IRIS Utrecht presenteert:

Replication of Smart City Projects

Comparing two Mobility as a Service solutions and their ecosystems

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Kernvraag:
Could a Smart City business model's replicability potential to other cities be assessed by relying on local and generic conditions?

Samenvatting:
Despite widespread interest, empirical research on smart city solutions is scarce. To address this knowledge gap, this paper analyzes two projects facilitating a Mobility-as-a-service (MaaS) service entitled We Drive Solar and EC2B, which was launched in Utrecht (the Netherlands) and Gothenburg (Sweden) in 2018 and 2019 respectively. This paper uses the Smart City Business Model Canvas proposed by Giourka, Sanders, Angelakoglou, et al., 2019 to systemically map these projects and test their replicability empirically as this tool is purely theorical and not tested empirically before. Local and generic factors are identified and used as assessment in concluding each project's replicability potential.

Tags:
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Replication of Smart City Projects – Comparing two Mobility as a Service solutions and their ecosystems

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Statement of Originality

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Abstract

Despite widespread interest, empirical research on smart city solutions is scarce. To address this knowledge gap, this paper analyzes two projects facilitating a Mobility-as-a-service (MaaS) service entitled We Drive Solar and EC2B, which was launched in Utrecht (the Netherlands) and Gothenburg (Sweden) in 2018 and 2019 respectively. This paper uses the Smart City Business Model Canvas proposed by Giourka, Sanders, Angelakoglou, et al., 2019 to systemically map these projects and test their replicability empirically as this tool is purely theorical and not tested empirically before. Local and generic factors are identified and used as assessment in concluding each project's replicability potential.

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1 Introduction

The paramount challenges and disadvantages associated with urban agglomerations did not discourage the word population from manifesting itself in urban areas, as cities all over the world are in a state of flux. In today's word more than 75% of the EU population (and 55% of the world's population) lives in urban areas, using 70% of available energy resources. (Caragliu, Del Bo & Nijkamp, 2011). As a consequence, cities possess a certain power considering that everything that happens within cities, say of social or economic nature, could have a huge impact on a bigger environment (Mori and Christodoulou, 2012). Due to population increase, cities are challenged and encouraged to come up with smart solutions in order to continue facilitating increased economic opportunities, while at the same time improving the quality of life**.** This can be accomplished by reducing the city's environmental footprint, improving smart mobility, improving air quality, increasing energy efficiency, etc., which each require a combination of public and private sector investments (Giourka, Sanders, Angelakoglou, et al., 2019). These smart solutions require cities to 'be and act smart', and these city-specific challenges explain why the concept "Smart City" has received a lot of attention in scientific literature and international policies in the span of more than two decades. Many definitions of smart cities exist, but what generally makes smart cities unique compared to the 'average' city is that smart city investment cases differ from regular private business development and public sector management as all costs and benefits, uncertainties and risks, end up with different parties. These parties are not by definition included in the decision-making process, which makes it urgent that city leaders develop a transparent smart city investment agenda and design business models that allow the relevant actors (e.g. public, cooperative, and market actors) to share costs, benefits, and risks.

This urgency has been recognized and is addressed in the paper "The Smart City Business Model Canvas—A Smart City Business Modeling Framework and Practical Tool" by Giourka et al. (2019), which offers visionary city leaders a useful and clear guidance to tackle this complexity and provide them with the tools to mobilize and communicate with their constituency and the many stakeholders involved. This particular paper, thus, gives the advice that proposed investment projects should be mapped out onto a business model canvas that is adapted to smart cities solutions. The Business Model Canvas is a standard tool in business incubation practice and is widely used by firms to develop new businesses around the globe. Making use of a business model canvas contains multiple advantages as it is developed to help (I) entrepreneurs clarify their value proposition, (II) map the venture's environment and (III) identify the SWOT of their business (Giourka, et al., 2019). When it comes to the challenges in smart city development specifically, the IRIS project - *Integrated and Replicable solutions for co-creation In Sustainable cities*[1] - aims to demonstrate integrated solutions that tackle the multitude of these challenges. Given this condition that cities could act as large-scale demonstrators of integrated solutions, and greatly value socially inclusive energy and mobility transition, IRIS is brought into the world to demonstrate and replicate the cities' great potential. Demonstration projects take place in the project's leading lighthouse cities - Utrecht (The Netherlands, coordinator), Nice (France), and Gothenburg (Sweden). Each city has its own mix of universities & research organizations, local authorities, innovation agencies and private expertise to accelerate communities to adopt e.g. mobility initiatives.

This means that solutions cannot simply be copied and pasted to different context conditions. Firms have to review and adapt their business model to local circumstances and

[1] IRIS is a HORIZON 2020 EU funded project beginning October 2017 for a duration of five years.

cities. It is, therefore, essential to identify the needs across sectors and design solutions accordingly that address the (specific) potential end users. Additionally, the solution needs to provide the right incentives to each (important) stakeholder. This paper will systematically map the business models that can be developed with two of these rather identical demonstration projects located in Utrecht and Gothenburg, which will serve as the cases in this case study analysis. The purpose of this case study analysis is to identify the local and generic conditions a Smart City business model needs to meet in order to be replicated to other cities.

The research question of this paper, thus, is: *Could a Smart City business model's replicability potential to other cities be assessed by relying on local and generic conditions?*

2 Literature Review

Over the last few years, there has been a steady increase in the number of cities around the globe that have witnessed a mushrooming of pilot projects that zero in on developing new urban sustainability solutions. The goal of these projects, ultimately, is to enhance the quality of life for citizens. Often being referred to as "smart city" projects, these types of projects exist in many forms, sizes, and types. Over the last few years, these projects have attracted the interest from city administrations, businesses, research institutes, and other local stakeholders (van Winden, van den Buuse, 2017). Interestingly, a large number of recent papers have attempted to define and conceptualize smart cities on a rather abstract level (Albino et al., 2015; Chourabi, et al., 2012; Hollands, 2008). However, the literature on smart cities is lacking when it comes to the issue of upscaling and replicating solutions from pilot projects. Van Winden & Van den Buuse (2017) note in their paper *Smart City Pilot Projects: Exploring the Dimensions and*

Conditions of Scaling Up that only a very small number of studies zoom in on the more concrete level of smart city initiatives, projects, and business models.

Unfortunately, the nature of most smart city pilot projects is usually not readily affordable and require support through (inter)national funding. For this reason, a myriad of funding opportunities is specifically created for smart city projects in recent years. The European Union's Horizon 2020 Research and Innovation program is an example of this, that made smart-city-related research possible by providing an enormous amount of funding, €18.5 billion to be exact, in subsidies for green mobility, clean energy and climate actions. Projects like these advocate innovative approaches to citizenship, with the aim of involving citizens as stakeholders at every stage of the process to co-create solutions and services (Calzada, 2016). This is a decision that is supported by more recent literature characterizing the citizen as an innovation partner with government (Crowley et al., 2016). The notion of citizen participation is expanded from a passive role of acting as a data generator or technology/service user to an active role of bringing ideas and innovation to the table (Trencher, 2019).

Despite support through funding, a rather large number of projects fade out after a subsidized demonstration phase. This leads to failure of upscaling and replication, which could make urban development a frustrating process for policymakers on various levels. Opponents of these large-scale funding programs, such as the Europe's Horizon 2020 program, argue that the approach these programs follow are mere *one-size-fits-all solutions* and based on *the smart-city-in-the-box* paradigm, where urban smartness is simplified (Amitabh Satyam & Igor Calzada, 2016). Calzada (2016) argued in the paper *(Un)Plugging Smart Cities with urban transformations: towards multi-stakeholder city-regional complex urbanity?* That in order to tackle these issues, efficient policy tools are needed to understand and intervene in our daily urban realities better, whilst at the same time considering the whole range of stakeholders that determine whether a solution is a ‘smart’ one for a specific city, taking context conditions into account.

There are some context independent factors, though, that can lead to successful pilot projects. One factor is the prospect of economies of scale, and a suiting incentive to capture these benefits of scale, which is most prevalent in the roll-out type of scaling (Sofronijević, Milićević, & Ilić, 2014).

Aside from this, another example of an important factor is awareness of all values and benefits a smart city project provides. Investment subsidies for solar power related equipment, for instance, are essential to encourage active participation in smart city co-creation, making it important that all agents, and in particular investors, involved are fully aware of the project’s added value (Kogan and Lee, 2014).

A last example of a factor that can ensure success is knowledge transfer. According to Roberts (2000), it can be said that transfer of know-how requires a process of show-how. He argues that face-to-face demonstration and the social interaction involved enable the sharing of skills and the establishment of mutual understanding and trust. As a consequence, knowledge transfer, and especially tacit knowledge, within and between organizations is a condition to make scaling and replication a reality. Replicating a project in a different, read cultural, setting asks for adequate understanding to cultural norms and values, and the ability to act accordingly. This can lead to a necessary re-configuration of the partnership. On an institutional level, the most success regarding possible replication can be achieved if the relationships between actors has a low degree of complexity, making knowledge transfer sustainable (Binswanger and Aiyar, 2003).

Despite the willingness to incorporate all possible factors, it remains clear that smart city projects are often managed by municipal authorities and smaller, local players. These actors often do not acquire an international network of offices and are not well equipped to replicate solutions elsewhere as they often are not competent enough and/or financially incentivized to do so. When these situations occur, it is almost impossible to facilitate knowledge transfer. A large funding contribution is provided by the European Commission, but with funding also comes rules and conditions that must be followed in order to receive a grant or subsidy. As the European Commission values knowledge transfer and deems it as an essential element for replication, project proposals are required to have work packages on knowledge sharing ready in order to facilitate replication [EC], 2017.

3 Methodology

3.1 Sample description and context

The overarching aspect of IRIS is the Transition Strategy, which comprises five Tracks that, together, provide a universal framework to address both common and district specific challenges. These five tracks share to desirability to demonstrate a set of integrated solutions built on top of mature and innovative technologies. Within these five tracks, I will study two projects that fall under the *IRIS Transition Track #3: Intelligent mobility solutions*.

This track consists out of projects that are dedicated to integrating electric vehicles and e-cars sharing systems in the urban mobility system. I will look at these two projects for the reason that they both focus on Mobility-as-a-Service (MaaS). MaaS is a service concept that integrates public transport with other mobility services, such as car sharing, and bicycle sharing. The main idea is that intermediary digital services make it easier for users to plan, book, and pay for complementary mobility services, thereby facilitating less car-centric lifestyles (Smith, 2020). The research question will be answered by conducting a case study of two MaaS projects that are both part of IRIS project, see the *appendix Table 1* for a clear overview. I chose to compare two similar projects to determine the impact the local environment has on a project's replicability potential.

3.2 Data collection and approach

Among the lighthouse cities, the integrated solutions are planned for replication from the early beginning of the project. To find out if there are local and generic conditions a business model needs to meet in order to be replicated in another city, a qualitative approach will be used to assess the projects' replicability potential. The Smart City Business Model Canvas (SC-BMC) is used as a tool for both projects. The information that is required to fill out this canvas is obtained through desk research and in-depth interviews with all agents involved.

Official deliverable reports published by the IRIS project were sufficient in filling out a large part of the SC-BMC, such as the main executor's perspective and which other actors were involved. Additional interviews were required to (1) fill the empty gaps in the SC-BMC that could not be retrieved from desk research, (2) find out the perspective from relevant actors on potential replication of each project, and (3) validate the data by asking various representatives of each actor similar questions that relate to the business model of their project.

In most cases, multiple representatives per actor were interviewed (1) to reduce bias, such as personal believe, and (2) in order to get answers from different angles on similar questions. A total of 17 interviews were conducted over a period of two months. Altogether, I have spoken with 18 different individuals, of which 9 were representing the actors from the We Drive Solar project (UTR) and 5 the EC2B project (GOT). A detailed list of the interviews (of both case studies) conducted can be found in *appendix table 4 and 5.* The transcription of each interview can be found in *8.5 interviews.* The actors (and suppliers) are fundamental to the SC-BMC and the input from interviews with all actors form the biggest contribution to the completion of the SC-BMC.

Additional to the interviews I conducted regarding both case studies, I explored the implications and learnings of these two cases, and, therefore, look at the Merwedekanaalzone project in the city of Utrecht. I conducted various interviews regarding the Merwedekanaalzone, which can be retrieved by consulting *table 6 in the appendix.* The transcription of these interviews specifically can be found in the *appendix 8.5.3 special case: Merwedekanaalzone*

As can be seen in *table 4*, there is no shortage in interviews when it comes to We Drive Solar e-car users. This relatively high number of representatives is not without thought, as the success of smart city projects and its applications is highly based on citizens' adoption and usage. In this case, e-car users are going to be the end users, and solutions need to have a straightforward benefit in their everyday busy life to make these kinds of projects viable on a long-term basis (Giourka, et al., 2019).

As for the EC2B end-users, there are two distinct groups of end-users: the tenants and the property owners and developers. As it was not possible to speak to the tenants myself, I consulted Göran Smith, who is selected to be the representative for the tenants as can be seen in *table 5*. Smith has done thorough research for the EC2B project and his expertise and knowledge regarding this project makes him a legit representative for all tenants involved. Then we have another group of end-users, the property owners and developers. I managed to find one property developer in Gothenburg. As it was difficult to trace a 2nd property owner or developers in Gothenburg willing to do an interview, I choose to include Dennis Kerkhof as 2nd representative, who is the project manager for the housing project Explorion based in Lund (see note under *table 5*).

4 Findings

In order to identify the local and generic conditions a business model needs to meet in order to be replicated to other cities, I will interpret my findings at a MaaS project level and a broader Smart City project level. I will begin by zooming in, and discuss the results of both MaaS projects. I will identify the local and generic conditions for each case and mark the conditions when they overlap with each other. Additionally, I will analyze a planned MaaS project that is called Merwedekanaalzone (UTR). The Merwedekanaalzone project was mentioned by many interviewed actors from the We Drive Solar case and is very similar to the EC2B case in Sweden. Uniquely, the Merwedekanaalzone project has the components in place to allow both projects from this case study in complementing each other. Therefore, I will directly take the learnings from both cases and how to best anticipate on projects like the Merwedekanaalzone project in Utrecht. After this, I will end by zooming out, to state how some of these found conditions could be universal conditions for Smart City projects in terms of potential replicability.

4.1 Specification generic and local conditions

Before I identify the generic and local conditions, it is important to state the appropriate level of analysis. Especially regarding location conditions, it can be said that at some level, all is local.

I identify generic conditions at a city-level, which are non-location bound, and thus can be controlled.

I identify local conditions at a city-level, which are location bound, and thus cannot be controlled.

There are, of course, different levels of local analysis that can be done, such as within the city itself. In Utrecht, for example, there are fairly large local differences within the city. The pre-pilot of We Drive Solar in Lombok gathered different results compared to the pilot in Kanaleneiland-Zuid (see *Table 1: Overview case studies).* However, for this study, I will look at Utrecht and its city structure as a whole and compare it to other cities in the Netherlands. At the end of the day, each city, and especially large cities, experiences large within-city differences. As the research question makes clear, the purpose of this study is to find the generic and local conditions that are needed to replicate Smart City projects in other cities, not within cities.

4.2 MaaS Project level

In this section I discuss the generic and local conditions that are needed to reproduce MaaS projects in different cities, which I identified during the interviews. Both the generic as the local conditions are visually presented in *Table 2: MaaS Project level (generic and local conditions)*. In the *description generic conditions*, I sometimes quote an interviewee and refer to the interview by number. As can be seen in the *appendix table 4 and 5,* the numbers are linked to each interview of which the full transcription can be found back in *appendix 8.5 interviews.*

Regarding the EC2B project, besides having conducted interviews with representatives of actors based in Gothenburg, I also did interviews with representatives of actors based in Lund (*table 5*). This implies I take local conditions from both cities into account and, therefore, I will specify in the description whether I use Lund or Gothenburg as example. When overlapping conditions occur, I will mark that specific condition grey, as it is immediately noticeable.

Table 2: MaaS Project level (generic and local conditions)

MaaS Project level		
MaaS project	*Generic conditions*	*Description generic conditions*
We Drive Solar	Trusted network	High uncertainty requires high trust and flexibility and there is a need for community involvement.
EC2B		Trusting relationship between property developers, solution prover (mobility consultant) and municipality
We Drive Solar	Municipal support	The municipality grants parking permits without payment
EC2B		Giving discounts for developing building with a very low parking norm. In the case of EC2B in Lund, they municipality gave a discount of 95%. In the case of Gothenburg, Emma Lund said: "*If the municipality won't give any rebates on the parking requirements, there would be no willingness to pay for the EC2B service. The opportunity that the municipality will actually allow this kind of service and also make it a requirement that the property developers provide something in exchange for it using the number of parking lots, that's essential for the business model.*" *(interview nr. 12)*
We Drive Solar	Recognised added value users	Users must see the added value of the project for themselves
EC2B		
We Drive Solar	Citizen engagement	Users are the brand ambassadors of We Drive Solar. In some cases, they need to convince 5 to 6 citizens in their neighbourhood in order to make use of the We Drive Solar e-car sharing service.
EC2B		Mobility coaching and engaging customers

We Drive Solar	Goodwill factor	There must be a certain degree of goodwill at play coming from the municipality as they sometimes would lobby for parking permits that also permit parking in different cities. Another example is granting parking permits without asking payment for it. Matthijs Kok: *"We also work with other major cities, often for a generic purpose. This may, for example, be in the interest of We Drive Solar. It may be desirable to have a permit for all those cities, so that you can park in one city and also in another city with such a parking permit. We sometimes try to do something and organize cooperation and lobby. We Drive Solar also does not have to pay for their permits, whereas citizens do have to pay for a permit."* *(Interview nr. 1)*
Ec2B		
We Drive Solar	Willingness to work with different suppliers	We Drive Solar currently is the charging point operator; they are doing this themselves in the municipality of Utrecht. However, when upscaling, willingness to work with different suppliers might be necessary. Matthijs Kok: *"We Drive Solar places their own charging points. They want to do the whole chain themselves with that car, the smart charging, the charging points, and the solar energy generation. That is their concept, and that is unique. That is why they place their charging points themselves. However, if they would want to do this in other cities, they may have to start partnerships with another charging point operator."* *(Interview nr 1)*
We Drive Solar	Adjustable business model	Matthijs Kok: *"Most municipalities are rigid. You would have to adjust your own model to make that growth when upscaling to different cities. This also means that you may have to organize that system differently. That you have to adjust your business model, working method and approach a bit every time. The model they have in Utrecht does not fit everywhere. Other parties will not adapt to We Drive Solar, they can do it the other way around."* (*interview nr 1)*
EC2B	Property developers who value social and environmental aspects	

EC2B	Risk neutral property owners/ developers	
MaaS project	*Local conditions*	*Description local conditions*
We Drive Solar	Well-connected	The city should be well-connected to other cities through public transport.
EC2B		
We Drive Solar	Compactness	The city should be dense, compact that within-city movement is possible by bicycle. If it's pretty compact, the solution works well in urban and suburban environments.
EC2B		
We Drive Solar	Central location / close proximity to public transportation	
EC2B		
We Drive Solar	A bicycle culture	
EC2B		
We Drive Solar	Relatively high educational level	
EC2B		
We Drive Solar	A well-developed mobility system / infrastructure	
EC2B		Göran Smith*: "Within and outside the city a good public transport network is important. Also walking, cycling and or active mobility, because that's the cheapest way to travel. If you can do a lot of traveling with cheap options, that can make it interesting to look at this kind of solution. And that is what makes the cost very different from owning a private car." (interview nr. 11)*
We Drive Solar	Progressive municipality and government	

EC2B		Göran Smith: *"The municipality does not have to be right or left-wing to quicken the process If you look at the national, regional and local level, some of them are left wing and some of them are right wing. Mobility as a service in Sweden is a quite liberal idea. It's based on that the public transport authority, public sector, shouldn't do everything, but instead we need to make use of the innovation power and investment capability of the private sector. Of course, it is important to have both the local, national and regional government that are interested in moving away from a car centric society. And perhaps, more common with left wing governments."* *(interview nr. 11)*
EC2B	Local fleet providers with diverse offerings (cars, e-cars, bikes, etc.)	

4.3 Takeaway Learnings: Anticipating on a planned MaaS project: Merwedekanaalzone (UTR)

At this moment, there are big plans to transform the Merwedekanaalzone, a business park in Utrecht (The Netherlands), to a green and sustainable urban neighborhood. The Merwedekanaalzone is a testing ground for sustainable living in the city and has ambitions to integrate new forms of mobility and explore the possibilities to create car-free areas. On 8 February 2018, the city council of the municipality of Utrecht adopted the environmental impact assessment (EIA) of the Merwedekanaalzone Environmental Vision. I have conducted various interviews to find out more about this project in terms of its smart molbity strategy, planning and expectations. For more information regarding the interviewees and why they were selected, consult *the appendix Table 6 - Interviews Merwedekanaalzone.* The Merwedekanaalzone project was often mentioned by interviewees as it has the components in place to allow both projects from this case study to complement each other. In the Merwedekanaalzone area, around 6000 buildings are going to be developed in the near future, where a parking norm of 0.3 will be the standard. The municipality of Utrecht plans to set-up a PPS, a public-private cooperation, with other landowners of the area. This cooperation is going to recuit MaaS providers and a platform (app) provider. MaaS providers, such as We Drive Solar, could offer their services to the platform and integrate their services this way within a larger system. Essentially, EC2B is a platform provider that integrates and connects all the MaaS providers in one app. This service will be offered to the prospective tenants and citizens that live nearby. We Drive Solar currently struggles stimulating demand for their e-carsharing services. If it would be willing to offer its services on such a platform, their demand should raise steadily and is secured. To do so, We Drive Solar should open up its services and share it with other mobility providers in the area. The representative of the municipality, Sebastiaan van der Hijden, confirmed that the municipality sees this as a requirement for the MaaS providers, who are interested in being part of the platform, since they value healthy competition in the city. Additionally, that this way, the municipality values that prospective users of these MaaS offerings can choose between different providers and brands *(see 8.5.3. Special case: Merwedekanaalzone).*

4.4 Smart City Project Level

For this section, the focus is less on the different case study projects and more on the general generic and local conditions that transcend MaaS projects, but can be applied to Smart City projects in general. Both the generic as the local conditions are visually presented in *Table 3: Smart City Project level (generic and local conditions).* In order to identify these Smart City Project level conditions, I will take the overlapping conditions identified in *Table 2: MaaS Project level (generic and local conditions)*. From there, I select which of these conditions transcend the MaaS project applicability, and can be seen as Smart City project applicability. As the goal of this research is to find out whether a Smart City business model's replicability potential can be determined by relying on generic and local conditions, this is crucial to identify in order to prepare future Smart City projects well in their design, strategy, expectations, and decision-making in terms of location and alliances.

Table 3: Smart City Project level (generic and local conditions)

	Smart City Project level
Nature of condition	*Key words*
Generic	Trusted network, municipal support, Recognised added value users, Citizen Engagement, Goodwill factor
Local	Progressive municipality and government

5 Discussion

5.1 Implications of the SC-MBC

The goal of this study is to see whether a Smart City business model's potential to be replicated can assessed by relying on universal generic and local conditions found in this case study analysis. This study uses the SC-BMC as a tool to research this as Smart City investment cases differ from regular private business development and public sector management. The SC-BMC allows all parties that are not (by definition) included in the decision-making process to assess their costs and benefits, uncertainties and risks.

To answer the research question, we must be critical towards the usability of the SC-BMC in identifying the local and generic conditions of Smart City projects. The SC-BMC indeed helps to map which different urban stakeholders engage in coalitions and innovate together within the project, but the SC-BMC lacks in representing the role and importance of the suppliers as they are underestimated in their influence on the business model's outcome.

For instance, ElaadNL, a supplier and partner of We Drive Solar, unexpectedly, played a significant role in the business model of We Drive Solar. This had to do with a high degree of coincidence and serendipity on the side of We Drive Solar (see *appendix 8.5.1.9: Baerte de Brey).*

Another example related to EC2B is the importance of mobility providers in their business models, which are, in fact, suppliers. However, even though suppliers are not included in the proposed SC-BMC canvas, they have been included regardless and as an implication: the SC-BMC has been slightly adjusted to depict the whole picture.

Another complicated task was to find financial overviews that correctly depict the state of inflows and outflows (in numbers). Interviewees were not able to provide this information in both cases. Additionally, the EC2B project in Gothenburg is fully subsidized and does not earn monetary revenues yet. In Lund, EC2B is considered as a possible solution to implement for housing association Explorion. Therefore, it is unknown what the financial terms will be as EC2B is still deciding upon this.

More notes and comments on difficulties that occurred when answering the questions of the SC-BMC can be find in the *appendix table 8.*

5.2 Limitations, implications and suggestions for future research

A large funding contribution is provided by the European Commission, but with funding also comes rules and conditions that must be followed in order to receive a grant or subsidy. Previous studies argue that many Smart City projects are forced to put on hold after the subsidy phase ends (Calzada, 2016). This paper incorporates the critique that is given to large-scale funding programs, such as the Europe's Horizon 2020 program that subsidizes the MaaS projects in his case study analysis. As the approach these programs follow are often regarded by opponents as *one-size-fits-all solutions* and based on *the smart-city-in-the-box* paradigm, where urban smartness is simplified (Amitabh Satyam & Igor Calzada, 2016). Taken this into account, I look for possible context conditions that could give a rich assessment of all relevant elements that must be in place to make replication possible under certain circumstances (local and generic conditions). My research gives insight in the replicability of smart city projects on different cities, however when starting such a Smart City project one should also consider where within the city in should take place. My research focuses on locational factors for a city as a whole, but this may be different per neighbourhood. More research on the latter locational factors could help to give smart city planners even more insight on how and where to implement Smart City projects.

However, I have only analyzed two cases orientated towards smart mobility (MaaS) within the existing five Tracks, which falls under the Transition Strategy IRIS designed. Together, these five Tracks provide a universal framework to address both common and district specific challenges. As I only looked at two projects that belong to one track out of a total of five tracks (*IRIS Transition Track #3: Intelligent mobility solutions*), it is certainly reasonable to assume the generic and local conditions I find in this study do not apply to all MaaS projects, let alone Smart City projects.

To draw conclusions from this study that apply to Smart City projects in general should be taken with caution due to the nature of my analysis.

First of all, because of the sample size. Due to time constraints, the sample size is relatively limited in the number of actor representatives in both cases.

Second, due to self-selection bias. Both the e-car users as the tenant/e-vehicle users in this study are verified to be prone to self-selection. All interviewed users were well-off financially, environmentally aware and highly educated in the We Drive Solar project, also confirmed by Göran Smith, representative of the tenants, in the case of EC2B (*see table 5*). The We Drive Solar e-car users admitted these types of projects attracts individuals that possess these kinds of characteristics. Furthermore, the users that are willing to do an interview can be said to value contributing to research like this and are happy to give their opinion and motivation to join such a project, but this means I have most likely spoken to users that are already content with the service that is delivered and/or are overrepresenting a certain user profile, that now might be distorted.

Third, the locational aspects of both projects happened to be similar in many ways. In both projects, the infrastructure and mobility culture and patterns are fairly similar to each other.

Lastly, the nature of MaaS project EC2B in this case study is atypical compared to most MaaS projects, making it difficult to draw general conclusions about local and generic conditions that are applicable to other MaaS projects. What makes the EC2B project atypical from other MaaS projects is the fact that the apartments (Brf Viva) of the pilot project in Gothenburg where EC2B is launched were quite pricy. Therefore, the conclusion can be drawn that most tenants that live there are very likely to be either fairly well-off and/or have affluent relatives. It is, furthermore, speculated that these tenants are relatively more interested in new mobility solutions, such as MaaS due to the innovation and sustainability profile of the Brf Viva apartment. These tenants are relatively more likely to be interested in new mobility solutions, such as MaaS, due to the innovation and sustainability profile of the Brf viva apartment. Taking these characteristics into account makes the studied case atypical as the conditions for adoption are auspicious compared to when MaaS targets the general population of a given area.

However, this last implication regarding the EC2B is compensated by the Lund perspective. The ongoing EC2B pilot in Lund, the other city in Sweden in this case study analysis is less atypical. Representative Dennis Kerkhof, project manager of housing association Explorion, *(see table 5)* reasoned that you could compare it with a housing association, but that with difference that the property is owned by the municipality. The system is slightly different in Lund compared to Gothenburg. They do not have social rents, it is commercial rent, but since they don't need the same profit margin as the commercial cases, it makes a difference and attracts different kind of potential tenants in terms of background, education and budget.

To summarize, more research on MaaS projects would be valuable in examining projects with different characteristics to observe the differences it would give in outcome to see how crucial the generic and local conditions of this case study analysis actual are for other MaaS projects. Additionally, a case study analysis which focuses on within-city level dynamics is recommended for further research. Even though my research offers valuable and interesting insights on generic and local conditions of these case studies specifically, more research is needed to verify whether these insights are actually universally applicable.

6 Conclusion

Smart City projects are intriguing new arenas in urban development and innovation, where different urban stakeholders (public, private, and civic) engage in coalitions and innovate together. Understanding the replication and scaling process of smart city solutions requires insights into the subtle interplay between the project level and the individual organizational/firm level. The purpose of this study is to find out whether a Smart City business model’s replicability potential can be assessed by relying on universal generic and local conditions found in this case study analysis. The SC-BMC served as a guiding tool in identifying the different urban stakeholders involved in each Smart City - MaaS project, and their role in the project. Currently too many projects simply die when the subsidy dries up. The BMC approach can help build sustainable business models, and is used to find critical, both generic and local, conditions that future Smart City projects should consider beforehand. This paper demonstrated a base on which MaaS project can be replicated, the identified generic and local conditions, a base whom might also be valuable to be used in general smart city replicability.

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8 Appendices

8.1 Overview case studies

Table 1: Overview case studies

Case study	*Description*	*Objective*	*Main executors*	*Demonstration location*	*Project duration*
1. We Drive Solar (UTR)	The concept We Drive solar is a car sharing system deploying electric cars, which are solar powered.	Demonstrate an alternative to the private car for travel and test the business model of a MaaS concept integrated with households.	We Drive Solar & LomboXnet	Kanaleneiland-Zuid, Utrecht (The Netherlands)	5 years (starting 1 October 2017)
2. EC2B (GOT)	The concept EC2B is a e-mobility service that offers customers alternatives to owning a car, allowing access to a variety of transport modes in connection to accommodation. The added value for property developers is the saved money through reducing the number of parking spots needed	Designing a service that responds to the needs all actors involved: end-users as well as property developers and transport service providers, in order to find a working business model.	EC2B & developer Trivector	Johanneberg campus area, Gothenburg (Sweden)	5 years (starting 1 October 2017)

8.2 Interview scheme

Table 4 – Interviews We Drive Solar (UTR)

We Drive Solar (UTR)				
Nr.	*Actor*	*Representative (interview)*	*Function*	*Date of interview*
1	The municipality of Utrecht	Matthijs Kok	Municipal Project leader Horizon2020 project IRIS and project leader/counsellor Electric Transport and charging infrastructure	06/12/'20

2		Maarten Koning	Project manager renewable energy and city councilor Utrecht D66	06/09/’20
3	e-car users	<Personal data removed>	n/a	05/27/’20
4		<Personal data removed>		05/22/’20
5		<Personal data removed>		06/26/’20
6		<Personal data removed>		06/09/’20
7		<Personal data removed>		05/29/’20
8	LomboXnet / We Drive Solar	Robin Berg	The overall Data Protection officer (DPO) of LomboXnet and owner of We Drive Solar	06/06/’20
Nr.	*Supplier*	*Representative (interview)*	*Function*	*Date of interview*
9	ElaadNL	Baerte de Brey	Chief International Officer	06/11/’20

Table 5 - Interviews EC2B (GOT)

EC2B (GOT)				
Nr.	*Actor*	*Representative (interview)*	*Function*	*Date of interview*
10	Municipality of Gothenburg	Christian Rydén	The head of traffic planning in Lund and responsible for the parking norm	06/11/’20
11	E-Verhicle Users / Tenants	Göran Smith	An industrial Ph.D. candidate in innovation for sustainable development. In his doctoral project, he studies the development and diffusion of Mobility as a Service (MaaS)	06/18/’20
12	EC2B / Trivector	Emma lund	Researcher/consultant and sustainability coordinator for the Trivector Group	05/29/’20
13	Property Developers	Charlotta Brolin	Riksbyggen’s project lead for the implementation of EC2B in Brf Viva	06/12/’20
14		Dennis Kerkhof	The project manager for the housing project Explorion	06/10/’20

Note. Christian Rydén and Dennis Kerkhof both are not representing the original location of the EC2B project, Gothenburg, but Lund instead. In Lund, the option to implement EC2B is currently being explored.

Table 6 - Interviews Merwedekanaalzone

Unique case: Merwedekanaalzone (UTR)				
Nr.	*Actor*	*Representative (interview)*	*Function*	*Date of interview*
15	Independent actor	Emilie Vlieger	Cooperative area development and location marketeer	06/16/’20

16	Municipality	Marcel Haak	Project manager Urban Development	06/18/'20
17		Sebastiaan van der Hijden	Strategic mobility adviser	06/17/'20
2		Maarten Koning	Project manager renewable energy and city councilor Utrecht D66	06/09/'20

Note. Vlieger has been responsible for bringing the property developers together, and it not tied to an organization that could benefit from this action. Haak is the strategic project manager Urban Development Utrecht and is responsible for the Merwedekanaalzone project. Van der Hijden is the strategic mobility adviser of the municipality of Utrecht and is specifically looking into the smart mobility aspect of this project. Maarten Koning has been interviewed about both the We Drive Solar project as the Merwedekanaalzone project as he is the Project manager renewable energy and city councilor, with the portfolio of the Merwedekanaalzone project.

8.3 Consulted reports and critique

Within the canvas the business model of this mobility as a service offering is closely analyzed.
Please find desk research sources used to complete the canvas in table 7.
Notes and comments which are numbered throughout the text can be found in table 8.

Table 7 – Sources desk-research

#	*Name*	*Type*	*Perspective*
1	Adopting Mobility-as-a-Service: An Empirical Analysis of End-Users' Experiences	Academic Publication	Tenants
2	IRIS Deliverable 7.5 – Activities on Smart e-mobility (Gothenburg)	Report	Project Overview
3	IRIS Webinar: Developing & applying a successful Mobility As A Service (MaaS) business model	Presentation	Trivector/EC2B
4	IRIS Smart Cities – Website	Website	Project Overview
5	Brf Viva – Riksbyggen	Website	Project Overview
6	Brf Viva – Johannaberg Science Park	Website	Project Overview
7	Brf Viva – Smart City Sweden	Website	Project Overview
8	Launch of T.T.#3 activities on Smart e-mobility – Utrecht	Report	Project Overview
9	D5.2 Planning of Utrecht integration and demonstration activities	Report	Project Overview
10	D1.4: User, Business and Technical requirements of T.T.#3 Solutions	Report	Project Overview

Table 8 – Notes and comments SC-BMC

#	*Comment*
1	There is much overlap with the contents of Value Proposition.
2	Even though suppliers are not included in the proposed SC-BMC canvas, we felt the need to include them here.

3	This is very in-depth information and the overall value to the business model analysis is comparatively low.
4	In order to answer these questions, detailed information from a more technical perspective is needed.
5	A lack of financial overviews left us unable to understand the exact economic implications of the business model.
6	Based on the research we expected business related KPIs to play a bigger role in the project. We were not able to confirm this hypothesis.

Note. The notes and comments were written down in collaboration with Julian Bammer

8.4 SC-BMC

The SC-BMC canvas is a tool created within the academic publication The Smart City Business Model Canvas—A Smart City Business Modeling Framework and Practical Tool (see bibliography) to create an overview of smart city projects.

The canvas for project We Drive Solar (UTR) was filled out by Britt Kuipers (b.c.kuipers@students.uu.nl).

The canvas for project EC2B (GOT) was filled out by Julian Bammer (j.a.bammer@students.uu.nl) and Britt Kuipers (b.c.kuipers@students.uu.nl).

8.4.1 Smart City Business Model: We Drive Solar (UTR)

Business model description removed due to confidentiality. Please contact Robin Berg at We Drive Solar (info@wedrivesolar.nl) for more information.

8.4.2 Smart City Business Model: EC2B (GOT)

Building Blocks	*Question(s)*	*Agent(s)*	*Content*
Key Actors	Who are the smart city network key actors?	Municipality of Gothenburg	The local municipality.
		E-Verhicle Users / Tenants	The tenants of the newly developed housing. They gain access to the MaaS offerings (car, bike and light vehicle sharing) within the development instead of having a parking garage.

	EC2B / Trivector	Trivector is a Swedish mobility consulting company. Trivector funded EC2B daughter company to show long-term commitment to the MaaS business model tested in this pilot.
	Property Developers (Riksbyggen)	Companies building new housing in the area of Gothenburg. This project covers the developer Riksbyggen who piloted the MaaS solution within a new building complex in Gothenburg.
	IRIS Smart Cities	An EU-spanning smart city project. Actively involved in this pilot project by providing funding and learning from the results.
Who are the smart city network key suppliers?	SmartResenär	The EC2B app has been implemented based on a MaaS ICT platform from the subcontractor SmartResenär. SmartResenär assists Maas operators by supplying bespoke development and customization services. The SmartResenär platform consists of three main parts: a frontend component library for rapid mobile app development, a collection of generic MaaS backend services and tools that runs on SmartResenär servers and an integration layer where API integrations towards mobility suppliers are implemented and managed by SmartResenär.
	Västtrafik	Västtrafik is responsible for public transport in western Sweden. This is the first time a public transport operator in Sweden opens up to sell their digital tickets through a third-party digital retail channel. So, only for a trial period until the end of 2019. Trivector is involved in a constructive dialogue on a continuation.
	Sunfleet (now: "our green car")	E-cars are leased through car sharing operator Sunfleet, which has a contractual agreement with Riksbyggen. Normally, this fleet provider provides Volvo cars but due to IRIS funding electric cars were obligatory. This provider has been replaced (by "our green car"). The services offered did not change.

		Riksbyggen	Riksbyggen has procured the e-bikes and the key cabinet. Riksbyggen owns GoRide (bikes).
		Clean Motion	Light e-vehicles were leased through Clean Motion. These providers offerings have been canceled due to a lack of interest by the tenants. There was no willingness to pay, possibly because vehicles were "too new" for tenants.
Key Activities	Which key activities are required to realize the value proposition? Definition: In the SC-BMC, key activities refer to the management and delivery of activities of the actors involved in the smart city solution, capitalizing on the offerings by each network actor and working toward realization using co-creation practices.	Municipality of Gothenburg	Provides the setting, which allows the pilot project to take place. The project is based on an innovative policy that should allow the business model to work sustainably. The policy was based on flexible parking norms, enabling car sharing instead of offering parking space. The policy involves rebates for parking requirements. This means property developers have to build less parking per tenant in new developments. The more ambitious the mobility solution, the bigger the rebate (a ratio, e.g. one parking space for every tenant).
		E-Verhicle Users / Tenants	They are the every-day users and provide payment for the service. Interest in and accessibility of the offerings are key.
		EC2B / Trivector	Expertise in mobility solutions to help urban developers explore and integrate MaaS solutions. Sustaining relationships between all parties. Consolidating the suppliers by integrating them into a single solution. An app which is a convenient tool for the end-users.

		Property Developers (Riksbyggen)	In new developments they provide payment for the initial part of the solution (except in this case the project was subsidized by IRIS Smart Cities). They build the foundation for the solution by providing infrastructure. No car parking but instead e-vehicle storage and charging. In this development a special focus was on community space, etc. It is unclear if this "culture of community" has an effect on the mobility solution.
Value Proposition	What value does each actor deliver? Definition: Value proposition refers to the benefits each actor in the network creates for a single or multiple end user in the network	Municipality of Gothenburg	Implementing additional mobility services to provide higher flexibility when travelling, reducing the need to own and use a car. Contribute to a "good economy" in the construction of new accommodation and create attractive urban spaces. Ultimately, the municipality wants to create a more attractive urban environment and sustainable development with fewer cars and a significantly more efficient land use.
		E-Verhicle Users / Tenants	Provide payment for the solution. Provide feedback for service. Ideally citizens engage in actively improving the solution to create a more sustainable urban environment.

	EC2B / Trivector	Trivector (EC2B) brings together the services of others in an integrated offer which benefits both mobility providers (who can gain a broader audience), and users. Value generation includes: Helping residents to a carefree mobility without the need to own a car. Helping real estate developers to offer the market a low-car housing concept through a package solution, attractive to both customers (residents) and authorities (the municipality). These communicate to the municipality that that the mobility solutions are in good hands. Which in turn profits the property developers who have to obtain a green light for their project. Helping mobility service providers who want to reach a larger and affluent market for their sustainable mobility services.
	Property Developers (Riksbyggen)	The project has shown that many property developers in the sector of commercial properties are interested in offering their tenants – and employees – a sustainable mobility service also in existing buildings. Propery owners/developers facilitate alternative options for tenants to be more sustainable by paying and providing them the EC2B service.
Which of the end users' problems is the smart city project helping to solve?	Property Developers (Riksbyggen)	The focus of Trivector/EC2B is to primarily reach property owners who have a desire to develop sustainable alternatives for their accommodation and excel as leading sustainable players (based on the policy introduced by the government). Currently most urban developers do not have the expertise to provide these solutions by themselves. However, Riksbyggen would probably not have paid for the EC2B service if it wasn't funded by the EU. They planned on using separate services for every vehicle category. The overall value added for the property developer is still unclear.

	What bundles of products and services does the project offer to each end user?	Property Developers (Riksbyggen)	Trivector/EC2B offers complete solutions to property developers, who seek to integrate MaaS solutions into their new development. However, the property developer disagrees that the offering is complete as much work must still be done by the developer to integrate the solution (contracting, interaction with tenants, etc.). In the future the property developer would appreciate a complete solution.
	Which end-users' needs is the project satisfying? (e.g. Performance, customization, price, getting the job done, cost reduction, risk reduction, accessibility, convenience/usability)	Property Developers (Riksbyggen)	Cost reduction: Urban developers can save costs by replacing building a car garage in favor of integration of a MaaS solution. Getting the job done: Trivector/EC2B is one of the most reputable mobility consulting companies and can also work in more novel projects like this one.
	What are the respective target values/thresholds/KPIs to be reached?	Municipality of Gothenburg	Diverse KPIs related to environmental and social progress set by the local government (e.g. improved access to vehicle sharing solutions; ease of use for end users of the solution; reduction in car ownership among tenants; yearly km driven in e-car sharing systems; reduction in driven km by users of the service; energy savings; carbon dioxide reduction)
		E-Verhicle Users / Tenants	None.
		EC2B / Trivector	Further research needed.
		Property Developers	

Actor Relationships	Which type of relationship does each actor expect within the network? Which ones are established? How are they integrated with the rest of our business model? How costly are they?	Municipality of Gothenburg	The municipality keeps contact with property developers to check-in on learnings about the "no-car pilot". There is a relationship with MaaS providers, which is needed to expand/scale up the business model in the future. There is a relationship with other municipalities and the EU for sharing learnings, planning and funding of similar pilots.

		E-Verhicle Users / Tenants	Due to the innovativeness of the project there is a close relationship between tenants and MaaS solution provider. This is a very costly relationship and it is unclear if a similar relationship is needed in other MaaS projects. However, it is clear that the close interaction helped initially skeptical tenants to "warm up" to the solution.
		EC2B / Trivector	Ability to build long-lasting relationships with both property developers and mobility service providers, as well as to navigate within the legislative and political landscape. Close interactions with property developers is key to form good, trustworthy relationship. Forming long-term business relationship with partners is considered Trivector's strength in the sector. Successful relationships are needed for Trivector to find new customers.
		Property Developers	Counterparty to the relationships mentioned above.

Network Beneficiaries	Which target users is the value created for? How do the target users benefit from the value created and what are their needs?	Property Developers	Property Developers are the end user of this business model by purchasing mobility solutions from Trivector. (See Value Proposition)
	What specific values does each network beneficiary get? (i.e. Community, business, research, organizations, decision-making bodies/government and non-profit)	Municipality of Gothenburg	Less cars in the area, which fulfils policy goals. Possibly increased use of public transportation. Network effect: The more mobility solutions there are, the more choices and the more flexible the services are for the end users, which profits the city as more citizens might forego car ownership. However, from the municipality’s perspective an integrated MaaS solution is not necessary. Mobility offerings by itself (not integrated into one platform) would also be a solution if certain criteria are fulfilled. Decisions about these criteria are made on a per project basis.

		E-Verhicle Users/Tenants	Tenants have access to electric cars, electric cargo bikes and five electric bikes, as well as public transport. There might also be other benefits. Property developers invest into different offerings instead of building a parking garage such as a common room, etc.
		EC2B / Trivector	Income and further expertise for their next projects. Possibly new connections, expanding the company network.
		Mobility Providers	Access to a bigger market by integration into the mobility offering. So far, no fee is charged for participation in the project but that might have to change in the future.
		Property Developers	There is a financial incentive, it's cheaper for them to build the MaaS solution compared to a car garage.
		IRIS Smart Cities	Learnings from pilot project, which is considered the reason for investing in the project to begin with.

Key Actors Offerings	What offerings does each actor deliver? (i.e. technology, development of products/processes/services, R&D, Citizen Engagement, etc.)	Municipality of Gothenburg	Support for the EC2B concept to be viable. Local authorities need to be supportive of the idea of exchanging parking lots for a MaaS. In this case a policy-based innovation was necessary. (Related: Lund wanted to pilot a zero-parking housing for about ten years. Just now it is catching interest, seemingly the government is more ambitious than the private sector in this regard.)
		E-Verhicle Users / Tenants	Willingness to pay for the service. Some tenants are more likely to use new vehicles than others. In this case when using light e-vehicles there is a certain customer group that thinks the vehicles are "cool".
		EC2B / Trivector	

			Development of the EC2B application to be used was procured by Trivector within the IRIS project. However, the main focus of the EC2B demonstration in IRIS is not on the app or the ICT scheme behind it. Rather, the focus is on designing a service that responds to the needs all actors involved: end-users as well as property developers and transport service providers, in order to find a working business model. The ICT-solution used in the project is a necessary prerequisite for being able to demonstrate a MaaS service, but it has a subordinate role. Citizen engagement. User dialogue and the possibility for users to get personal travel advice has been seen as a key part of the EC2B concept all along.
		Property Developers	Development of the housing complex, focusing on solutions to integrate MaaS and other offerings for new tenants.
Key Actors Co-creation Operations	Which key operations do the key actors perform? (i.e. Sourcing of materials, system's design, operation and monitor and impact monitoring of the smart city solutions, deliver value, city coverage and links to other stakeholders e.g. Innovation hubs	Municipality of Gothenburg	Further research is needed.
		E-Verhicle Users / Tenants	
		EC2B / Trivector	
		Property Developers	
Key Resource and Infrastructure	What key resources are required to realize the Value Proposition (buildings, vehicles, machines, systems, point-of-sale systems, and distribution, networks) Our deployment channels? Our actor relationships? Revenue streams?	Municipality of Gothenburg	City-wide infrastructure such as public transport and bike lanes and parking. Oftentimes also route planning software/integration. Ideally, the city could be able to provide more infrastructure for innovations like e-cars to increase the likelihood of fast scaling solutions. However, for a Swedish city Gothenburg is relatively car-orientated (Volvo HQ).

		E-Verhicle Users / Tenants	Smart phones, credit card, driver license and access to the internet.
		EC2B / Trivector	Work force to include the MaaS solution both on a technical as well as societal level.
		Property Developers	Buildings and infrastructure to provide setting for MaaS solution including car sharing space and charging ports; (e-)vehicle space and charging ports; bike garage and workshop, etc.
		Suppliers (2)	There must be (local) suppliers to provide vehicles for the business model to work.
Data	What data will be made available from the services designed? To whom and under what conditions? Availability and types of Open Data (i.e. Energy efficiency, climate indicators. Traffic etc.)	Municipality of Gothenburg	Gathers data from the property developers on how the project is going. Further research is needed about the exact content.
		E-Verhicle Users / Tenants	Further research needed involving a more technical perspective.
		EC2B / Trivector	Information needed for KPI measurement is collected through the app and from collaborators (e.g. statistics on number of trips with different vehicles/public transport or trip length for e-cars). A survey with questions on previous travel habits and expectations on the service was sent out to future residents before moving in.
		Property Developers	Further research needed involving a more technical perspective.
Deployment Channels	Through which channels do our customers want to be reached? How are we reaching them? How are our channels integrated? Which ones work best? Which ones are most cost efficient?	Property Developers	The property developers of project Viva got connected via Johanneberg Science Park (and then to IRIS Smart Cities). In general property developers are reached through webinars and innovation seminars, specialized on MaaS networks. So far feedback for the concepts mainly positive, interest for similar offerings since a long time but only now projects are starting.

	How are they integrating with the customer routines?	E-Verhicle Users / Tenants	The tenants are reached via a (web) application to book and manage vehicles. Furthermore, the mobility coaching plays an essential role in communication (see Key Relationships).
Budget Cost	What are the most important costs inherent for each actor deploying a smart city solution? Which key resources are the most expensive? Which key activities are the most expensive? What cost can be covered by each actor? Is there opportunity for blending public funding with private financing? Which costs are covered by such mechanism?	Municipality of Gothenburg	Complementary infrastructure to make MaaS a possible solution for citizens, thereby providing a real alternative to car ownership. This means that cities who do not have a certain amount of infrastructure might not be able to integrate MaaS solutions effectively.
		E-Verhicle Users / Tenants	The only cost is the cost of renting the vehicles for tenants. The users pay for a mobility solution, which is (hopefully) cheaper than car ownership. So far bikes so far for free, car usage is payed. This might change in the future. However, if garage had been built tenants would have needed to pay off build costs instead (regardless of use). A cost/benefit analysis from the tenants was not possible due to lack of financial data.
		EC2B / Trivector	Developing and integration the mobility solution. Payment for the maintenance of the vehicles (5). Very close connection to tenants providing mobility coaching.

		Property Developers	Building the development with the right infrastructure to provide the EC2B service. Building an underground garage is a very expansive endeavor in Sweden, so property developers are interested in forgoing the cost. Furthermore, there are now incentives by the government to fund such projects (savings through car-free housing are about 90-95% of conventional parking requirements). Currently, property developer would be unwilling to pay if the service wasn't subsidized. Only once EC2B is proven to be self-sustaining business model, property developers would think it is worth the integration.

Revenue Streams	For what value are the network beneficiaries really willing to pay? For what do they currently pay? How are they currently paying? How much would they prefer to pay? How much does each revenue stream contributing to overall revenues? Which actors have revenues? What are the non-monetary revenues?	Municipality of Gothenburg	In the current business model, the municipality does not incur any direct revenue. Indirect revenue might incur as the solution might stimulate public transport use. There is a willingness to fulfill their policy goals: Less cars, more usage of public transport, greener environment (better quality of life).
		E-Verhicle Users / Tenants	Mobility in urban space is somewhat of a given, so users expect a meaningful alternative if they previously relied on car usage. (see Budget Costs)
		EC2B / Trivector	Receiving payment for their bundles provided to property developers. Furthermore, non-monetary revenues involved: experience, expertise and networks for new possible contacts.
		Property Developers	Main revenue stream for Trivector. This can still be a "win-win" as property developers save money through avoiding the construction of expensive car infrastructure. In the future property developers want car providers to pay them, as they are gaining many new customers. Property developers also gain expertise by pilot projects like this.

		IRIS Smart Cities	This project is subsidized by the European Union. Therefore, the property developer did not incur any costs. Willingness to pay for a pilot project, gaining expertise and insights about the feasibility of such a mobility solution.
Environmental Impacts: Costs and Benefits	What is the ecological cost of the smart city solution? (i.e. Greenhouse gas emissions, land use, energy and water used) What is the ecological benefit of the smart city solutions? % of reducing energy consumption. % reducing the environmental footprint.	Positive Aspects	A previous study suggests that if 200 persons in the 132 apartments at Brf Viva join the car sharing service included in EC2B, their carbon footprint from transport can be expected to be reduced by 123 tons of CO2. (See sources for additional details). Current "green transformation" of the transportation sector does suggest that building more parking in new developments might be very wasteful.
		Negative Aspects	New vehicle acquisition still does impact the environment, but it is the better alternative over personally owned vehicles.
Social Impacts: Values and Costs	What is the negative social value generated by the Smart City Solutions? (i.e. Social exclusion, digital illiteracy, accessibility to advanced services) What is the positive social value generated by Smart City Solutions (i.e. Growth, Job creation, air quality, key traffic etc.	Positive Aspects	Direct and measurable: less traffic, improved air quality, less reliance on your car. Some tenants gradually give up their car after living in the housing complex for a while. Indirect: social inclusion and community of sharing. Unfortunately, community of sharing is not really happening as planned. Pilot for the "housing of the future". The property developer does think pilots like these are an important part of transitioning towards different modes of transport.

Negative Aspects	The business model is new for all actors. Long-term implications and economic viability is unclear. Complicated for older tenants that suffer from digital illiteracy (integrated coaching helps overcome this problem). Car owners are clearly discriminated (however, there is a self-selection effect between owners of the flat). Tenants are much higher educated than average (located close to a university and "innovative building"). Tenants seem to view the service as more of a complementary good than a sustainability necessity.

8.5 Interviews

Interview transcripts removed to protect personal data and due to confidentiality.