ANALYTICAL REPORT

SHARE.VLAANDEREN

SHARE VLAANDEREN

AUTODELEN.NET CARSHARE BELGIUM

Vlaanderen verbeelding werkt

Interreg North-West Europe eHubs

CONTENTS

1. Introduction

It's 2025. Maryan has just bought a second-hand corner sofa. She has to pick it up a few kilometres away, but unfortunately she won't be able to with the small city car she shares with her neighbours. Not to worry - with the 'Share and Go' app Maryan can view and use the offers of all the nearby car-share organisations. In just a few clicks, she searches and finds a van in which the seat fits perfectly. Maryan reserves and pays for the shared van using the app and can easily pick up her new lounge furniture. The interoperable 'Share and Go' car-sharing system enables her to reserve not only the shared car in her neighbourhood, but also vehicles from other car share organisations across the country. In this way, a (shared) car can be found anytime, anywhere, in a simple and user-friendly way.

An interoperable tool like the fictitious 'Share and Go' described above should offer travellers like Maryan a service that enables them to use the offerings of different car-share organisations. In effect, such a tool will combine access to several (or all) car-share organisations into one service. The interoperable service that is the subject of this report is intended to make combined car-sharing - accessing (and using) cars from different Flemish car-share organisations from a single platform - a reality for consumers. Travellers can plan, book and pay for car-sharing trips through the interoperable platform. This report studies total interoperability: we examine how interoperability can be extended to all aspects of the tool in order to obtain the best performing platform possible. The development of such a service can also pave the way for the simultaneous integration of different car-share services into Mobility as a Service (MaaS) tools (meaning that they can be readily combined with other mobility modes).

Interoperable car-sharing is no longer in a far-off future. At the end of 2016, the Flemish Parliament asked the Flemish government to stimulate car-sharing, not least by developing a common reservation platform.[1]Following this Flemish resolution, Autodelen.net and Ecomobiliteit Gent vzw together examined the possibilities of such an interoperable tool in the mobility project Share.Vlaanderen. This project aims to develop a proof of concept for a first interoperable solution between different Flemish car-sharing systems. This analysis report is the final result of that project and explains the various aspects of interoperability for this interoperable car-sharing service. It therefore provides a basis for marketing the interoperable service.

We will start this report by outlining in chapter 3 the (Flemish) mobility context, including its challenges and developments, within which the idea of an interoperable service arose. We also zoom in on the opportunities that an interoperable service offers to different parties. The fourth chapter presents an environmental analysis for the development and success of such a tool.

The fifth chapter contains a stakeholder analysis. Here we consider the attitudes of car-sharers, non car-sharers, car-share providers and MaaS players towards an interoperable tool of this type.
Chapters six and seven then examine what such an interoperable service enabling combi car-sharing might look like. Chapter six explores similar interoperable instruments from home and abroad. Chapter

[1] Flemish Parliament (2017), *Text adopted by the plenary session of the proposal for a resolution by Annick De Ridder, Dirk de Kort, Marino Keulen, Lies Jans, Karin Brouwers and Paul Van Miert on the promotion of car-sharing,* http://docs.vlaamsparlement.be/pfile?id=1267545

seven presents a practical analysis of the possible scenarios for an interoperable service. Here we analyse the interpretation of the various aspects of interoperability (legal, organisational, semantic and technical) and their practical implications.

This report, and with it the first steps towards the service envisaged by the project partners, was made possible by the financial support of the Flemish Government's Mobility and Public Works Department. We are grateful for their support and great faith in this technological evolution. We would also like to thank the experts who provided input to prepare this analysis report for their time and their valuable feedback.

2. Abstract

In response to the resolution on car-sharing in Flanders, Autodelen.net set up the Share.Vlaanderen project to investigate interoperability between car-share providers. The end result is an analytical report presenting the state of the art of interoperable car-sharing, analysing the attitude of stakeholders in the ecosystem and exploring opportunities and potential obstacles for providers in Flanders.

This report shows that end-users welcome the concept of interoperable car-sharing and believe that it can make car-sharing more popular. Mobility providers - both car-share providers and MaaS players - can only be found if the tool is integrated with MaaS players. Interoperable initiatives in the car-sharing world demonstrate that a high degree of uniformity among participating providers is the key to a functioning interoperable service. However, this report shows that car-share providers want to maintain their individuality in a small car-sharing landscape with a good deal of overlap. Finding the right balance between these two factors is therefore necessary if interoperable car-sharing is to be successful in Flanders.

3. Background

This section describes the context in which the 'Share.Flanders' mobility project came about. Here it becomes clear why an interoperable car-sharing tool can be a useful means of tackling the mobility challenges in Flanders.

First, we address the current mobility situation and the additional challenges, followed by the policy response, namely the basic accessibility decree. We then discuss the role of car-sharing within this policy, explaining the benefits of car-sharing, the car-sharing landscape and the trends and outlook for the coming years. Finally, we discuss the role of technology in tackling these mobility challenges.

3.1. Mobility context

Mobility is a very important part of the Belgian economy. According to Traxio, the overall mobility and transport industry accounted for some 147 billion euro in 2019. That corresponds to about a third of our GDP.[2]Despite its great importance, Belgian mobility is often associated with car traffic, the resulting congestion and poor air quality. This is not without reason: the number of passenger cars registered in Belgium is increasing year after year. The consequences of this car-centric mobility have a major social impact:

- Traffic density is increasing worldwide, not least on the roads in Flanders.[3] Over a 15-year period the number of vehicles on our roads has risen by more than a million.[4]This relentless stream of cars is causing ever **more frequent and longer traffic jams.** According to the TomTom Traffic index (an international list of cities ranked by traffic congestion), a journey in Brussels takes 38% longer on average due to traffic jams. In Antwerp, it takes one-third longer. In recent years, these traffic jams have also increasingly occurred outside rush hours and on motorways, so we can no longer call this an urban phenomenon. Smaller town centres and municipalities are also affected. According to research by VRT and its mobility partner Be Mobile, 75% of congestion is not on motorways, but on smaller roads.[5]
- The direct impacts of rising car ownership are ever more visible locally. The private car is claiming more and more **public space** (for parking or via the construction of new roads), making scarce public space unusable for alternatives such as meeting places, green areas and play opportunities for children.
- There are also important invisible consequences of the growth of transport on our roads. Studies show that **CO2 emissions** from road traffic in Flanders have increased by ten percent

[2] Deloitte. (2019). Future of Mobility: a new deal for mobility in Belgium, https://www2.deloitte.com/content/dam/Deloitte/be/Documents/strategy/FOMBrochureFinalVersion.pdf, p. 5.
[3] TomTom. (2019). Traffic Index 2019, https://www.tomtom.com/en_gb/traffic-index/ranking/
[4] Environment Department. (2018). Number of road vehicles, https://www.milieurapport.be/sectoren/transport/sectorkenmerken/aantal-wegvoertuigen [in Dutch]
[5] Beeckman T. (2019). Fewer traffic jams on Belgian motorways in 2019. But what about jams on smaller roads and rat runs?, https://www.vrt.be/vrtnws/nl/2019/12/19/2019-minder-files-op-de-belgische-snelwegen-maar-meer-op-de-ge/ [in Dutch]

over the last sixteen years[6], even as Belgium committed itself to producing 35 percent fewer emissions by 2030 compared with the base year of 1990. Mobility policy, too, will require efforts to achieve the goals of the Paris climate agreement. In addition, air pollution caused by passenger cars remains significant. The use of passenger cars contributes more than 50% to air pollution emissions from road traffic, directly contributing to the health risks caused by particulates, soot and NOx.[7]

To future-proof our mobility, many challenges must be tackled. Not least, we need a **modal shift**, with more people in Flanders opting for alternatives to the private car. Solutions are therefore being vigorously pursued at a number of policy levels. For example, the Flemish Parliament adopted the basic accessibility decree in 2019.

3.2. Basic Accessibility Decree and the Flemish Mobility Centre

The new, demand-driven vision of mobility in Flanders was laid down in the **basic accessibility decree**. This decree aims to guarantee the (basic) accessibility of social destinations via a **sustainable, safe, intelligent and multimodal** mobility system in Flanders.

The vision is based on a network logic. This basic accessibility is to be achieved through four transport layers (the train network, the core network, a supplementary network and customised transport). To translate this vision into practice and to tackle local mobility challenges, Flanders was divided into 15 transport regions, each drawing up local transport plans together with municipal representatives. Unlike the first three layers of transport, which must cater for journeys with substantial demand, the fourth layer, 'customised' transport, will facilitate local trips with lower demand. This will be achieved with a combination of transport modes (determined by the different transport regions) such as shared cars, shared bicycles, (shuttle) buses and collective taxis.

The ambition is to closely co-ordinate the different layers and modes of transport and thus prompt travellers to adopt combined mobility solutions. Combi-mobility means using different means of transport one after the other (e.g. first the train and the last 10 km by shared car) or using different means of transport at different times (e.g. today the bicycle, tomorrow the train, and the day after the car). Mobi-points, known in Flanders under the brand name Hoppinpunten, provide the **physical** connection between the different modes of transport. Here, travellers can find different transport modes to help them make a smooth interchange or mobility choice.

In order to organise the connections between the layers and the use of the different transport modes in a cost-efficient and convenient way, there is a need for **overarching mobility management**, regardless of the mode. The **Flemish Mobility Centre** (VMC), which will be set up on behalf of the Flemish Government, will ensure that travellers can get from A to B smoothly and in a multimodal way. The mobility centre handles planning, booking and payment for journeys. The centre analyses the user's

[6] Vlaamse Milieumaatschappij. (2018). Emissions of greenhouse gases in Flanders 2000-2016, www.vmm.be/publicaties/uitstoot-van-de-broeikasgassen-in-vlaanderen-2000-2016 [in Dutch]
[7] Vlaamse Milieumaatschappij. (2020). On the right track? Air pollution from road traffic, https://www.vmm.be/lucht/infografieken/vmm_verkeer_2018.jpg [in Dutch]

demand for transport and mobility options, provides information on public transport and makes recommendations if necessary. Transport requests for trips are collected, efficiently planned and then carried out by one or more carriers or transport services. In time, the VMC will develop into a Mobility as a Service (MaaS) platform, that is, a range of mobility services (both public and private) offering customised integrated travel options via a digital platform with real-time multimodal information.[8]The intention is to test and expand the Flemish Mobility Centre in the near future.

3.3. Car sharing as an essential link in combi-mobility

Car sharing, where a car is used by several households in turn, **makes people use their cars more rationally and opt for alternative, sustainable modes of transport.** British research has shown that people who car-share make on average 12% more journeys by bicycle and as much as 20% more journeys using public transport (light rail and trains).[9]Research from Bremen confirms this conclusion and indicates that car-sharers are five times less likely to use their car for commuting than private car owners.[10] Car-sharers use a bicycle twice as often for the same journey. Conversely, car-sharing offers a solution for living without a car of your own. A robust car-sharing policy is therefore necessary if combi-mobility is to be made a reality.

Besides the obvious benefits that it can achieve in terms of combi-mobility, car-sharing offers important wins in other policy areas.

1. **Climate, environment and energy**
   On average, one shared vehicle replaces between 4 and 16 private cars. Not only does this mean that much less (parking) space is required; it also reduces the energy and valuable raw materials needed for the production of cars. German research also suggests that car-sharers emit on average between 39 and 52% less CO2.[11]Car-sharing can be a catalyst in the transition from fossil fuels to cars with cleaner technologies. Due to the faster turnover of shared cars, the more advanced and least polluting technologies are always used. It is also an ideal introduction to electric driving.
2. **Well-being**
   Car sharing (by comparison with private car ownership) can make vehicle mobility more accessible to a larger group of people in Flanders and thus contribute to social inclusion. Car-sharing stands for affordable, trouble-free vehicle mobility when needed. After all, car-sharers only pay for a car when they actually use it.

[8] Seeuws B. (2019). Flanders continues to work on its mobility centre, https://www.autodelen.net/vlaanderen-maakt-werk-van-mobiliteitscentrale/ [in Dutch]
[9] CoMoUK. (2019). Car Club Annual Survey for London, https://como.org.uk/wp-content/uploads/2019/09/London-Car-Club-Survey2017_18.pdf
[10] Karbaumer R. and Glotz-Richter M. (2017). Results of Impact Analysis of Car-Sharing Services and User Behaviour Delivers Interesting Results in Bremen, https://share-north.eu/2018/05/results-of-impact-analysis-of-car-sharing-services-and-user-behaviour-delivers-interesting-results-in-bremen/
[11] Le Vine S., Zolfaghari A. and Polak J. (2014). *Carsharing: Evolution, Challenges and Opportunities*. ACEA Scientific Advisory Group Report, p. 12.

3. **Local economy**
   A recent scientific study in Bremen found that car-sharing also has beneficial effects on the local economy.[12]
4. **Public health**
   Because car-sharers drive fewer vehicle kilometres, car sharing also has a positive impact on air quality. Car-sharing reduces PM10 and NOx emissions by 13%.[13]Finally, we also have good reason to assume that car users are healthier and exercise more than the average Flemish person, since they tend to cycle more, walk more, or use a combination of transport modes to get from A to B.

The fact that the Flemish Parliament also sees car-sharing as a partial solution in the achievement of combi-mobility was already apparent in the 2016 resolution on encouraging car-sharing. In this resolution, the Parliament calls on the Flemish Government to investigate the possibility of creating a common reservation platform (as part of an overarching quality framework). This analytical report (and the Share.Vlaanderen mobility project itself) goes some way to meeting this request.

"Shared cars can thus be an ideal solution, providing a link in the mobility chain for journeys where public transport or cycling are not optimal. Car sharing can also be used for the 'first or last mile' journeys as part of basic accessibility."

- Resolution on encouraging car-sharing, 30 November 2016[14]

3.2:2. Car sharing in Flanders

Car sharing is based on a simple principle. The car is used when it is needed. If not, it will be used by someone else. The emphasis here is always on car use, not car ownership. The car-sharing market has an increasing number of players, which can be divided into two main categories:

1. Car share providers with their own fleet

These car-share providers make a vehicle fleet available to their customers. The fleet varies for each provider and can consist of various models. The user pays the organisation for the use of a vehicle.

a. Operational differences

Within this car-sharing category, there are systems in which the user must return the shared car to the location from which it was collected after the journey (round-trip car sharing). A distinction can also be drawn between systems that use permanent locations (station-based) or a specific zone to which the vehicle must be returned (home zone-based). On the other hand, there are also operators that allow

[12] Karbaumer R. and Glotz-Richter M. (2017). Results of Impact Analysis of Car-Sharing Services and User Behaviour Delivers Interesting Results in Bremen, https://share-north.eu/2018/05/results-of-impact-analysis-of-car-sharing-services-and-user-behaviour-delivers-interesting-results-in-bremen/

[13] Kennisinstituut voor mobiliteitsbeleid. (2015). Mijn auto, jouw auto, onze auto: deelautogebruik in Nederlands: omvang, motieven en effecten, https://www.kimnet.nl/publicaties/rapporten/2015/december/8/mijn-auto-jouw-auto-onze-auto, p. 47.

[14] De Ridder A. et al. (2016). Proposal for a resolution encouraging car-sharing, http://docs.vlaamsparlement.be/pfile?id=1222487 [in Dutch]

their customers to leave the shared car in a different location (within the city) after a journey (free-floating car-sharing). A further distinction can be drawn between systems that use permanent stations (pool stations) or a specific zone, within which the car may be parked anywhere on its return ('operational area'). In this case the user must have a smartphone in order to locate the shared car. Figure 1 gives a visual representation of the four types of car-sharing and also states which car-share organisations active in Flanders belong to which categories.

Figure 1Car-share providers with their own fleet in Flanders (August 2021)

There are a good number of car-share organisations with their own fleet active in Flanders. As mentioned above, they can be divided into station-based versus free-floating, but they also differ in other respects. Each has its own unique features. The most important differences are summarised below:

- Radically digital vs extensive services
  Some systems require the use of a smartphone to reserve, locate and open a shared car. Other systems have a call centre and make it possible to reserve a car even without internet/digital skills.
- Fully electric vs mixed car fleets
  Flemish car-share providers' fleets range from 100% electric fleets through mixed fleets to fleets mainly powered by fossil fuels.
- Standard vs A-class cars
  While many car-share providers target customers who do not see cars as status symbols and offer standard vehicles, there are also providers who distinguish themselves by offering their users more luxurious car makes and models.

b. Business differences

The variety of formulas developed by the various car-share providers with their own fleets is already almost as great as their operational diversity. Below we try to provide a picture of these various approaches:

- **Subscription formulas**, where users become members and pay monthly for the journeys they make. These systems require users to pay a monthly subscription fee in addition to a kilometre and/or hourly rate. Users of these systems also have to pay a one-off deposit.
- **Prepaid formulas,** where users pay a fixed monthly prepaid charge or a user-defined prepaid bundle as necessary. These prepaid costs are then used to cover travel consumption, which can be charged per kilometre and/or per time and/or per kW/h. A reservation fee is also sometimes part of the journey price. In this case users here pay a deposit either when activating membership or by blocking a credit card for each trip.
- **Pure consumption formulas** whereby users only pay for journeys taken. This involves temporarily securing a deposit on the user's credit card.

These organisations tend to provide business-to-government (B2G) and business-to-business (B2B) services, which they combine with the business-to-consumer (B2C) segment to achieve a profitable business model. Especially in less densely populated, commercially less interesting areas, linking B2C and B2G/B2B can guarantee a minimum income and make car-sharing profitable. Shared cars are then used both by companies and authorities for service trips and by private individuals.

2. Private car-share

In Flanders, there are also some organisations that facilitate the sharing of private cars. In these cases, the car-share provider does not own any cars itself. Owners who make their cars available through the organisation receive a fee from users. The vehicles are picked up from the owner's premises and returned there afterwards. We can distinguish two further subcategories within private car-sharing:

- **Private cost-sharing car-share**
  This form of car-sharing allows individuals to share cars among themselves on a cost-sharing basis. This means that the price per kilometre that users pay reflects the true price of car use and, de facto, that the owners (and the organisations behind them) make no profit. Consequently, the services provided by such systems are limited and/or based on the efforts of users or volunteers. The organisations that set up this form of car-sharing are therefore non-profit associations (VZWs). There are both organisations that work with small car-sharing groups where the owner directly enters into a contract with the users, and shared fleets that are managed by an intermediary (= voluntary organisation) that enters into the contracts. The vehicles may either be the property of one member of the car-sharing group or can be bought in joint ownership by several members of the group.

- **Private car-sharing at market rates**
  There are also online platforms where owners can register their cars. Anyone who then registers as a user can hire any vehicle on the platform at a market rate specified by the owner (price per kilometre and/or an hourly rate). The platform provides matching, user ratings and supplementary insurance for car users. In return, these platforms charge a commission to the

car owners. Payments and the securing of a deposit are made on these systems using a credit card.

Figure 2 shows which Flemish private car-sharing companies fall into which category.

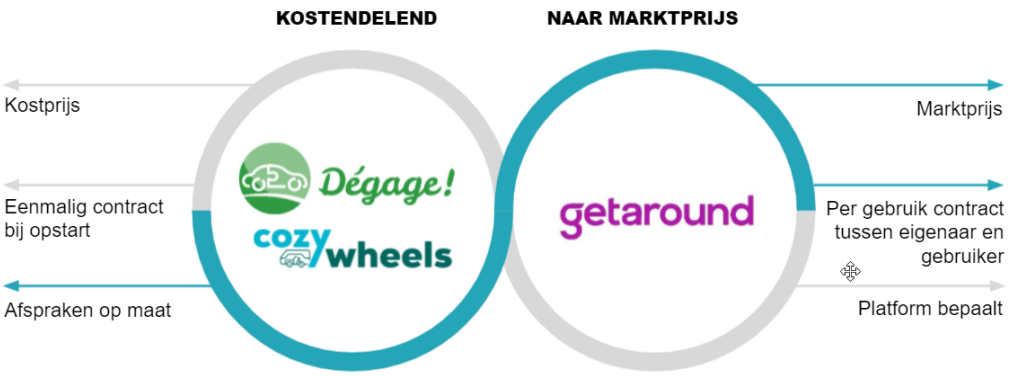

Figure 2Private car-sharing in Flanders (August 2021)

Different forms, complementary use

There are a good number of systems operating in Flanders. Car-share providers all target a particular customer segment because of their different USPs. This attracts different customer groups.

In practice, we find that car-share systems can also work in a complementary way. Car sharers are often members of several car-share organisations to meet different needs. For example, for family weekends you can use a larger car obtained via a private car-share system, but if you missed the last tram after the late-night show and want to make a one-way trip home, a free-floating car-sharing system might be more convenient.

3.3.2. Development and outlook for car- sharing in Flanders

Car-sharing is on the up! At the start of 2021 there were around 150,000 Belgian car-sharers. Especially in Flanders, car-sharing is becoming more and more widespread. In 2021 some 82,000 people opted for a shared car, a figure that is rising year on year. A representative survey by Autodelen.net shows that 1.5% of people in Flanders are car-sharing.[15]In line with the rising demand, the supply of shared cars has increased significantly in recent years. The car-sharing landscape is dynamic, with ten new providers emerging in the last five years alongside the established players. There are currently 11 car-share providers active in Flanders.

[15] Matthijs J. (2020). Car sharing is becoming mainstream in Flanders, https://www.autodelen.net/autodelen-wordt-mainstream-in-vlaanderen/ [in Dutch]

Alongside the number of car-sharers and shared cars, the geographical scope of car-share systems in Flanders is also growing. Whereas car-sharing used to be mainly an urban phenomenon, it is now also taking off in more rural municipalities. Local authorities are increasingly turning to car-sharing and are thus establishing it in rural areas as well.[16]It is striking that local garage owners are jumping on the car-sharing bandwagon. In recent years, car sales in Belgium have no longer been growing so strongly.[17]In response, companies are looking for other business opportunities, such as car-sharing. Often, these are local initiatives that try to provide an answer to mobility issues in their own districts.

The future of car-sharing also seems promising. A market survey carried out by Autodelen.net in 2019 showed that about 10% of people in Flanders are interested in car-sharing. More than nine in ten of the doubters would be more readily persuaded if there were greater availability of shared cars at all times. Analyses of the European car-sharing market also predict an upward trend and forecast an increase to 2.3 million shared cars in 2025 and 7.5 million shared cars in 2035 in Europe.[18]

Finally, new technological developments such as Mobility as a Service (MaaS) offer the (shared) mobility sector additional growth opportunities (see 3.4. Emergence of Mobility as a Service (MaaS)).

3.4. Emergence of Mobility as a Service (MaaS)).

The increasing offer of mobility services, and the social trend whereby consumers are gradually coming to see transport-sharing as equivalent to ownership, are creating a breeding ground for technological developments such as Mobility as a Service (MaaS). MaaS is a response to the rapid increase in the number of mobility providers, which enable travellers to travel from A to B in many different ways. Users can use MaaS to make multimodal travel easier and more efficient. Today's technological capabilities offer opportunities for MaaS in the pursuit of a modal shift in the coming years.

Experience from abroad shows that the impact of MaaS on mobility can be significant. The Finnish company Whim, a pioneer in the MaaS industry, reduced the use of private cars among its users in Helsinki by 50%. In Vienna, residents using the 'smile' app are using public transport more and multimodal transport is becoming more popular.

By 2020, there were also already a number of MaaS initiatives in Belgium. Some MaaS providers, both local start-ups and international companies, are rolling out the first MaaS activities in our country. This is driven by both policy and commercial interests.

- The city of Antwerp, for example, is promoting various MaaS systems as part of the '**Smart ways to Antwerp**' mobility project to connect and launch mobility services via a dedicated app.
- On the other hand, MaaS players are also offering white-label services to banks, insurers and the like to facilitate integrated mobility solutions. This was partially influenced by the federal

[16] Poppelmonde J. (2019). Shared cars are conquering Flanders and Brussels, https://m.standaard.be/cnt/dmf20190212_04172259 [in Dutch]
[17] Febiac. (2020). Datadigest 2020, http://www.febiac.be/public/statistics.aspx?FID=23&lang=NL
[18] ING Economics Department. (2018). Car sharing unlocked, https://think.ing.com/uploads/reports/ING_-_Car_sharing_unlocked.pdf , p. 18.

'**Smart Mobility Belgium**' initiative, which former Minister of Mobility Bellot and Minister of Digital Agenda De Croo set up to stimulate smart mobility solutions.

- Finally, there are also a number of MaaS providers offering an app to the general public (B2C).[19]

Besides these private players, the policy is also working towards MaaS by developing and rolling out the Flemish Mobility Centre.[20]This centre will be expanded in the coming years under the terms of the basic accessibility decree to support travellers with transport questions. At the same time, a 'Flemish MaaS agreement framework' is under development, whereby the different stakeholders in the MaaS ecosystem are jointly investigating which rules should be applied. Users, MaaS providers, transport providers, (local) authorities, etc. are working together in a co-creation process to make the MaaS ecosystem work optimally in Flanders.

Car sharing and MaaS

Some MaaS suppliers in Flanders have already included car-sharing schemes in their mobility solutions. For example, you can use Cambio via Olympus Mobility, Whim and Skipr Poppy.

3.5. Conclusion

It is clear that car-sharing can be part of the solution enabling the Flemish to transition to sustainable transport alternatives. For various reasons, however, it makes sense to promote not only car-sharing, but also combined car-sharing by means of an interoperable tool. This tool is of interest to a number of groups. Its advantages for potential end-users, car-share providers, MaaS providers and policymakers are described below.

For end-users

An interoperable tool enables users to use a wide range of shared cars in a **straightforward manner**. It significantly increases ease of use: users can participate in combined car-sharing via a single app, without needing to register with all these different organisations or follow a mass of procedures.

An interoperable tool also improves the status of **car-sharing as a reliable alternative** to the private car. Both availability and the supply of different models increase with combined car-sharing. This will encourage car-sharers to choose sharing for their journeys even more than today. The interoperable tool will also make this option more attractive for non-sharers who may be considering car-sharing.

For car-share providers

With 11 different car-share providers, the Flemish car-share landscape in 2021 is quite fragmented. There are three players with a substantial supply (+150 shared cars). However, the vast majority are relatively young businesses that need **strong customer growth and the additional economies of scale** more than the other companies in the short term. An interoperable tool can increase the customer base of these car-share providers.

[19] Deloitte. (2019). Future of Mobility: a new deal for mobility in Belgium, https://www2.deloitte.com/content/dam/Deloitte/be/Documents/strategy/FOMBrochureFinalVersion.pdf, p. 9.
[20] See 3.2. Basic Accessibility Decree and the Flemish Mobility Centre

Whether they like it or not, car-share providers (will) have to take account of the emergence and ongoing development of MaaS. Currently, the companies that organise this service, the MaaS providers, have all developed their own API (application programming interface, through which car-share providers can access the MaaS app) for the technical integration of car-sharing into their offerings. This integration, separate for each MaaS system, demands an enormous amount of time and financial resources from car-share providers. An interoperable tool ensures that car-share providers only have to carry out this technical integration once. Communication with all MaaS APIs could then run through this service. Participating car-share providers are also **in a stronger position to negotiate** with international and domestic MaaS providers who may only be interested in one or two car-share providers.

Alongside the organisational and financial benefits, the interoperable tool can also **offer added value in terms of communication and customer service**. The tool promotes the general concept of car-sharing and leverages the diversity of supply as a unique selling point (USP) for the customer who, thanks to the interoperable service, can access a huge pool of shared cars. Through this larger and more diverse offer, car-sharing will attract a wider range of customers, which will benefit the individual car-share providers.

For MaaS providers

As discussed above, MaaS providers currently need to negotiate and technically integrate each car-share provider separately. Developing an interoperable tool makes it possible **to identify these processes and to save time and financial resources in the event of subsequent integration into MaaS apps.** In addition, once successfully integrated, the MaaS app becomes much more attractive as they can **offer a much larger number of available shared cars.**

For policy

In light of recent developments in Flemish mobility policy, including the basic accessibility decree discussed above, **combined mobility** is gaining in importance. What is more, the Flemish government's coalition agreement targets a modal split for commuting of 40% sustainable travel. **Here car-sharing is an essential component in car-free living**, either at the beginning or end of journeys using public transport or at times when travel by car is necessary (e.g. shopping, weekends away, trips to the container park, etc.).

Car-sharing is also seen as one of the solutions for organising customised transport. Among other things, this lowest layer of basic accessibility must provide an answer to the disappearance of the dial-a-bus system. An interoperable tool will make many more regions, cities and municipalities accessible via a single car-sharing subscription, making the concept one of the alternatives to dial-a-bus schemes. It also simplifies administration for the Flemish government because with an interoperable car-sharing tool, agreements and settlements only have to be made with a single party.

4. Environmental analysis

This chapter looks at the broad environment in which the interoperable tool will operate. Some trends in this macro environment may have an influence (both positive and negative) on the operation and development of an interoperable car-share service that encourages combined car-sharing. These aspects should be taken into account in its design. We will discuss these, addressing each DESTEP factor in turn.

4.1. Demographic context

- The population of Flanders and Belgium will increase significantly in the coming years. On 1 January 2021 Flanders counted a population of 6.65 million, representing an increase of 24,000 since the beginning of 2020. Between 2000 and 2021 the population grew by 12%. If we add the Flemish administration of the Brussels Capital Region to the population of Flanders, Flanders has just over 7 million inhabitants.[21]
- Population growth is mainly concentrating in expanding cities, blurring the boundaries between the urban environment, the urban periphery and the countryside.

  This results in **increased urbanisation.**[22]
    - More **opportunities and growth potential for shared mobility**, since shared mobility is currently still mainly an urban phenomenon. More city dwellers may result in more users of shared mobility, thus also increasing the potential of the interoperable tool.
- About 65% of the expected population growth will be due to migration. This migration creates a kind of **super-diversity** in ethnic, linguistic, cultural, technological and religious terms. The **proportion of people over 65** is also increasing.[23]
    - These groups cannot be ignored if we are to convince a sufficiently large number of consumers. The development of an interoperable service must take account of this diverse and multilingual social context. The interoperable tool should therefore be **inclusive, accessible and reader-friendly**.
    - On average, the Flemish are increasingly making use of the possibilities of the internet and digitisation, but that use is still very limited for some 18% of internet users whose **digital literacy is much lower**.[24]Sufficient attention should therefore be paid to the development of a low-threshold mobility app so that they too can come on board.

[21] Eurostat, Stabel & Statistiek Vlaanderen, Population: size and growth, https://www.vlaanderen.be/en/statistics-flanders/population/population-size-and-growth.
[22] Eurostat, Stabel & Statistiek Vlaanderen, Population: size and growth, https://www.vlaanderen.be/en/statistics-flanders/population/population-size-and-growth.
[23]Eurostat, Stabel & Statistiek Vlaanderen, International migration, https://www.statistiekvlaanderen.be/nl/internationale-migratie#al_jarenlang_meer_internationale_immigranten_dan_emigranten. [in Dutch]
[24] De Marez L. et al. (2020). imec.digimeter 2020, digital trends in Flanders, Ghent, https://www.imec.be/sites/default/files/inline-files/DIGIMETER2020.pdf, p. 20. [in Dutch]

4.2. Economic context

- Mobility is a very important part of the Belgian economy: according to Traxio, the overall mobility and transport industry accounted for some 147 billion euro in 2019. That corresponds to about a third of our GDP.[25]Unfortunately, this mobility is focused entirely on cars, and Belgium is also the "world champion of traffic jams". Car traffic will increase by a fifth by 2030. By then, it will take us 32 minutes longer to cover 50 kilometres during rush hour. A **modal shift** is needed if we are to **future-proof our mobility.**
    - There must be sufficient transport alternatives to enable this modal shift to be made. The development of an interoperable car-sharing tool as part of combined mobility could be an attractive alternative to help people make the switch to sustainable mobility.
- The **proportion of households living below the poverty line** will increase.[26]In addition, the lower middle class (too rich to be poor and too poor to maintain a comfortable standard of living) is growing. Mobility (12%) is the third most important item of household expenditure, after housing (24%) and food (13%).[27]
    - Owning a car will become more difficult for more people. Combined mobility (with an important role for car-sharing) as a cheaper alternative is becoming more attractive for more people.
- **In most cases, shared mobility does not seem to be cost-effective today.** This has led to the disappearance of a number of initiatives (e.g. ShareNow, Zen Car and Zipcar in Brussels). [28]
    - This unstable market situation can create a rather unfavourable investment climate. Potential investors are at risk, since both the offer and service provision through the interoperable tool could deteriorate as a result.
    - On the other hand, this climate can offer opportunities for venture capital.
    - Car share providers themselves may not have the means to invest in the necessary adaptations.
- Currently, the **market segment of car-sharers is very small** in Belgium: there are about 150,000 people who participate in car-sharing.[29]
    - If the interoperable service is to be profitable, a strategic effort will be required to attract new customers in addition to acquiring existing car-sharers.
- The increasing number of car-share players also has a downside. The car-share landscape is fragmenting, customers can no longer see the wood for the trees and it is difficult for start-up

[25] Deloitte. (2019). Future of Mobility: a new deal for mobility in Belgium, p. 5.
[26] Temmerman M. (2020). Poverty risk is increasing in almost all Flemish municipalities, https://www.vrt.be/vrtnws/nl/2020/09/28/het-risico-op-armoede-stijgt-in-bijna-alle-vlaamse-gemeenten-en/ [in Dutch]
[27] FPS mobility. (2014). How much do Belgian families spend on transport? p. 1. [in Dutch]
[28] Beeckman T. (2019). Car sharing is fast gaining popularity, but will it solve our traffic jams?, https://www.vrt.be/vrtnws/nl/2019/09/14/autodelen-wint-snel-aan-populariteit-maar-lost-dat-onze-files-o/ [in Dutch]
[29] Deceunynck F. (2021). YES OR NO? Car-sharing, https://www.standaard.be/cnt/dmf20210611_97749369 [in Dutch]

car-share providers to gain a foothold because they cannot initially offer sufficient scale (i.e. sufficient supply of shared cars).[30]

- An interoperable service can remove these barriers and ensure that both customers and providers benefit from centralising the car-share offer.

4.3. Socio-cultural context

- In recent years, the **trend from owning goods to using them has continued**. This also has repercussions for the economy, which is becoming more and more focused on services rather than products. Companies are responding to this trend by becoming service platforms, introducing other services alongside their core business in order to reach more customers (e.g. banking or insurance services).[31]
  - Car sharing and an interoperable car-sharing tool are a perfect fit for this scenario. Car-sharing is based on car use rather than car ownership. An interoperable car-sharing tool can also be a service offered by a bank or insurance company as part of its mobility solution.
- **Young people are slower to get their driving licences.** Cars are becoming less and less of a status symbol.[32]
  - This reduces the potential customer base for an interoperable car-sharing tool.
  - On the other hand, car-sharing and the interoperable car-sharing tool fit right into this changing culture.
- **Working from home** is becoming more widespread due to the Covid-19 crisis.[33]Companies were obliged to adopt home working. A lasting rise in home working after Covid-19 is expected. This can lead to less car frequent use and a decreasing need for car ownership.
  - This awareness can give a boost to car-sharing, combined car sharing and MaaS.

4.4. Technological context

- The Covid-19 crisis has led to the **increased normalisation of digital services** (e.g. online ordering and delivery services, online meetings, consulting a menu via QR code, etc.).[34]
  - This makes the move towards using digital mobility solutions, including the total interoperable service, a smaller step (see 7. Exploring the ideal car-sharing instrument).

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[30]see section 3.3.1. Car sharing in Flanders

[31] Basselier R. et al. (2018). De opkomst van de deeleconomie, https://www.nbb.be/doc/ts/publications/economicreview/2018/ecotijdiii2018_h3.pdf

[32] Cardone N. (2019). Fewer and fewer Belgians are getting a driving licence: "Young people no longer see a car as a status symbol", https://www.vrt.be/vrtnws/nl/2019/03/13/steeds-minder-belgen-halen-een-rijbewijs-jongeren-zien-een-aut/#:~:text=Uit%20die%20cijfers%20blijkt%20dat,haalden%22%2C%20aldus%20De%20Dobbeleer.&text=Er%20is%20een%20groep%20jongeren,Die%20groep%20wordt%20groter.%22 [in Dutch]

[33] Braeckman K. (2021). Teleworking expert: "Ideal combination is two days at home and three days at the office", https://www.vrt.be/vrtnws/nl/2021/06/14/expert-over-telewerk-ideale-combinatie-is-twee-dagen-thuis-werk/ [in Dutch]

[34] Van Bakel L. & Vanwalleghem E. (2021). Going to the town hall? Even after Covid, half of municipalities want you to make an appointment first, https://www.vrt.be/vrtnws/nl/2021/02/24/alleen-nog-op-afspraak-naar-helft-van-vlaamse-gemeentehuizen-na/ [in Dutch]

- The technological landscape is **dynamic and rapidly changing**.
  - The interoperable tool must be flexible and quickly adaptable, so that it is not immediately obsolete and works on all existing and potential operating systems.
- **Decentralised technologies** are increasingly emerging (e.g. blockchain)[35]
  - These things create unprecedented opportunities for connected, on-demand and seamless mobility.
- The future of mobility can be summarised in the acronym '**ACES**' (autonomous, connected, electric and shared). Almost all vehicle manufacturers worldwide are experimenting with these new trends.[36]
- Heavy investments are made in **Mobility as a Service (MaaS)**, whereby a range of mobility options can be chosen and paid for via a single app. (see 3. Background.
  - The MaaS evolution increases the (economic) usefulness of developing an interoperable tool, since car-sharing is a vital part of MaaS and the development of such a tool can be a step towards smooth integration.
  - For commercial reasons, international MaaS providers are only interested in cooperating with the largest providers. In time, this will become a competitive disadvantage for smaller, start-up car-share organisations. If they combine forces in an interoperable tool, they will be in a stronger bargaining position as a basis for integration into MaaS apps.
- Efficient data exchange is important to provide travellers using MaaS with a satisfying digital experience. For this reason, the **standardisation of data** is gaining in importance. In recent years, several initiatives have sought to exchange data from different mobility domains in a structured manner (e.g. GBFS and TOMP).
  - In developing an interoperable tool, it is appropriate to take account of ongoing developments in standardisation to ensure that the tool can be a preliminary stage in the integration of car-share services with MaaS apps.
- Technologies to facilitate the process behind interoperable car-sharing are being created and optimised (see 7.2 Operational interoperability) For example, there are technologies that facilitate registration (ITS.ME, European initiative on European identity) as they provide automatic recognition of the validity of driving licences, identity cards, etc. [37]

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Commented [3]: Ik denk niet dat deze verwijzing klopt, maar weet ook niet goed naar wat we wél willen verwijzen.

[35] NPO Kennis. (s. D). How is blockchain changing the world?, https://npokennis.nl/longread/7704/hoe-verandert-blockchain-de-wereld [in Dutch]

[36] Lance E. (2019). Fireworks About ACES As Key Acronym For The Future Of Mobility And Self-Driving Cars, https://www.forbes.com/sites/lanceeliot/2019/07/04/fireworks-about-aces-as-key-acronym-for-the-future-of-mobility-and-self-driving-cars/?sh=23f1cf96654e

[37] Ministry of Foreign Affairs (2019). European Commission presents a proposal for a European digital identity,https://ecer.minbuza.nl/-/europese-commissie-presenteert-voorstel-voor-een-europese-digitale-identiteit?redirect=%2F [in Dutch]

4.5. Environmental context

- **Climate awareness is rising.** Here in Flanders, people are increasingly interested in climate-friendly solutions to contemporary problems. In 2017, 85% of Belgians saw climate change as a problem to be tackled urgently.[38]
    - Car sharing and interoperable car-sharing are becoming more attractive to the climate-conscious citizen in Flanders.
    - As a result, the circular economy is booming, which is good for the popularity of car-sharing and, by extension, for an interoperable service.
- On the other hand, it needs to be said that people can also become **climate-fatigued**. The environmental benefit must therefore be harnessed strategically and thoughtfully.
- **Electric vehicles** are increasingly becoming the future of car mobility.[39]
    - Car sharing provides an affordable way to experience an electric vehicle, and the attractive interoperable tool will ensure that even more people do so.

4.6. Political and legal context

As mentioned in chapter 3. **Background**, policy (at various levels) is an important factor in the development of an interoperable car-sharing tool. The most important trends are summarised below.

- Currently, the **Flemish Government** is setting out its new vision for public transport based on the **basic accessibility decree**. Combined mobility and the modal shift play an important role in this.[40]
    - Car sharing is a vital part of combined mobility
    - The expansion of the Flemish Mobility Centre (a public MaaS player) provides commercial opportunities for an interoperable car-sharing tool.
- To stimulate public and private MaaS initiatives, the Flemish government is committed to the efficient exchange of mobility data. It does so by defining mobility data as Linked Open Data and designating standard interfaces (APIs). Accordingly, the Flemish Government has established rules on interoperability, open data, real-time data and standards for information exchange for passenger transport. To this end, a **Trips and Offers Open Standard for Linked Organisations (OSLO)** has been created. This semantic reference standard will structure data in a similar way across different organisations and make it easy to exchange data. The Trips and Offers OSLO is both a technical and a semantic reference standard. The semantic element is a description, a vocabulary, which ensures that all parties understand terms in the same way (

[38] M.A.S. - Market Analysis & Synthesis on behalf of the FPS Public health, Food chain safety and Environment (2017). Climate survey 2017: Final report, https://klimaat.be/doc/enquete_klimaat_2017_rapport.pdf, p.30. [in Dutch]

[39] Beeckman T. (2020), 17 percent of the new cars we buy are electric and hybrid; the market share is increasing ever-faster, https://www.vrt.be/vrtnws/nl/2020/11/02/17-procent-van-de-nieuwe-autos-die-we-kopen-zijn-elektrisch-en-h/ [in Dutch]

[40] Flemish Government (2020). Basic accessibility: Hoppin, https://www.vlaanderen.be/basisbereikbaarheid/hoppin [in Dutch]

for instance, the term 'traveller' has the same meaning for everyone). The technical component consists of an app profile for technical integration.[41]

- It is important for the interoperable tool to be OSLO-compatible so that it can connect with all stakeholders in this MaaS ecosystem.

- In 2020, the Flemish Government started a co-creation process to develop a Flemish MaaS framework for agreements. The stakeholders have combined to create a framework to make MaaS a success in Flanders.[42]
  - If MaaS becomes a real success, the interoperable car-share service can prove its usefulness as a hub for car-sharing in Flanders.
- For the purposes of Multimodal Travel Information Services (MMTIS), the European Commission has issued a regulation on the **collection and standardisation of mobility data** (again with a view to easier access and exchange). [43]Each EU Member State must establish a national access point (NAP), storing all the data relating to (passenger) transport for consultation by European citizens and companies when desired. The FPS Mobility (federal administration) collects the Belgian data on the web site www.transportdata.be. The intention is that this database will eventually be able to communicate with data from other EU Member States to facilitate the exchange of transport information.[44]
  - The interoperable tool must take account of this data regulation.
- Cities (e.g. Antwerp) are also increasingly **regulating the operation of sharing systems**. One such access condition, for example, could be opening up the subsystem to MaaS players[45]
  - This promotes interoperability and can provide an additional incentive to integrate with the interoperable tool.
- In May 2016, the European Commission imposed new **rules for the protection of personal data**, adapted to today's digital age. The well-known General Data Protection Regulation (GDPR) has been in force since May 2018. This legislation has repercussions for almost all companies and government bodies, since holding personal and sensitive data is often part of the service they provide.[46]
  - This legislation must be followed when exchanging personal data within the interoperable tool.
- **The fiscal policy on company cars** poses a major source of competition to car-sharing and shared mobility.

[41] Lippens I. (2019). OSLO initiative: standardisation of mobility data in Flandershttps://www.autodelen.net/oslo-traject/ [in Dutch]

[42]Flanders Ministry of Public Works and Mobility (undated). Draft Flemish MaaS Framework for Agreements https://maasafsprakenkader.vlaanderen.be/overzichtpublicreview#inleiding [in Dutch]

[43]European Commission (2017). Commission Delegated Regulation (EU) 2017/1926 of 31 May 2017 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32017R1926

[44] De Reys E. and Lippens I. (2020). Launching a personal travel national access point,https://www.autodelen.net/lancering-van-een-national-access-point-personenvervoer/ [in Dutch]

[45] Smart ways to Antwerp (undated). Permit for free-floating sharing systems https://www.slimnaarantwerpen.be/en/mobility-providers/permit-for-free-floating-sharing-systems

[46]European Commission (undated). Data protection in the EU, https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en

- However, the **regulations on cash for cars, the mobility budget**, may constitute a driving force for MaaS players.[47]

4.7. Conclusion

It is clear that there are many opportunities for an interoperable tool. In order to future-proof mobility, a modal shift is needed so that everyone - and there are more and more of us - can travel easily and smoothly. On the policy side, too, supporting initiatives are emerging to make this modal shift a reality. An interoperable service can therefore be part of the solution. We can also see that people are increasingly becoming accustomed to the idea of use instead of ownership, and that this is a growing area of the service economy. Climate awareness is also rising, which may ease the introduction of car-sharing and an interoperable car- share service.

However, there are a number of possible pitfalls. Firstly, account must be taken of the nature of the car-share sector in Flanders: it is currently small, quite fragmented and not profitable. Close attention must be paid to potential customer segments in the business model, especially if the interoperable service is to be profitable. The interoperable instrument must also be tailored to the needs of our changing society. It must be multilingual and intuitive, so that everyone can use it.

[47] Flemish Government (undated), Traffic: Mobility allowance (cash for car), https://www.vlaanderen.be/mobiliteitsvergoeding-cash-for-car

5. Stakeholder analysis

This analysis explores the opinions of stakeholders regarding an interoperable car-sharing tool. We seek to identify the target group, and the needs and requirements that the various stakeholders have in respect of a service promoting combined car-sharing.

To conduct this analysis, we involved four stakeholders:

1. **Today's car-sharers** - Is there a demand for a combined car-sharing tool among existing car-sharers? What functionalities could offer added value to make car-sharing develop into a fully-fledged and comfortable alternative to the private car? What is the value of such a tool to car-sharers?
2. **Potential car-sharers** - Can the development of an interoperable tool persuade potential car-sharers to make the switch to car-sharing? How can an interoperable tool make car-sharing more attractive than car ownership?
3. **Today's car-share providers** - What are their current experiences of interoperability? Are existing car-share organisations prepared to adopt such a tool? What are the opportunities and conditions for them?
4. **MaaS operators** - Are MaaS players interested in an interoperable tool for integration into MaaS platforms? What is the value to them of a service of this kind?

In the first part of the market analysis, we take a closer look at potential users' attitudes to combined car-sharing both car-sharers and non car-sharers. The second part examines how Flemish car-share providers view the development of an interoperable tool. Finally, the attitude of MaaS operators to an interoperable service is addressed in the final section.

5.1. Attitude of potential users

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5.1.1. Mobility profile of respondents

We used an online questionnaire to map the attitudes of car-sharers and non car-sharers to combined car-sharing.

We surveyed **286 car-sharers** who use one or more car-share platforms, with a preponderance of private car-sharers who are members of Cozywheels and Dégage. Figure 3 shows the distribution of car-sharers' membership of various car-share organisations. As a side note, it is also interesting to note that almost eight in ten of these car-sharers (N=185) do not have their own car and use a shared car for their car journeys. Almost four in ten (N=90) drive a shared car on average once to three times a month, while a quarter (N=57) do so once to three times a week.

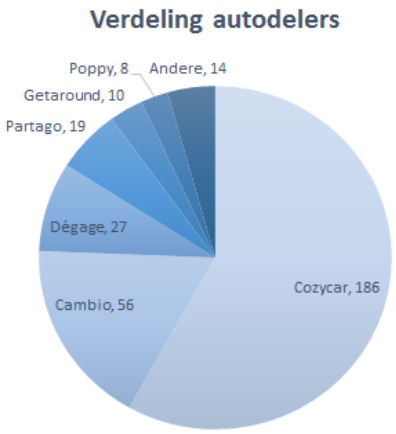

Figure 3 Distribution of car-sharers by membership of car-share organisations (Cozycar has since changed its name to Cozywheels)

In addition, **985 non car-sharers** took part in this survey. More than 93% of these had at least one car in the family at the time of the survey and more than 90% held a driving licence. Around one in ten (88 respondents) are considering becoming a **customer or member of a car-share organisation**. It is striking that, in this group of non car-sharers who are considering taking up car-sharing, 16% of families do not have access to a car of their own, compared with 7% of families in the entire sample of non car-sharers. It also appears that respondents who are considering car-sharing are much more likely to opt for journeys by bicycle (49% use a bicycle more than four days a week, compared with 26% of respondents who are not interested in car-sharing). The use of public transport is also significantly higher among respondents considering car-sharing in the future.

It should be noted that respondents had the opportunity to leave questions open. Not all questions were therefore answered by all respondents.

5.1.2. Attractiveness of combined car-sharing

Can combined car-sharing be a catalyst for car-sharing?

The interoperable tool aims at once to increase existing car-sharers' satisfaction with car-sharing, and to increase the market share of car-sharing (as compared with car ownership).

When we investigate what features and/or incentives might persuade potential car-sharers (i.e. non car-sharers considering a switch to car-sharing) to start car-sharing, more than 90% of respondents considering the switch mentioned the following aspects:

- Ease of use;
- Vehicles in sound clean condition; and

- Ensured vehicle availability (sufficient numbers, reservation procedure, etc.)

This information suggests that an interoperable tool should be capable of attracting new car-sharers, to some degree. Such a tool could significantly increase the number of available cars in a user-friendly manner.

Furthermore, the survey of **existing car-sharers** also shows that they would help increase market share through word-of-mouth advertising (one of the main introductions to car-sharing[48]). Indeed, six in ten respondents said they would be more inclined to promote car-sharing to friends or family if a combined car-sharing service existed. This presumably means that car-share organisations could attract additional customers or users if an interoperable tool were to be created.

Demand for combined use of car-share systems

When we turn our attention to **existing car-sharers**, the question of the combined use of different car-share systems in practice also arises. One in six of the car-sharers surveyed are already using a range of car-share systems. More than half are considering joining an additional car-share system. These figures indicate that **part of the car-sharing population already needs different (complementary) car-sharing systems** to provide a comfortable alternative to their own (second) car, without there being any specially integrated tool for this purpose. They would consequently gain in comfort from an interoperable service.

The main motives for using an additional car-sharing system now, according to respondents, are:

- the wider choice of vehicle types (73%);
- the ability to use shared cars in more different locations (70%); and
- the larger number of shared cars available (70%).

We also probed the factors that discourage car-sharers from combining multiple systems. Here, cost (45%) and the large number of apps or websites needed for this purpose (45%) appear to be the main barriers. This last reason, in particular, is a further indication that an interoperable tool may lower the threshold for multiple sharing platforms for a large number of car-sharers.

Interest in interoperable car-sharing and reasons for use

The vast majority of **car-sharers surveyed** (85%) indicated that they would like to use a combined car-share system. The grounds previously advanced by respondents for using multiple car-share systems are echoed in the reasons for using a combined car-share system. Four reasons stand out:

- Access to a larger number of available cars (80%);
- Ability to use shared cars at different locations (78%);
- Receiving a single invoice for all shared car journeys from different providers (74%); and
- Having access to more types of shared vehicles.

[48] Nehrke G. et al. (2018). Mobility cultures and mobility styles, deliverable 4.2. Horizon 2020 STARS project. www.stars-h2020.eu

5.1.3. The recipe for a successful interoperable tool

Interoperable tool desired functionalities and conditions

We presented **car-sharers** with a number of possible features of a platform for combined car-sharing and asked them how important they thought these were. Four features stand out:

- Transparency regarding the prices of the different modes (92%);
- Low price for the use of the platform (89%);
- User-friendly app (88%):
- Clear information about all the systems and modes on the platform (87%).

The option to use shared bicycles, shared scooters and public transport as well as shared cars within the app (67%), the secure storage of mobility and personal data in one place (64%) and the option to call on an ambassador or a help centre (53%) are slightly less critical.

Willingness to pay for an interoperable car-sharing system

Alongside general interest in a combined car-share system, we also assessed willingness to pay for such a platform. We are particularly interested in willingness to pay among car-sharers and those non car-sharers who are considering car-sharing.

A third of the **car-sharing respondents** said that they were unwilling to pay a fee for an umbrella application and only wanted to pay for the use of the shared cars. However, two-thirds are willing to pay extra for an interoperable platform. Just over half of these are open to paying a small percentage per ride and four in ten would accept a small monthly contribution. The results among **respondents considering car-sharing** are fairly similar. Almost three-quarters of this group are prepared to pay for the use of such a tool. Almost half would prefer to do so via a per-journey contribution, while about one-fifth would just prefer a monthly contribution.

5.1.4. Car ownership and use in a combined car-sharing scenario

Impacts of the interoperable tool on travel behaviour

An interoperable car-share system should enable users to easily use shared cars from different car-share providers. This has the potential to enhance the attractiveness of car-sharing and should persuade more people to adopt shared mobility. However, we are curious to know whether the fact that people have easier access to more shared cars will encourage them to use them more often.

According to half of the **experienced car-sharers**, their use of shared cars would generally remain the same if they had access to a combined car-sharing platform. Four per cent suspect that the use of shared cars would decrease as a result. The remaining 46% think they would use a shared car more often. These results suggest that an interoperable platform would lead car-sharers to opt for travelling by car more often than before.

However, this picture deserves some qualification. We suspect that the increase in shared car journeys will also partly replace private car journeys. We asked the respondents how they see their use of a

private car changing once they have access to a combined car-share platform. The majority of car-sharers (60%) expect the number of journeys using a private car to remain the same. The remaining 40% foresee a slight to strong decrease in private car use. In order to interpret these figures correctly, however, car ownership should also be taken into account. Among car-sharers who also use their own private car, half would use the private car slightly or significantly less (51%), 46% would continue to use it in the same way, and only a small minority (3%) indicated that their use of a private car would increase if they had access to a tool that makes combined car-sharing possible. However, 65% of this group said they would drive shared cars more often. The additional journeys made by shared cars will therefore only partly replace journeys using private cars. We can therefore conclude that the interoperable tool may potentially lead to a growing number of car-sharing trips, but possibly also to more car-kilometres as such.

If we make a comparison here with **people considering car-sharing**, the potential increase in car-sharing trips is even more pronounced. More than two-thirds of people who say they are considering car-sharing say they would be more likely to use shared cars (69%) and sharing systems (including car, bike and scooter sharing) (68%) if these were organised via a single platform. About 6 in 10 potential car-sharers would also be inclined to give up their own cars if public transport services were integrated.

The **car-sharers** who would make more use of a shared vehicle thanks to an interoperable car-share system would mainly do so for travelling or weekend trips (61% consider this fairly or very likely). Slightly more than half would probably use the extra available share cars to visit family, while a third would use them for recreational purposes such as visiting restaurants or the cinema. Remarkably, only 6% say that they would use the additional shared cars for commuting.

Impacts of the interoperable tool on car ownership

The majority (58%) of car-sharers who own a car agree or strongly agree that they would be tempted to give up their car or postpone buying one if they had access to different mobility services via a single platform. The interoperable car-sharing tool, as the impetus for a platform offering a range of mobility services, therefore has the potential to reduce the number of private cars among car-sharers and to prevent the future purchase of vehicles.

Three groups of **non car-sharers** would be significantly more willing to get rid of their own car (or not buy a new one) if they can use a service that gives them access to all mobility services. These groups include city dwellers (22% willing), people aged under 34 (24%) and drivers who use their own car less than 4 times a week (72%).

Profile of potential users

Obviously an interoperable tool can target existing car-sharers, 85% of whom say they are interested in this tool. However, this is a rather restricted market segment. But it is also interesting to see what common features can be distinguished among non-car users who say they would like to use car-sharing if they can use shared cars from different providers via a single platform or app (n = 220). We found some significant characteristics:

- They tend to be men (25%, compared with. 19% of wowen);

- They tend to be better educated (30%, compared with 17% of people with low levels of education);
- Unsurprisingly, they are very often people who are considering car-sharing (69% compared with 16% of those who are not interested); and
- They tend to be people with no car in the family (35% compared with 20% of people with one or more cars in the family).

5.2. Attitudes of car-share organisations

We asked Flemish car-share providers about their vision of an interoperable car sharing tool (questionnaire in Annex 3). Once again, respondents had the opportunity to leave questions open. Not all questions were therefore answered by all respondents.

5.2.1 Opportunities and pitfalls

Providers cite 'increasing the customer base' (89%, n = 8), 'increasing consumer confidence in car sharing' (78%) and 'extending service and convenience to existing customers' (78%) as the main benefits of an interoperable platform. Just one provider could see no benefits but rather risks and complications. Opinions are more divided on the pitfalls of rolling out an interoperable service. These concerns mainly relate to 'the complicated technical integration with the interoperable service' (100%, n = 8), 'uncertainty as to whether customers are sufficiently informed about the proper use of the car-sharing scheme via the interoperable platform' (88%), 'the possible costs of being connected to such a platform' (88%) and 'complicated administrative/organisational integration (GDPR, process alignment, etc.) with the interoperable service' (88%).

Car-share providers are unconvinced about the establishment of an interoperable car-share platform. Only (57%, n = 7) say they are currently willing to take part. Strikingly, 100% (n = 5) of the respondents would be more likely to join an interoperable platform if the interoperable tool were connected to a MaaS platform. If this were not the case, only 20% (n = 5) of car-share providers would be likely to join. We can therefore assume that there is little interest in an interoperable platform per se; providers mainly see added value in a platform that connects them to MaaS services.

5.2.2 Willingness to invest

Only 38% of the providers are prepared to make financial investments in connecting to an interoperable car sharing tool. This is because of the narrow financial margins currently experienced in the car-share business. Some providers are looking for subsidies for this.

5.2.3 Developments in practice

In practice, some providers are already taking steps towards interoperability today. For example, the car-share platform Share.Mobility, which already facilitates interoperability between different, affiliated organisations that use Share.Mobility's software (see 6.1.2 Intrinsic interoperability in Flanders), wants to facilitate a test to explore interoperability with external car-share organisations. The idea is to develop a new app to serve as a learning experience for interoperable car sharing and to take the findings into account for subsequent linkage with MaaS players. Following on from the Flemish MaaS agreement framework that is being drafted, Share.Mobility wants to test this in 2021 with the cooperation of a second car-share organisation, namely Coopstroom. The intention is to build a new app based on the functionalities of the current Share.Mobility app and then connect it to Coopstroom's management tool. By developing a parallel app, Share.Mobility can take a flexible and agile approach to any interoperability barriers (creating a sandbox) to construct the ideal interoperable solution that can then be applied to the Share.Mobility system. This is not possible with their existing app, which is

built on the Glide platform. Many different parties use this app, so Share.Mobility's influence is too limited to allow changes to be made.

The interoperability of Share.Mobility will be achieved by connecting the management tool and telematics of one organisation to the user tool of another (for further explanation on these terms see 7.2.2.1 Core Stakeholders). At the technical level, the Flemish OSLO reference standards will be adopted so that other car-share providers can be easily connected if necessary. In legal and organisational terms, the necessary agreements are under investigation.

Commented [6]: ik zou na de eerste zin doorverwijzen nr desbetreffende deel in HS7

Commented [7]: Hier worstel ik nog wat mee. Moeilijk om mee te zijn zonder eerst H7 te lezen. Dit past hier niet echt, maar past ook niet echt in H6 of H7

5.3. Attitudes of MaaS players

The last stakeholder group we interviewed were the MaaS players. Chapter 3, Background, made it clear that MaaS players would like to integrate car-share services into their platforms. Here, we want to explore whether an interoperable car-sharing tool could be of interest to these stakeholders. We asked three Belgian MaaS players what the advantages and possible pitfalls are for such a tool, how they see it and whether they are prepared to invest (questionnaire in appendix 4).

5.3.1 Opportunities and pitfalls

Two out of three MaaS players surveyed (67%; n = 3) support the integration of an interoperable car sharing service within their operations. They main see advantages in a possible integration:

- Simple way of adding car-share providers to my MaaS offer (time saving) (100%);
- Elimination of complicated technical integration with separate car-share providers (100%); and
- Elimination of complicated organisational and legal integration with separate car-share providers (100%).

Although they also see some pitfalls, such as:

- Problems in clearly communicating diverse car sharing offerings to customers (67%); and
- Possible investments required to adapt their own processes to an interoperable service (67%).

The player who was unconvinced commented: "This is a very complex exercise that will cause quite a lot of additional delay and does not directly resolve a market problem. The complexity is not technical (APIs) because the standards are actually already there." He believes that the commercial, strategic and legal agreements are the most complex issues, rather than technical aspects. So this will also be an area for attention.

5.3.2 Features of the interoperable tool

The integration of an interoperable tool in MaaS platforms appears to be conditional upon the participation of the car-share provider with the largest offer in Flanders in the relevant tool (100%; n=3). Exclusive collaboration (as the sole MaaS player) with the interoperable tool is not seen as a condition (67%). Opinions are divided on the involvement of private sharing systems; two-thirds of respondents are open to this, one-third are not.

When asked about the tasks they would like to be taken over by the interoperable tool, it is striking that MaaS players are not prepared to outsource communication and marketing (100%; n=3).

However, MaaS players are in favour of outsourcing customer service (100%). Opinions differ on other tasks such as 'journey management', 'software development for integration' and 'onboarding customers and processing data'.

5.3.2 Willingness to provide finance

Respondents were divided as to their willingness to invest in an interoperable car sharing tool or its integration. One player was definitely prepared to do so, another said it might, and a third that it would not be considering it. In terms of the services provided, respondents were willing to pay for journey management (67%; n=3) and to a lesser extent for software development for the integration (33%) and customer service management (33%).

5.4. Conclusion

An interoperable tool can accelerate car-sharing in Flanders. A tool of this kind can make car-sharing more attractive to non car-sharers, and car-sharers are more likely to promote car-sharing among their acquaintance by word of mouth. In addition, more than half of existing car-sharers are considering the use of an interoperable tool. The majority of car-sharers (and of those considering car sharing) are also willing to pay a limited extra charge for the additional interoperable service.

Mobility providers have a less positive attitude towards an interoperable car-share platform. There is little interest in a stand-alone interoperable platform among car-share providers. And there is little willingness to invest in them. Both car-share providers and MaaS players are interested in an intermediate platform integrating different car-share providers into a MaaS platform.

6. Competition analysis

Based on desktop research and a few in-depth interviews, this chapter provides an overview of existing (semi-)interoperable car sharing tools at home and abroad. We distinguish two forms of interoperability, which can be illustrated as follows.

- **Intrinsic interoperability**, where the interoperability results from the use of the same software (and underlying processes) by the participating car-share providers. These car-share providers are, in a sense, inherently compatible, so interoperability is just a matter of enabling an interoperable function.
- **Interoperability using a roaming server** centrally to translate data between systems that are not inherently compatible so that they can exchange data with each other.

6.1 Intrinsically interoperable car-share services

6.1.1 Flinkster from Germany

In Germany, 'car-share operators', who provide the hardware, and 'car-share software providers', who provide the software platform for the service, are often two different parties, with the former buying a service from the latter. In addition, car-sharing in Germany has achieved a significant scale, with more than 100 car-share operators. Consequently, there is also a non-negligible market for car-share software providers. This situation greatly simplifies the interoperability of car-share services.

Flinkster software forms the basis for interoperable car sharing

Flinkster is in fact an umbrella booking platform that hardly operates any cars itself, but offers car-share operators an appropriate software platform. Deutsche Bahn, the originator of Flinkster, does have about 300 shared cars itself (under 'DB connect' at stations), but chose to rely on local partners for the additional customer offer. This means that there is no need to manage shared cars on the other side of Germany, and the customer can always use a local player, which is an important criterion for gaining the trust of German car sharing customer.

Flinkster uses a modular contract for its affiliated car-share organisations. There is a choice of modules when joining the Flinkster network: 1) via a white-label app tailored to the corporate identity of the provider, 2) the Flinkster app or 3) via an API connection. This establishes the collaboration, and the car-share organisations pay both fixed and flexible fees, such as IT costs. There are no fixed monthly fees.

All the car-share organisations that join Flinkster and operate via the associated app sign a user agreement allowing customers of other member organisations to book their cars. Bi-annual meetings involving all these Flinkster network partners (i.e. all connected providers and Flinkster itself) define the business opportunities and any rules of play. This should ensure that cannibalising competition is kept in check and that trust is maintained between the parties. However, there could also be tensions, as Flinkster advertises its service as a network of over 4500 shared cars, although the majority of these

cars are owned by other operators. For example, the term 'DB Connect' is not used for end users, who see these vehicles on the platform under the Flinkster label.

Using shared cars via Flinkster

Car sharers who use the Flinkster app can use shared cars from their own organisation at the customer rate, or cars from another organisation (at the overall rate). It is also possible to register as a shared car user with Flinkster without being affiliated with any of the individual organisations, and thus make use of the different shared cars at the overall Flinkster rate.

The advantages and disadvantages of intrinsic interoperability are summarised below.

Table 1: advantages and disadvantages of intrinsic interoperability

Advantages	Disadvantages
Maximum efficiency because the underlying processes are fully aligned.	Assumes the use of the same software. If all providers are to be involved (including those who use other software), they will have to switch software or make more adjustments.
No additional investment required to achieve interoperability between providers already using the same software	
User-friendly	
Clear business model: providers pay for the use of the software	

6.1.2 Other examples

Centralised approach in Italy

The Italian 'Iniziativa Car Sharing' network, consisting of a number of cities and municipalities, has a mission to make local car sharing operators in Italy interoperable. By registering with a single car-share operator, Italian car-sharers should be able to use car-sharing systems throughout the country without any additional membership or subscription fees, with technological support from the ICS.

Intrinsic interoperability in the Netherlands

MobyOne was founded in the Netherlands in the summer of 2021. MobyOne has developed a platform and app for reserving, accessing and using shared cars. Car share operators can connect to the platform and use the app. MobyOne then ensures that all the cars are shared with all the affiliated parties.

6.1.3 Intrinsic interoperability in Flanders

During the writing of this report, a number of developments took place on the Flemish car-sharing market. Recently, some interoperable Flemish systems (The Mobility Factory, Share Mobility) have been built based on a single central, white-label app, hence relying on intrinsic interoperability. The use of identical technical operational processes ensures optimal efficiency in the provision of interoperable services. An overview of the different systems in this category is presented in the table below.

Table 2: Intrinsically interoperable car-share services

Interoperable **service**	**The Mobility factory (TMF)**	**Share Mobility**
Initiators	Partago, Som Mobilitat (ES)	Valckenier Share
Direction of interoperability	Cooperants in all participating cooperatives can use all the connected shared cars	Users of the 'Share Mobility' app can use all the connected shared cars

Below we briefly explain how both systems came about.

Share Mobility

Share Mobility's interoperable car-share services are based on Renault's 'Glide' app, developed and managed by Glide.io, a French software company. This 'Glide' app is used for all kinds of purposes by a variety of players: from car-share services to services offering replacement cars, in Flanders but also beyond (in the EU, for example Madrid). Users download the app, agree to its terms of use (usage, insurance and data specifications) and will pick up a car from another operator depending on their location and their particular demand. Afterwards, the users pay Glide.io for the use of the car, which in turn (after deducting a commission) reimburses the operator for the journey.

Valckenier Share launched the 'SHARE Mobility' app in 2019 based on the white label B2B app 'Glide' and uses it to establish collaborations with local operators elsewhere in Belgium (e.g. Fox Share, Kenis Share). This creates a network of local car-share providers, which are linked via the SHARE mobility app to form a regional network. Cars abroad cannot yet be used with the same app, although this is expected to change in the future The different bundled operators are not in competition with each other as they each operate in a different geographical area. To this end, the Flemish postal codes have been distributed in consultation among the participating operators who are all shareholders of the supporting company Share4Mobility. The management board of this company acts as arbitrator in the event of disputes.

The Mobility Factory

The European platform 'The Mobility Factory' (TMF) is a white label software platform used by eight cooperative car-share organisations in Europe. The Flemish cooperatives Partago and Coopstroom are among the providers that use this platform to offer a high-performance app to their customers. TMF was created to meet the rapidly changing technological context (updates, new developments, etc.) and

the high demands of end users. The different cooperative organisations found it difficult to meet this challenge on their own, so they pooled their strengths, resources and expertise in TMF.

In early 2021, the Coopstroom and Partago fleets became available to each other's members. In May 2021, the CEDAN network was established to enable all the shareholders of cooperatives or associations that are members of REScoop[49] to use the electric shared cars of these two civil cooperatives. In the future, it should also be possible to extend interoperable car-sharing on a European scale so that there is an even greater supply of shared cars.

6.2. Interoperability via roaming server

6.2.1 Stadtmobil, Cambio Germany and Cantamen from Germany

The "Stadtmobil" car-share network was founded in Germany in 1999 and is now a collaboration between nine independent Stadtmobil divisions, operating on a station basis in various German regions. The different regional companies have a partnership agreement and operate using the same car-share software from Cantamen GmbH. Interoperability within this network goes from common software and hardware to a common brand and associated marketing. However, the different regions have their own rate structure with different monthly fees and charges for use.

The Stadtmobil organisations later became interoperable with some other car-share organisations, many of which also use Cantamen's software. However, one organisation in the interoperable network, the German Cambio, uses its own software. To organise interoperability between Cantamen's system and Cambio, a collaborative roaming server called 'Koomo' was set up in 2017. This server translates/standardises data input from different systems so that this information can be exchanged where necessary.

The interoperable network was created as a bundled response to the arrival of international (and larger) MaaS players. Cambio and Cantamen want to ensure that the German car-sharing sector can unite in order to command a stronger negotiating position in MaaS integrations. The aim of these platforms is to avoid competition, so as not to create unworkable financial models. As yet, however, there has been no coupling with MaaS services.

Underlying agreements form the basis of Koomo

To make interoperability workable and user-friendly, the whole car sharing procedure is standardised across the different providers in the network, including the terms and conditions. The different operators also have agreements on internal rates. The difference between Koomo rates (which the customers pay) and internal rates (received by the operators) is used to finance the interoperable service. The internal rate structure is such that it is not attractive for a provider to develop a business

[49] REScoop.vlaanderen is the Flemish federation of associations and cooperatives of citizens for renewable energy.

model based on a small number of its own cars and mainly allows customers to use cars from other car-share organisations.

To limit competition, there are also agreements within the interoperable network as to where the underlying providers may and may not operate. Due to the Koomo rate management, it remains more financially beneficial to join a car-share organisation than to make frequent Koomo journeys with a car-share organisation other than the organisation of which you are a member. Most car-sharers therefore mainly use cars from their own car-share organisation. Only 2.5% of all journeys prove to be interoperable in practice.

Using shared cars via Koomo

Komoo is not advertised as a brand and consumers cannot join an umbrella 'Komoo' platform. This means that only existing users of the various affiliated organisations can use cars from the other Koomo organisations through their membership of their own car-share organisation. These cars carry the 'Koomo' label (so you do not see which organisation the car belongs to) and can all be used at the same rate ('Koomo' rate).

If users want to use a car from another provider, they are asked whether they agree to share their data with the third party. They are then transferred to a different interface. Reservations can be made via a telephone service as well as on the website. In practice, this is the reservation method most often used because customers seem to find it difficult to work with an additional interface. No smartphone app has yet been developed for the Koomo service.

The advantages and disadvantages of interoperability via roaming server are summarised below.

Table 3: advantages and disadvantages of interoperability via roaming server

Advantages	Disadvantages
Can be expanded to include more and different mobility services	Labour and cost-intensive to implement
Individual emphases in the service are possible	No real business model

6.3. Conclusion

The majority of the interoperable car-share services that we investigated for this chapter have been made possible because the individual services are based on the same software. Making the service interoperable is then just a matter of minor technical adjustments. There is also a German example that uses a roaming server, but here again, there is a standardised procedure for using the shared cars. Standardising the various car-share services to a high degree makes interoperability a user-friendly and achievable proposition. However, this far-reaching standardisation will not be straightforward in Flanders, where the various providers place very different emphases in the services the provide (see 3.3.1 Car sharing in Flanders). The final exercise will have to strike a balance between preserving the distinctiveness of the different car-share systems and achieving interoperability.

7. Study on the ideal instrument for interoperable car sharing

This chapter will use desktop research to explore the best way to design an interoperable car-sharing service. In order to present the fullest possible overview of the possibilities, opportunities and pitfalls, we will follow the structure established by the EU's European Interoperability Framework (EIF).[50]The EU distinguishes four layers of interoperability to create an interoperable model that can be applied to all digital public services:

- **Legal interoperability:** What agreements are needed so that everyone can participate optimally in the interoperable ecosystem? What legislation applies specifically to the establishment of an interoperable car-sharing service?
- **Operational interoperability:** What should be taken into account in the choice of a business model? What procedures should the parties take into account to become interoperable?
- **Semantic interoperability:** What data are shared? What are the options for data sharing?
- **Technical interoperability:** How are the different players connected to each other? What might the technical architecture look like?

Figure 4: interoperability model, taken from New European Interoperability Framework: promoting seamless services and data flows for European public administrations, European Commission, 2017, (https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf).

Total interoperability only exists when there is interoperability at all these layers. This is the aim of this report. All these layers of interoperability are interdependent: how the interoperable service is organised affects technical interoperability and vice versa.

[50]European Commission (2017). New European Interoperability Framework: promoting seamless services and data flows for European public administrations, https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf, p. 22.

7.1. Legal interoperability

The development of an interoperable service creates a complex ecosystem of stakeholders (service providers, customers, competitors, etc.), raising very specific legal issues. These are discussed in detail below. The standard legal aspects of setting up a company or collaboration unrelated to interoperability are not considered here.

7.1.1. Cooperation agreement

First and foremost an interoperable system needs robust agreements. There are all kinds of risks and management challenges involved in offering a car-sharing service. Making the services interoperable makes sharing these risks and management challenges even more complex. The following aspects will have to be documented in an agreement establishing interoperable car-share services on the basis of a detailed allocation of roles:

1. **Fleet management and fleet-specific risks**: maintaining the shared cars and the risks associated with stationing a fleet in the public space (e.g. damage caused by weather and natural disasters, vandalism, accidents and burglary).
2. **Monitoring journey management**: the monitoring of journeys including any irregularities that may occur before, during and at the end of the journey as a result of users failing to comply with the rules of use; the occurrence of an accident, force majeure or a technical fault.
3. **Oversight of administrative procedures**: registration and deregistration of customers, reservation centre management, invoicing (and its follow-up), etc.
4. **IT and data management**
5. **Marketing**

Section 7.2.2.2., Core activities and partners' roles looks in more detail at the potential allocation of roles for these different tasks in an interoperable car sharing service between the stakeholders involved.

In addition, clear agreements must be defined regarding:

- Liability;
- Sharing and using confidential business data with competing car-share services and/or a third party;
- Intellectual property rights.
  If the interoperable service provides a solution to a technical problem, a patent can be applied for. Where an app has been developed, it may be possible to apply for copyright protection. The logo, name, graphic design and databases that are used and which have an economic added value can also be protected.
  It is important to establish contractually who holds the property rights. For example, if a freelance software developer develops the tool, it is best to stipulate that all the results accrue to the commissioning party;
- Conditions of use. The terms and conditions to be adopted and communicated for the use of the interoperable service, and the extent of their harmonisation across the different systems, must be defined;

- Exclusion clauses. This includes determining how to prevent users who are 'blacklisted' by one provider from continuing to access the interoperable service.

7.2 GDPR legislation

The General Data Protection Regulation (GDPR) is a European privacy law imposing rules on organisations, governments and businesses concerning the processing of personal data. The aims of these regulations include improving the protection of the personal information of natural persons in the the European Union. Since personal data will be transferred in the interoperable service, GDPR rules must be borne in mind from the outset and the necessary precautions must be taken.

Processes

In order to be able to describe the exact actions performed, it is necessary to consider the data flows and storage. As described in the section on semantics (see 7.3.1 Information flows), there are several ways to implement these data flows. We list here the processes, insofar as we can describe them, in which personal data is used.

In an interoperable car sharing service, we distinguish the following information flows using personal data. This inventory consists of:

- The personal information (ID, driving licence, any information for insurance purposes, payment details) of the (potential) car-sharer
- The financial transactions for the use of the shared cars by the car-sharer
- The financial transactions for the use of the interoperable service by the car-sharer

Data flows may differ, depending on the organisational model chosen (see 7.2 Organisational interoperability).

GDPR principles

The GDPR establishes four basic principles that must be observed at all times:

- Legality
- Proportionality
- Transparency
- Rights of data subjects

We will discuss these in more detail below and indicate their practical implications. Who should carry out these actions will be addressed in the next section.

1. **Legality**

The data controller must have a legal basis to do so before processing personal data. The GDPR presents 6 legal bases for the processing of personal information, as follows:

- processing is necessary for the performance of a contract
- processing is necessary for compliance with a legal obligation
- processing is necessary for the performance of a task carried out in the public interest
- processing is necessary in order to protect vital interests
- processing is necessary for the purposes of legitimate interests

- the data subject has given unambiguous consent

It is best for an interoperable service to use the last of these legal bases: unambiguous consent. Customers must therefore be asked for their consent.

Steps to be taken to establish legality: requesting consent using an adapted privacy statement

- In order to obtain the unambiguous consent of existing car-sharers, it may be necessary for car-share providers to amend their privacy statement. A clause must be included stating that personal data will be passed on to third parties for the purposes of interoperability.
- In order to obtain the unambiguous consent of any customers who use the interoperable service alone (without being affiliated with a car-share organisation), a privacy statement must be drawn up containing a clause to the effect that personal data will be passed on to third parties for the purposes of the interoperability.

2. Proportionality test

The processing or measure is necessary in order to achieve the objective pursued by the interoperable service. Data processing must always be kept to a minimum. Data may only be retained:

- If there is no other way to obtain these data
- For the time necessary to achieve the purpose
- In a way that gives as few parties access as possible
- If they are pseudonymised as much as possible.

Steps to be taken to satisfy the proportionality test

Some recommendations for satisfying the proportionality test:

- Explore the use of anonymisation. Each customer might be given an anonymous user ID to which all the data needed to use a shared car via the interoperable tool would be linked. This will simplify the actions needed to comply with the GDPR legislation.
- Ensure that as few partners as possible can access the data. It is therefore best to store the data on one platform (e.g. at the car-share provider's end). If they are stored twice (e.g. also (temporarily) on the server of the interoperable service), this may bring additional aspects of the GDPR legislation into play. Data processing agreements must be concluded between the data controller and the processor (this can be the insurer or cloud provider, but also the affiliated car-share providers). This is an agreement between a customer and provider for the processing of personal data submitted by the customer. It contains agreements on the duration, description and purposes of the data processing, security measures, etc.

3. Transparency

Customers of the interoperable tool should be proactively and clearly informed about the processing of personal data and the rights of data subjects. The following information must be provided:

- WHAT data will be processed
- WHERE the organisation will obtain or gather the information
- WHY the information will be stored
- WHO will process the information within the organisation

- WHO will obtain the information
- WHAT exactly will be stored, HOW, WHERE and for HOW LONG
- HOW the information will be secured
- HOW data subjects will be helped to exercise their rights

Steps to be taken for the purposes of transparency

- The privacy statement of the interoperable service (or of the individual car-share providers) informs data subjects (customers whose data is used) about how their data is handled.
- Consideration must also be given to the technical and organisational security mechanisms that will be applied in the event of leaks. These measures must be such as to guarantee that the processing activities comply with the GDPR and are sufficiently secure. What measures are appropriate, the potential for loss and the impact of its consequences, all depend on the purpose of the processing activities and may differ depending on how the interoperable service has chosen to operate.

4. Rights of data subjects

The GDPR gives data subjects a wide range of rights. Therefore, the interoperable service should inform data subjects properly about those rights (e.g. via the privacy statement) and how the organisation facilitates the exercise of those rights.

- right to information
- right of access and to obtain copies
- right of rectification
- right of objection
- right to be forgotten (removal of information)
- right to withdraw consent
- right of portability
- right to refuse automated individual decision making, including profiling
- right to restrict processing

Actions to be taken in respect of the rights of data subjects

- Establishing procedures/mechanisms to ensure that data subjects can exercise their rights. A register must be created recording an overview of the processing of data, linked to the purposes of each processing procedure. This concerns the collection, consultation, distribution, linking, registration and destruction of data, which must be as specific as possible.

Other steps to take

- Appointment of a Data Protection Officer (DPO). This is a data protection expert who assists the interoperable service organisation in monitoring its internal compliance with the GDPR. He gives advice on the use of the database, new software, and so on. If there are data breaches, he is also responsible for reporting them to the authorities. Not every organisation is obliged to appoint a DPO. The interoperable service marketer must check if this is necessary.
- Notification of a data breach The GDPR establishes an obligation to report data breaches that could cause damage to the data subject(s) (e.g. financial loss, breach of confidentiality, identity theft). A data breach can be understood in broad terms: hacking of databases, but also the loss

or theft of data carriers (e.g. a laptop). Any incident that may impact on the security of your data and cause any kind of damage to the data subject(s) must be reported to the Privacy Commission within 72 hours. This task may fall to the DPO.[51]

Privacy by design & privacy by default

A final point for attention is the concept of privacy by design vs privacy by default. Companies/organisations are encouraged to implement technical and organisational measures, at the earliest stages of the design of the processing operations, in a way that safeguards privacy and data protection principles right from the start ('data protection by design').

They must always ensure that personal data are processed with the highest level of privacy protection (e.g. only necessary data are processed, short storage period, limited accessibility) so that personal data are not normally accessible to an unlimited number of people ('data protection by default').[52]
These two principles should be applied right from the start of the development of the interoperable service.

Different roles in GDPR

The table below presents the different roles required when implementing the GDPR legislation in an interoperable service. It also lists the tasks of the respective players.

Table 4: summary of GDPR roles and associated tasks

Data controller	determines what data will be collected and processed determines the purpose and means of data processing is responsible for providing information to data subjects reaches agreement with the processor maintains the register of processing activities drafts the privacy statement
Processor	acts on behalf of the controller must adhere to the (written) agreements Examples of processors include cloud providers, ticket administrations, insurers, etc. Maintains the register of processing activities adapts the privacy statement if necessary

[51] Scwitch. (undated). GDPR logbook, https://scwitch.be/wp-content/uploads/2017/09/gdpr-logboek-site-def189.pdf

[52] European Commission (undated). What does data protection 'by design' and 'by default' mean?https://ec.europa.eu/info/law/law-topic/data-protection/reform/rules-business-and-organisations/obligations/what-does-data-protection-design-and-default-mean_en

Third parties	receive data from the controller Recipient may process data according to its own terms (and not according to instructions from the controller) Recipient must inform the data subject that it has received data (unless it was received by the controller)
Data subject	identifiable person whose data is processed

7.1.3 Competition law

Finally, it is also important that the creation of an interoperable instrument does not conflict with competition law and the ban on cartels. In particular where price agreements are made between the providers on the platform, this may be in breach of competition law. When developing an interoperable service, the necessary legal advice should be obtained.

7.2. Operational interoperability

Operational interoperability refers to the way in which business processes, business models and the division of roles between the different stakeholders in the interoperable system are aligned in order to achieve interoperability.[53]This section examines what **business models** already exist in interoperable settings and how they can be integrated into an interoperable car sharing tool. At the same time, we also address the **agreements** that need to be made in the ecosystem and the **roles** that need to be adopted in order to achieve effective interoperability.

We consider both the adjustments that existing car-share providers need to make to become successfully interoperable in business terms and the business opportunities for the overarching interoperable tool (referred to here as the *interoperable operator*).

7.2.1 Implications of interoperability for business models of individual car-share providers

The development of interoperable activities stands or falls with good cooperation and mutual trust between the different partners involved. Effective prior coordination between the parties involved will be crucial to getting this cooperation off to a good start. Interoperability also has far-reaching implications for the business model and the operations of individual providers. This is because when an interoperable service is set up, a very particular form of competition arises. Firstly, an interoperable tool can compete with the individual car-share services; secondly, the various collaborating car-share services are also in competition with each other. Of course, all this also depends on how the interoperable tool is designed on the technical level (see 7.4., technical interoperability).

Research and practical examples suggest that a few principles can keep this competition manageable:

- Cooperation seems to work best when the different interoperable operators are on an equal footing: similar size, similar interests and comparable business models.
- It can be seen that participating car-share services in existing interoperable systems rarely operate in the same geographical region. If they do, competition will almost inevitably arise. Users can then compare prices very efficiently and choose the cheapest option for each journey. This erodes the profitability of the different providers' business models. Clear agreements on whether or not to operate in certain geographical locations can therefore be a significant factor for car-share services that aim for financial profitability. Another possible solution could be a uniform rate for interoperable users across all the affiliated car-share services.
- If cooperating systems do operate in the same region, a complementary service seems the most promising. Thus, additional services such as station-based and free-floating systems may have an added value in interoperable cooperation.
- Although the car-share services are competing with each other, the aim is to avoid using the interoperable platform to settle competitive rivalries. In order to avoid a price war, it may be advisable to discuss appropriate platform prices or internal rate structures that ensure this.

[53]European Commission (2017). New European Interoperability Framework: promoting seamless services and data flows for European public administrations, p. 28.

- A degree of fair play on the part of the participating car-share services working together on the platform is also desirable. A price structure can be devised to prevent slip-streaming on other providers' large fleets without much personal investment from being a financially viable strategy for car-share providers connected to an interoperable service (cf. the distinction between internal and platform rates at Koomo, 6.2., Interoperability via roaming server)
- In order to offer their own users (where the interoperable service is a service to existing users) an equivalent service (same product at similar price) for interoperable journeys, it may be useful to make clear price agreements about which services (= which type of vehicles) are offered in which price category.

7.2.2 Business model of an interoperable enterprise

If we look at existing and experimental interoperable platforms, it is technical and semantic interoperability that is most extensively documented. Operational interoperability is often relegated to second place, behind the technical connection of the different services. In the initial development phase (test pilots), operational interoperability usually commands only limited attention. At this stage, operators regularly get by with bilateral agreements between operators and opening up data sources and services for the exchange of data.[54]Even the business models of existing interoperable operators are often not yet profitable in economic terms, or only to a limited extent. This is typical of a market that is in a constant state of flux and where innovation is very important. However, in the long term, a solid business model with sound procedures and role allocation is crucial for the development and survival of an interoperable service.

Based on the relevant sections of the **Business Model Canvas**, we will discuss the options for the organisational set-up of an interoperable tool in what follows. Aspects such as sales channels and production resources are not considered here as they do not differ significantly between standard and interoperable tools.[55] Note that the actual details will, of course, also depend on the choices made when designing technical and legal interoperability and their possible limitations. (see 7.1 Legal interoperability and 7.4 Technical interoperability).

[54] Langford J., Poikola A., Janssen W., Lähteenoja V. and Rikken M. (Eds.). (2020). Understanding MyData Operators, https://mydata.org/wp-content/uploads/sites/5/2020/04/Understanding-Mydata-Operators-pages.pdf, MyData, p.26.

[55] VLAIO. (undated). Osterwalder's business model canvas, https://www.vlaio.be/nl/begeleiding-advies/groei-innovatie/je-bedrijf-onder-de-loep/het-business-model-canvas-van [in Dutch]

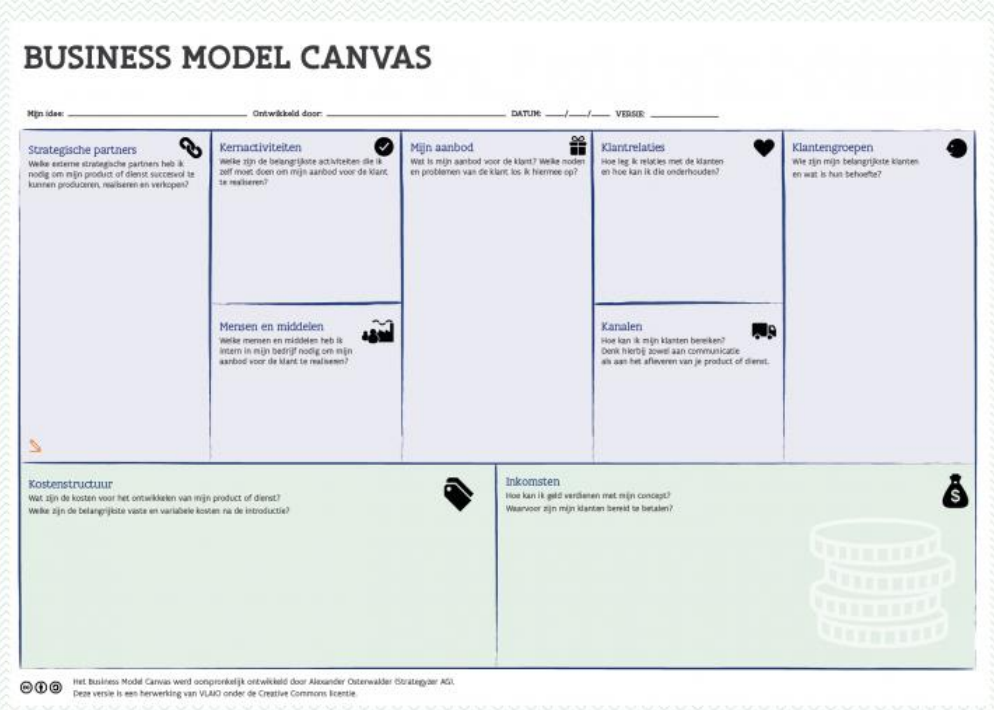

Figure 4: Osterwalder's business model canvas, taken from https://www.vlaio.be/nl/begeleiding-advies/groei-innovatie/je-bedrijf-onder-de-loep/het-business-model-canvas-van

7.2.2.1 Core stakeholders

As already mentioned in section 7.1, the development of an interoperable service creates a complex ecosystem with multiple partners. This section discusses what parties are involved in an interoperable tool. To this end, we will define some roles that are crucial for organising (interoperable) car-share services (see also Figure 6):

- The transport operator or TO is the party that owns the vehicles and the raw data. This party is responsible, on the one hand, for ensuring that the shared cars are operational (maintenance, cleaning, parking, etc.) and, on the other hand, for providing the raw data (the number of shared cars, their location, reservations, etc.) for the car-sharing service. This (real-time) data is passed on to the Mobility service operator (see below) in order to provide accurate fleet information to end users.
    - Product: shared cars including telematics supplying raw data
- The Mobility Service Operator or MSO uses a back-end management tool to convert the raw data coming in into information useful to the end-user, such as a visualisation of the cars available at any given time.
    - Product: processed data via management tool
- The Mobility service provider is the party with which end users conclude a contract and which supplies a user interface containing the information needed to offer the car-share service to

the end user. This party is the 'face' of the interoperable car-share service. An interoperable service can work with a third, shared interface or make use of the individual car-share service's own interface. In practice, this role can be fulfilled by a third party, one of the participating car-share organisations, or each individual car-share organisation. In the following sections, we refer to this party as the interoperable tool or 'IO' if it is an external third party. In other cases we will refer to the MSO/P. In the case of interoperable car sharing, we can also distinguish between a 'structural MSO/P' (of which you are a member) and an 'occasional MSO/P' (whose cars you only use sporadically).
    - Product: information for users via a user interface
- The end user is the user of the car-share system, also known as the car-sharer

In practice, the provider and operator functions are often closely intertwined and are sometimes even managed by the same party. However, in order to achieve total interoperability, the decoupling of these functions may be necessary.

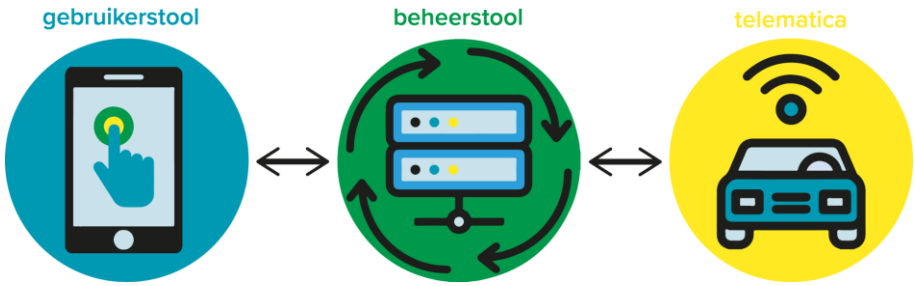

Figure 5: different roles in an interoperable car-share service

7.2.2.2 Core activities and partner roles

Five core activities can be identified when establishing an interoperable car sharing service:

1. Customer registration, management and unsubscription
2. Reservation
3. Journey management
4. Payment
5. Marketing and communication

Below, we describe the separate actions for each core activity, listing the advantages and disadvantages of various possible scenarios in terms of the division of roles between the stakeholders of the interoperable tool and their implications for the end user and the participating car-share providers. Note that, as the analysis of technical interoperability makes clear (see Section 7.4, Technical interoperability), there are also many hybrid role assignments for the interoperable services to be considered. However, we will not describe these "hybrid forms" here, as this would lead us too far.

Table 5: core activities and possible role allocations in interoperable car sharing

1. Customer registration, management and unsubscription

Sub-tasks	Scenario	Responsibility assumed by:	Advantages	Disadvantages
Registration (how the customer accesses the interoperable service) + storage of customer's personal data	Access via separate interface	IO	• One central manager for all information • User-friendly for those who are not customers of a car sharing system • Interoperable tool can foster customer retention	• Providers partly outsource customer management and retention • Car sharers who are already customers must register twice (with their own organisation and with the interoperable service provider). • Complex initial set-up and agreement framework • Not user-friendly for car-sharers
	Access via own provider's interface	structural MSP and TO	• Car-share providers continue to be responsible for customer management and retention • Car sharers only have to register once (user-friendly)	• Additional administration/processes required to get the data to the right organisation (if system is not bilateral) • Complex initial set-up and agreement framework • Inaccessible to potential car-sharers who are not yet members of a car-share organisation.
	Access via the car-share provider whose shared vehicle the customer uses via the interoperable service	Structural MSP and TO and occasional MSP and TO	• Technically and organisationally much easier for car-share organisations (little integration required) • Clarity as to the location of customer data and few agreements needed about data flows	• Providers partly outsource customer management and retention • Car sharers who are already customers must register twice (with their own organisation and with the interoperable service provider). • Potential for competition (poaching customers from other providers, undermining interoperable model)

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Sub-tasks	Scenario	Responsibility assumed by:	Advantages	Disadvantages
Security deposit	Customer pays security deposit to the interoperable service	IO	• When the interoperable service is responsible for the risks, it also manages security deposits and guarantees that MSP & TO are paid. • Outsourcing the management of security deposits for all car-sharing journeys to the interoperable service could justify any cost to the affiliated car-share providers.	• If the interoperable service only facilitates security deposits for interoperable journeys, car-sharers may have to pay such deposits twice over: once to the interoperable tool and once to the car-share organisation of which they are customers. • Some risk to interoperable service manager: if customer does not pay the (journey) costs, interoperable tool manager bears the costs
	Customer pays the security deposit through own car-share organisation	Structural MSP and TO	• MSP has guarantee in the event of damage to its TO's fleet. • Structural MSP and interoperable tool security deposits for the use of shared cars can be obtained via a single route. Customer then only has to pay a (higher) security deposit once	• MSP must assume responsibility for security deposit • MSP must forward security deposit via interoperable tool to other MSP where damage has occurred (additional administration) • Inaccessible to potential car-sharers who are not yet members of a car-share organisation.
	At all organisations whose cars are used		• Little administration for interoperable service provider • Easy to implement	• Presumably only administratively feasible via credit card blocking. This can be an additional barrier for some users.

2. Reserving cars

Sub-tasks	Scenario	Responsibility assumed by:	Advantages	Disadvantages
Oversight of shared cars & Reservation	Request availability and book via an additional interoperable interface	IO	• Users who are not members of a car-share organisation can also use the shared cars. • Straightforward information and guides for the user	• An additional tool creates high development and operational maintenance costs • Easy for users to compare prices. This risks eroding the business models of the different providers.
	Requesting availability and booking via an additional interoperable interface through the car-share organisation from which the journey will be booked.	IO and MSP &TO	• Users who are not members of a car-share organisation can also use the shared cars.	• Easy for users to compare prices. This risks eroding the business models of the different providers. • Less user-friendly for end users • Complex and expense to achieve
	The usual reservation module of your organisation shows available cars from other organisations and enables you to book them.	MSP &TO	• Customer retention for car-share providers is maintained • User-friendly for the customer to view availability and book via a familiar system	• Rather complex to achieve (connecting with other car-share providers) • Inaccessible to potential car-sharers who are not yet members of a car-share organisation.
	You can see the car via your own organisation's usual reservation module, with booking through the car-share provider whose shared car you use	Occasional MSP and TO	• Easy to achieve • Customer retention for car-share providers is maintained	• Customer must be willing and able to use multiple systems • Inaccessible to potential car-sharers who are not yet members of a car-share organisation.

3. Journey management

Sub-tasks	Scenario	Responsibility assumed by:	Advantages	Disadvantages
Management of journey-related matters (unlocking, driving, returning, refuelling) + customer support + claims follow-up & breakdowns	IO manages all journeys	IO	• Interoperable tool takes over role of MSP and hence offers service to providers. This may justify any cost to the affiliated providers. • Customer-friendly: everything is managed through a single system	• Depends on standardised procedures at the expense of individuality • Complex and expensive to develop and maintain operationally
	Car-share organisations manage all their own customers' journeys	Structural MSP and TO	• Customer-friendly: everything is managed through a single system	• Not straightforward if there are no standardised procedures • MSPs and/or TOs must transfer data to each other • The majority of car-share providers are reluctant pass this over • Inaccessible to potential car-sharers who are not yet members of a car-share organisation.
	Providers themselves manage all journeys with their own vehicles, both for own users and for interoperable users	All MSPs and TOs	• Limited resources needed to adapt the existing procedures and processes of individual car-share providers. • Individuality of providers can be maintained, as only limited adjustments are required.	• Customer retention by structural car-share provider is partially lost • Not so customer-friendly: customers must (learn to) use several systems if there are no standardised procedures

4. Payment

Sub-tasks	Scenario	Responsibility assumed by:	Advantages	Disadvantages
Payment procedure (responsibility for invoicing and collection of invoiced amounts, risk of non-payment)	IO invoices all journeys	IO	• Outsourcing service for providers. This may justify any cost to the affiliated providers. • User-friendly for customer: a single invoice for all journeys • Use of a standard clearing house for third-party payment systems is possible	• Complex and expensive to develop and maintain operationally
	Car-share organisations invoice all journeys to their own customers	MSPs and TOs	• User-friendly: a single invoice for all journeys • Customer retention by structural car-share provider is maintained	• Additional administration for affiliated car-share providers • Not all providers have the same payment procedures (frequency, data retrieval, etc. may differ). Adjustments will be required. • Inaccessible to potential car-sharers who are not yet members of a car-share organisation.
	Providers themselves invoice all journeys with their own vehicles, both to own users and to interoperable users	All MSPs and TOs	• Few adjustments necessary	• Users receive several invoices • Customer retention by structural car-share provider is partially lost • Requires sensitive information to be shared (customer data)

5. Marketing and communication

Sub-tasks	Scenario	Responsibility assumed by:	Advantages	Disadvantages
Marketing to end-users	Entirely in the hands of the IO tool	IO	• Service to MSPs This may justify any cost to the affiliated providers. • Marketing investments can be efficient • More car-sharers can be attracted: increases car sharing impact	• Partial or complete loss of individuality of different providers • Customer retention for car-share providers is lost
	Remains entirely in the hands of individual providers	Own MSP and TO	• Individuality maintained • Customer retention for car-share providers is maintained	• Perhaps no additional users due to interoperable car sharing, only service for car-sharers

Brand	Interoperable tool is stand-alone brand	IO	• A great deal of freedom to shape the product according to the wishes of any IO (= third party).
			• High visibility: positions the interoperable tool as a separate brand and product
				• Starting from zero to attract customers
				• Intensive way to position IO tool in the market: starting from zero in terms of:
				  ○ Technological development
				  ○ Design
				  ○ Attracting customers

	Interoperable tool complements MSP offering	MSPs and TOs	• Expansion of car-share provider's existing tool: less intensive way to position IO tool in the market	• Attracts no or limited potential car users • Interoperable tool is less visible: not positioned as a separate tool and product in the market • Tied to providers' app design rules

In order to optimise core activities, it would be simplest if the participating car-share organisations all used the same software and standard user rules. However, car-share providers are reluctant to take this route, due to the complexity of making these adjustments and the lack of 'own emphasis' in this scenario. It is important to find the right balance between standardisation and thorough interoperability on the one hand, and room for distinguishing features on the other.

Issues arising when sharing private vehicles with no use of on-board computer

If the interoperable service involves car-share organisations that facilitate private car sharing without the use of an on-board computer, some additional issues must be considered with respect to the processes described below. The absence of automation, in fact, implies a more active role for the users of the shared cars.

1. **Key handover**
   The key handover takes place physically. This means that the car owner hands over the key to the borrower. No software (such as an app or card) is used here, but the car is opened and started manually.

2. **Journey request can be refused**
   When sharing involves privately owned cars, the owner must always confirm the request. In exceptional cases, the request will be refused (e.g. battery level too low for driving).

3. **Invoicing (price calculation based on mileage)**
   After a journey in a private shared car, the users must enter the mileage manually in the car-share organisation's system. This does not happen automatically using customised software as is the case with car-share providers with their own fleet.

4. **Location and vehicles**
   The location of the vehicle must also be reported manually by the borrower at the end of the journey.

These issues need to be taken into account when aiming for total interoperability.

Extensive communication with the interoperable user (possibly with an additional on-boarding process for users for whom private car sharing is new) will therefore be crucial if private car sharing is to be included in an interoperable tool. Systems can also be designed in which private car-sharers can use other fully-interoperable sharing systems, but not vice versa. It could also be decided only to integrate private cars of owners who are open to an adapted process into an interoperable tool, and not the others.

7.2.2.3 Customer segments and value proposition

Chapter 5 analysed the stakeholders of the interoperable car-sharing tool, which also included the potential end users. For the needs of the target audience of an interoperable car-sharing tool, please consult section 5.1.

These findings form the basis for the value proposition of the ideal interoperable tool. We translated them into the following desirable USPs for potential users:

- The interoperable tool
  - offers a full range of car-sharing, in terms of numbers, models and geographical coverage
  - has a functional and instinctive user tool, including a well-functioning reservation tool and central payment system
  - requires a relatively small contribution from the customer

However, these requirements must be weighed against the needs of the different participating car-share providers for such a tool and the technical and economic feasibility.

7.2.2.4 Cost structure

As the exact cost structure will depend on yet uncertain choices in the development of the interoperable tool, it is not possible to conduct a detailed exercise on the cost structure. Below we list the factors that would form the basis of this exercise.

1. Investment and operational costs for technical aspects of the interoperable tool
2. Marketing, customer service and business development costs of the interoperable tool
3. Provider access costs to achieve compatibility between the individual services and the interoperable tool. This includes the following investments:
   a. Organisational and legal adjustments
      i. Contracts with consortium: In 7.1, Legal interoperability we described the importance of sound agreements on property rights and competition, but agreements on the transfer of data and liability must also be clear. Legal support is therefore indicated.
      ii. Adapting customer contracts: Amendments must be made in line with the GDPR (see 7.1 Legal interoperability). Providers must acquire expertise in order to do so correctly.
      iii. Individual organisational procedures must be adapted to achieve a compatible operating procedure (see 7.2.2 Core activities and roles of partners) so that the interoperable service functions smoothly.
   b. Technical adjustments
      i. Adjustment of internal data model: the internal technical model must be made compatible with the interoperable service (e.g. maintain unique ID and primary customer operator).
      ii. The export API or data standard needs to be adapted or created to ensure proper data delivery.

7.2.2.5 Revenues

In order to achieve a workable, economically viable interoperable tool, it is important to give extensive consideration to ways of generating revenue. For existing interoperable operators (in different domains) we can usually distinguish three revenue streams[56]:

- Turnover generated by the interoperable operator's ancillary activities
- The operator is financed by an external third party
- Turnover generated by the interoperable activities

There is also a third option with potential:

- Revenues from other (interoperable) operators that use or engage with the interoperable service

These different possibilities are discussed in more detail below.

1. **Revenue generated by the interoperable operator's ancillary activities**

In principle, the most obvious business models should break even on providing the interoperable service itself. In practice, however, this will not be straightforward, due to the limited willingness of potential users to pay and the small margins on car-share services. It may therefore be of some interest to consider what potential ancillary activities could finance the interoperable service. Some possible avenues include:

- Advertising on a (possibly additional) interoperable interface. This requires a sufficiently large customer base.
- Revenues from the individual car-share services finance the interoperable services. For this, the individual car-share services must have sufficient margin.
- A third player offers a total service (car-sharing software) to the car-share providers, whereby interoperability is a technical functionality. This option requires the different services to use the same software in the interoperable tool.

2. **The operator is financed by an external third party**

Especially in the start-up phase, subsidies can be an attractive way of keeping interoperable operators in business.[57]In Flanders, there are many possibilities for part-funding the interoperable model. Annex 1 explains the possible channels.

It is important to be aware that a great deal of political effort (and investment) is currently directed at steering today's mobility towards a sustainable transition. For example, the shift towards combined mobility and the decree on basic accessibility (see 4. Environmental analysis) A variety of initiatives, such as the development of an interoperable service, should support this transition. There is a budget for such initiatives through various channels (private, public and private-public).

Financing through a private investor is also possible in principle.

3. **Revenue generated by the interoperable activities**

[56] Langford, J. et al. (Eds.). (2020). Understanding MyData Operators', MyData, p.26.
[57] Langford, J. et al. (Eds.). (2020). Understanding MyData Operators', MyData, p.26.

A solid business model should ideally be self-sustaining, i.e. the enterprise should operate on the basis of revenue from the interoperable activities. In this way, there is no influence from the authorities and no commercial activities on which the business depends.[58]Operators have some options as to how and by whom the revenue is generated. The commercial advantages and disadvantages are set out in the tables below.

- By interoperable service **users** (mobility users):

Table 6: Options for revenue generated by end users

What	Advantages	Disadvantages
A monthly subscription paid to the interoperable operator: end users subscribe to the tool offered by the interoperable operator.	• Constant revenue stream for the interoperable service	• If there are not yet many users, a constant revenue stream is not guaranteed • Willingness to pay is not so great among either car-sharers or non-sharers
Fee per journey: for each journey made by the car-sharer using the interoperable operator's service, a percentage of which goes to the interoperable operator	• Willingness of existing and potential car-sharers to accept this form of payment • Attractive to very occasional users	• If there are not yet many users, a constant revenue stream is not guaranteed
A more expensive subscription with your own car-share provider: End users can pay a surcharge to their own car-share provider to use the interoperable service	• User-friendly for customers: paying for an extra service	• Expensive for very occasional users • If there are not yet many users, a constant revenue stream is not guaranteed

By **players who provide services** (the car-share providers):

Table 7: Options for revenue generated by players providing services

What	Advantages	Disadvantages
Recurring fees: car-share providers pay for the interoperable operator's service	• Gives the interoperable tool some assurance of constant revenues	• If not many providers are yet affiliated, revenue stream remains limited • Scale is initially limited (few car sharing

[58] Langford, J. et al. (Eds.). (2020). Understanding MyData Operators', MyData, p.26. 26.

		journeys and players) which means that the contributions per player would be high • Car-share providers have narrow financial margins
An on-boarding fee: car-share providers make a one-off payment to become active on the interoperable operator's service	• Implementation costs would be met from the on-boarding fee.	• Car-share providers have narrow financial margins • Scale is limited (few car sharing journeys and players) which means that the contributions per player would be high • There is no constant revenue stream
Buying **services in bulk** from car-share providers and selling them to end users at a higher price	• Car-share providers are more likely to participate if they do not have to take financial risks themselves	• Financial risk borne by interoperable operator. Effective marketing is crucial.

4. **Revenues from (interoperable) operators that use or engage with the interoperable service**

Third parties (e.g. MaaS platforms) may also contribute to interoperable service revenues in the long term. This is possible in various ways: through an on-boarding fee, a recurring (monthly) fee, a percentage per service used, bulk purchase, etc., or by a combination of all of these.

Of the MaaS operators we surveyed (n = 3), one was prepared to make a financial contribution, one was not prepared to invest and a third said "maybe" when asked about its willingness to invest.

In order to establish an optimal revenue stream, we recommend a smart and complementary combination of these options, whereby several parties make an appropriate contribution.

7.3 Semantic interoperability

Semantic interoperability ensures that the precise format and meaning of the data is preserved when it is exchanged between different parties. In order to exchange data easily, a **semantic data standard and its associated APIs** (which ensure the technical exchange) should ideally be used.
This section considers how an interoperable service can best address the issue of semantic interoperability. We analyse the information flows within the interoperable tool, the APIs used and standards applied by the car-share providers. Finally, we take a closer look at some well-known international standards.

7.3.1. Information flows

A key focus in the development of an interoperable tool is the design of the information flows and the standardisation of data. This is also a condition for achieving technical interoperability

In an interoperable car sharing service, we distinguish the following information flows:

- The personal information (ID, driving licence, any information for insurance purposes, payment details) of the (potential) car-sharer
- The data describing the characteristics of the shared cars (fuel type, transmission type, vehicle type, etc.)
- The availability of the shared vehicles (future data)
- Vehicle reservations by car-sharers (real-time data)
- Data on the journeys made by car-sharers with the shared vehicles
- Financial transactions for the use of the shared cars
- Financial transactions for the use of any intermediate platform

7.3.2. Current standards and APIs among Flemish car-share providers

A survey shows that APIs are not yet widely used in the Flemish car-share landscape. A few organisations have already developed their own APIs, while others said that they would like to use the TOMP API.

In terms of data standards, most car-share providers structure data using JSON files. Other data standards that are widespread in the mobility world are not (yet) used.

7.3.3. More standardisation in the future: the OSLO reference standard & internationally applicable data standards

Data standards have a strong presence in the mobility world, including the shared mobility sector. Below we give an overview of the different data standards used in the shared mobility context. We will only discuss GBFS and TOMP, as they are based on the mobility provider's point of view. Other standards such as MDS and CDS-M focus mainly on the role of authorities in data exchange and are not addressed here. We consider the advantages and disadvantages of the standards and their implications for the Share.Vlaanderen project.

1. **GBFS**

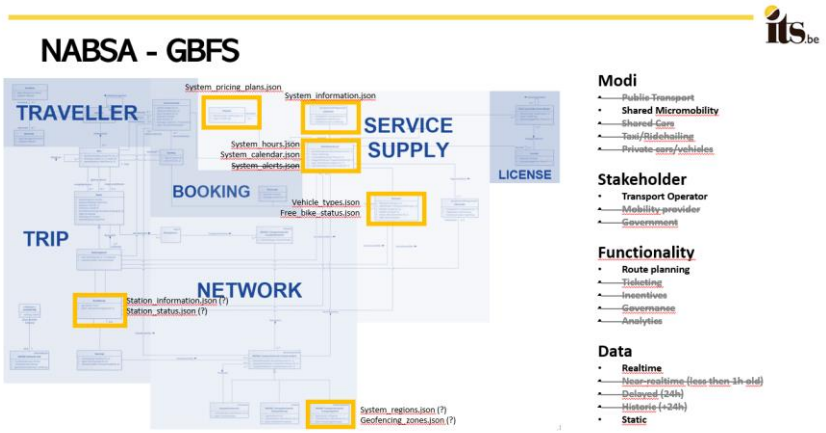

Figure 7: The GBFS standard, taken from Toward smart mobility APIs, Stijn Vernaillen, 2020.

GBFS is a standard first developed in 2015 by the NABSA (North American Bike Sharing Association). The standard is very widespread, both within the US and beyond. More than 290 bicycle and scooter sharing systems have adopted this data standard. GBFS is primarily intended for public use to support travellers' travel planning.[59]This standard originates with transport operators (providers of micro-mobility) and therefore focuses mainly on the exchange of real-time data regarding route planning (e.g. vehicle availability).

Table 8: advantages and disadvantages of the GBFS standard for Share.Vlaanderen

Advantages for Share.Vlaanderen	Disadvantages for Share.Vlaanderen
• Originates with transport operators • Covers a part of the use cases that also arise in SHARE Flanders project	• Only covered real time data and thus insufficient to describe car sharing offer (e.g. no planning tool available) • No ticketing • All the data are public, so (commercially) sensitive data cannot be protected • Only real time data display, may not cover complete car sharing offer (e.g. station-based car sharing)

2. TOMP

[59] NABSA (undated.). ‚GBFS & OPEN DATA, https://nabsa.net/resources/gbfs/#:~:text=The%20GBFS%20format%20allows%20mobility,helped%20municipalities%20meet%20their%20goals.

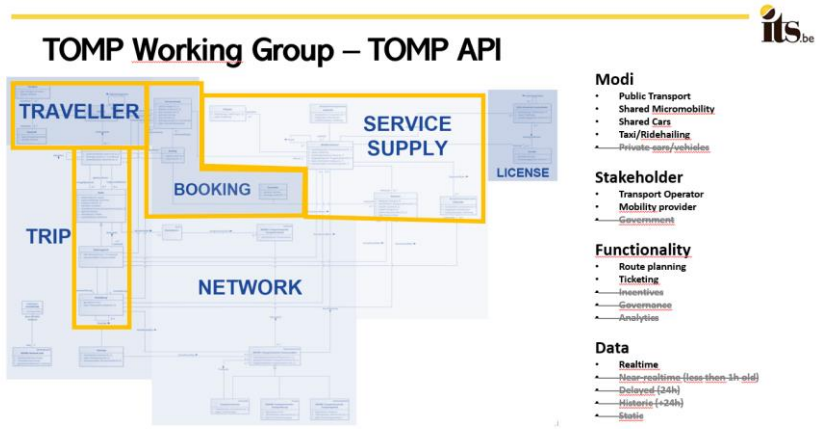

Figure 8: The TOMP API, taken from Toward smart mobility APIs, Stijn Vernaillen, 2020.

A TOMP working group has been set up in the Netherlands in which transport companies, MaaS players, network organisations and universities work together on a data standard covering the entire MaaS ecosystem. TOMP describes what exchanges are needed to ensure interoperability between transport operators and mobility providers (MaaS players). TOMP begins with the customer journey to describe this. TOMP therefore provides much information about the traveller, booking, service and journey.[60]This standard is used in the Dutch MaaS pilots and in the European eHUBS project, in which Autodelen.net is also involved.

Table 9: Advantages and disadvantages of the TOMP API for Share.Vlaanderen

Advantages for Share.Vlaanderen	Disadvantages for Share.Vlaanderen
• Involves entire ecosystem (other mobility domains besides car-share providers) • Already in use in Benelux • Also offers ticketing • Not only real-time, but also future data (for station-based and planned journeys)	• Some processes specific to shared car use (e.g. opening the car) cannot as yet be described in the TOMP API. • Car share providers are not always familiar with this data standard and may need help to become compliant.

The above data standards are applicable if participating parties use other protocols. If they use open standards (and therefore the same protocols), the interoperable service is 'interoperable by design'. Building the services in the same way can bring many benefits in terms of interoperability.

[60] MaaS working group, Blueprint for an Application Programming Interface (API), From Transport Operator to MaaS Provider. A first technical milestone towards Mobility as a Service, https://ris.utwente.nl/ws/portalfiles/portal/215808522/2020_07_15_Blueprint_for_a_TOMP_API_version_Dragonfly.pdf

As shown above, there are many standards in the mobility world. In order to mainstream this across the entire mobility world, the Flemish Government (Digital Flanders Agency) recently rolled out the OSLO 'Trips and offers' semantic standard. The Flemish Government aims to facilitate the exchange of mobility data within passenger transport by defining such data as linked open data and APIs (see 4.6. Political and legal context). It is important for the interoperable service to be aligned with this reference standard as it will be used for the mobility centre, and the OSLO standard will address information (GBFS), booking (TOMP) and also the urban context (MDS). In addition, mobi point exchanges will also be OSLO-compliant.

In the OSLO project, a semantic reference standard was developed from a mapping of all the use cases (e.g. traveller travelling from A to B) that were created. The complete mapping can be found below. The mapping will be used as a frame of reference to compare common standards in the mobility field.

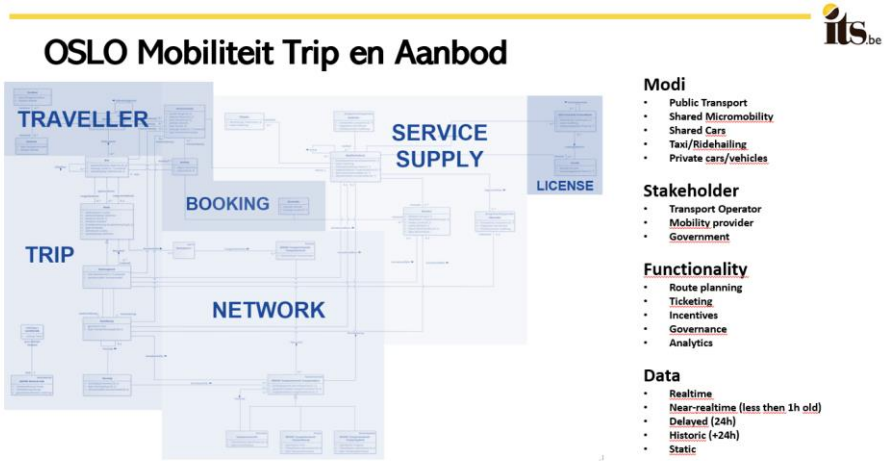

Figure 9: OSLO standard, taken from Toward smart mobility APIs, Stijn Vernaillen, 2020.

The purpose of this reference standard is to harmonise standards that are common in the mobility world and allow them to communicate with each other at a semantic level.

Table 10: Advantages and disadvantages of the OSLO standard for Share.Vlaanderen

Advantages for Share.Vlaanderen	Disadvantages for Share.Vlaanderen
• Organised by Flanders and therefore customary for public initiatives (Flemish MaaS centre, mobi points, etc.) • Broad spectrum of mobility (not only shared mobility, but all forms of passenger transport), can be of interest for MaaS expansion • Also offers ticketing • Not only real-time, but also future data (for station-based and planned journeys)	• Currently only a theoretical standard, not yet used in practice. • Providers are not always familiar with this data standard and may need help to become compliant.

7.4. Technical interoperability

By technical interoperability we mean technical compatibility in coordinating the various car-share services. Aspects include data exchange and interoperable data display. This chapter considers the range of possible technical architectures for the development of an interoperable service, the associated advantages and disadvantages, and the operational implications. As discussed in 7.2 Organisational interoperability, different functions and roles are involved in an interoperable service (Figure 10). These functions are also the building blocks of the different technical structures.

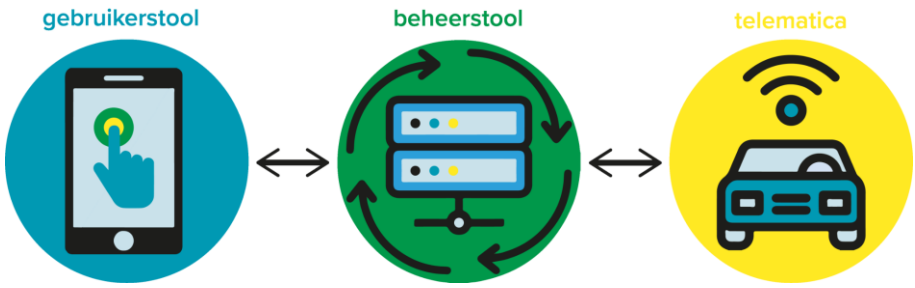

Figure 10: different roles in an interoperable car-share service

In order to open up multiple car-share services via a single channel (= interoperability), the transport operator function and the service provider function will have to be (partially) decoupled. German research [61] shows that there are three plausible architectures for this decoupling:

1. **Bilateral model**: Car-sharers can use vehicles from other car-share organisations via the organisation of which they are members. This is achieved through bilateral agreements between all car-share providers. From the user's point of view, this seems to be a good

[61] Guijarro F.C. (2015), Analysis of the Integration of Carsharing Interoperability among Operators in the City of Munich, pp. 26 - 33.

approach, as there are no changes in procedures for them but they can rely on additional cars. For car-share providers this scenario is much more complex. The investment in terms of time and resources to reach an agreement (and establish a corresponding procedure) with all the different car-share providers is significant. This model seems to be workable mainly for connecting a very limited number of parties and is not very flexible or future-proof.

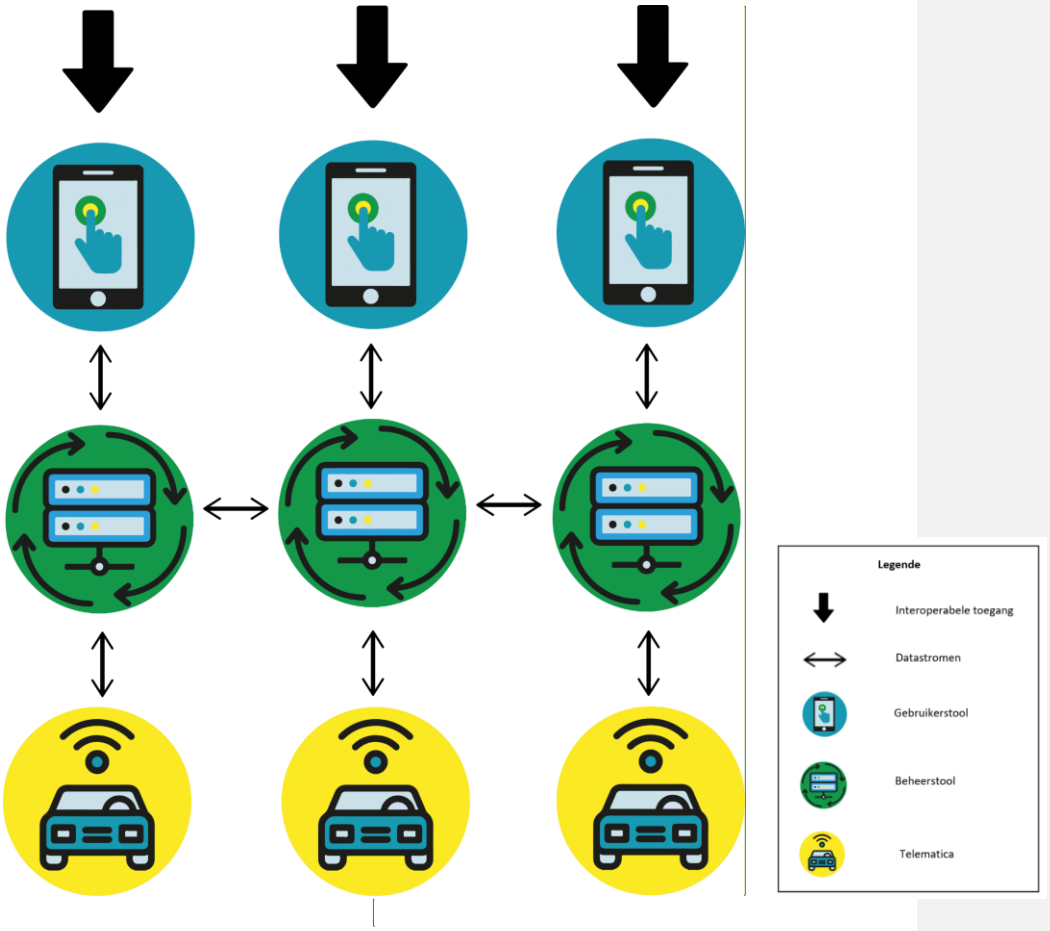

Figure 11: The bilateral model

2. **Common service provider:** (Potential) car-sharers can use cars from all car-share providers via a new platform. This is achieved through a single interface displaying data from the various car-share providers. However, this platform will only be able to access the data that the individual providers want to share, which reduces the consistency of the data displayed. In this scenario, the service operators are the car-share providers themselves. They each handle the data processing individually, and deliver it in a format of their choice. This means that the common service provider can only access the data that the car-share providers want to share and cannot update it to reflect a standardised set of aggregated data. This system provides the end-user with an interoperable service, but the process is not uniformly interoperable.

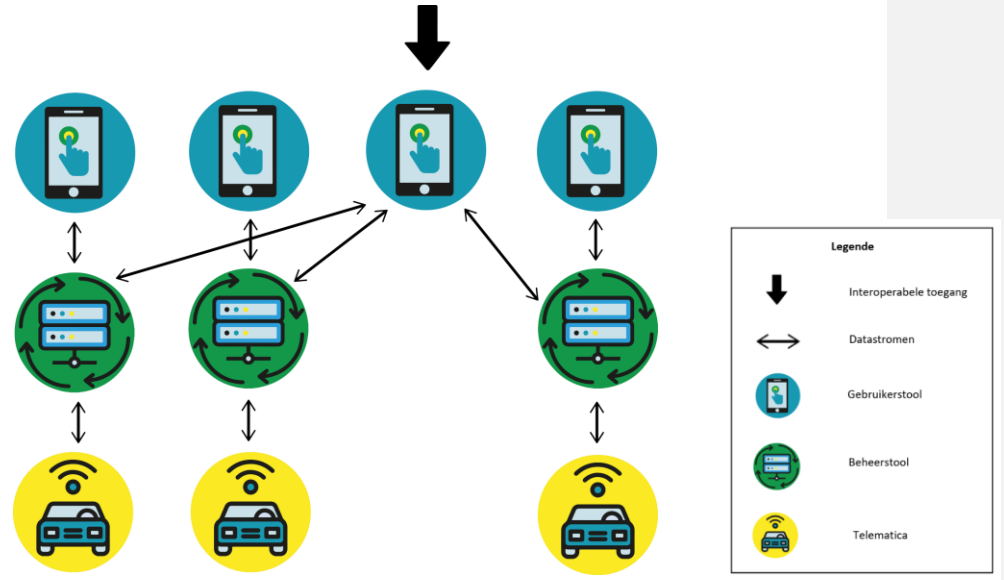

Figure 12: The common service provider model

3. **Common service provider and service operator:** (Potential) car-sharers also use a new platform to access shared cars from the various providers. Alongside a single common interface, providers use entirely the same processes to offer the services to end users. For car-sharers, there will be a new (but user-friendly) interface with convenient and up-to-date information. Installing an additional operator function incurs high costs and the willingness of providers to outsource these technical organisational processes is crucial (as is trust in the third party).

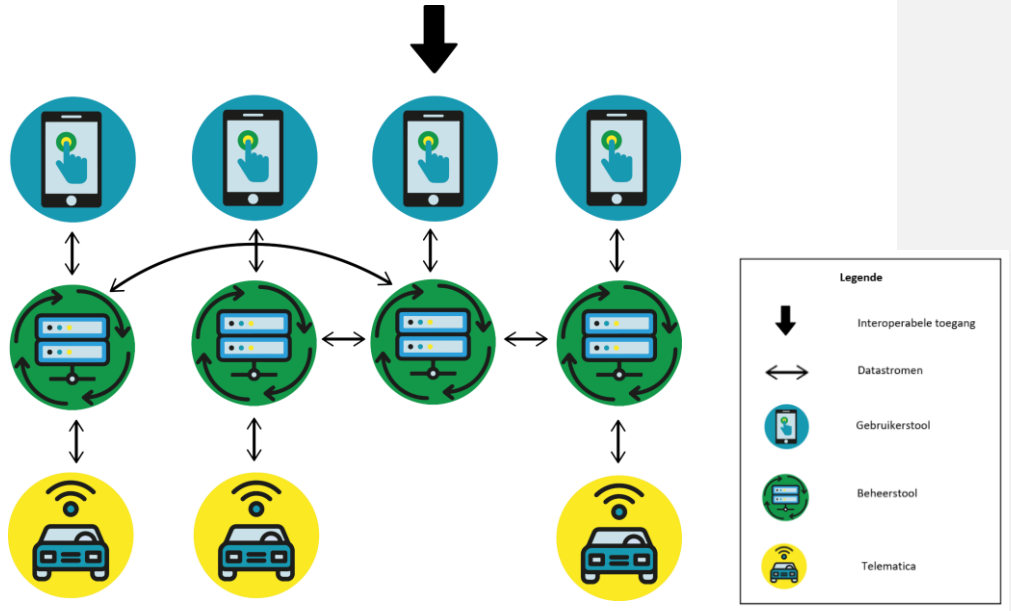

Figure 13: The common service provider and service operator model

We would also like to explore some additional options here:

4. **Common service operator only:** Car-sharers can also use the shared vehicles of other car-share providers via the platform of their own car-share organisation. There is no common interface, but all providers use the same processes. This results in a standardised set of aggregated but dispersed data. This model guarantees a high degree of brand retention for individual providers, but is also dependent on the willingness of car-share providers to relinquish the technical organisational processes.

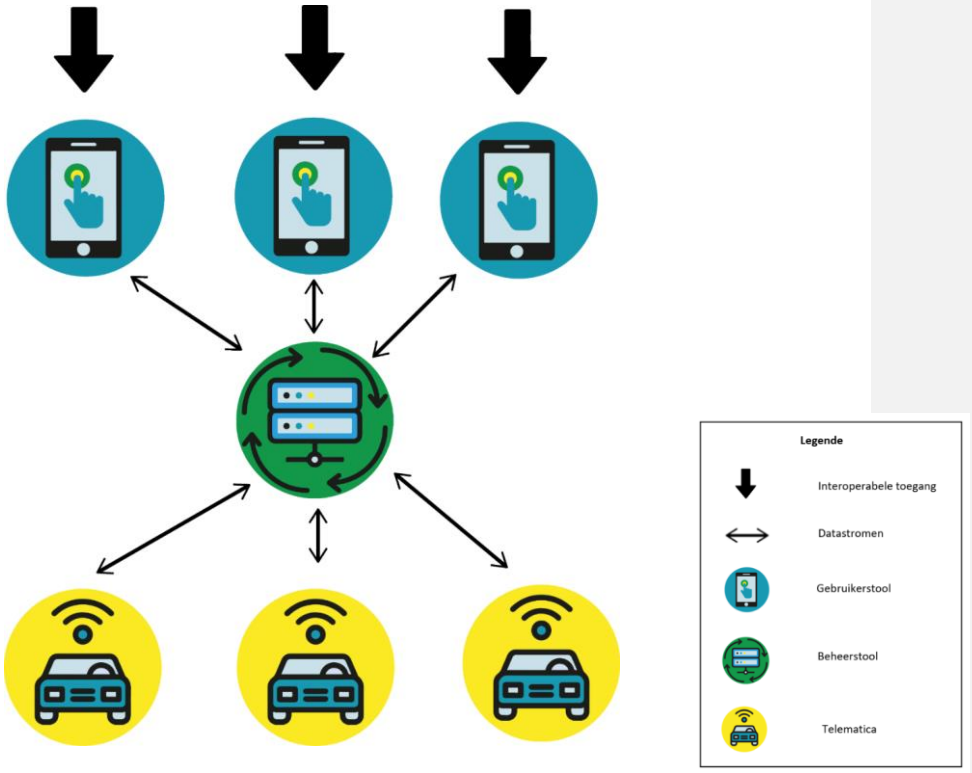

Figure 14: The common service operator only model:

5. **Hybrid model**, in which there is both a common service provider and a common service operator, and in which the interoperable service is accessed through different interfaces. This enables car-sharers to reserve vehicles from any provider via the familiar interface of their own organisation, but also allows non car-sharers to use vehicles from all providers via an umbrella platform.

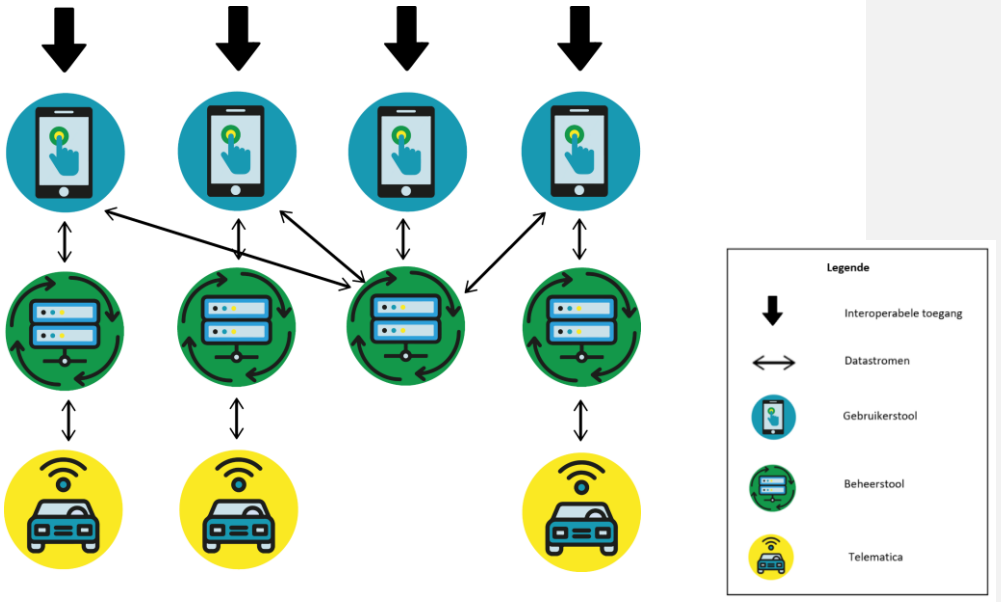

Figure 15: the hybrid model

A summary comparison of the different models is presented in table 4.

Table 11: Strengths, weakness and implications of the different technical architectures

	Strengths	Weaknesses	Implications
Model 1	• Organisationally not very complex (on a small scale). • Very quickly set up (on a small scale). Short 'time-to-market'. • Bilateral agreements can easily preserve individual interests. • Individual USPs maintained, clear ownership • When the same standards and data formats are used, the data can be used and adapted • Harmonised information possible (but only in decentralised way)	• Not future-proof, not easily scalable (outdated model of cooperation) • Inefficient way of achieving interoperability • Inefficient system once operational • The costs of technical and organisational alignment carry weight in a cost-benefit analysis • Error-prone • Interoperability is minimal • Individual organisations require knowledge	• Only for members of one organisation (= car-sharers) • Existing users need no new app • Absence of a third party means that negotiating position vis-a-vis MaaS is not supported • Total interoperability (with all players) unlikely
Model 2	• The costs carry limited weight in a cost-benefit analysis • Few technical organisational adjustments required • Providers can be relieved of invoicing, marketing, etc.	• The data behind the info displayed at interface level cannot be edited by service providers (because they are not operators). • No harmonised info • Ownership and USPs are unclear • Not very efficient (parallel data streams) • Requires uncoupling of the operator and service provider functions. Not technically feasible for all providers • Third party behind interoperable interface becomes dominant; a party that enjoys the confidence of the participating players is required	• Some degree of integration of information (availability, price information, reservations, etc.), but no integration of use (opening, payment, etc.) • People who are not members of a car-share organisation can also use a vehicle, from a technical point of view. • Behaviour of non car-sharers may cause problems compared with allowing access to car-sharers only (= people who are already members of a car-share organisation). • No other mobility services (public transport, shared bikes, etc.) can be introduced in the future in the absence of a common service

Model 2			operator Limited interoperability ensures proper functioning of individual services even in the event of problems with the interoperable service (own platform tends to be isolated)
Model 3	• The data behind the info displayed at interface level can be edited by service providers. • Harmonised information can be displayed • Costs are in line with the benefits of such interoperability • Providers can be relieved of invoicing, marketing, etc. • Efficient process • Advanced interoperability • Implementation of common servers possible	• 'Time-to-market' is high due to development of additional interface • Monetary cost of an additional service operator is high. • The different car-share providers are not universally willing to surrender control of their procedures. • Ownership and USPs are unclear • Third party behind interoperable interface becomes dominant; a party that enjoys the confidence of the participating players is required	• Integration of both information (availability, price information, reservations, etc.) and use (opening, payment, etc.) is possible • People who are not members of a car-share organisation can also use a vehicle, from a technical point of view. • Behaviour of non car-sharers may cause problems compared with allowing access to car-sharers only (= people who are already members of a car-share organisation). • Future-proof, additional (and complementary) services can be introduced in the future
Model 4	• The data behind the info displayed at interface level can be edited by service providers. • Reasonable agreement costs. • Individual USPs maintained, clear ownership • Providers can be relieved of invoicing, marketing, etc.	• Not very efficient (many parallel data streams) • The different car-share providers must be prepared to surrender control of their procedures. • 'Time-to-market' is high due to development of additional interface and harmonisation of technical organisational procedures • High monetary costs for development of additional interface and harmonisation of technical organisational procedures • Independent (third) party enjoying the trust of the different players is necessary	• Only for members of one organisation (= car-sharers) • Future-proof, additional (and complementary) services can be introduced in the future • Existing users need no new app
Model 5	• The data behind the info displayed at interface level can be edited by service	• Not very efficient (many parallel data streams) • The different car-share providers must be	• Integration of both information (availability, price information, reservations, etc.) and use

	providers. ● Reasonable agreement costs. ● Individual USPs maintained, clear ownership ● Providers can be relieved of invoicing, marketing, etc.	prepared to surrender control of their procedures. ● 'Time-to-market' is high due to development of additional interface and harmonisation of technical organisational procedures ● High monetary costs for development of additional interface and harmonisation of technical organisational procedures	(opening, payment, etc.) is possible ● People who are not members of a car-share organisation can also use a vehicle, from a technical point of view. ● Behaviour of non car-sharers may cause problems compared with allowing access to car-sharers only (= people who are already members of a car-share organisation). ● Future-proof, additional (and complementary) services can be introduced in the future ● Existing users need no new app

7.5 Conclusion

It is clear that interoperability occurs at different levels and that these are all interlinked. When choices are made at one level, there are repercussions at the other levels. For example, strategic operational choices regarding competition (such as whether to pass sensitive data to an interoperable service) have consequences for the technical development of the interoperable tool.

Some level of uniformity is desirable if core activities are to run efficiently. However, car-share providers say that preserving their individuality is of some considereable importance. It is therefore important to find and respect this balance.

Finally, we can conclude that an effective, interoperable business model still requires research, And for this a diverse revenue stream is desirable.

8. Conclusion

In this report, we have investigated the attitude of the different players within the ecosystem of interoperable car sharing and the state of the art of interoperable car sharing in 2021. We have also looked at the opportunities and possible pitfalls facing the development of a total interoperable service in Flanders.

The stakeholder survey suggested that it is mainly potential users who are interested in an interoperable service. More than half of existing car-sharers are considering the use of an interoperable tool. For those respondents who are considering car-sharing, an interoperable service would also make it more attractive, and existing sharers would also promote car-sharing more through word-of-mouth advertising.
The majority of car-sharers (and of those considering car-sharing) are also willing to pay a limited extra charge for the additional interoperable service.

A less optimistic picture emerges from the survey of mobility providers (Flemish car-share providers and MaaS operators). There is little interest in a stand-alone interoperable platform among car-share providers, and there is minimal readiness to pay for it, largely due to limited margins. Both car-share providers and MaaS players are interested in an intermediate platform that can simplify the simultaneous integration of different providers into a MaaS platform.

In order to set up an interoperable car-share service, the individual providers need to harmonise the different layers of interoperability (legal, organisational, semantic and technical). These different layers of interoperability are very closely entwined. Organisational choices influence the technical level, for example, and vice versa.

Existing tools for interoperable car-sharing show that this is usually achieved by individual car-share services making use of the same software, so that interoperability requires only a small technical adjustment. Standardising the various car-share services to a high degree makes interoperability a user-friendly and achievable proposition. In addition, a roaming server that provides interoperability has already been developed in Germany. Here, too, a high degree of standardisation (in terms of operating procedures) forms the basis. However, in the Flemish context, the geographical zones in which car-share providers are active often overlap. This means that Flemish car-share providers are strongly wedded to their own USPs for marketing purposes. It will therefore be crucial to strike a balance between standardising the various user processes and preserving individuality in order to establish a well-functioning interoperable service. Organisational interoperability may therefore pose the greatest challenges. Furthermore, the search for an effective, interoperable business model with a diverse revenue stream has not yet been resolved.

This analytical report may serve as a starting point for further research into, and the design of, an interoperable car-sharing service in Flanders. However, more research is needed to develop a practical business and technical model. To do so, some decisions must first be taken regarding the configuration of the interoperable service (e.g. should we opt for intrinsic interoperability or a roaming server? Is it a commercial service?) At that point, a pilot may also be a useful source of working knowledge.

Finally, some policy recommendations may follow from this. For example, providers say that it is currently very difficult to invest (financially) in an interoperable car-share service. The Flemish government can help with this by taking further measures to promote semantic interoperability, and providing accompanying measures in the OSLO reference standard. Financial and technical support will enable the car-share providers to implement this and make the achievement of total interoperability more realistic.

The providers also suggest that interoperable car-sharing would be of more interest if it were to provide access to a (public) MaaS service. The government may choose to set this up and use the interoperable car-sharing service as an intermediate level in the MaaS narrative.

9. Annexes

Annex 1: funding & grant opportunities

The most interesting is the financial support for realising an innovation through a **development project**. The Flemish agency for innovation and enterprise (VLAIO) provides grants and advice to companies that develop innovative ideas, but are not yet profitable. The grant serves to support the enterprise to overcome difficulties when taking high-risk steps. In practice, the grant can be used for staff and other expenses. The amount of the grant is 25-50% of the project budget with a minimum of EUR 25,000.[62]

To promote technological innovation, it is also possible to take part in an **imec.icon call**. The imec.icon research programme conducts demand-driven, cooperative research on hardware, software and combined hardware/software innovations. Over a typical two-year period, multi-disciplinary research teams of scientists, industrial partners and/or social profit organisations work together to develop digital solutions that deliver an economic benefit to the industry partners. The interoperable operator can participate as an industrial partner and achieve economic benefits through the applied research. VLAIO can finance industrial partners up to a certain level.[63]

In addition, you can apply for an **SME e-wallet, which enables entrepreneurs to receive training and advice in order to build up expertise.** The grant amounts to a maximum of EUR 7,500 per year.[64]

In order to claim these grants, you must have the legal form of a closed company (BV) (see section 7.4, Legal interoperability). In addition to this ad hoc funding, the interoperable operator can also apply for structural support as a traffic organisation. For this it must be a non-profit association (vzw/asbl).

Funding sources often have to be combined as they do not provide 100% financing individually.

[62] https://www.vlaio.be/nl/subsidies-financiering/ontwikkelingsproject
[63] https://www.imec-int.com/en/icon
[64] https://www.vlaio.be/en/subsidies/sme-e-wallet/how-apply-sme-e-wallet

Annex 2: Survey of potential users

Commented [12]: Waar vinden we deze?

Annex 3: Survey of car-share providers

Introduction

Currently, the Share.Vlaanderen mobility project is conducting research into **an interoperable service that makes combined car-sharing possible.** By this term, we mean access to (and use of) shared cars from different Flemish car-share organisations by means of a single service. The interoperable service that is the subject of this report is intended to make combined car-sharing a reality for consumers. For this research, the vision of Flemish car-share organisations in such a tool is naturally indispensable. Could you please complete this short survey? It will only take you about 20 minutes.

When completing the questionnaire, you should interpret the term 'interoperable service' in the broad sense. The interoperable service can take different forms: either 1) a back-end coupling through which car-sharers can use an expanded offer via their car-share service, or 2) an interoperable interface through which car-sharers use a shared car, or 3) a hybrid form. Please bear this in mind when completing the questionnaire.

Questionnaire

1. What organisation do you represent?

2. For your organisation, which of the following are **benefits/opportunities** of an interoperable service that promotes car-sharing? Please indicate your top 5. 1= biggest advantage (multiple choice, 5 answers possible + box to indicate other advantages)
    - *Increasing own customer base*
    - *Expanding service and ease of use for my customers*
    - *Opportunity for additional promotion and marketing through interoperable service*
    - *Opportunity to outsource administrative burdens to the interoperable service*
    - *Being prepared for technical and organisational integration with private MaaS players*
    - *Being prepared for technical and organisational integration with public MaaS players (Flemish mobility centre)*
    - *Interoperable service can increase consumer confidence in car-sharing*
    - *The presence of an interoperable service makes it possible to develop new car-share products/services for new target groups*
    - *Interoperable service offers Flemish car-share providers a stronger position vis-a-vis major (international) MaaS players*
    - *Complying with mandatory integration imposed by governments*
    - *etc.*
3. Does an interoperable service like this offer **any other advantages** or opportunities for your organisation? *(open question)*

4. What are the **possible pitfalls** of an interoperable service for your organisation? What potential risks should be taken into account when creating an interoperable service? Please indicate your top 5. 1= biggest pitfall (multiple choice, 5 answers possible + box to indicate other pitfalls)
    - Possible loss of customers to other car-share providers

- Customers are less aware of the correct use of your car-share system than if they were directly connected to your system
- Potential to play down USPs, loss of brand recognition
- Own marketing no longer fully under your control
- Own administration no longer fully under your control
- Own customer service no longer under your control
- Joining an interoperable service is less straightforward than joining your own car-share scheme
- Harmonisation of terms of use for all participating car-share systems
- Complicated administrative/organisational integration (GDPR, process alignment, etc.) with the interoperable service
- Complicated technical integration with the interoperable service
- Concerns about exchanging data with competitors
- Concerns about uncertain return on investment (technical integration, GDPR compliance, etc.)
- Any costs for being connected to the interoperable service
- Uncertainty as to whether there is demand for an interoperable service
- Smaller financial margin (promoting pernicious business models)
- Possible lack of trust in the interoperable service developer (e.g. if it is a private mobility provider, other car-share provider, etc.)
- Possible lack of trust in competitors
- Interoperable service business model not yet clear
- Undermining the existing business models of car-share organisations: price and supply can always be compared, so the customer chooses the cheapest.
- etc.

5. Does an interoperable service like this offer **any other pitfalls** for your organisation? *(open question)*

6. Provided that full account is taken of the potential pitfalls you identified for such a service, would you be willing to actively participate in an interoperable service? (multiple choice, several answers possible)
    a. Yes, I would like to connect to an interoperable car-share service
    b. Yes, I would like to set up an interoperable service myself
    c. No, I am not interested at the moment
7. Explain your answer (open question):

8. Under what **conditions** would you consider joining an interoperable service? (scale: no, definitely not; no, probably not; yes, probably; yes, definitely + option to enter other conditions)
    a. If my car-share system is linked to a complementary car-share provider, e.g. free floating car-share provider linked to round trip car-share provider
    b. If all other providers were connected
    c. If the interoperable service were to include only vehicles powered by 'clean technologies'

   d. If the interoperable service were connected to a MaaS platform
   e. If the interoperable service were not connected to a MaaS platform
   f. If the affiliated car-share providers are about the same size
   g. If the affiliated car-share providers have a similar operational and/or business model (round trip only, similar opening mechanism, rate structure, etc.)
   h. If the affiliated car-share providers are not active in the same region as my service
   i. Only car-sharers can access this service (people who are registered with a car-share organisation)
   j. If the interoperable service is not operated by another car-share provider
   k. etc.
9. Is there anything else you would like to say? (open field, not obligatory)

10. Interoperability can also mean that the interoperable service takes over some software services from the car-share providers.**What functionalities could the interoperable service take over in order to unburden you as a car-share provider (operator)?** (scale: no, definitely not; no, probably not; yes, probably; yes, definitely)
    a. Customer service
    b. Software development
    c. Marketing & communication
    d. Customer on-boarding and data processing
    e. Journey management
    f. Invoicing
11. Is there anything else you would like to say? (open field):

12. Are there any **other functionalities** that an interoperable service provider can take over?

13. How do the changes brought about by the creation of the **Flemish Mobility Centre** affect your point of view? (open field)

14. Do you foresee that your opinion about possible participation in an interoperable service will **change in the next five years**? (multiple choice)
    a. Yes, probably
    b. Perhaps
    c. No, probably not
15. Why/Why not?

16. What circumstances/**developments in the next five years** might change your opinion? (multiple choice, several answers possible + field to add own development)
    a. My car-share service becomes more profitable
    b. Interoperable service business model is clear and successful
    c. Breakthrough of MaaS
    d. More competition
    e. Less competition
    f. Rapidly expanding car-share sector
    g. More control through regulatory framework

h. Accompanying measures in the regulatory framework (both financial and operational)
i. Other:

17. If full account is taken of the potential pitfalls you identified for an interoperable service, are you prepared to make initial **investments to become compatible** with such an interoperable service? (multiple choice, one answer possible)
    a. Yes, definitely
    b. Yes, probably
    c. Perhaps
    d. No, probably not
    e. No, definitely not
    Any comments (open field)

18. Explain your answer (open question)

19. How do you envisage your **financing contribution** to an interoperable service? Several options are possible: (multiple choice, several answers possible, + field in which to enter own contributions)
    a. I am not willing to contribute to it
    b. Interoperable journeys at extra cost
    c. Bulk purchase of journeys at lower fares through interoperable service
    d. Offering more expensive subscriptions with the option of using shared cars from other organisations at an additional cost
    e. The interoperable service takes over a number of tasks (e.g. invoicing, customer service) for which I am prepared to pay a supplement (see question 12)
    f. Partial release of staff to the interoperable service
    g. Other (please specify)

20. Explain your answer (open question)

21. What **functionalities are you willing to adapt** when integrating with the interoperable service? Several options are possible: (multiple choice, several answers possible, + field in which to enter own functionality)
    a. None, I am not willing to integrate into an interoperable service
    b. Conditions of use (minimum age, claims history, etc.)
    c. Rate structure
    d. Reservation procedure
    e. Invoicing
    f. Breakdown assistance
    g. Procedures for the use of shared vehicles (Opening and use, fuelling/charging, etc.)
    h. Other: ….

22. When someone books an interoperable journey (read: a car-sharer from another car-share organisation or a new car-sharer), a user process must be completed. This requires a **clear division of roles** between the different players in the interoperable service. What activities in

running the interoperable service do you want to control as a car-share provider? (multiple choice, several answers possible, + field in which to enter own functionality)

a. Registration (access) to the interoperable service
b. Storage of personal data
c. Customer security deposit
d. Overview and reservation of shared vehicles
e. Management of journey-related matters (unlocking, driving, returning, refuelling) + customer support + claims follow-up & breakdowns
f. Payment procedure (responsibility for invoicing and collection of invoiced amounts, risk of non-payment)
g. Marketing
h. Positioning the brand in the market

23. Which API and/or data standard does your car-share organisation currently use? (open question)

23. How do we create the ideal climate for trust between stakeholders within the ideal interoperable car-sharing service?

Annex 4: Survey of MaaS providers

Introduction

Currently, the Share.Vlaanderen mobility project is researching an interoperable tool that makes combined car-sharing possible. By this term, we mean the access to (and use of) shared cars from different Flemish car-share organisations by means of a single app or tool. The interoperable service that is the subject of this report is intended to make combined car-sharing a reality for consumers. At a later stage, such a tool could be a stepping stone towards the simultaneous and relatively straightforward integration of different car-share services into MaaS services. For this research, the vision of the MaaS player as a potential stakeholder in such a tool is naturally indispensable. Could you please complete this short survey? It will only take you ten minutes.

Questionnaire

1. What organisation do you represent?

2. For your organisation, which of the following are **benefits/opportunities** of an interoperable service that promotes car-sharing? Please indicate your top 5. 1= biggest advantage (multiple choice, 5 answers possible + box to indicate other advantages)
    a. *Simple way of adding car-share providers to my MaaS offer (time savings)*
    b. *Elimination of complicated technical integration with separate car-share providers*
    c. *Elimination of complicated organisational and legal integration with separate car-share providers*
    d. *Elimination of separate negotiations with individual car-share providers*
    e. *Simpler administrative processing through centralisation of providers in one platform*
    f. *Providing customers with a better and more comprehensive offer*
    g. *Attracting new customers by reaching the customers of car-share providers*
    h. *etc.*

3. Does an interoperable service like this offer **any other advantages** or opportunities for your organisation? *(open question)*

4. What are the **possible pitfalls** of an interoperable service for your organisation? What potential risks should be taken into account when creating an interoperable service? Please indicate your top 5. 1= biggest pitfall (multiple choice, 5 answers possible + box to indicate other pitfalls)
    a. *Weakened negotiating position vis-a-vis the Flemish car-share sector*
    b. *Not being able to choose which particular car-share providers to work with (interoperable car-share service is intermediary)*
    c. *No direct control over the quality of the final car-share service*
    d. *Problems in clearly communicating versatile car-share offerings to customers*
    e. *Possible investments required to adapt own processes to an interoperable tool*
    f. *Any costs for connection to the tool*
    g. Concerns about exchanging data with car-share organisations

   h. *Possible lack of trust in the interoperable tool developer (e.g. if it is a private mobility provider, government body, etc.)*
   i. *Possibly smaller financial margin than if integrated with providers separately*
   j. Interoperable service business model not yet clear
   k. *etc.*

5. Does an interoperable service like this pose **any other pitfalls** for your organisation? *(open question)*

6. Are you willing to integrate an interoperable car-share service into your operation?
   a. Yes, I am willing to integrate an interoperable car-share service in my MaaS service
   b. No, I am not interested at the moment

7. Explain your answer (open question):

8. Under what **conditions** would you consider integrating an interoperable service in your MaaS service? (scale: no, definitely not; no, probably not; yes, probably; yes, definitely + option to enter other conditions)
   a. If I have exclusive access (as the only MaaS player) to the interoperable car-share tool
   b. If all car-share providers in Flanders are included
   c. If the car-share provider with the largest offer in Flanders is definitely included
   d. If the car sharing provider with the largest car-share offer in Flanders is not included in the tool
   e. *If there is a complementary car-share offer through the interoperable tool (geographical coverage)*
   f. *If there is a complementary car-share offer through the interoperable tool (range of vehicle models)*
   g. *If there is a complementary offer (focused on different types of travel)*
   h. If the interoperable service were to include only vehicles powered by 'clean technologies'

9. Do you see potential for an interoperable car-share service that includes private sharing? In this form of car sharing, private individuals make their cars available to people in the neighbourhood. You can use the vehicle by joining a car-share group (car-sharing with shared costs) or by registering on a platform (car-sharing at market price).
   a. No, definitely not
   b. Yes, probably
   c. No, probably not
   d. No, definitely not
10. Explain your answer

11. **Which services or functionalities would the interoperable service best perform for you as a MaaS player in order to relieve your operations?** (scale: no, definitely not; no, probably not; yes, probably; yes, definitely)
   a. Customer service

b. Software development (for integration)
c. Marketing & communication
d. Customer on-boarding and data processing
e. Journey management

12. Is there anything else you would like to say? Are there other services or functionalities that the interoperable tool can take over? (open question):

13. To what extent are you prepared to pay the interoperable tool for taking over the following functionalities? (scale: no, definitely not; no, probably not; yes, probably; yes, definitely)
    a. Customer service
    b. Software development (for integration)
    c. Marketing & communication
    d. Customer on-boarding and data processing
    e. Journey management

14. Do you foresee that your opinion about possible integration into an interoperable service will **change in the next five years**? (multiple choice)
    a. Yes, probably
    b. Perhaps
    c. No, probably not
15. Why/Why not?

16. What circumstances/**developments in the next five years** might change your opinion? (multiple choice, several answers possible + field to add own development)
    a. My MaaS service becomes more profitable, so I can take more risks
    b. The demand for shared cars increases among my customers
    c. Interoperable service business model is clear and successful
    d. More competition (and opportunities for differentiation)
    e. More control through regulatory framework
    f. Other:

17. Are you prepared to invest in this kind of tool? *yes/no/yes + comments (why not)*
    a. Yes, definitely
    b. Yes, probably
    c. Perhaps
    d. No, probably not
    e. No, definitely not
    Any comments (open field)

18. Explain your answer (open question)

19. How do you envisage your **financing contribution** to an interoperable service? Several options are possible: (multiple choice, several answers possible, + field in which to enter own contributions)

a. I am not willing to contribute to it
b. One-time licence
c. Monthly licence
d. Other (please specify)

20. Explain your answer (open question)

21. What API and/or data standard should the interoperable tool use so that it can be integrated into your MaaS service? (open question)

22. In the opinion of your organisation, what advantages can linking an interoperable tool to your MaaS application bring to car-share providers?
    a. More revenue
    b. More brand famiiarity
    c. Other (please specify)
23. Have you any other comments? Let us know in the space below *(open field)*