€ (Twizy) or 0,39€ per minute (Zoe)	8.7€ (Twizy) or 11.7€ (Zoe)
Uber	1.2€ base + 1.05€/km + 0.3€/min	18.07€
Kapten	1.1€ base + 1.1€/km + 0.28€/min	17.75€
Marcel	1.5€ base + 1.1€/km + 0.32€/min	19.35€
Taxi	4.1€ base +1.07€/km + 0.61€/min	30.42€

Table 4: Fares comparison between car sharing services, ridesharing services and taxis in Paris[28]

There are currently three free-floating car sharing systems that are potentially in competition with taxis in Paris: Car2Go[29], Free2Move[30] and Moovin.Paris[31]. The three main ridesharing companies are Uber, Kapten and Marcel. There are around 18 000 taxi drivers in the Paris metropolitan area and their fare is set annually by public authorities as they are considered a public transport. We chose 30 minutes as the time for a trip as it is about the average rental time for the Autolib' service back when

[28] 2019 prices https://www.journaldunet.fr/patrimoine/guide-des-finances-personnelles/1209180-prix-uber-2019/
[29] Car2Go's Paris website: https://www.car2go.com/FR/en/paris/
[30] Free2Move's Paris website: https://www.free2move.paris/
[31] Moovin.paris' website: https://www.moovin.paris/

it was still in service[32, 33]. Additionally, we set the comparison during a weekday outside of rush hours to avoid over-complication linked to the consideration of traffic, ridesharing dynamic pricing and taxi companies' different pricing categories[34].

Although the information contained in Table 4 are mere estimates and puts many factors aside[35], it gives us a picture of prices comparisons among popular car sharing services and taxis/ridesharing in the Parisian context. **Car sharing offers are clearly more affordable than taxis** as our calculation shows that the average price for taxi's offer is 10€ more expensive than the average car sharing price for the same distance and time.

Results of Cuevas and al. (Cuevas, 2016) also elaborate that a taxi's or a ridesharing's service is more expensive than pool station based free-floating car sharing as the egress time is non-existent with taxi/ridesharing. This shortened service is provided to the cost of having to pay a taxi/ridesharing driver and the acquisition of a taxi/ridesharing license, two expenses that substantially increases the unitary cost of taxis.

The research by Cuevas and al. also stresses that both systems require an important financial investment. However, it highlights that **investments will most often only be made by one entity (or by a joint venture) in the case of car sharing whereas, for taxis and ridesharing, several stakeholders** (individual drivers and public aid) **can share the cost burden**. This difference represents a significant advantage in taxis/ridesharing business model and **can potentially weaken the feasibility of starting a free-floating car sharing system**.

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[32] https://6-t.co/autolib-nest-toujours-pas-rentable-et-ne-le-sera-peut-etre-jamais/

[33] This equals to a distance of 7.5km, considering that the average speed of 15km/h.

[34] Ridesharing companies put in place dynamic fare that fluctuate depending on supply and demand. Parisian Taxis have three distinct types of fare calculation:

- A (Mon-Sat outside rush hours and in the daytime),
- B (Mon-Sat during rush hours or nighttime),
- C (Sunday).

Both B and C pricing categories are more expensive than A.

[35] The following factors could affect the price gap between the two services:

★ Factors that can affect ridesharing prices:
  - Dynamic pricing (varying the price for a product or service to reflect changing market conditions, in particular the charging of a higher price at a time of greater demand or lower supply)
  - The type of chosen ridesharing service car category (the most common being: pooling, normal, luxurious, entirely electric, van, and special cars for passengers with reduced mobility)
  - Traffic

★ Factors that can affect taxis prices:
  - Reserved taxi lanes can shorten trip-time and lower the final price
  - Traffic

★ Factors that can affect car sharing prices:
  - The type of car/fuel
  - Traffic

On this point, some observers (AFP, 2018) argued that what put a final end to Autolib' operations in Paris was the success and development of ridesharing services for which customers agreed to pay a higher price in exchange for a more convenient and comfortable service. **If customers consider car sharing prices high for what it is, there are very few steering options available to free-floating car sharing operators to compete with a satisfying taxi/ridesharing service.**

Results from Stars deliverable D4.2 on mobility culture and mobility styles (Nehrke et al. 2018) as well as other research (6-t ADEME, 2019; Yakovlev, 2018) reported, at least in some contexts, a significant part of users reverting to car sharing as a replacement for public transport rides or **as taxi substitute**. Overall, research concluded that free-floating car sharing users decreased their use of transport modes relying on "private" use of cars, including personal car, taxis and ridesharing. Although these results should not be interpreted as a general rule true to every context, there is evidence that **modal report exists between taxis/ridesharing to car sharing after adoption, representing competitive mechanisms between stakeholders with similar customer segments.**

Policies

Free-floating car sharing services in cities around Europe usually benefit from some sort of **direct or indirect public aid to operate.** This aid can take the form of free parking, allocated spaces for pool stations, investments into charging infrastructure, preferred taxes on transactions or the right to operate in certain areas usually restricted to other vehicles (such as reserved lanes). While these "favours" toward car sharing seem to become increasingly more frequent, they are far from being the norm. Taxis, however, have obtained such assistance in an important share of European jurisdictions, to the point where they are sometimes considered as part of public transport services. **Such policies skew the competition and represent a competitive advantage for taxis over car sharing** that might affect the choice of passengers (and revenues) when, for example, taxis are faster because they may use a less busy lane. Furthermore, the explanation of an unequal treatment is hard to grasp since, as previously discussed, **free-floating car sharing goes towards the public interests of minimising cars' negative externalities by optimizing vehicles' occupation and reducing their numbers in cities' streets.**

Table 5 compiles the different VAT rates applied to compiles the different VAT rates applied to taxis, ridesharing and free-floating car sharing in eight European countries. Other transport solutions have been included to have a complete picture.

	Public transport	Taxi	Uber	Car rental	Free-floating car sharing	Bike sharing
Belgium	6%	6%	6%	21%	21%	6%
France	10%	10%	10%	20%	20%	20%
Denmark	0%	0%	N/A	25%	25%	25%
Germany	7%	7%	7%	19%	19%	19%
Italy	10%	10%	N/A	22%	22%	22%
Poland	8%	8%	8%	23%	23%	23%
Portugal	6%	6%	6%	23%	23%	23%
Spain	10%	10%	10%	21%	21%	21%

Table 5: VAT rates for selected transport methods in various European countries. (LGI, 2019)

We can see here how the qualification of "public interest" matters to urban transport. Public transport, taxis and ridesharing (Uber in this case) all receive the lowest level of VAT in the countries listed. Car sharing and bike sharing, on the other hand, are often treated the same as traditional car rental services, receiving double or triple the VAT as their counterparts (or, as in the case of Denmark, a VAT of 25%, with public transport and taxis going tax-free).

As bike sharing services are often restricted in terms of distance travelled and inclement weather, car sharing services are the closest competitor for taxi and rode sharing services, and perhaps are therefore impacted even more so by the difference in VAT rates. It is important to note that even with a high VAT, car sharing is not always the most expensive option (the price drivers pay depends on various factors, such as distance travelled, time of day, whether the car is fuel or electric, etc.). However, with a VAT that is 10 – 25 percentage points higher than the other options, the decrease in prices caused by a lowering of the VAT would give the incentive to drivers to adopt the solution or would consolidate the viability of car sharing operators who could maintain prices to their previous level.

As a short summary, the elements differentiating taxis/ridesharing and free-floating car sharing have been compiled in the Table 6 below.

	Free-floating Car sharing	Ridesharing & Taxis
Price for a 30 min trip in Paris	★ Around 10€	★ Ridesharing: around 20€ ★ Taxis: around 30€
Investment (initial vehicle cost, maintenance)	★ Made by one operator	★ Cost shared among several stakeholders
License	★ In most case given within a PPP after a public tender	★ Ridesharing: Cost of a ridesharing license in Paris: 170€, valid for 5 years ★ Taxis: Emission regulated by policy makers in many jurisdictions. Fluctuating cost and can be resold. In 2019 in Paris, a taxi license cost around 120 000€
Training	★ Driving license	★ Ridesharing ★ Driving license, 3 weeks of paid training ★ Taxis ★ Driving license, 16 hours training every 5 years
Number of trip legs from origin to destination	★ 5	★ 3
VAT rates in France	★ 20%	★ 10%

Table 6: Short summary of differences between car sharing and taxis[36]

Limits to Competition

Some key differences between car sharing and taxis limit the competition dynamics:

- ★ Differences in the profiles of their users
- ★ Differences in their use purposes

On profiles, several studies found that free-floating car sharing users are younger than Taxi clients. Basing ourselves on surveys conducted in France and published by 6-t free-floating **car sharing users tend to be younger than taxis customers** and there appears to be an important gender difference between the two categories as **men are slightly over-represented among car sharing users, while women compose a larger part of the most of taxis and ridesharing customer base** (6-t ADEME, 2016) (6-t ADEME, 2019). Furthermore, there seems to be a difference in the living locations of the two groups as **free-floating car sharing users are more likely to be living in city centres (75%) whereas the suburban population is more represented in both the taxi (55%)**

[36] Specificities of each mode significantly vary from on country to another. We give here the picture in Paris, France.

and ridesharing (41%) customer base (6-t ADEME, 2019). The cited studies do raise similarities as both groups tend to be highly educated companies executives. However, it is worth mentioning that these Parisian differences could certainly differ from the realities observed in other locations.

Taxis and ridesharing also allow for a significant part of the market to gain access to motor vehicles (people without driving license, people with reduced mobility, people with cognitive impairment, etc.) to whom they are of great value in certain cases (during night-time, after alcohol consumption, in areas not covered by the public transport system, etc.) and they are often favoured in usage for business purposes.

Indeed, **several key features of taxis/ridesharing make them a strong component of cities' transport supply difficult to compete with by free-floating car sharing systems**. One of their advantages is comfort which is subjectively considered superior to almost every other mean, particularly in the top range category. Furthermore, taxis/ridesharing services are unbeatable on their door-to-door capability which requires no indirect trip path between an origin and a destination while other means, including free-floating car sharing and private cars, can only compete if a free and available parking guaranteed at the start and at the end of the trip. As mentioned earlier, competitive advantages of taxis also include the ability to drive on reserved, less busy, lanes and park on reserved areas near important transportation hubs which further limits free-floating car sharing's ability to compete with it as it shortens waiting time within a trip to the minimum.

As implicitly presented earlier, **taxis and car sharing services are used for different purposes and as such, it is hard to classify them in the same category.** Roundtrip and peer to peer car sharing are used in cases that would have excluded the use of taxis in the hypothesis of an absence of car sharing. An example of such use is for the purpose of leaving the city for leisure, visiting acquaintances or make important errands (6-t ADEME, 2019) p. 20). As such, the modal report to roundtrip and peer to peer car sharing first concerns traditional car-rental and private car ownership (6-t ADEME, 2019), as presented in part 1.2.2.2.

To conclude on the nuance that should be given to the competitive nature of relations between free-floating car sharing and taxis/ridesharing: car sharing is currently a modest fraction of the total number of trips made in European metropolises and **the numbers temper the potential competition it could represent toward taxi/ridesharing services**. On the other hand, **an attractive taxi or ridesharing service (in terms of reliability, comfort, or price) is a potential risk to free-floating car sharing**, as exemplified earlier by the case of Uber's arrival to Paris and the struggle of Autolib' in adjusting its fares low enough so that its upper-middle class users wouldn't leave when revenues and public subsidies for the car sharing service were too low to be viable, which eventually led to its disappearance in 2017.

1.1.6 Generating synergies within MaaS

As seen in the previous part, the competition between taxis/ridesharing and free-floating car sharing is led on various fronts. Nuances to the competitive nature of the relations were given but we can go further and distinguish some synergies. Indeed, all three services participate to the generalisation of the "shared mobility" which has raised the interest, and investments, of some historical actors of the automotive industry. To illustrate this trend, we will look into the examples of two groups which have decided to invest in shared services: the joint venture between Daimler and BMW and the group launched by Renault.

Common participation to the "shared mobility"

Taxis, ride sharing and car sharing do share something in common: they participate to the emergence of a "shared mobility" which, contrary to one based on personal vehicles, favors an economy in which a transportation asset, in this case a car, is used by multiple passengers throughout its daily life. The term has gained popularity in the last decade with the return of the interest for car sharing, carpooling, bike sharing and micro-mobility. The trend concerns first and foremost dense metropolitan regions already well served by a network of public transport and other alternatives to the personal car (for example, in the case of Paris, the share of households owning a personal car is 32% while the national average is 83%) (Lama, 2019)**. Car sharing and taxis are part of the alternatives to personal vehicle ownership and, as such, potentially contribute to a normalisation of shared-mobility for everyday commutes. By doing so, they reinforce each other's attractivity**.

An analysis of IPSOS on this trend looked into people's prediction of owning a car vs. using shared mobility. **The survey results show a significant readiness for shared mobility which is expected to gain in importance** (Yakovlev, 2018). Indeed, in every studied country, more than half of respondents predict that most people will favour shared mobility over owning a car in the future (Figure 7). This expectation is highest in China, Italy and France while respondents in the USA, the UK and Germany seem more sceptical.

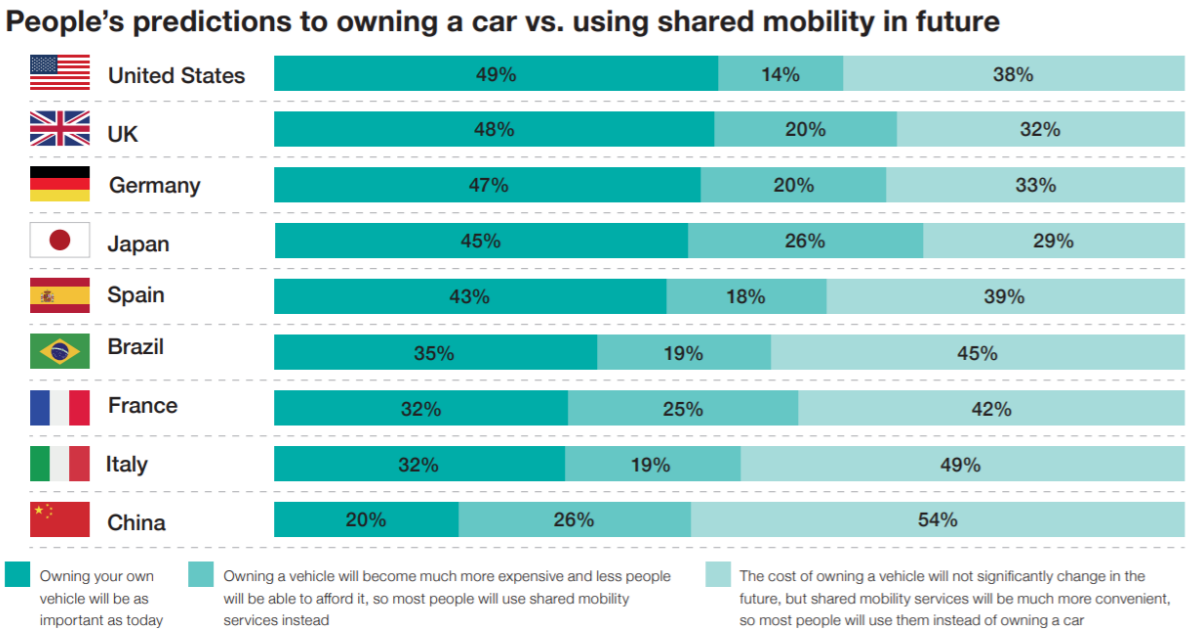


Figure 7: People's predictions to owning a car vs. using shared mobility in future. (Yakovlev & Otto, 2018)

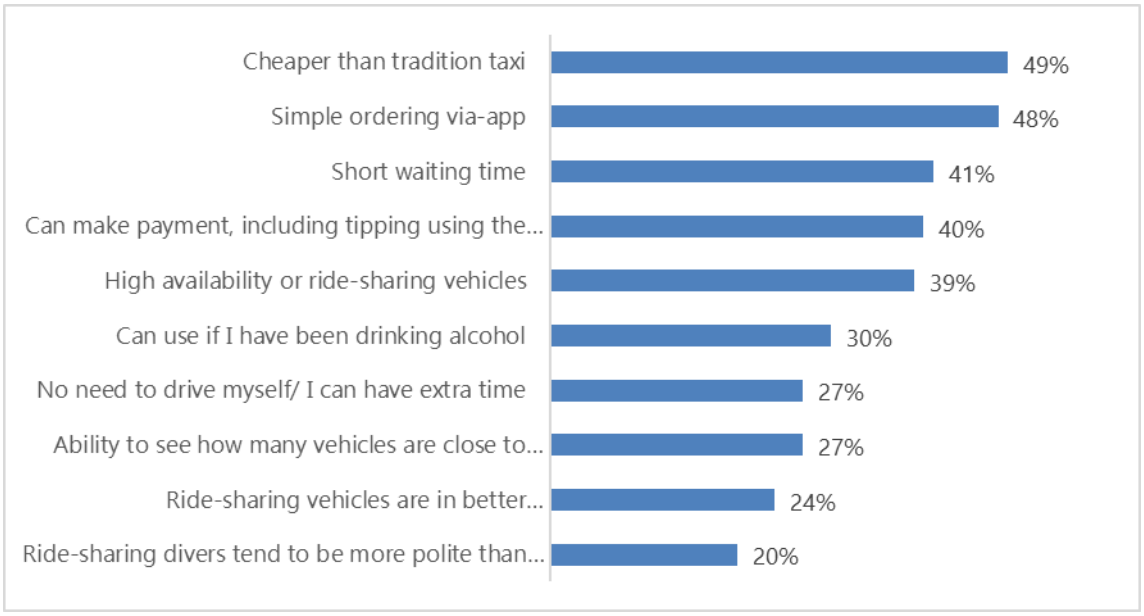


Figure 8: Benefits to using ridesharing (Yakovlev & Otto, 2018)

This view of the majority can be explained by cultural, technological and economic changes that occurred since the 1970s. On the economic aspect: research shows that an average private car's daily use is as little as 63 minutes per day while the car is not used at all for 67 days per year (18% of the year, more than two months). As a result, a car is parked at a standstill 96% of its lifetime (UK Department of Transport, 2018). When considering that the average annual cost of car in France is about 6 000€ per year (Automobile Club Association, 2019), this use can be considered as a significant deficit of economic efficiency. **Confronting the economic efficiency of car ownership is at the core of all alternative services' value proposition** and is a convincing message to

customers who, as reflected in Figure 7 and the following graphics, **are increasingly more to trust shared solutions' alternative offer**.

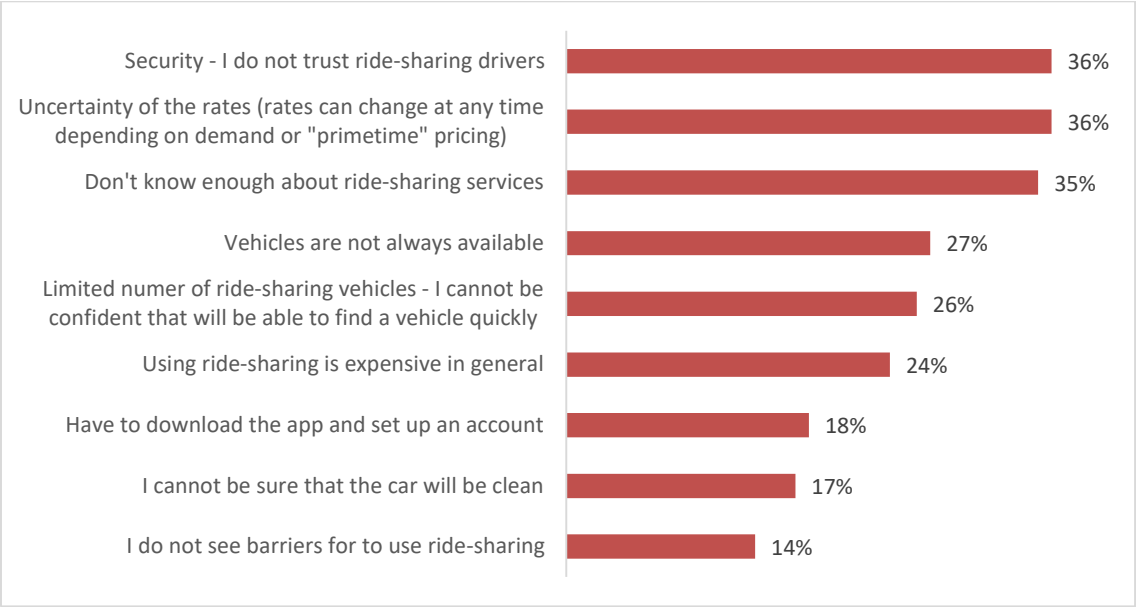


Figure 9: Barriers to using ridesharing (Yakovlev & Otto, 2018)

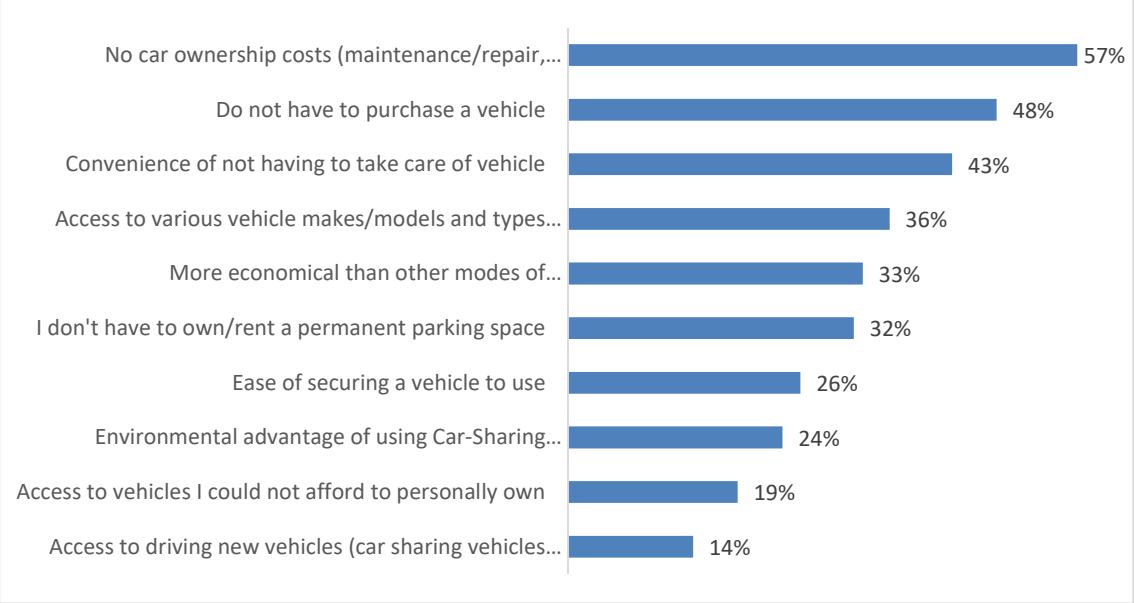


Figure 10: Benefits to using car sharing (Yakovlev & Otto, 2018)

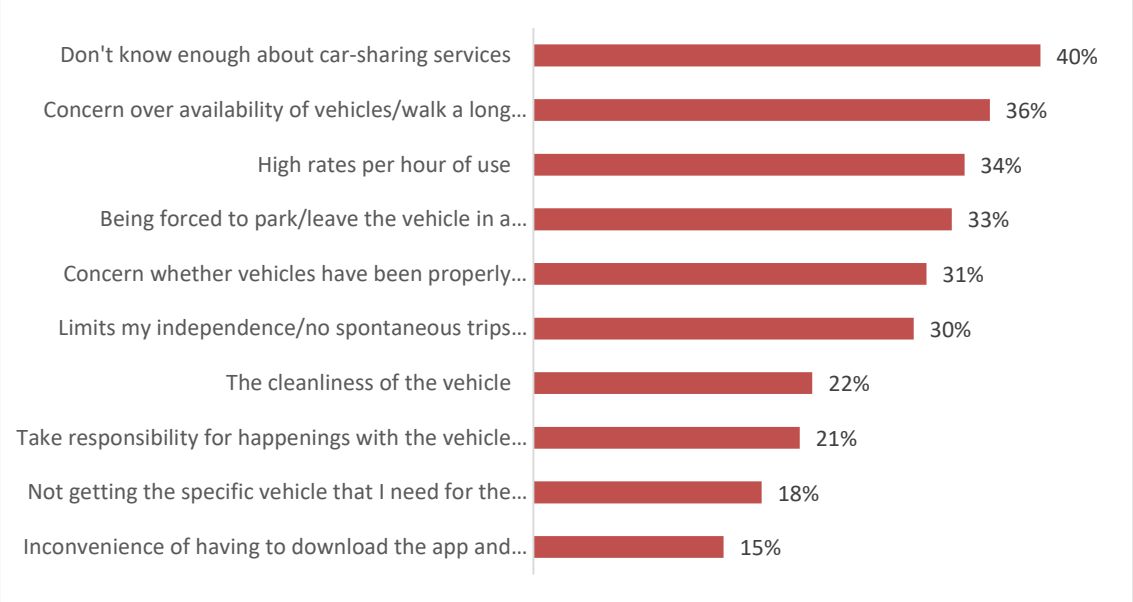


Figure 11: Barriers to using car sharing (Yakovlev & Otto, 2018)

Acquisition of both services by groups of important actors of the automotive industry

In recent years, **increasingly more car manufacturers have been investing in shared mobility by considering it as one of their key future activities**. Almost every leading manufacturer has diversified its business in ridesharing or car sharing by either fully acquiring a company, launching a new offer, investing into technological solutions or establishing partnerships with specialised companies. As a result, by running these offers, **operating car fleets have become a part of their business models when they used to be entirely relying on selling and maintaining cars.** Even when the service is not generating revenues (depending on the context and offer, most shared mobility services are not profitable (Accenture, 2018)), car manufacturers use such public exposure to showcase their cars and technology.

Illustrating this trend in the automotive industry are the examples of the "Your Now" suite (the result of a partnership between Daimler and BMW) and of Renault M.A.I. (Mobility as an Industry). Both entities regrouped taxi/ridesharing services and car sharing offers into their activities.

In 2018, two historical car manufacturers, Daimler and BMW, joined forces to consolidate their shared mobility and MaaS services under five names: Freenow (taxis and ridesharing services), Sharenow (car sharing services), Parknow (parking aid services), Reachnow (itinerary and mobility data platforms) and Chargenow (electric charging station mapping). With this suit, the group is one of the most advanced examples of the integration of shared-mobility services under one roof. According to their website[37], their ridesharing services are present in more than 130 cities and more than

[37] https://www.your-now.com/our-solutions

750 000 drivers operate with them while their car sharing services gather more than 20 000 cars (3 200 fully electric) and are present in more than 30 cities around the world.

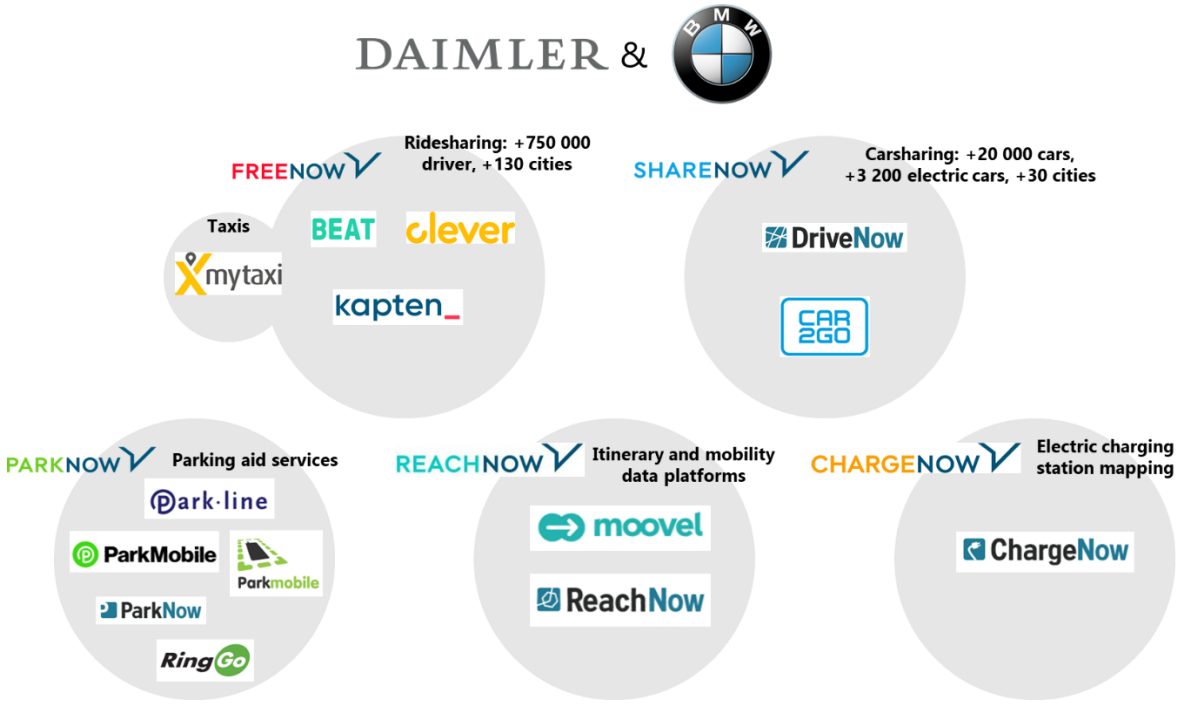


Figure 12: Ridesharing and car sharing companies owned by Daimler and BMW (LGI, 2020)

In turn, Renault has started diversifying its business in the last decade by acquiring and investing in projects in relation to shared mobility and the world of Mobility as a Service. The ridesharing platform start-up Marcel, founded in 2014, was bought by Renault in 2017 via its investment bank RCI and is mostly present in the Parisian metropolis where professional drivers drive passengers in Renault's fully electric car Zoe which makes up to 90% of a fleet composed of about 500 cars. In car sharing, Renault invested in the development of three services: Moovin.paris[38], Zity[39], and Mobility Renault. Finally, similarly to Daimler/BMW, Renault also invested in companies such as Yuso[40], Karhoo, Como, iCabbi[41] and Glide[42], companies specialised in the development of tools used for the planning and operation of shared mobility solutions.

[38] https://www.moovin.paris/
[39] https://zitycar.es/home/
[40] https://www.yusofleet.com/?lang=en: Providing smart dispatch solutions designed for the future of on-demand mobility. Yuso, Karhoo and Como are partner of FLIT Technology Group (https://flit.tech/)
[41] https://www.icabbi.com/
[42] https://glidemobility.com/en/

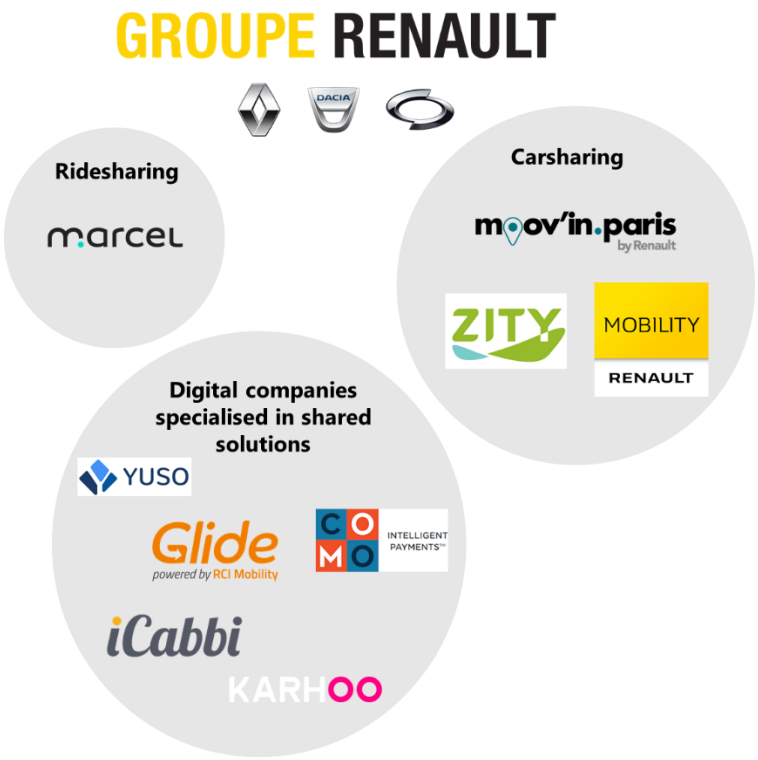


Figure 13: Ridesharing and car sharing companies owned by the Groupe Renault (LGI, 2020)

In both examples, taxi/ridesharing and car sharing services seem to coexist with competing interests on the same markets: Daimler/BMW is present in Paris with Kapten and Drivenow/Car2Go and Renault is also present there with both Marcel and Moovin.paris. The internal competition doesn't seem to be worrying the two groups as **their aim is to take a lead on shared mobility in the hope of gaining a monopoly**, either through market dynamics or by winning a public call for tender, and eventually make a profit.

However, the recent withdrawal of Daimler/BMW from the North American market London, Brussels, Florence -service ending February the 29th, 2020 (Share-Now, s.d.) - shows the complexity in reaching profitability with shared mobility as it is heavily dependent of local economic, behavioural, urbanistic, legal and political contexts (Miller, 2019).

2 Comparative assessment of new implementation processes for economically viable projects

2.1 Business model innovation in car sharing

Business model innovation can support the creation of disruptive innovation that generally asks for new competitive approaches, for example, to lower prices or reduce the risks and costs of ownership for customers. In times of instability and crisis, companies generally reinvent themselves, rather than fostering incremental innovation or deploying defensive or reactive tactics in the market (Lindgardt et al., 2009).

This section uses a classification of innovation that helps to categorise emerging business models: "Ten types of innovation", by Ryan Pikkel, provides a powerful tool able to frame different sources of innovation and identify new business opportunities (Pikkel, 2015). It is structured into three categories: configuration, offering and, experience.

- Configuration includes innovations in the structure of the company, process, network and, profit model – the way companies make money.
- Offering compromises product performance and product system.
- Experience is subdivided into service, channel, brand, and customer engagement.

This tool has influenced thousands of companies and has been used to accelerate and amplify existing ideas. It is a good guideline to think about the business transformation of the energy system. Therefore, it was used as a starting point in order to make a new classification of innovation for STARS for which a specific classification of innovation was created. The purpose of the application of this particular framework to the project is to categorise the business models identified as noteworthy car sharing study cases.

Our specific classification of innovation

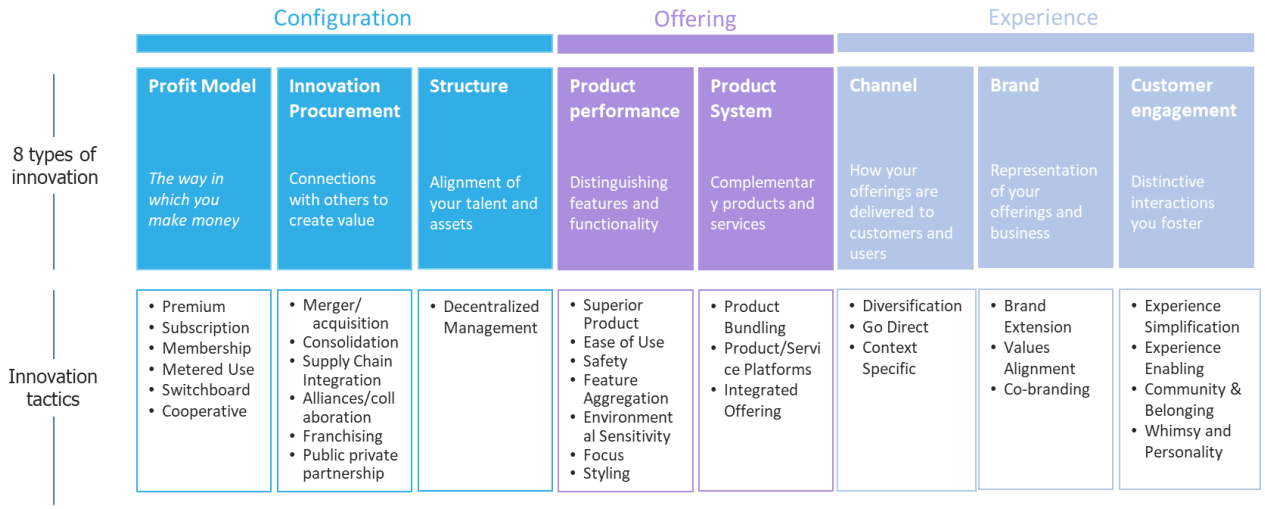


Figure 14: Classification of innovation (LGI, 2020)

After analysing the main innovation sources of our business model mapping and the comparison with the innovation frameworks found in the literature, three main categories and eight subcategories were brought about. Each subcategory is composed of various tactics. The three main categories of innovation that were kept for the analysis of car sharing business models are: configuration of the company, service offering, and service experience (Figure 14).

- **Configuration:** Innovation in configuration deals with the innermost workings of an enterprise and its business system. The three subcategories that compose "configuration" innovations are:
  - **Profit Model:** Finding a new way to convert a firm's offerings and other sources of value into cash. A good profit model understands what its customers cherish and where new revenues and opportunities are. It is often a challenge for the old assumptions about what to offer, charge, or how to collect revenues.
  - **Innovation procurement:** It is an expansion strategy where a company adds business operations into different steps on the same production path. For instance, a manufacturer that acts as both supplier and distributor. This strategy helps to reduce costs, turnaround time, transportation expenses, and improve efficiencies.
  - **Structure:** This subcategory of innovation enables to take advantage of the company' processes, talents and assets.
- **Offering:** Innovation may also come from the introduction of new technologies in an enterprise. In this case, there are three subcategories.
  - **Product performance:** Distinguishing innovations in features and functionality of the product/offer.
  - **Product system:** Innovations in complementary products and services developed around the main offering.
- **Experience:** These three types of innovation are focused on more customer-facing elements of an enterprise and its business system.
  - **Channel:** Channel innovations gather all the connections between company's offerings and customers. Although, E-commerce has gained force in recent years, traditional channels such as physical stores are still crucial. It also compromises all the new ways to bring their products and services to customers.
  - **Brand:** Innovations in branding focus on the representation of a company's offerings and business.
  - **Customer engagement:** Customer engagement innovations are all about understanding the needs of customers and users and using inputs to develop meaningful relationships

between them and companies. Customer engagement innovations improve customers' life, making them more conscious about the current problems of the energy system.

In short, the definition of innovation for STARS refers to the development of a novel activity that can be achieved by changing the configuration, offering, or experience of the business system. This classification is used to characterise the business models presented in part 2.2.

2.2 A benchmark of innovation tactics in car sharing

In this part, 21 car sharing business models were selected to be analysed through an adapted *ten types of innovation* framework, as presented in part 2.1. Each case presentation lists up to four different *innovation tactics* that are specific to the business model and describe the elements that compose them.

2.2.1 Free-floating business models

Free-floating with an operational area

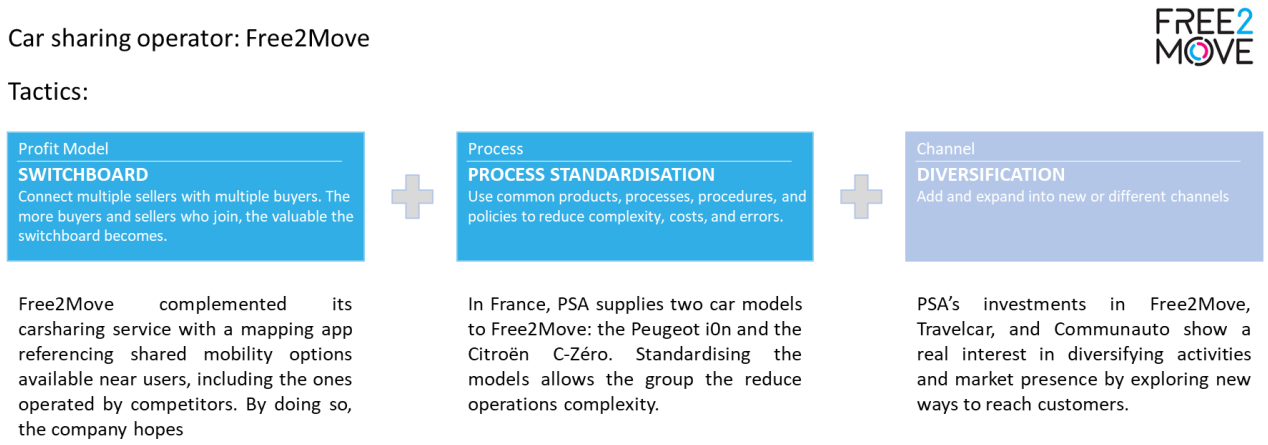


Figure 15: Innovating tactics implemented by Free2Move

Car sharing operator: Moov'in Paris

Tactics:

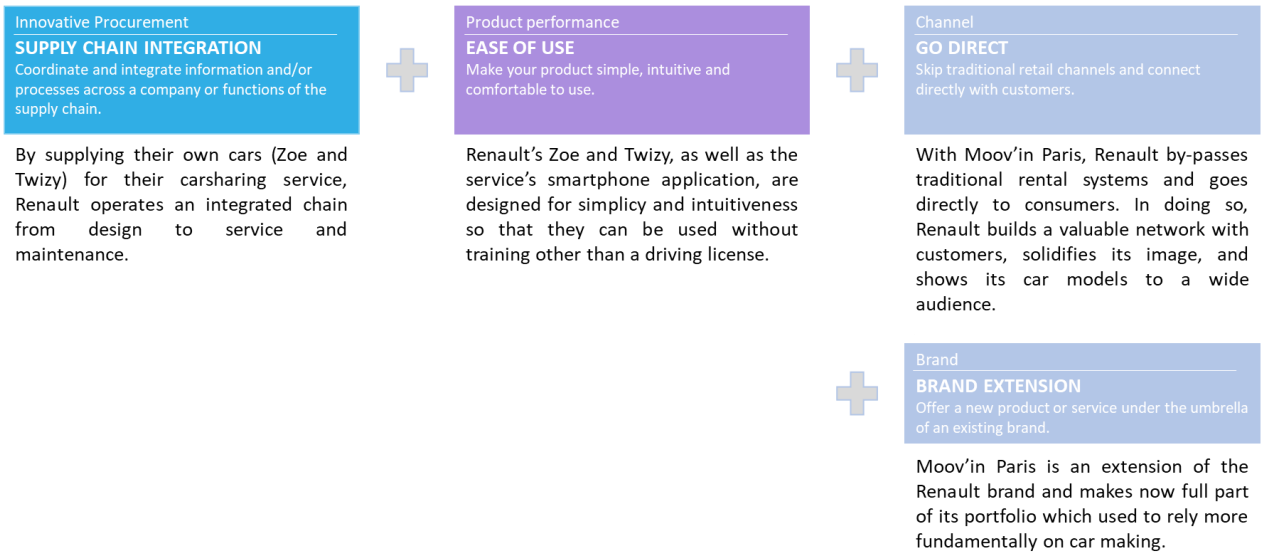


Figure 16: Innovating tactics implemented by Moov'in.paris

Car sharing operator: ShareNow

Tactics:

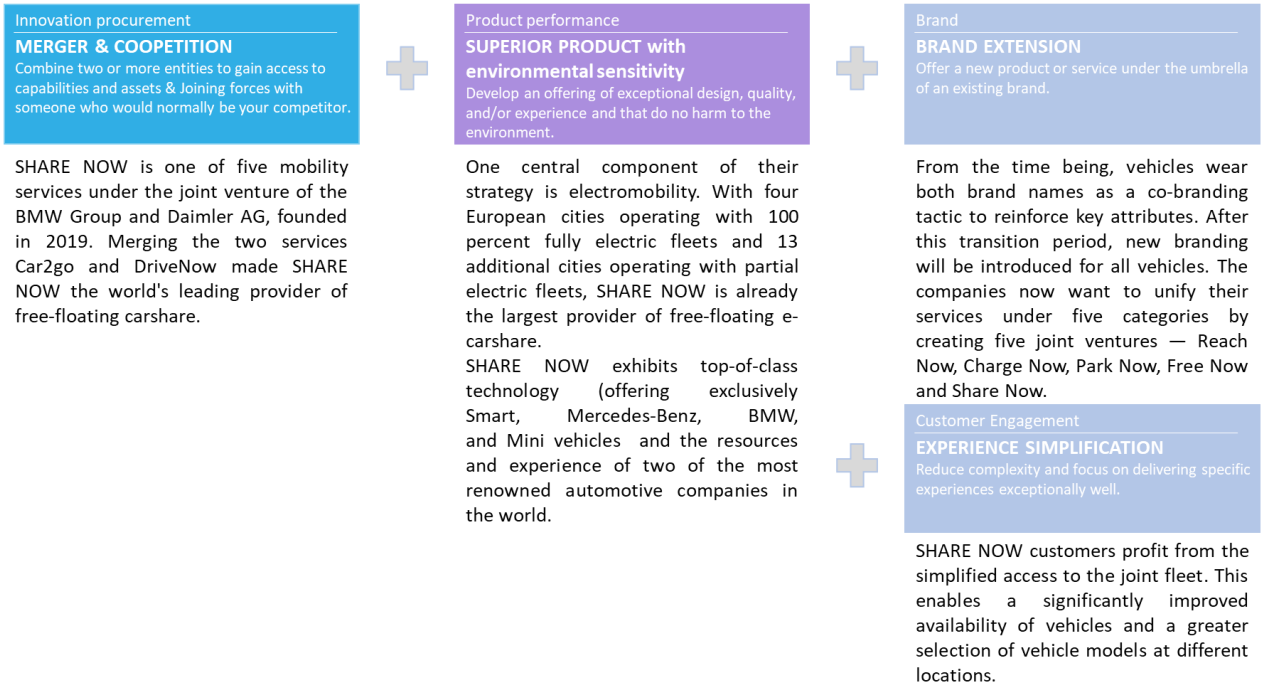
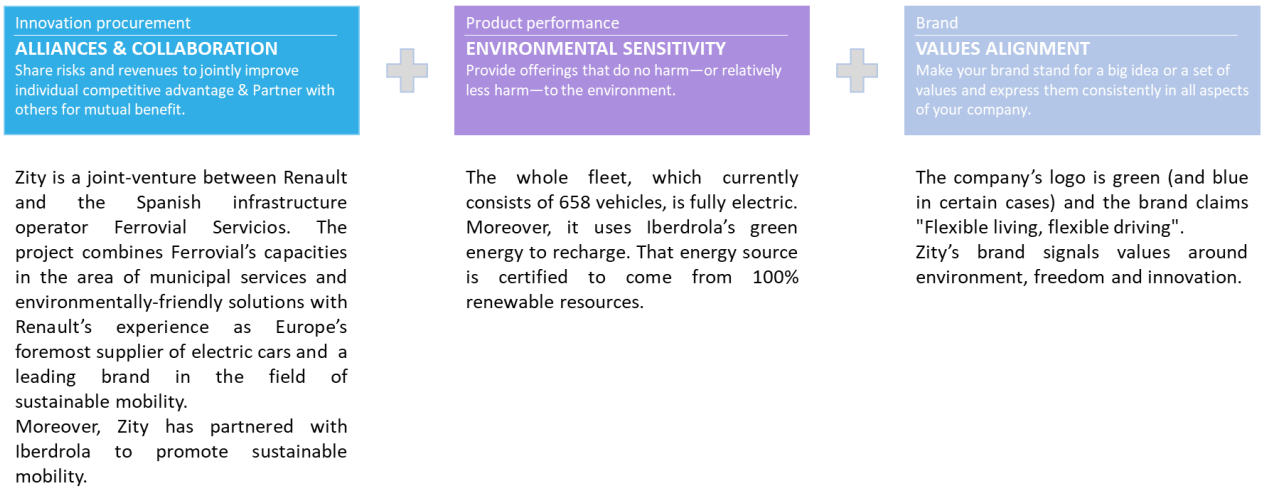


Figure 17: Innovating tactics implemented by ShareNow

Car sharing operator: ZITY

Tactics:



Zity is a joint-venture between Renault and the Spanish infrastructure operator Ferrovial Servicios. The project combines Ferrovial's capacities in the area of municipal services and environmentally-friendly solutions with Renault's experience as Europe's foremost supplier of electric cars and a leading brand in the field of sustainable mobility.
Moreover, Zity has partnered with Iberdrola to promote sustainable mobility.

The whole fleet, which currently consists of 658 vehicles, is fully electric. Moreover, it uses Iberdrola's green energy to recharge. That energy source is certified to come from 100% renewable resources.

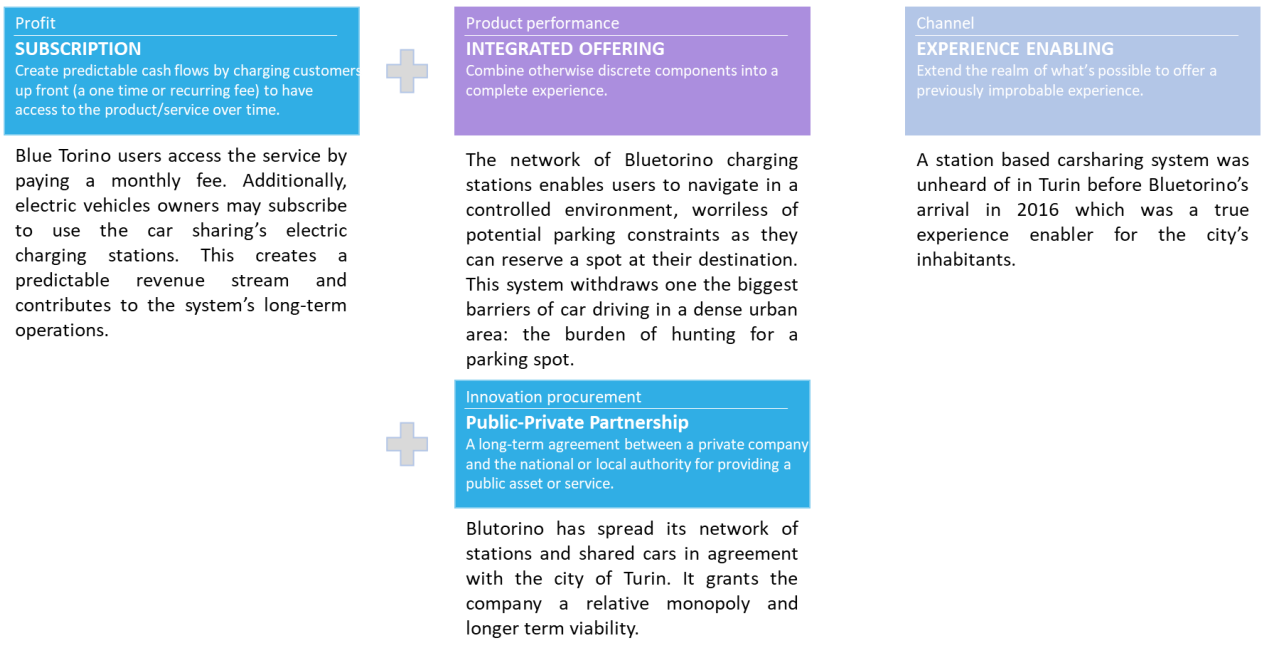
The company's logo is green (and blue in certain cases) and the brand claims "Flexible living, flexible driving".
Zity's brand signals values around environment, freedom and innovation.

Figure 18: Innovating tactics implemented by Zity

2.2.2 Free-floating with pool stations

Car sharing operator: Blue Torino

Tactics:



Blue Torino users access the service by paying a monthly fee. Additionally, electric vehicles owners may subscribe to use the car sharing's electric charging stations. This creates a predictable revenue stream and contributes to the system's long-term operations.

The network of Bluetorino charging stations enables users to navigate in a controlled environment, worriless of potential parking constraints as they can reserve a spot at their destination. This system withdraws one the biggest barriers of car driving in a dense urban area: the burden of hunting for a parking spot.

Blutorino has spread its network of stations and shared cars in agreement with the city of Turin. It grants the company a relative monopoly and longer term viability.

A station based carsharing system was unheard of in Turin before Bluetorino's arrival in 2016 which was a true experience enabler for the city's inhabitants.

Figure 19: Innovating tactics implemented by BlueTorino

2.2.3 Roundtrip station-based

Car sharing operator: Cambio

Tactics:

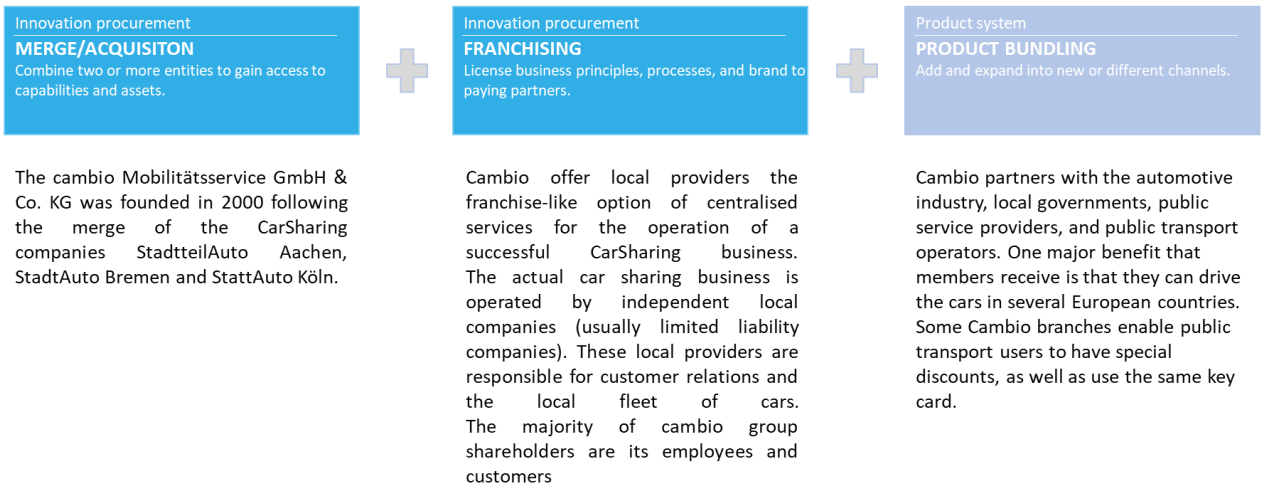


Figure 20: Innovating tactics implemented by Cambio

Car sharing operator: Communauto

Tactics:

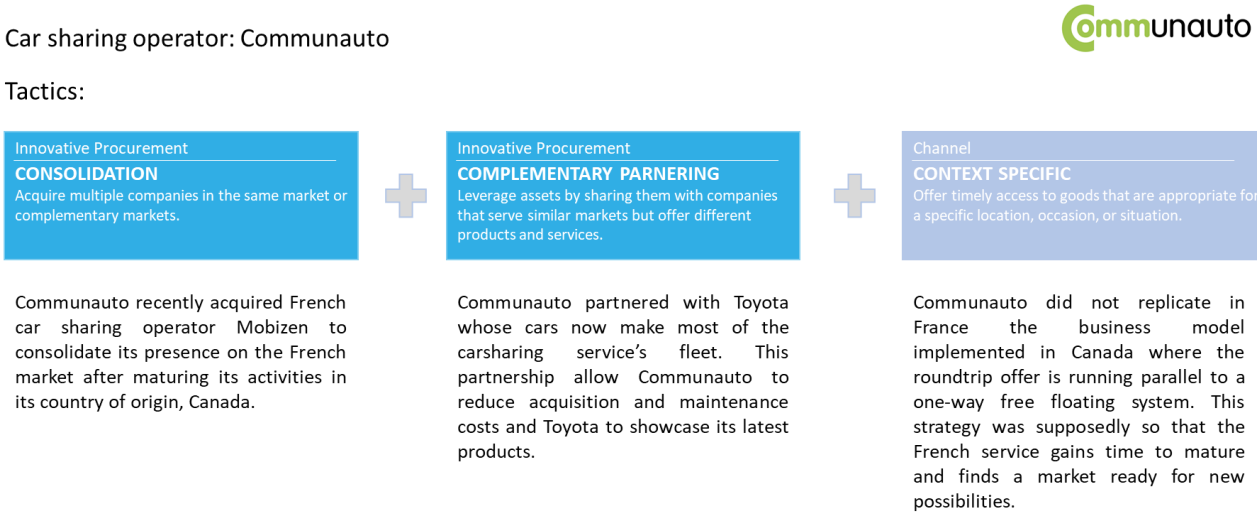
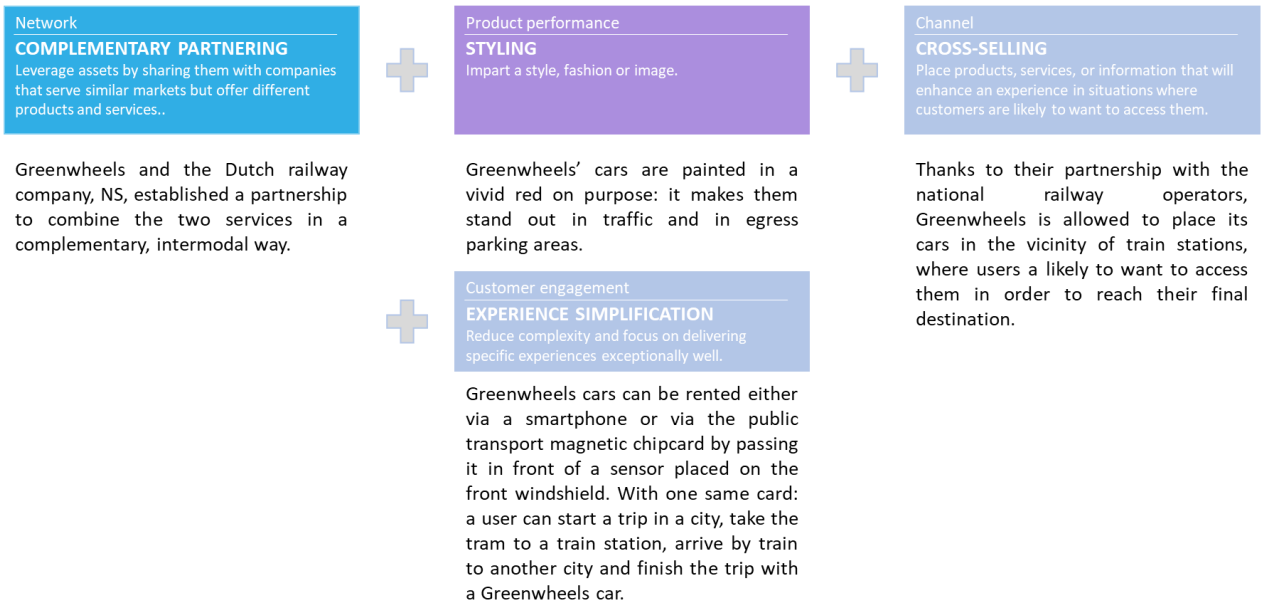


Figure 21: Innovating tactics implemented by Communauto

Car sharing operator: Greenwheels

Tactics:



Greenwheels and the Dutch railway company, NS, established a partnership to combine the two services in a complementary, intermodal way.

Greenwheels' cars are painted in a vivid red on purpose: it makes them stand out in traffic and in egress parking areas.

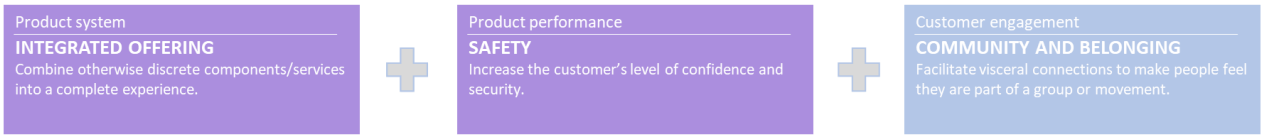
Greenwheels cars can be rented either via a smartphone or via the public transport magnetic chipcard by passing it in front of a sensor placed on the front windshield. With one same card: a user can start a trip in a city, take the tram to a train station, arrive by train to another city and finish the trip with a Greenwheels car.

Thanks to their partnership with the national railway operators, Greenwheels is allowed to place its cars in the vicinity of train stations, where users a likely to want to access them in order to reach their final destination.

Figure 22: Innovating tactics implemented by Greenwheels

Car sharing operator: MAVEN

Tactics:



MAVEN enters the sharing mobility ecosystem offering three primary services:

- MAVEN Car sharing;
- MAVEN Gig, which is for drivers in the gig economy who need a car for a rideshare or delivery jobs;
- Peer-to-peer car sharing, which provides GM car owners the opportunity to earn passive income when they are not using them.

When a vehicle is listed with Maven, Maven will enroll the vehicle with OnStar® Safety and Security Plan coverage. If there's an emergency, one push of the red Emergency button can give a priority connection to a specially-trained Advisor, even if you can't speak. Advisors can also pinpoint your vehicles location and offer critical assistance until help arrives.

Maven home car-sharing service is built for specific residential communities. It provides members with 24/7 access to cars parked right inside of their building.

Figure 23: Innovating tactics implemented by MAVEN

Car sharing operator: Réseau CITIZ

Tactics:

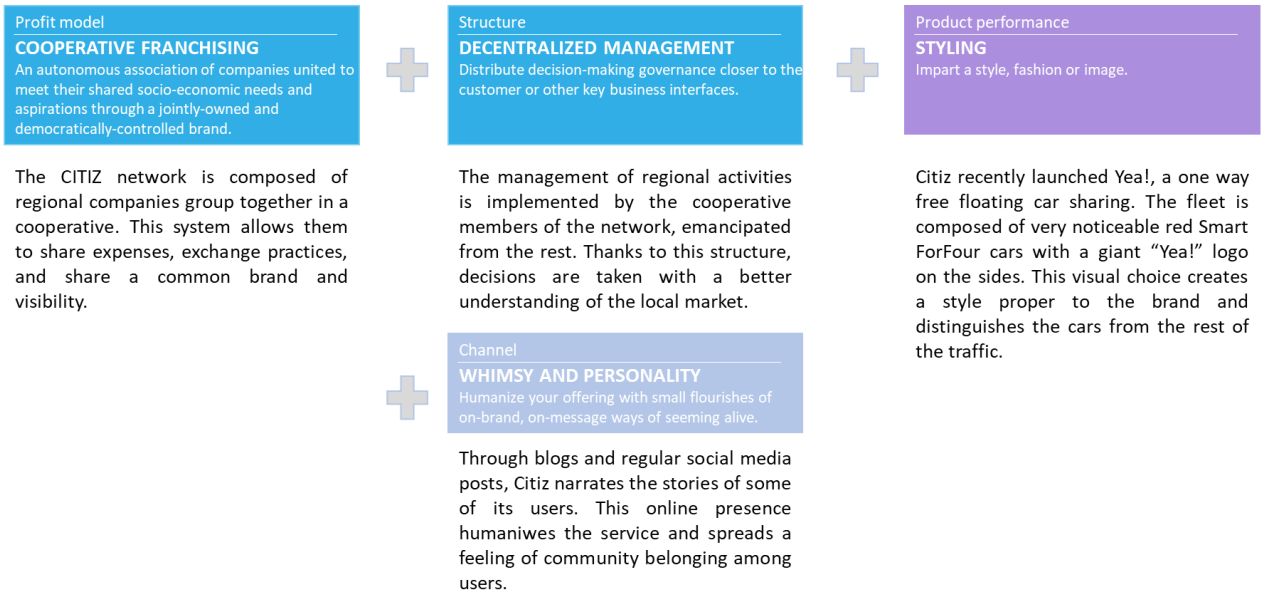


Figure 24: Innovating tactics implemented by Réseau CITIZ

Car sharing operator: Respiro

Tactics:

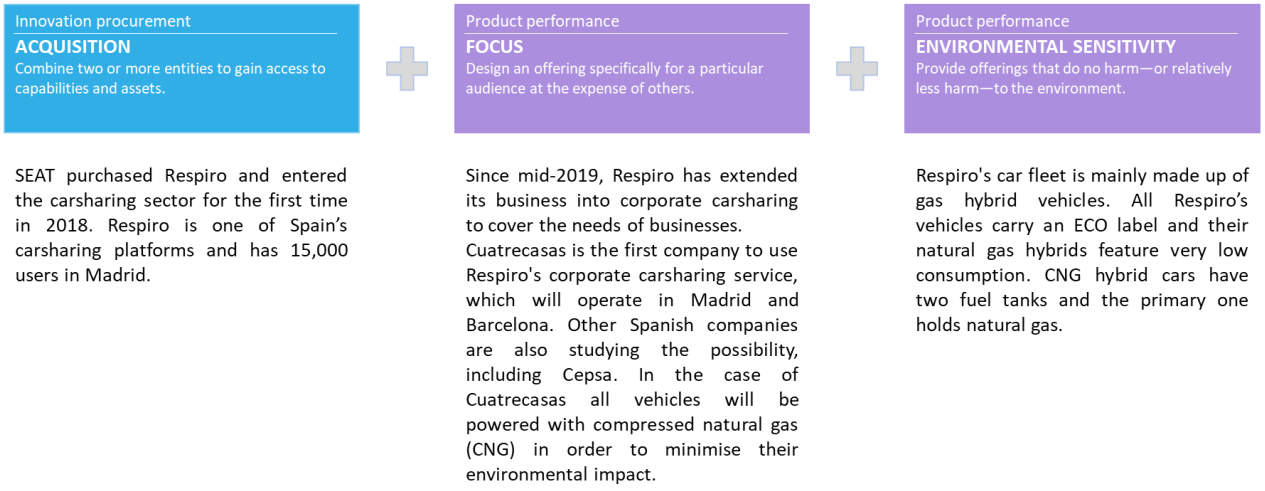


Figure 25: Innovating tactics implemented by Respiro

Car sharing operator: Ubeqoo

Tactics:

Europcar acquired in 2015 the French startup Ubeqoo. This strategic step allowed them to strengthen their efforts of integrating alternative and innovative mobility solutions.
Ubeeqo team managed the maintenance side of things, while Europcar added their weight and expertise on the marketing and commercialization front.

Ubeeqo was pioneering the market by introducing in 2011 the car sharing concept for business. Their first clients included Airbus, Danone and L'Oreal.
Groundbreaking innovation was introduced in 2013 with the launch of the iconic alternative to the company car: a mobility credit to spend on our Ubeeqo platform.

In 2013 the concept 'One stop shop' was born. A platform where various mobility solutions are bookable from one single platform.

Figure 26: Innovating tactics implemented by Ubeeqo

Car sharing operator: Yuko

Tactics:

Yuko offers a normal rate and premium rate. The premium rate is more expensive but it gives access to a Lexus car, Toyta's luxury vehicles division.

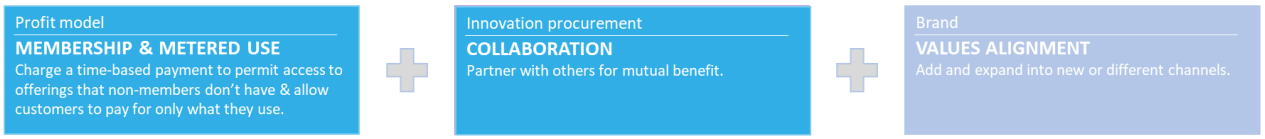
Yuko is trying to distinguish itself from the rest of the market by supplying vehicles granting more comfort to users.

The car sharing system represents a true extension of Toyota's activities which complements its traditional car making operations with B2C services in the shared mobility sector.

Figure 27: Innovating tactics implemented by Yuko

Car sharing operator: ZIPCAR

Tactics:



Zipcar members, or Zipsters, as the company likes to label them, can pick the membership plan that work best for them. In the Smart and Plus plans, users are charged for example a monthly fee. Moreover, the flexible metered used model allows customers to rent cars for as little as an hour at a time.

More than 600 universities have partnered with Zipcar to offer the campus community a cost-effective alternative to car ownership. Zipcar provides students and local community residents with the freedom to travel without the hassles of owning a car (offering interesting membership rates). The new service on the other hand helps universities meet its sustainability goals by reducing the need for personal vehicles and parking spaces on campus and in Grinnell.

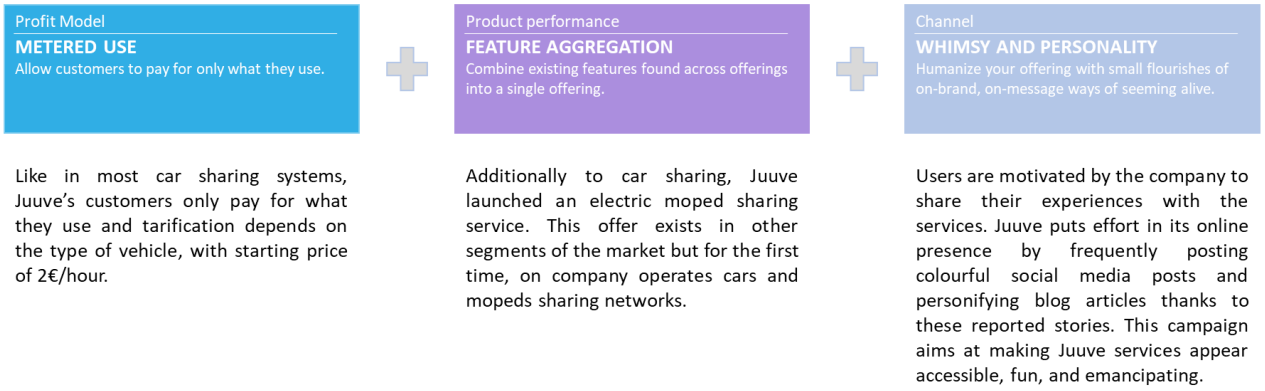
The company's logo is green on purpose. Zipcar's brand signals values around responsibility and environmental benefits of shared car usage. As CEO Scott W.Griffith described in the company's 2011 annual report "Our brand connotes simplicity, freedom, fun, sustainability, community and smart consumption".

Figure 28: Innovating tactics implemented by Zipcar

2.2.4 Roundtrip home zone based

Car sharing operator: JUUVE

Tactics:



Like in most car sharing systems, Juuve's customers only pay for what they use and tarification depends on the type of vehicle, with starting price of 2€/hour.

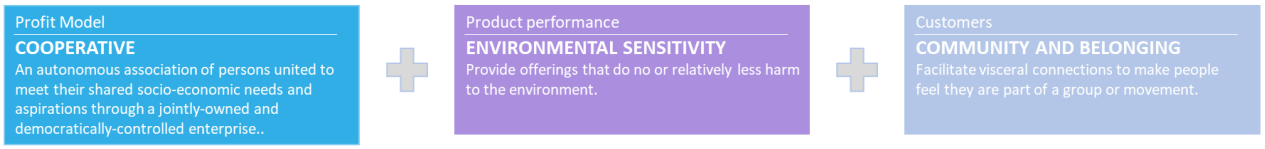
Additionally to car sharing, Juuve launched an electric moped sharing service. This offer exists in other segments of the market but for the first time, on company operates cars and mopeds sharing networks.

Users are motivated by the company to share their experiences with the services. Juuve puts effort in its online presence by frequently posting colourful social media posts and personifying blog articles thanks to these reported stories. This campaign aims at making Juuve services appear accessible, fun, and emancipating.

Figure 29: Innovating tactics implemented by Juuve

Car sharing operator: Partago

Tactics:



Partago's users are also its owners. Among other advantages: this system shares investments risks among members, assures a long term use of the service and reduces maintenance costs as members feel more responsible for the well functioning of the service.

The use of electric cars is a fundamental prerequisite of Partago's added value for their smaller environmental footprint compared to combustion engines cars. Electric cars also require less maintenance.

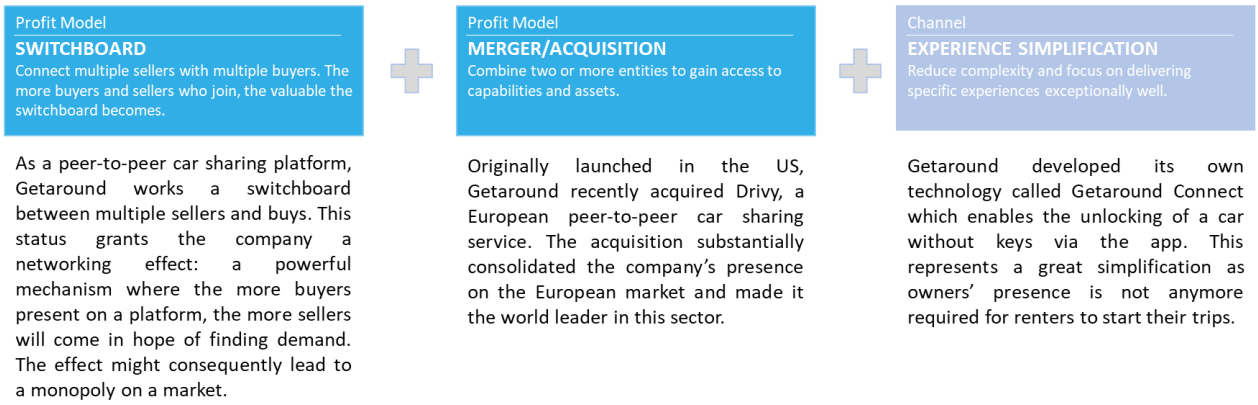
The cooperative structure gives members a feeling of belonging and pushes them to participate in the activities of the company.

Figure 30: Innovating tactics implemented by Partago

2.2.5 Peer-to-peer

Car sharing operator: Getaround

Tactics:



As a peer-to-peer car sharing platform, Getaround works a switchboard between multiple sellers and buys. This status grants the company a networking effect: a powerful mechanism where the more buyers present on a platform, the more sellers will come in hope of finding demand. The effect might consequently lead to a monopoly on a market.

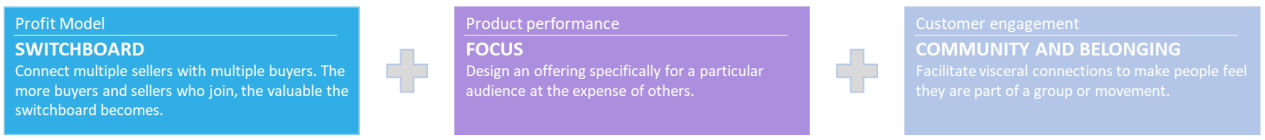
Originally launched in the US, Getaround recently acquired Drivy, a European peer-to-peer car sharing service. The acquisition substantially consolidated the company's presence on the European market and made it the world leader in this sector.

Getaround developed its own technology called Getaround Connect which enables the unlocking of a car without keys via the app. This represents a great simplification as owners' presence is not anymore required for renters to start their trips.

Figure 31: Innovating tactics implemented by Getaround

Car sharing operator: Wheeliz

Tactics:



Wheeliz is a peer to peer car sharing service launched in 2015 that makes it possible for people in a wheelchair to rent an adapted vehicle from a private individual or a company in a way that is convenient, smartphone-friendly, and cheap. Finding a vehicle equipped with a ramp or a car with an adapted driver's system is now possible throughout France.

Wheeliz has designed an offering that addresses the mobility needs of disabled travellers. It is a niche market in the sharing mobility ecosystem.

Wheeliz facilitates connections between owners concerned about mobility difficulties.

Wheeliz was selected as the best social innovation project by the European Commission and has won multiple awards including the APAJH Trophy, the Moovjee Civic Engagement trophy, the Reporters of Hope Prize, the Startup & Handicap prize for their favorite project, the Handi-Entrepreneur trophy, and more. The brand signals for inclusivity and sustainability.

Figure 32: Innovating tactics implemented by Wheeliz

2.3 Trends analysis

	Profit model	Innovation procurement	Structure	Product performance	Product system	Channel	Brand	Customer engagement
ShareNow		Joint venture of two competitors		Superior product with environmental sensitivity			Brand extension	Experience simplification
Zipcar	Membership and metered use	Collaboration					Values alignment	
Zity		Alliances & collaboration		Environmental sensitivity			Values alignment	
UBEEQO		Acquisition		Focus	Service platform			
RESPIRO		Acquisition		Focus & Environmental sensitivity				
MAVEN		Merger/Acquisition & Franchising		Safety	Integrated offering			Community and Belonging
CAMBIO					Product bundling			
Wheeliz	Switchboard			Focus			Values alignment	Community and Belonging
Partago	Cooperative			Ease of use, environmental sensitivity				Community and belonging
Moov'in Paris		Supply chain integration (Renault), Complementary partnering (between Renault and Ada)		Ease of use, environmental sensitivity			Brand extension	
Free2move	witchboard (map platform)		Process standardisation			Diversification		
BlueTorino	Subscription (optional)	PPP			Integrated Offering			Experience enabling
Communauto		Consolidation Complementary partnering				Context specific		
Réseau CITIZ	Cooperative franchising			Styling (Yea)		Whimsy and personality		
YUKO	Premium			Superior product			Brand extension	
Greenwheels		Complementary partnering		Styling		Cross-selling (transport hubs)		Experience simplification
Juuve	Metered use			Feature aggregation				Whimsy and personality
Drivy/ Getaround	Switchboard	Merger/Acquisition						Experience simplification
CarAmigo	Switchboard		User generated					

Table 7: Complete analysis of selected car sharing business models (LGI, 2020)

Innovative business models are emerging within the three archetypes proposed – **configuration, offering and experience**. Four subtypes stand out: **profit model, innovation procurement, product performance and customer engagement.**

Studied car sharing companies most often lay down a profit model that is usually **a flexible metered use model**, allowing customers to rent cars by the minute/hour. Membership and subscription fees are applied in certain cases. Cooperatives are also found, especially for community peer-to-peer platforms. In some cases where car sharing services operate at national level, franchising tactics are applied (like in the cases of Cambio and Réseau CITIZ).

Moreover, the Table 7 shows that innovations are occurring within the configuration of car sharing companies, in particular innovation procurements dynamics. **Many relatively recent mergers and acquisitions have been observed,** either between two competitors (Sharenow, Cambio) or between a carmaker and a car sharing start-up to help them enter the sharing mobility (Ubeqoo, Respiro etc). The reduction of players might as such indicate a **consolidation and a certain maturation of the market**. Rarer are the cases of public-private partnership (BlueTorino), alliances (Sharenow, Zity), or partnerships with a bigger transport operator (Greenwheels and Dutch national railways).

On product performance, **most car sharing services emphasize an environmental sensitivity**, either by putting forward the shared nature of the system, which represents an interesting division of environmental footprint for the use of the car, or by highlighting the fact that vehicles are fully electric. Some companies offer premium services by renting more comfortable cars to users in exchange of a higher fee (Yuko) in parallel to a more classical one, or directly as their prime offering (Sharenow). On product systems, some companies integrated various similar services (MAVEN) or complementary services (such as BlueTorino which offers shared electric cars but also shared charging stations to electric cars owners).

Many of the studied business models **serve as brand extensions for historical carmakers or car rental companies** (PSA, Renault, Toyota, GM, Daimler, BMW, Volkswagen, Avis, Eurocar, Ada), highlighting, once more, **the great surge in interest of traditional stakeholders for innovating shared solutions**.

We noticed **a significant emphasis on branding by several car sharing operators** trying to stand out from the rest by working on their image. This can materialize in very noticeable cars (with big logos or bright colours) and in an important activity on social media, engaging customers in posting their own experiences with the service. **This branding effort often goes hand in hand with values alignment on environmental or social/community belonging**.

2.4 Recommendations

Based on earlier research and on the insights of the car sharing operators we interviewed, a couple of policy recommendations for cities and regional or national governments came up.

- **Invest in performant public transport**. Living without owning a private car is only feasible when it is possible to rely on easy and safe mobility alternatives. In addition to car sharing services, performant public transport and safe walking and cycling infrastructures are essential. Car sharing operators will also be more willing to cooperate with a well-performing and highly regarded public transport operator.
- **Define the role of public authorities within MaaS-ecosystem**. Car sharing operators and other mobility providers are wondering if public authorities should keep an eye on how MaaS-platforms perform and how they e.g. rank different providers, in order to foster the most sustainable way of traveling. A clear definition of the role of local, national and European governments within the MaaS-ecosystem could definitely help mobility operators to speed up their integration within MaaS-applications.
- **Create mobility hubs**. In order to foster the use of online MaaS-applications, cities should think about physically bringing together mobility services. By bundling the offer of public transport, taxis and shared mobility on a number of dedicated places, people are able to find the services and switch between different modes more easily.
- **Introduce social fares for shared mobility**. A lot of cities have social fares for the use of public transport or taxis. In order to attract new and less prosperous target groups for shared mobility, the same system of social rates could be extended to other mobility modes. This measure could entice people to get rid of their (old and more polluting) cars and switch to use shared mobility instead.
- **Communicate about synergies between different modes**. The lack of understanding about car sharing and its benefits is fuelled by a natural resistance to change own habits. The European Mobility Week is the ideal opportunity to inform citizens about the advantages of (combining) different modes of (shared) sustainable mobility.
- **Reserve parking lots and charging infrastructure for shared cars**. STARS research (see e.g. Bergstad, C. et al., 2018) made clear people using roundtrip station-based systems own and use less cars than customers of free-floating services. In order to generate the best impact possible with car sharing, cities should therefore reserve parking lots and charging infrastructure for shared cars, making it possible for roundtrip car sharing systems to operate.

Regarding the role of the cities in relation to car sharing, and shared mobility in general, we can also advance the following recommendations based also on the experience of city of Bremen (STARS partner) and all the cities that participated to STARS webinars. Every city can play three different roles and governance towards (shared) mobility by supporting and promoting or by inhibiting it; these roles are: **city as a regulator, city as a provider, and city as an enabler**.

- **City as a regulator** is quite simple: the governance employs a range of different mechanisms such as low, taxes, discounts or permissions to operate.
- **City as a provider** foresees a more direct engagement with either financial support (e.g. bike sharing promoter and financed by the city) or infrastructural support (e.g. access to city technology infrastructure such as traffic camera or traffic lights network).
- Finally, **City as an enabler** means that the city is at the centre of collaboration among mobility operators or by creating PPP. The city may also communicate new projects or pilots recognizing best practices or sharing new achievement (e.g.: a city communicates the results of autonomous shuttle and its benefits).

Every city can employ any of the previous roles and combine them when dealing with any sharing mobility operators. Of course, each city is different: by how its local government is composed, by national contexts, by the level of infrastructure available, and of course by its economy. Also, during interviews it emerged that municipalities are limited in their actions by multi-level governance structure and something decision makers have to wait for both internal political party higher level and other actors at regional/national level.

Below we also gathered some recommendations for car sharing operators.

- **Emphasize unique selling points**. Within (future) MaaS-applications different car sharing operators are presented to possible customers next to each other. In order to stand out, car sharing operators should emphasize their unique selling points (e.g. full electric, no subscription fee, fixed parking lots…), but also stress their complementary role in relation to other mobility providers like public transport.
- **Use the same language as other mobility providers**. A lot of countries are working on a unified language for the exchange of mobility data in order to meet European standards. Car sharing providers should be prepared to adopt their own data language in order to be able to connect to future mobility data aggregators.
- **Be creative**. Why not integrate other mobility solutions within the existing offer of car sharing organisations? Several car sharing operators throughout Europe are experimenting with the integration of e.g. shared bikes or shared scooters within their own services. This makes it possible for customers to book and drive different mobility modes with one subscription. Car sharing operators (especially roundtrip services) could also look for cooperation with taxi services, since we know car sharing customers use taxis significantly more than non-car sharing users (see Bergstad, C. et al., 2018).
- **Undertaking an integration with PT ensure a better understanding of three areas**:
    - **Understanding the "demand":** Where do people live in relation to where they work, shop, send their children to school? Where do people have their leisure activities? How do they get there? What transport do they use for business trips? Collaborating with a PT will help in obtaining all information.
    - **Understanding the "supply":** How PT network is distributed? How easy is travelling by car, by PT or by bicycle in that city? How easy is to find a parking? Based on this

information, a CS operator can better identify the most suitable business model to implement in synergy with local mobility supply.

- **Identifying the "common opportunities":** before creating "mobility hubs" and communicating about synergies between different modes of transport as previously mentioned, all actors should work together to identify common goals and opportunities for an "integrated" and "combined" growth.

Conclusions

As observed, public transport operator has the broadest customer base and, as a sustainable public service, it is the natural integrator of all (sustainable) mobility services. Nevertheless, PT cannot be everywhere and cannot reply to all mobility needs (in particular in less populated or rural areas). In these situations, car-based services and especially car sharing are the obvious complement to public transport as they offer the benefits linked to car usage without the need to own the car. Car sharing services are rather complement to PT as underlined in this report.

The main question CS operators must address is that CS services are seldom used by users as observed in other STARS reports (see D4.3 STARS surveys and D5.1 STARS report). On the other hand, the same surveys show that users that are members to different car sharing systems tend to use them more intensively, and to adopt a multimodal travel experience.

However, the fact that CS services are not frequently used is not a drawback, while it should be seen as an opportunity for CS operators in adapting their offerings and enlarging their customer base.

Regarding how to enlarge customer base, a way might be the development of joint venture or even the cooperation among different car sharing variants, since previous STARS studies confirm that user groups of different type of service are different (FFOA young people, RTSB older ones) with different trip purposes.

In term of business model, it seems that there is not a winner/looser. Recent ShareNow withdrawal from North America and three European cities, but also the downfall of Autolib in Paris could have risen questions about the robustness and profitability of car sharing if not well integrated in larger mobility solutions or properly integrated in OEMs' core business. Recent mergers -as observed in the document- might indicate a consolidation and a certain maturation of the market. PPP are still rare, but both private and public actors have understood that collaborating is possible and a win-win solution.

We may conclude that the trend towards integrated solutions or MaaS can propose a great diversity of car sharing applications, as public transport (PT) might not be able to sufficiently solve the full spectrum of citizens' transport needs. In the report we underlined what some PT operators are doing in order to propose an integrated mobility solution to their customers: SNCF, DB and De Lijn examples and their active roles in shared mobility can be seen as an extension of their core businesses looking for a hybrid and integrated mobility solutions. PT case studies described in the report show that effective PPP are possible, also in reaching and better serving rural areas.

In a nutshell, car sharing operators and cities/public authority agencies should work together to find the right strategy for differentiating their services based on local context and needs, evolving value proposition from single "hardware provider" to "integrated mobility service providers".

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Appendix 1

Interview (main) questions asked for WP6 deliverables – STARS H2020.

Target:	Question	D6.1	D6.2
City	What is your experience about the impact of CS on Car ownership in your town/city/urban area?	X	
City	In your experience, what are the best practice to promote CS vs Car ownership? (e.g. integrating PT and/or synergies with Taxi);	X	X
City	How do you see CS in helping mobility in weak demand areas (rural areas surrounding cities, city outskirts)?	X	X
City	Based on your experience, in 5 years, which are the possible scenarios for Car Sharing?	X	X
Public Transport	What is the impact of the Car Sharing on public transport/your business?		X
Public Transport	Did you activate or are planned any joint program or for common CS and PT users?		X
Public Transport	Based on your experience, in 5 years, which are the possible scenarios for Car Sharing?	X	X
CS operator	- Scenarios in case of city center forbidden to ICE cars/car sharing (contingency plan?) - If CS operator fleet is 100% EV, why that choice? - Composition of the fleet of cars - Environmental awareness of young generations and more attention by public bodies	X	
CS operator	Synergies or not with Local Public transit		X
CS operator	Based on your experience, in 5 years, which are the possible scenarios for Car Sharing?	X	X
General question for all (stakeholders) interviewees			
	The best available & less efficient car sharing business model and why		X