Exploring MaaS Business Models on Strengths, Weaknesses and Sustainability

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MaaS Programme

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TU Delft

MaaS
Mobility as a Service

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Exploring MaaS business models on strengths, weaknesses and sustainability

Master thesis submitted to Delft University of Technology

in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in **Management of Technology**

Faculty of Technology, Policy and Management

by

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To be defended in public on April 15th 2020

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Preface

This thesis lying before you is the final product of 7 months of research and the culmination of 2 years following the master programme Management of Technology. This was not where I expected I would be when I started my bachelor Life Science & Technology more than 6.5 years ago, but I would not have wanted it any other way. I was born in Delft and lived here most of my life. My mother has worked at the TU Delft since before I was born, as have other people in my life. I have looked at those graduating from the university for all that time and wondered whether I could do the same. In particular, the idea of doing a master thesis has been an intimidating prospect even before I started my bachelor's. This makes it all the more special to me to have studied and finished this master thesis at the TU Delft.

I conducted my research as an intern at the MaaS-team at the Ministry of Infrastructure and Water Management. I want to extend my gratitude to Liselotte Bingen for supervising, supporting and advising me all these months. I also want to thank Eric Mink as well for the input and help during this research and his ever-present enthusiasm and vision for MaaS in the Netherlands. I truly enjoyed my time with them and all the other colleagues in the MaaS-team and I hope to see them again in the future.

I want to thank my academic supervisors Jan Anne, Laurens and Bert as well for the input and feedback on my thesis. I want to thank Jan Anne in particular for his incredible enthusiasm and support during this whole thesis. There were plenty of times I felt stuck or demotivated but every meeting with Jan Anne left me motivated and ready to give my 100% again. I could not have done it without you.

I want to thank my parents, John and Mary, and my sister, Kim, for their unrelenting support for whatever I do. I don't think I say this enough, but I would not be where I am today without their support in whichever way possible.

Finally, I want to thank Izma, Kay, Arjan and Ilin and all other people important to me not only for their support during my thesis and studies but, perhaps more importantly, the great times and experiences I've had with them before and during this thesis and undoubtedly in the future as well.

I write this preface on the 2nd of April 2020 and would be remiss if I did not mention I do so during the start (and hopefully not far from the end) of the COVID-19 pandemic. In all likelihood, I will hold my public defence over a video conference call and will not be able to return to the office before the end of my thesis. These are strange times. Although I'm slightly disappointed I will not be able to hold my defence at the faculty of TPM in front of friends and family, there are more important things in life. Most of all I am grateful my loved ones are still healthy. I am sure we will overcome this crisis and when we do, I look forward to seeing what that future may hold for me and everybody else.

Executive Summary

Mobility-as-a-Service (MaaS) is a new mobility concept that would allow users to plan, book and pay for a multimodal and seamless trip in a single application. Real-life examples of a MaaS-proposition are still scarce and most have not left a trial or pilot face.

Knowledge gap

The MaaS-team of the Ministry of Infrastructure and Water Management (IenW) wants to steer the development of the nascent MaaS market in the Netherlands. They want to avoid negative side-effects other new platforms such as Airbnb have brought with them and let MaaS be sustainable and contribute to a public value case. To this end, they have set up a framework agreement which provides boundary conditions and requirements to participating MaaS Service Providers (MSPs). In return, they provide coordination and bring stakeholders together to stimulate the development of the MaaS market. To experiment with different forms and contexts for MaaS they have set up 7 pilots with general and regional goals, for which the MaaS-team provides subsidies. The MaaS-team does not want these subsidies to be structural. There thus need to be viable business models for MaaS.

The MaaS-team wants to know more about MaaS business models and how sustainable these are. Literature and empirical information on these subjects are scarce. Previous research has brought forth ideas of what a (governance) model for MaaS could look like, but these are still early sketches and except for one are not specific to the Dutch context. Literature has found that MaaS propositions can have a sustainable impact, but there is little knowledge on how sustainable MaaS is on a business model level. The framework agreement and pilots offered a great opportunity to investigate MaaS business models and their strengths, weaknesses, and sustainability.

This has led to the following research question:

What are the strengths and weaknesses in the business models for MaaS Service Providers that are currently being developed in the Netherlands and how sustainable are they?

This main research question is answered by answering the following sub research question:

- *Which business models for MaaS have been identified in literature?*
- *What makes a MaaS business model sustainable?*
- *Which business model elements, and sustainability impacts and methods are being developed and considered for MaaS business models in the Dutch market*?
- *Which common business models exist in the Dutch MaaS market and how developed are they?*
- *How sustainable are the business models in use or under development by MSPs in the Netherlands*?

The first two sub research questions were answered by doing a literature review in chapter 3. Additionally, the definition of MaaS and background and context in which the MaaS business models would have to operate was reviewed.

Definition and background

Because of the active role of the MaaS-team, the definition of MaaS used by the MaaS-team was chosen for this research: the offer of multimodal, demand-driven mobility services, where customized travel options are presented with real-time information to customers through a digital platform. MaaS business models were found to operate in a market with large potential and could adhere to many different governance forms. The framework agreement restricts these possibilities as the MaaS-team the participants in the framework agreement are required to share data with a learning environment. Winners of the pilots are additionally required to implement 7 core functionalities: planning, booking, paying, travelling, personal traits and preferences, support and adaption. In return the MaaS-team supports and stimulates the development of the MaaS-ecosystem in the Netherland

Building a conceptual model

Through the literature review, a conceptual model was made that was used to further guide this research. The conceptual model covered 3 main fields. The first was the business model. This field contained several factors on the business model elements: target customer, value propositions (conceptual and concrete), revenue and pricing models, core functionalities and transport operators. These factors (together with other factors outside the scope of this research) form a MaaS proposition. MaaS business models were evaluated for how well developed the business model elements, i.e. if there is a concrete value proposition and revenue models coupled to a target customer, which of the 7 key functionalities defined by the MaaS-team they planned to implement and whether the implementation and dealings with transport operators were well thought out. The variety of business models in the market in general was evaluated as well.

The second field was sustainability efforts, containing two factors for analysis: sustainable methods, and contributors to sustainability.

The third field contained effected factors: sustainable impact, end-user travel behaviour and the ability to capture sustainable value. The MaaS-team is most interested in the potential sustainable impact MaaS can make. Just as important is the change in end-user travel behaviour, which includes whether a traveller chooses a sustainable travel option or not, and the ability to capture sustainable value that is made in a MaaS business model. For a business model to be truly sustainable it must be able to capture sustainable value it creates.

Literature on MaaS specifically has found business model elements and sustainability methods that were searched for specifically, next to new insights.

General strategies and expectations of MaaS by MSPs were investigated as well to determine the general standing of MSPs in the MaaS market. Questions regarding the stance and expectations of MSPs towards the government were asked to be able to compare these to the intentions and ambitions of the government.

Data gathering and coding

The third sub research question was investigated by data gathering and processing. Data was gathered by interviewing 13 employees from MSPs, of which 12 participated in the framework agreement. They were questioned in semi-structured interviews based on the conceptual model. To ensure the interviewees were comfortable sharing sensitive information about their business models, their names and company names have been kept anonymous.

The interviews were transcribed verbatim and processed through line-by-line coding using the qualitative data analysis software package Atlas.ti 8. In an iterative process, codes were attached to sections of text in the interviews. From these, code categories and sub-categories were made to identify themes in the interviews. These were cross-tabulated and visualised in tables in chapter 4. In this chapter, the results were further described and compared between MSPs.

Results

Most business model elements identified in the literature review were found in the results. Five target customers were found: consumers, employers, government, businesses with a product to bundle with mobility services and other MSPs. The number of necessary customers was often not clear or unknown. Estimates for consumers ranged from 50,000 to 100,000, for employers 2000 to 100,000 and for WMO groups around 2000.

The interviews yielded several concrete value propositions, such as a reduction in administrative load, and conceptual value propositions such as comfort, flexibility and speed.

A range of revenue models has been identified, some specific to value propositions such as charging for services that reduce administrative load, and general revenue models such as kickback fees and income on own wheels. The revenue model for selling data identified in the conceptual model was absent, but this was likely due to the requirement of the framework agreement to freely share the data among the participants.

It was further found that not all MSPs plan to implement all 7 core functionalities defined by The MaaS-team and that not all MSPs believe that the market for MaaS will become big.

Analysis and conclusion

In chapter 5 the results were synthesised in a single table and analysed to answer the fourth and fifth sub research question. In chapter 6 this analysis was reviewed again, and all research questions were answered.

Business models

The following dominant business models per target customer group were found, with at their core the offering of a MaaS app offering integrated travel options accessible through the app:

- **Employer:** Administrative and control services
- **Consumers:** Kickback fees
- **Government:** WMO-optimization and government projects
- **MSP**: Sales of white label services
- **Businesses:** Bundling mobility with customer products

Although the MaaS-team expected there to be a business case for consumers, it was found that the business model towards consumers is very weak. There are no specific value propositions; there is no problem these business models seem to solve. Additionally, there is no direct revenue model for consumers. Consumers are not expected to be willing to pay service fees on top of their transportation expenses. These business models almost entirely rely on kickback fees and/or own wheels. A revenue model based on advertisements was absent, which may be because value propositions are not enticing enough to put up with advertisements.

Business models for employers are stronger. They solve a problem that employers have: high expenses on mobility and difficulties in reaching CO_2 targets. However, they are less novel. Many rely on existing mobility card, while the MaaS-team would like to remove these cards from the MaaS-propositions altogether.

Business models aimed at the government mainly promise to optimise the WMO-market, which is what the MaaS-team expected and intended for these business model to do. It is not yet clear how they would achieve this. If MSPs manage to optimize the WMO-market, their business model is a strong one.

The business models towards businesses and other MSPs may not be central to the MaaS-team's vision on MaaS, but they seem to be strong business models. The business model towards businesses already has existing examples, like the bundling of NS ticket with admission ticket or hotel stays. The business models towards other MSPs are also offered already among the MSPs of the framework agreement and may prove to be important in the proliferation of diverse MaaS business models. Being able to buy a white label MaaS platform allows smaller players to set up a MaaS-proposition without heavy investments in developing a proprietary platform.

Nearly all business models rely to some extent on kickback fees. This may prove to be problematic. It is not certain whether MSPs can convince transport operator to pay kickback fees. They do not offer MSPs anything beyond more customers. It is not always certain whether they can do this, whether transport operators believe they can do this or whether transport operators consider this enough of a value proposition. Additionally, kickback fees may prevent neutral travel advice.

Finally, they could give an unfair amount of power over their transport operators if a monopolist MSP arises, similar to what is happening now with Takeaway.com.

Income on own wheels is also mentioned by many MSPs but the MaaS-team would like MaaS business models to be able to stand on their own. If a MaaS business model can only survive with income on own wheels, this would disproportionately benefit bigger players in the MaaS-market. On the other hand, it could support the MaaS business model in the early stages and reduce the need for subsidies

Sustainability

The MaaS-team expects that MaaS will contribute to sustainable goals. While the MaaS-team cannot expect MaaS business models to have enough of a sustainable impact without government intervention, they will nonetheless make an impact. Many MSPs have mechanisms in their business model to both create and capture sustainable value, making them sustainable. Most MSPs are socially sustainable and a considerable amount of MSPs are ecologically sustainable. Ecological sustainability comes forth mostly out of the use of electric vehicles, while social sustainability comes forth mostly out of making mobility more accessible through the MaaS-propositions. Creating new sustainable value and capturing it is a win-win for the MSPs and the government. The MSPs capture new sources of value and the government can spend less resources on enabling the MSPs to create and capture the sustainable value. There is a caveat: especially in the case of ecological sustainability, MSPs consider themselves to be more sustainable than they are, which may inhibit their development of a sustainable business model.

Some MSPs cannot be considered sustainable according to the criterium used in this research, but have methods to help make a sustainable impact, nonetheless. Examples are tools to help steer travel behaviour or the inclusion of CO_2 emission information per travel option in the app. These methods do need an input from another actor, e.g. an employer that sets sustainability targets which they pay for.

Finally, MSPs have indicated that the MaaS-team steers the market too much as it is, but at the same time expect them to stimulate MaaS with policies and regulations and protect the level playing field in the MaaS market.

Revision of the conceptual model

The conceptual model has been revised with the findings of this research. This research has found that the target customer is central to specific MaaS business models and that all the separate business model elements influence each other and cannot be viewed in isolation. The model has been adapted to better reflect this.

This research has also found that government policy and the use of steering tools provided by the MaaS proposition are expected to have a large effect on the development of the MaaS proposition and their influence on how the MaaS proposition has an impact on end-user travel behaviour, its ability to capture sustainable value and the sustainable impact. These two factors have been added to the model and it has been visualised how these factors fit in this model.

Additionally, it was found to complicate proper research into the sustainability of MaaS business models by considering sustainable methods as separate factors outside of the traditional business model elements. Sustainable methods have been removed as a separate factor in the conceptual model and it is instead advised to judge the business model elements for how sustainable they are. In practice, the best measure for how sustainable a business model is, is to determine whether it can capture the sustainable value it creates and this stems from the business model, not separate methods for sustainability.

Finally, to better reflect all these adaptions the field for sustainability efforts was removed, and a field with external inputs was added containing government policy, the use of control tools by customers and external contributors to sustainability.

Policy recommendations and managerial implications

With these findings, policy recommendations and managerial implications were given. The policy recommendations are:

- Stimulate the use of MaaS by consumers, mainly through fiscal benefits.
- Accept the current MaaS-propositions towards employers.
- Experiment with MaaS-propositions for students.
- Provide clarity and regulations to MSPs and be willing to make concessions.
- Focus on the business and MSP business model as well.

Managerial implications were identified as follows:

- Specialize in smaller groups of consumers.
- Develop your value proposition to the transport operators.
- Reach consumers through employers.
- Explore the profitability of sustainability.

Implications for literature

While most value propositions, target customers and revenue model proposed in the literature were found among the MSPs, the advertising and sale of data revenue models were missing. Conversely, among the MSPs, the offering of administrative and control services as well as the use of multiple revenues revenue models was widespread, which was not present in much literature. Additionally, a disconnect between perceived sustainability and actual sustainability was found among MSPs, something not indicated yet by literature. The theorized inclusion of nudging and gamification proposed by much literature was not found to be widely present among MSPs as a way to be more sustainable.

A variety of the much-discussed bundle model for MaaS propositions was found: a guarantee to get from A to B without the guarantee of a specific modality. This would allow the MSP to offer cheaper and more sustainable transport options with their MaaS app, thus circumventing some of the downsides of this revenue model. Literature on the sustainability of MaaS could be enriched by this finding.

Finally, it was found that literature on MaaS business models sometimes analyses MaaS business model elements in isolation and gives blanket statements on MaaS with this. Instead, it was found that these elements are too reliant on each other to consider in isolation and a single solution for MaaS is unlikely.

Generalizing results

Generally, findings are likely to translate to other contexts and markets. The conceptual model was made with international literature, mostly not specific to the Dutch context. Yet many of the identified business model elements and findings on sustainability were found in this research. The ambition of MSPs to go international with their business models is another indication that they at least themselves believe that their business models can translate to other markets. How strong or weak they are is partially reliant on the local context due to differences in culture, needs and wants by local customers and differences in legislation. Findings on sustainability are expected to be generalizable, although the use of electric vehicles for ecological sustainability depends a lot on the infrastructure for and spread of electric vehicles in the market the MSP operates in. Limited access to electric vehicles could hurt the ecological sustainability of MSPs considerably.

In the final chapter limitations of this research are discussed and avenues for future research are proposed.

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1. Introduction

Companies like Airbnb, Takeaway.com and Booking.com bring two or more sides to a market, be it physical goods, car rides, accommodation or food delivery together by making it easier, cheaper and generally more convenient to buy services or products through them instead of straight from the supplier. The mobility market may soon join their ranks through a new concept, with which travellers can plan, book and pay for a multimodal trip in one application: Mobility as a Service, or MaaS in short.

1.1. Mobility as a Service

Being a relatively new concept, there is still confusion as to what MaaS exactly is, and a universal definition of MaaS has not yet been adopted. The popularity and first introduction and spread of the term MaaS can be attributed to Sampo Hietanen, CEO of MaaS Global, who proposed the often-cited definition of MaaS as ”a mobility distribution model in which a customer’s major transportation needs are met over one interface and are offered by a service provider” (Hietanen, 2014, p. 2).

Generally agreed upon core concepts are customer’s need-based, service bundling, cooperativity and interconnectivity (Jittrapirom et al., 2017). Key services include payment, ticketing, bundles/mobility packages, information and related services (Kamargianni, Li, Matyas, & Schäfer, 2016; Kennisinstituut voor Mobiliteitsbeleid, 2018b; Sochor, Arby, Karlsson, & Sarasini, 2018). A MaaS offering enables the traveller to plan, book, pay and travel with only the MaaS-app.

The MaaS-team at the Dutch Ministry of Infrastructure and Water Management (IenW), wary of negative side effects similar to those brought on by AirBnB or other new platform providers, want to play an active role in steering the nascent market for MaaS in the Netherlands. They not only want to make MaaS a success and avoid negative side effects, but they intend to let MaaS contribute to sustainable goals. To this end, they have set up a framework agreement which provides boundary conditions and requirements for its participants, and through which the development of MaaS in the Netherlands is coordinated. Additionally, they have set up pilots that the participants of this agreement can compete for. These participants will have to meet general and regional goals and requirements. They will receive subsidies when these goals are met.

1.2. Gap in the literature

The MaaS-team does not intend for these subsidies to be structural. The MaaS Service Providers (MSPs) that develop a MaaS-proposition need to develop a working business model. Previous research has brought forth ideas of what a (governance) model for MaaS could look like, but these are still early sketches and except for one are not specific to the Dutch context (Aapaoja, Eckhardt, & Nykänen, 2017; EMTA - European Metropolitan Transport, 2019; Kamargianni & Matyas, 2017; MuConsult, 2017).

To know whether viable business models are being developed in the Dutch market, it is necessary to determine how weak or strong the business models currently in development are. Additionally, knowing how many different business models are being developed could indicate whether many business models are possible and necessary, or a single overarching business model can be expected. A full description of enough business models to create a good picture of the Dutch market was not deemed feasible in the time available for this research. Instead, the key business model elements ‘target customer’, ‘revenue and pricing model’ and ‘value proposition’ were investigated. Additionally, the role of transport operators, a key component in a MaaS proposition, and 7 key functionalities determined by the MaaS-team have been included in the investigation of the business model

Additionally, there is little knowledge on how sustainable MaaS business models are. Research by CIVITAS (2016) and König et al. (2016) describes the potential of MaaS for strategic goals including potential environmental, sustainability, accessibility and urban traffic managing. The MaaS-team shares these expectations and wants MaaS to contribute to the public value case; in other words, to have a sustainable impact.

Sustainability can be divided in three major types: economic, ecological and social sustainability. Economic sustainability refers to the ability for a business model to be economically healthy in the long term. The ecological sustainability of a business model refers to what degree a business model not only avoids damaging the environment, for example through the generation of waste or harmful emissions, but to what degree it could even have a net positive effect on the environment. The social sustainability of a business model refers to how it contributes to society in a social sense. This includes stimulating equality, providing better access to mobility or development of the local community (Stubbs & Cocklin, 2008). By investigating whether these business models are sustainable, especially ecologically and socially, it can be determined whether MaaS business models in the Dutch market can be expected to contribute to sustainable goals.

On a business model level, research on MaaS and its sustainability is still lacking and what exists is mostly conceptual. A more in-depth literature review on these topics is presented in the chapter on building the conceptual model used in this research.

The MaaS-team wants to know more about potential business models for MaaS in the Netherlands and how these can contribute to sustainable goals. Not all potential MSPs are open about their intended business models and working examples are scarce. The framework agreement and pilots that the MaaS-team have set up have provided a great opportunity to investigate them empirically as they are being developed.

1.3. Aim and research question

Knowledge on the strengths, weaknesses and sustainability of MaaS business models is necessary for public and private actors to make fully informed business and policy decisions. What's more, mobility experts, public policymakers and commercial stakeholders have voiced the concern that there does not yet exist a proven business model (Smit, 2019). However, the parties that will carry out the pilots must have an idea for a business model or see potential to make money or they would likely not try to apply for the pilots. The problem then might not be the lack of appropriate business models and their sustainability, but the lack of knowledge of the different business models that are being developed or already being used in the Dutch context.

This research aims to contribute to the knowledge on MaaS business models, in particular their target customers, value proposition, revenue models and sustainability. Additionally, this research aims to compare the government's ambitions to the business models and intentions of MSPs in the framework agreement. In this way, additional tools can be given to both commercial MSPs and public policymakers to judge MSP business models and to make effective business or policy decisions. This could move MaaS beyond a business case and to a public value case were sustainable goals are pursued. While this research is conducted in a Dutch context, the goal is to generalise the findings to a broader setting in the analysis. This leads to the following research question:

What are the strengths and weaknesses in the business models for MaaS Service Providers that are currently being developed in the Netherlands and how sustainable are they?

To answer the main research question, the following sub research questions had to be answered.
First, the current state of the literature was investigated to guide the further investigation, provide background and answer the following sub research questions:

- *Which business models for MaaS have been identified in literature?*
  First literature on business models and business model for MaaS was reviewed to determine whether business models for MaaS have already been conceptualized.

- *What makes a MaaS business model sustainable?*
  Both general literature on the sustainability of business models and literature specifically on the sustainability of MaaS was researched.

The answers to these first two research questions were used to make a conceptual model through which the next sub research questions were investigated.

- *Which business model elements, and sustainability impacts and methods are being developed and considered for MaaS business models in the Dutch market*?
  The next step was to determine what business model elements in the framework agreement are being developed and how MSPs intend to have a sustainable impact. This is investigated through semi-structured interviews, for which the questions have been made with the conceptual model. Expectations of the government and MSP strategies that might influence the business model development were investigated as well to be able to consider these in eventual recommendations.

The answers to these research questions were used as input for the next two sub research questions.

- *Which common business models exist in the Dutch MaaS market and how developed are they?*
  Results from the interviews were used to identify common business models. Investigating how varied and how far developed ideas for business models indicates how likely it is there is a viable business model.

- *How sustainable are the business models in use or under development by MSPs in the Netherlands*?
  Using the conceptual model, the business models used or under development by MSPs in the framework agreement are evaluated for their sustainability to see how they can contribute to not only a business case but to a public value case.

The findings of this research are generalised to make statements on the MaaS market in general. The outcomes are used, together with findings on government expectations and MSP strategies, to provide policy recommendations and management-implications.

1.4. Structure of this research

In chapter 2 first the methodology of this research is presented. In chapter 3, a literature review is done first to properly define MaaS, present the stance of the MaaS-team on MaaS, provide an outline of current research on MaaS and give background. Literature specific on business models and sustainability is then reviewed, after which the conceptual model is presented. In chapter 4 the results of the interviews are presented. In chapter 5 the results are synthesised, analysed and discusses. In chapter 6 the research questions are answered, the conceptual model is reviewed, limitations are discussed, results are generalized, and future research is presented. Policy recommendations are made to the MaaS-team and managerial implications are given for MSPs.

2. Methodology

In this chapter, the methodology for this research is presented. First, the methodology for the literature research is briefly outlined. After that, the methods for gathering and analysing data are presented.

2.1. Literature review

To create the model through which MaaS business models and their sustainability have been investigated, a literature review was carried out.

Literature and news articles have been found through Google, Google Scholar and Scopus. The main keywords used were:

- Mobility-as-a-Service (including 'MaaS' and 'Mobility as a Service')
- Smart mobility
- Business model (in combination with 'Mobility-as-a-Service', 'ontology' and 'definition'
- Sustainable business models
- Sustainable MaaS business models

Additionally, literature and relevant (non-public) documentation has been shared by colleagues at the MaaS-team of the Ministry of Infrastructure and Water Management.

First, often cited literature on MaaS, in general, was used to introduce MaaS and provide context on the wider ecosystem and the framework agreement the investigated MaaS business models operate in. After this, literature was narrowed down to literature especially on business models and sustainability of MaaS. Since literature was scarce on this topic, the general literature on business models and sustainable business models was reviewed first to provide extra tools to build a model. Documentation from the MaaS-team and IenW was used to evaluate the stance of the MaaS-team and the Dutch government.

Due to the fast pace news and literature was published throughout this research, the literature research and the created model was kept up to date by including newly published articles and literature when relevant.

Through the literature, a conceptual model was constructed, and the first two sub research questions were answered:

- *Which business models for MaaS have been identified in literature?*
- *What makes a MaaS business model sustainable?*

2.2. Data gathering

Due to the explorative nature of this research, this research took a qualitative approach. Little research has been done on business models and their sustainability for MaaS that could inspire more specific interview questions or a questionnaire. Additionally, there was only a low number of potential participants. This precluded meaningful quantitative research at the time of this research.

A questionnaire spread through the MaaS-team could have reached all MSPs quickly. However, because the goal was to create an as complete overview as possible and due to the risk on a low response rate to surveys, it was deemed better to contact the businesses or other experts personally for information (Research Methodology, n.d.). Additionally, the MaaS-team estimated the amount of businesses or groups of businesses within the ROK that could offer a complete MaaS offering to be between 10 and 20. This rendered the advantage of being able to reach a lot of respondents with a questionnaire moot. Because of this, it was deemed more useful to approach them one by one and interview a sizable share of them.

2.2.1. Semi-structured interviews

Semi-structured interviews have been chosen as the main data gathering method. The main advantages of semi-structured interviews are that the essential (broad) questions are asked and that it ensures comparability between the different interviews, namely the factors that are specified in the conceptual model created in the literature review. At the same time, it allows for relevant deviations from the main line of questioning (Cohen & Crabtree, 2006). The participants for the semi-structured interviews have been approached and the interviews have been set up broadly following the guidelines set out by Adams (2015), which is described in the following paragraphs.

2.2.2. Selection and approach of participants

The interviewees have been selected among participants in the framework agreement on a basis of availability. Most participants were first approached with a first and second email. The email explained the goal of the research and asked if the MSP was willing to participate by giving an interview. The person was asked if they were willing to participate, whether it was allowed to audio record the interview and was explained that recordings and transcripts would not be shared in any case except with the direct academic supervisor. When there was no response through email, participants were called. Explanations on the interview and confidentiality were repeated at the start of the actual interview.

Although not ideal due to a risk of availability bias, the low number of potential participants did not allow for a better way of selection. The goal for the number of interviews was 15 but was subject to the availability of participants. During the analysis stage of this research, the degree of saturation of information was monitored to determine whether more interviews were needed.

2.2.3. Interview guide

The conceptual model that was constructed through the literature review was used to make the questions for the interview guide. Additionally, colleagues, other students and academic supervisors were consulted to supplement these questions. The interview guide has been tested with colleagues to ensure the interview would stay within the set amount of time and important questions have been prioritized to ensure the essential topics were covered. The interview guide has gone through several iterations as well after the first interviews to prioritize the most important questions and avoid going over the time limit.

In the first few minutes, time was reserved to exchange pleasantries and to ask questions about the interviewees to break the ice. The first questions were broad, non-threatening questions, letting the interviewee take their time to form an answer. Harsher and more critical questions were asked later in the interview when some rapport was established. To avoid only getting pre-screened or socially desirable answers, the interview guide has not been sent to the participants ahead of the interview. Instead, they were informed of the broad topics the interview would be about. Although this research is reported in English, all interviews were done in Dutch to avoid losing information in this stage of the data collection. Both the original interview guide in Dutch and an English translation are included in appendix A.

2.2.4. Interview setup

The interviews were carried out under similar conditions where possible: in person, for 1 hour and in the office of the respective MSP. 1 hour is considered reasonable to avoid fatigue for both interviewer and interviewee. If requested by the interviewee these conditions could be changed. Some interviews took place in different places, over the phone or were shorter than other interviews. All interviewees spoke Dutch as their main language. A neutral stance and tone were adopted in the interview to not insert the own opinions of the interviewer into the interview. Only when the interviewee asked for an opinion in return an opinion was given, making clear that these were personal views and that in the role of researcher the interviewer had no opinion.

2.2.5. Transcription

The interviews were transcribed verbatim from the audio recordings made during the interview, except filler words such as ‘eh’ or ‘um’. To have an optimal focus on the interview no notes were taken during the interview. The interviews were transcribed the same day if possible and never later than one week after the interview. No special software was used for the transcribing process.

The names and companies of the interviewees were and will not be disclosed. Instead, when speaking about a specific company a code was used. The identities associated with these codes are known only by the researcher and the academic supervisors judging this research. The drawback is that this means certain results may seem vaguer than they could have been if they were compared to the types of companies or discussed more in-depth in combination with other sources. This was a conscious trade-off to ensure the interviewees would feel comfortable disclosing sensitive information.

2.3. Coding

The general guidelines set up by Saldana (2009) have been used to guide the process of coding. The transcripts have been imported into Atlas.ti 8, a qualitative data analysis software package which was used for the whole process of coding. First, illegible grammar and sentence structures in the transcripts have been carefully corrected to increase legibility without losing information. In this process, the whole transcript was read line by line which refreshed the memory of exactly what was said in the interview.

2.3.1. Coding process

The coding process was started by reading the transcripts line by line and assigning open codes to every bit of information, called quotes, that seemed useful; so-called line-by-line coding. The codes were made in Dutch to expedite the process and to avoid losing information by incorrect or suboptimal coupling of codes to a quote. The conceptual model created in the literature review was used as a lens to determine which information was most salient and terms from the literature were used where possible. However, as other seemingly useful data came up that was not identified in the literature, these were coded as well with detailed codes. In this first iteration, no attempt was made yet to group the codes into categories and the codes were highly detailed. The first iteration yielded 900 unique codes.

In the second iteration, the codes were first ordered into categories, such as ‘government’, ‘value proposition’ or ‘target customer’ using the coding group function in Atlas.ti. Additionally, the codes were renamed to include the abbreviated name of the category at the beginning of the code, e.g. ‘vp: comfort’. These categories had a more manageable number of codes than the whole. Within these categories overlapping codes mere merged. Codes irrelevant to the research question were moved to a ‘discard’ category where they could be retrieved if in a later stage they still proved useful. Within categories with a large number of codes and clear divisions between codes, subcategories were made.

This process was repeated until there were no more codes without a category or categories with only 2 or 3 codes in them. This process continued during the analysis of the results. Codes sometimes proved to be more suited in a different category, needed to be split or merged, or had to be renamed to more accurately described the quotes the codes were attached to. Finally, the definitive categories of codes emerged. The final amount of unique codes was reduced to 200.

To increase the rigour of the results, a codebook with coding rules is often made and given to another researcher to use to code the interviews a second time. This ensures the rules of coding the researcher constructed are applied correctly and objectively. Due to time constraints, this step is skipped. Through multiple iterations and continuous careful coding, the interviews are analysed as rigorously as possible.

2.3.2. Cross-tabulation of codes

The documents, each corresponding to a certain MSP, were then cross-tabulated with the code categories. Atlas.ti offers the possibility to see how 'grounded' a code is, per document and in total. The term grounded corresponds to the number of times a code has been attributed to a quote. In theory, this can be an indication of how important and relevant this code is. However, it will only be considered whether a code has been attributed to an MSP at all, as opposed to how often.

This was done because the interviewees veered off-topic often, and an extensive number of topics has been covered in the interviews, leading to time constraints. Because of this, if an interviewee has made less mention of a topic than others, this could not necessarily be considered to be an indication of them considering it less important than another interviewee. Reasons may vary: the topic was mentioned at the end of the interview and time ran out, the interviewer tried to move the interview along to further topics or the interviewee got side-tracked.

The crosstables were then exported to excel and directly translated to English. These tables can be found in appendix B. The codes that were eventually displayed in the results chapter have been rewritten to be more legible.

Through coding the raw data gathered through the semi-structured interviews the third research question was answered:

- *Which business model elements, and sustainability impacts and methods are being developed and considered for MaaS business models in the Dutch market*?

2.4. Analysis

The categories and overarching themes found through open coding were used to come to an answer to the research question. These results were analysed through the lens of the constructed conceptual model. The results were synthesised into combined tables where possible to assist the analysis and presentation of the results. Additionally, to make policy recommendations the stance of the MaaS-team was compared to the results and findings in the analysis.

Through this analysis with the conceptual model, using the information gathered through semi-structured interviews and coding, the fourth and fifth sub-research questions were answered:

- *Which common business models exist in the Dutch MaaS market and how developed are they?*
- *How sustainable are the business models in use or under development by MSPs in the Netherlands*?

Together the answers to the sub research questions answered the main research questions. The outcomes of this research were then used to provide policy recommendations and management-implications.

3. Building a conceptual model

In this chapter, a review of the current literature is presented on business models, sustainable business models and literature on those topics specific to MaaS. This literature review served to create a conceptual model through which business models for MaaS in the Netherlands was investigated. This was in turn used to construct the interview guide and to analyse the results. The following sub research questions were answered in the process:

- *Which business models for MaaS have been identified in literature?*

and

- *What makes a MaaS business model sustainable?*

To provide a background to this, the literature on the definition of MaaS was reviewed. Information on the stance of the MaaS-team on MaaS, and the framework agreement and pilots are reviewed as well.

To provide background and make clear what MaaS is, literature on the definition of MaaS is first reviewed.

3.1. The definition of MaaS

In the introduction, it was already mentioned that the first definition and spread of the term MaaS can be attributed to Sampo Hietanen (2014, p. 2), who defined it as "a mobility distribution model in which a customer's major transportation needs are met over one interface and are offered by a service provider".

3.1.1. Core concepts

Jittrapirom et al., have made a review of literature of MaaS, and stated that the definition of Hietanen introduces some of the core concepts: customer's need-based, service bundling, cooperativity and interconnectivity (Jittrapirom et al., 2017). Sochor et al. (2018), have reviewed literature in their research to develop a MaaS topology and agree that MaaS is generally about these core-concepts and expand on them. According to them, MaaS is about offering a customer-centric transport service, offering (multimodal) mobility rather than transport, and offering integration of all travel-related services. Which services are to be integrated have an impact on the development of the MaaS-proposition.

Sochor names as examples for services: payment, ticketing, bundles/mobility packages, information and related services. These services are named as well in a literature review by Kamargianni et al. (2016) and are used in a literature review by the Netherlands Institute for Transport Policy Analysis (Kennisinstituut Mobiliteitsbeleid – KiM) (2018), indicating consensus to some extent of what services should be integrated in a MaaS offering.

Beyond these core concepts and services, there is less consensus on what MaaS is. Sochor et al. (2018) argue that MaaS is a radical innovation and that it at this point is undesirable to define MaaS in too rigid terms. Researchers and stakeholders place varied emphases and importance on what a MaaS offer is, how the core concepts translate to specific MaaS offering characteristics and what goals and opportunities these offerings have.

Some scholars place the technical aspect of MaaS and Mobility central in their definition. They emphasize the need to integrate different data and information streams to identify user needs and place the ICT systems central to MaaS and the general ability to transport persons through different means (Nemtanu, Schlingsiepen, Buretea, & Iordache, 2016).

Another group of scholars focusses on the use of MaaS for strategic goals including potential environmental, sustainability, accessibility benefits and the use of MaaS for urban traffic management. MaaS could help the spread of electric vehicles, reduce the use of private vehicles and in general be used to steer travellers towards more sustainable mobility choices. Additionally, it could help make mobility more equally accessible to different groups in society, including low-income households (CIVITAS, 2016; König et al., 2016; Sarasini, Sochor, & Arby, 2017).

Yet other scholars emphasize a shift from ownership to making use of mobility services, which could result in a more efficient use of modalities (Kamargianni et al., 2015).

These varied emphases underscore that the definition and goals of MaaS are indeed still fluid and depend on the priorities and goals of the stakeholders involved in the research. These in term influence on how MaaS is defined and are all contributions to the greater field of MaaS and help defining Maas. However, to do meaningful research and provide context to the results and conclusions, it is necessary to decide on core concepts and selection criteria for MaaS offerings. Scholars and consultants have begun to look at so-called levels of MaaS to make distinctions between what is called MaaS in the current field.

3.1.2. Levels of MaaS

There have been many earlier models for classifying levels of integration for mobility solutions (Hull, 2005; NEA and Partners, 2003; Preston, 2010). Kamargianni et al. (2015) have made a first classification specifically for MaaS, which categorized MaaS projects into basic integration, advanced integration or advanced integration with tailored mobility packages. However, this is only a basic model. Basic integration refers only to awarded discounts when modalities are combined and advanced integration can refer to any inclusion of ticketing, payment, ICT and/or institutional integration, with no further differentiation.

Other research has proposed topologies with different focusses (Lyons, Hammond, & Mackay, 2019; MuConsult, 2017; Traffic Technology International, 2018). Sochor et al. (2018) integrated these approaches. They developed a typology of five levels, ranging from 0 to 4 (see Figure 1). From level 0 to level 3 the MaaS offering features an increased level of integration of services. What separates this topology from the rest is the inclusion of the integration of societal goals in level 4 (Sochor, Arby, Karlsson, & Sarasini, 2018). An overview is shown in Figure 1, with examples of MaaS offerings that have reached these levels at the time of that research.

Figure 1: Topology of MaaS including Levels 0–4 (left) and examples (right) according to Sochor et al. (2018).

KiM, a research institute researching and advising on mobility in the Netherlands, has proposed to use the typology from Sochor et al. and to only treat offerings with a minimum level of 2 as MaaS (Kennisinstituut voor Mobiliteitsbeleid, 2018b).

3.1.3. Definition according to IenW

The MaaS-team defines MaaS as "the offer of multimodal, demand-driven mobility services, where customized travel options are presented with real-time information to customers through a digital platform" (Kennisinstituut voor Mobiliteitsbeleid, 2018b, p. 7). A MaaS offering would enable the traveller to plan, book, pay and travel with only the MaaS application. A MaaS Service Provider (MSP) would develop an app for the traveller which presents customized, multimodal travel options, drawing from all connected travel modalities, enable all necessary actions to complete this travel and offer real-time information, adaption and assistance. A MaaS app could include public transportation, share bikes, share cars and taxi rides, but could also include peer-to-peer shared vehicles in the planning. Existing modalities could be used more efficiently and be more accessible, new modalities could be developed, and a part of the current private car owners may opt to do away with their second or first car (ABN-AMRO, 2019). The MaaS-team has found that an MSP usually consists of multiple companies in a conglomerate or other form of cooperation; a single company is not expected to be able to provide all functionalities.

The MaaS-team (2018) has gone one to define seven core functionalities that an MSP must implement to be considered a full MaaS-offering:

- Planning
- Booking
- Payment
- Travelling
- Personal traits and preferences
- Support
- Adaption

These functionalities mostly correspond to a MaaS level 2. Absent from the definition of MaaS by the MaaS-team is the mobility bundle. This approach differs from most literature. the MaaS-team wants to leave freedom for experimenting with other revenue models than bundles. It is important to clarify that a higher level of MaaS does not necessarily mean 'more MaaS'. For example, bundling and subscription is not considered essential to MaaS by the MaaS-team, but just another way of ticketing. Additionally, MaaS can be level 4 without satisfying the criteria for a lower level.

This research focusses on MaaS in the Netherlands and is carried out in part for the MaaS-team. The MaaS-team, which is advised by KiM, has based itself on literature as well and includes most core elements of MaaS defined by literature. Due to their active stance, their definition is expected to not only describe but prescribe the development of MaaS in the Netherlands to some extent. It is thus considered to be the most useful definition for MaaS to adhere to.

3.1.4. Summary

Several definitions and approaches to the investigation and description of MaaS have been described. This research has decided to use the definition of MaaS as proposed by the MaaS-team: "the offer of multimodal, demand-driven mobility services, where customized travel options are presented with real-time information to customers through a digital platform" (Kennisinstituut voor Mobiliteitsbeleid, 2018b, p. 7). Maas could be used to further societal goals, which would respond to a MaaS level of 4 and is the goal of the MaaS-team. The 7 core functionalities of planning, booking, paying, travelling, personal traits and preferences, support and adaption are considered central to MaaS by the MaaS-team, but was not necessarily used to judge whether a MaaS proposition is complete.

3.2. Background

First, it is useful to give some background, describe the MaaS ecosystem and to specify which part is investigated in this research.

3.2.1. Mobility and its challenges in the Netherlands

The quality of public infrastructure in the Netherlands is high: it is ranked fourth most competitive in the 2014-2015 Global Competitiveness Report (World Economic Forum, 2014). This contributes to both high mobility and accessibility.

However, the infrastructure is running into the limits of its capacity and accessibility is at risk of declining. On the public roads, the amount of travelled kilometres by car is increasing (Kennisinstituut voor Mobiliteitsbeleid, 2018a) and traffic jams are estimated to have cost society up to 3.7 billion euros in 2016 alone (Kennisinstituut voor Mobiliteitsbeleid, 2017). Additionally, the largest train operator in the Netherlands, Dutch Railways (Nederlandse Spoorwegen - NS), reports record numbers of travellers, and estimates that the rail network reaches maximum capacity sometime between 2025 and 2027 (Ammelrooy, 2019). Increasing the capacity of infrastructure is costly, takes time and is not always physically possible (NOS, 2018). In rural areas decreasing ridership poses challenges to the continuation of public transportation (MuConsult, 2017).

Maintaining accessibility is not the only challenge. Environmental and societal effects of mobility are increasingly taken into consideration as well. The Netherlands has to reduce its CO_2 emissions according to binding treaties and court orders. The 8.2 million cars on Dutch roads in 2017 alone accounted for 16% of CO_2 emissions in the Netherlands (Centraal Bureau voor de Statistiek, n.d., 2018). Additionally, the Netherlands is a densely populated country and increasingly sparse public space is taken up by cars that sit idle 95% of the time (ABN-AMRO, 2019).

To use the existing infrastructure more efficiently and sustainably, technological and policy solutions are being developed, such as electric or automated cars, more efficient train planning, shared mobility or spread of commute related travel (Geels, 2019; NOS, 2019; Rohmensen, 2019). This includes MaaS.

3.2.2. The goals of the MaaS-team

The MaaS-team has taken an active stance in the development and introduction of MaaS in the Netherlands. The MaaS-team sees Maas as “the next step in switching from an infrastructure-centric to a data- and information-centric policy, where the traveller is put central. This will lead to more convenience for the user and more opportunities for smarter and sustainable mobility solutions. The mobility solutions enable more efficient differentiation in time, place and modality and a more efficient use of the current infrastructure.” (Nieuwenhuizen Wijbenga & Veldhoven - Van der Meer, 2019, p. 1). The Netherlands aims for a public-private development for MaaS (Nieuwenhuizen Wijbenga & Veldhoven - Van der Meer, 2019).

IenW wants to look at value that goes beyond profit. IenW thinks that MaaS could be used to reach social and environmental goals (Nieuwenhuizen Wijbenga & Veldhoven - Van der Meer, 2019). They would like more tools at their disposal to identify viable and sustainable MaaS offerings and to inform their policy decisions. The Dutch state has experienced the negative side-effects of platforms such as Uber and Airbnb and is determined to mitigate these negative effects. A better understanding of MaaS business models and which have the potential to contribute to sustainability can help in doing this. Additionally, MaaS touches on other important policy decisions concerning mobility. Concessions with transport providers need to be made suitable for Maas. Decisions will have to be made on how flexible the concessions need to be and what MSPs need to make MaaS thrive, without giving them free rein.

To gain further insight into the ecosystem of MaaS in the Netherlands, the MaaS-team wants to know more about potential business models for MaaS in the Netherlands.

3.2.1. MaaS Ecosystem and Roles

The ecosystem and network of businesses a MaaS business model will have to function in have been much researched in recent years. While investigating the governance and organizational structure of MaaS Service Providers is outside the scope of this research, it is valuable to understand the possible configurations and surrounding ecosystem of an MSP.

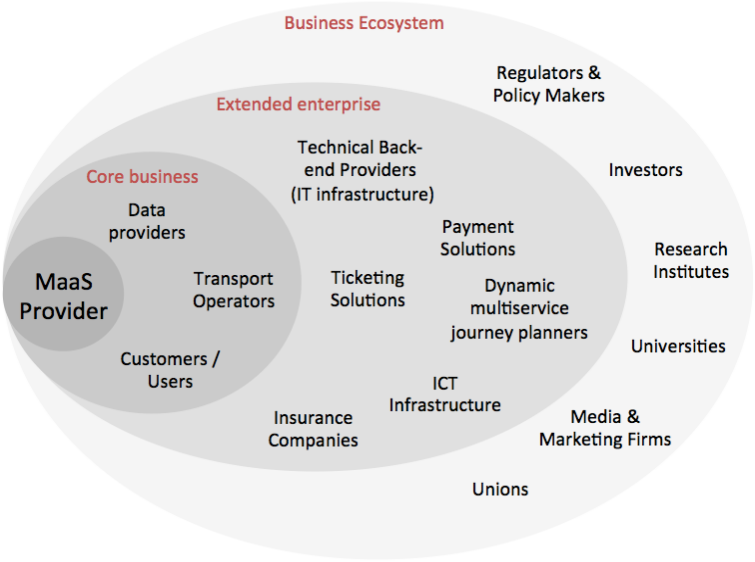

Figure 2: The Mobility-as-a-Service Ecosystem as proposed by Kamargianni and Matyas (2017).

Kamargianni and Matyas (2017) have made an early sketch of which stakeholders an MSP will deal with. An overview is shown in Figure 2. The focal company is the MSP which, in increasingly large layers that are further from the core business, has to deal with stakeholders. MuConsult has made a similar ecosystem (MuConsult, 2017). This research will focus on the core business in addition to the role of regulators and policymakers.

Aapaoja and Eckhardt have gone into more detail and identified five of what they call 'business models', through interviews of stakeholders in existing MaaS pilots and experts in Finland: The Reseller, Integrator, Public transport operator (PTO) as MSP, Public-private partnership (PPP) and Public-private-people partnership (PPPP). Although they have called these business models, they should rather be considered as governance or organizational models. An overview is provided in Figure 3.

The Reseller would simply provide the service of several transport service providers (TSPs) via one interface while the integrator would add extra features such as ticketing and payment. Both these models are fully commercial. The PTO as MSP would be similar to the integrator model, but the PTO would be the integrator. This model is fully public. The PPP model would be comparable to the integrator model but include a logistics service provider and may include subsidized transportation as well. The PPPP model is the most elaborate and complicated. It evolves combining traditional TSPs with all forms of other private transportation and services. Both these models are public-private. They also identified revenue models, such as commissions, sales of extra services or advertisements (Aapaoja et al., 2017). These conceptual models can provide stakeholders with a tool to think about the model they want MaaS to operate in their respective area or market. However, the authors note themselves that there is little evidence to back up these models in practice, due to the short history of MaaS models.

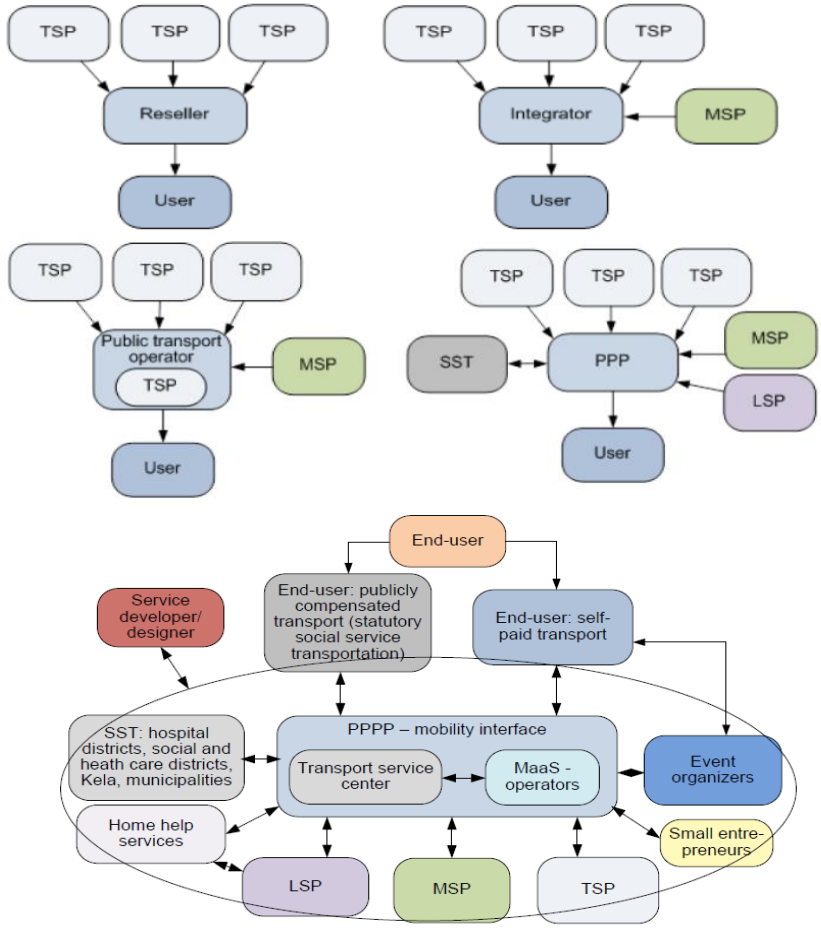

Figure 3: MaaS business models as proposed by Aapaoja and Eckhardt (2017)

Although it is not the goal of this research to investigate these organisational structures of MSPs, they offer insight into how MSPs can be structured. The criteria for MSPs that have been set up by the MaaS-team do not allow for the simple reseller model, but all other models are possible. An MSP could be an integrator of tickets itself, or let an external company do this. Additionally, there are PTOs in the Dutch market that pursue a role as MSP and there is a MaaS pilot that would see subsidized transportation included as well (Ministerie van Infrastructuur en Waterstaat, 2019). This also shows that the role of the transport operator, MaaS service provider and integrator are separate roles but may be carried out by a single company, nonetheless. Within this MaaS ecosystem, the MSP operates with its own business model, connected to other business models and actors.

3.2.2. Dutch Market Potential

The MaaS-team does not envision MaaS as a fully publicly organised and funded initiative. Private businesses need to be able to make money on MaaS, not (solely) through subsidies. There have been several inquiries into the market potential of MaaS in the Netherlands.

ABN AMRO has done a survey asking people's stance on MaaS and what they would be willing to pay and attached scenarios to them. It found a potential market size between 7.2 and 21.7 billion euro. The current amount of money spent on transportation by Dutch consumers is 46 billion euro per year, which is 15% of total personal household expenditure (ABN-AMRO, 2019; Kennisinstituut voor Mobiliteitsbeleid, 2017). Put into this perspective, this market potential is large, but has a wide bandwidth. A review of literature on Dutch market potential by KiM comes with a similarly wide bandwidth of 0 to 38% of the Dutch adult population that is interested in using MaaS (2019)

This wide bandwidth can prove to be problematic for MSPs. Their potential business models and opportunities can differ greatly for different sizes of customer base. The wide bandwidth can be attributed to the fact that most research has been stated preference and there is a large margin of error in the results. Real-world data is limited since most MaaS offerings are in their development phase.

There are worldwide estimates, but these are not very useful when focusing on the Dutch market. The most reliable data is then the aforementioned 40 billion euro spent on mobility by Dutch consumers, in addition to the expenses by companies in the Netherlands. Companies spent 56.7 billion euro on transport services and additional services (own shipping costs, business travel and lease cars) in 2016 alone (Kennisinstituut voor Mobiliteitsbeleid, 2017). Even a small portion of this market is already a lot of money.

The potential market is large, and choices on how to get a piece of this market will depend on how many customers MSPs think they can get and manage to get in practice.

3.2.3. The framework agreement and pilots

To learn more about MaaS and to stimulate the nascent market for MaaS in the Netherlands, the MaaS-team created a framework agreement (Raamovereenkomst – ROK), initially containing 24 parties, setting boundary conditions for public-private development of MaaS propositions. (Brouwer, 2018). the MaaS-team facilitates and subsidises seven pilots across the Netherlands, which the framework participants have competed for. These pilots have general and region-specific goals (e.g. cross-border MaaS or WMO transportation). One of the requirements is implementing all 7 MaaS-functionalities defined by the MaaS-team by the end of the pilots and have as many of these available right from the start. The MaaS-team provides subsidies, rules that dictate all pilot data will be shared with all parties, an Application Programming Interface (API) for companies to share the data they generate in a learning environment, and other rules that should ensure a level playing field. The MaaS-team has found that no single party within the framework agreement can provide all seven core MSP functionalities. All aspiring MSPs are conglomerates between parties in the framework agreement and/or subcontractors from in- or outside the framework agreement.

Market trends have urged a variety of commercial stakeholders in the mobility market to prepare for the future and the 24 companies that signed the framework agreement are diverse: ranging from start-ups to incumbents, Dutch to foreign, transport providers to tech companies, etc. For example, the automotive industry can expect a decline in the sales of private cars. They are in a position to diversify into the market for MaaS to compensate for these losses and even profit of this shift, if they act fast enough. The shift to new mobility services does not have to be a threat but can be an opportunity (Spulber, Dennis, Wallace, & Schultz, 2016). Some companies have already been operating on the Dutch market as MaaS or MaaS-like providers and are still developing their MaaS offerings further, partially through the cooperation with the MaaS-team.

Most business models for MaaS are at the moment being developed within the framework agreement. By the end of these pilots, the MSPs that won them will have to be financially independent of subsidies, be able to scale nationally and have implemented the 7 functionalities that have been mentioned earlier, in addition to meeting region-specific goals during the pilots (Brouwer, 2018; Ministerie van Infrastructuur en Waterstaat, 2018). Although different business models are expected, since the pilots all have different goals and associated target customers, there is little insight into what different business models are considered and developed. In practice, the MSPs within the framework agreement will be investigated, since there are very few MaaS-propositions outside the framework agreement.

3.2.4. Summary

In this section, the background was given that the MaaS business models will have to operate in. It was found that although the quality of the mobility system in the Netherlands is very high, there are future challenges that must be met, which could be done with MaaS. The MaaS provider operates within an ecosystem of actors, of which this research will only investigate the core business and the role of regulators and policymakers. Several governance models are possible, of which only the reseller model does not meet the criteria. The other models suggest increasingly complex and integrated governance models for how a MaaS ecosystem could be set up. The market size and potential for companies to step into the MaaS market is large, but highly uncertain. The framework agreement was then described: a private contract wherein the MaaS-team provides boundary conditions and goals and through which it facilitates the development of MaaS in the Netherlands. Within this framework agreement, a varied group of participants develop their own MaaS propositions, often in conglomerates, and have participated for pilots with goals that have to be met to qualify for subsidies.

3.3. The Business Model

Before looking at business models specifically for MaaS, general literature for business models was reviewed first.

3.3.1. Definition of the business model

Osterwalder created the business model canvas, a much-used ontology and tool to describe a business model, and his definition of a business model has been cited often. He defines a business model as "a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, in order to generate profitable and sustainable revenue streams" (Osterwalder, Pigneur, & Tucci, 2005, p. 10).

The business model canvas was developed to design or analyse a business model. Osterwalder et al. (2005) proposed a general ontology to describe business models. It provides nine building blocks by which to describe business models. This was further developed into a visual tool called the business model canvas (Osterwalder & Pigneur, 2010) The business model canvas is shown in Figure 4.

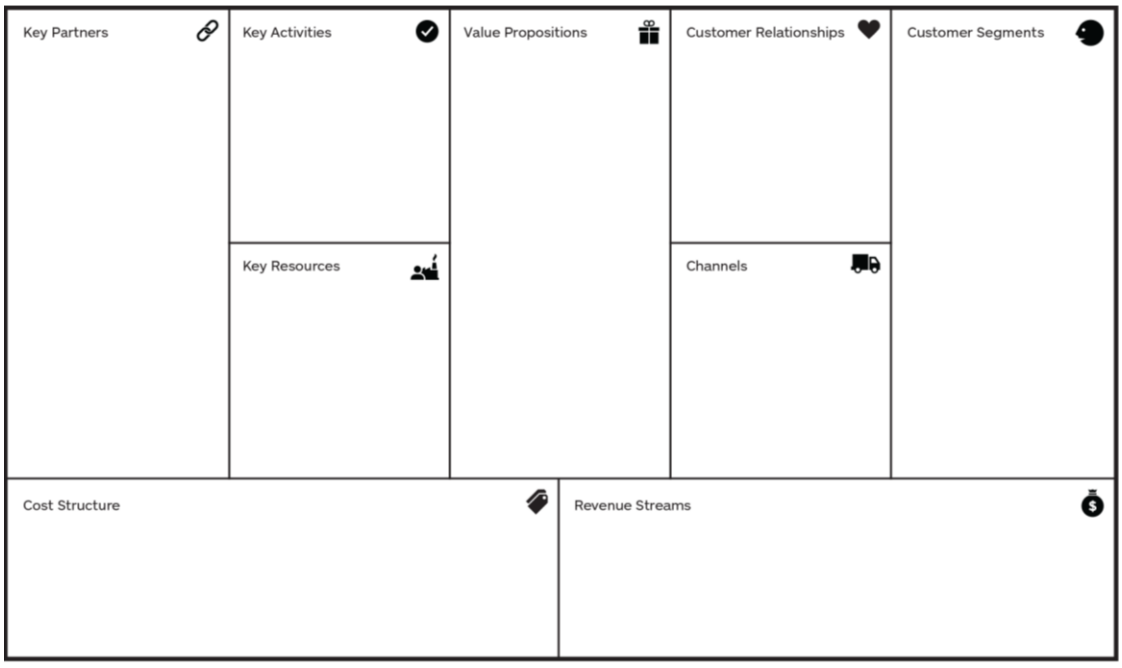

Figure 4: Osterwalder business model canvas (Osterwalder & Pigneur, 2010)

It is important to note that this approach to business models only considers the creation of value for customers, and not sustainable value for society, e.g. sustainability.

Summarized, a business model is a tool to formally describes how a firm creates and delivers its value. Ideally, relying on an explicitly defined business model ontology could enable a detailed inquiry into MSP business models in the Netherlands. However, the market for MaaS is still in its infancy. Many MSPs do not yet have fully worked out business models and are experimenting with them. Making extremely detailed descriptions of these business models thus serves little practical purpose since they will have likely changed before this thesis has been published.

Additionally, this would be so time-intensive that only a few companies' business models could be described within the time constraints of this research. Instead, this research strives to present a broader overview of what business models exist in the framework agreement.

Finally, finding enough MSPs that want to disclose their business model in fine detail, even when anonymized, would likely prove challenging. Since MSPs are still experimenting with novel business models it seems unlikely they would be willing to share all their trade secrets.

For these reasons descriptions of business models will be restricted to revenue models, target customers and value propositions and how these interact. The target customer is the party that pays the business for the value it creates for that customer. This value can be described as the value proposition, which can be conceptual or more specific. Revenue models are how a business captures the value it creates and is paid by the customer (Osterwalder & Pigneur, 2010). Because these are the elements that touch on most of society, they are expected to be the most relevant for government actors to know about. Additionally, it is expected that MSPs will have these business model elements most concretely developed.

Two business model elements will be investigated partially. The first is key activities, due to the requirement of the 7 functionalities by the MaaS-team. The second is key partners: the transport operators play a key role in the MaaS proposition. These key partners will therefore be investigated as well.

There are other ontologies as well, such as the STOF ontology (Bouwman, Haaker, & De Vos, 2008). They place emphases on different parts of the business model and structure the description differently, but the core aspects, such as the value proposition and target customer, are always included. Because of this, a more in-depth review of these is deemed unnecessary. The most used ontology (the Business Model Canvas) is considered sufficient to illustrate how the business model elements that were chosen to be investigated fit into a full description of a business model. Future research might choose a different ontology when investigating other business model element or when investigating the full business model in detail that better fits the nature of business models for MaaS.

Literature on business models for MaaS is now reviewed.

3.3.2. Business Models for MaaS

Literature specifically describing existing business model for MaaS is scarce and scattered. Most literature restricts itself to giving general advise in designing a MaaS business model. A possible reason for this is that there is still debate on the exact definition of a business model as well, leading to different descriptions if the researcher adheres to different definitions of business models. Much of the literature restricts itself to revenue models, target customer or value propositions, and not always all three in a single publication (Aapaoja et al., 2017; Kamargianni & Matyas, 2017). This is an additional reason this research focusses on these specific business model elements.

Polydoropoulou et al. (2020) have constructed one of the only complete descriptions of a prototype business model for MaaS, using the Osterwalder business model canvas. As mentioned earlier, only a part of the elements of these prototypes are considered in this research.

3.3.2.1. Revenue and Pricing model

For revenues and pricing models Polydoropoulou et al. mention commission on ticket sales, advertising, public subsidization and commissions from non-mobility service providers (such as events that want transportation bundled with their tickets). Tol (2017) found in her thesis that the revenue models of MSPs comes from their role as intermediator (kickback fees), the actual use of the service by the users (own wheels and service fees) and/or fees for carrying out administrative tasks. This was one of the few examples of researche that empirically gathered data on what companies are currently offering in the MaaS market.
Aapoaja & Eckhardt (2017) identified revenue models as well: commissions/kickback fees from transport operators, advertisements, strengthening of other business models through MaaS (such as events bundled with transportation), increasing occupancy and ridership of own wheels or direct or indirect income for stimulating environmental goals.

None of this research has had a focus on the Netherlands. One thesis has presented results specifically for the Netherlands. In an executive summary of this thesis, Verstoep (2019) mentions a potential business model for MSPs in the Netherlands. He found that offering tools for steering mobility patterns to make better use of infrastructure and resources has high potential in the Netherlands. He leaves in the middle whether the revenue would come directly through subsidies paid by the government or fees paid by employers, or indirectly through lower costs incurred due to a better spread of peak usage for transport operators. Another potentially successful business model is to offer added services the end-user would pay extra for. He specifies the potential interaction with other business models, possibilities for bundles or pay-as-you-go models and supporting income streams from international exploitation. The research did not offer more details.

Some of these revenue models are in essence the same. The unique identified revenue models are:

- Kickback fees from transport operators
- Service Fees
- Income on own wheels (including busses, or shared mobility)
- Fees for bundling transportation with products of other companies (e.g. a museum ticket)
- Fees for administrative services
- Advertising
- Subsidies for carrying out public tasks
- Fees for added services to mobility (e.g. Wi-Fi)

3.3.2.2. Target customers

A customer pays for a value proposition, generating the revenue stream. For target customer groups Polydoropoulou et al. (2020) mentioned consumers, businesses and employers to be main customer segments. Other target customers included government and other entities interested in the managed travel demand services of MaaS. The MaaS pilots target consumers, employers, travellers to specific locations and the government in the form of WMO travellers (Ministry of Infrastructure and Water Management, 2019). Aapoaja & Eckhardt (2017) identified self-paying end users, social transportation users and event organizers.

The unique identified broad target users are:

- Locations (such as events, attractions or other businesses)
- Government (including WMO)
- Employers
- Consumers

Among consumers, a lot of subgroups are identified. In the Netherlands, KiM identified young consumers, frequent users of public transportation, frequent aeroplane travellers, highly educated consumers, environmentally conscious travellers and travellers that often go on day trips as the most likely to use MaaS (Kennisinstituut voor Mobiliteitsbeleid, 2019). The end-user is for most target customer groups not the same as the target customer. For example, an employer pays for their end-users: the employees.

3.3.2.3. Value proposition

The value proposition is what the company offers its customer in return for them buying their product. It is in principle the reason a consumer would buy the product.

Polydoropoulou et al. (2020) presented various value propositions towards customers. KiM identified through own research and literature what MaaS must offer consumers in general in the Netherlands to be considered as an option: low costs, convenience, choice freedom and customization/personalization (Kennisinstituut voor Mobiliteitsbeleid, 2018b). Dror (2019) mentioned a seamless experience as the central value proposition of MaaS, something mentioned very often in the general discourse on MaaS. Some value propositions can be considered so inherent to MaaS that it does not seem useful to investigate these explicitly, since an MSP that does not offer it cannot be considered to be offering an actual MaaS proposition. An example is 'Integration of mobility services in a unified platform'. Some of the identified value propositions are more conceptual, such as 'comfort', but there are also more specific value propositions such as 'lowering of administrative burden'.

The identified concrete value propositions:

- Single booking, ticketing and payment (i.e. seamless journey).
- Data provided for demand management.
- Incentives for sustainable mobility.
- Lowering of administrative burden.

Identified conceptual value propositions are:

- Convenience
- Cost reduction
- Flexibility
- Sustainability
- Accessibility
- Personalization

There are value propositions as well that are a value proposition to the whole of society, in the form of sustainability. In this research, these are treated separately from general value propositions.

Polydoropoulou et al. (2020) identified a value proposition to other actors as well. One of the key actors that will be considered in this research as well are the transport operators. An increase in market share and revenue was identified as the main value proposition to these actors to convince them to participate in a MaaS proposition.

3.3.3. Summary

In this section, the definition of a business model was given, and the business model elements that were investigated in this research were presented: value proposition (conceptual and concrete), revenue and pricing model and target customer. Also, key partners (transport operators) and key activities (functionalities) were decided to be investigated partially. In their respective segments, examples of what business model elements of a MaaS business model look like have been presented.

3.4. MaaS and sustainability

In this section literature on MaaS and sustainability is reviewed.

3.4.1. Expectations

The Ministry of Infrastructure and Water Management considers sustainability a key goal for MaaS (Nieuwenhuizen Wijbenga & Veldhoven - Van der Meer, 2019). This would correspond to a MaaS level 4 proposition. They see a role for the MSP in this as well. This perception fits in a recent trend where scholars, governments and businesses see organizational sustainable transformations as necessary for a transformation to sustainability for society, with as a key component the business model (Schaltegger, Hansen, & Lüdeke-Freund, 2016).

Most literature investigated sustainable MaaS on a system level, in which MaaS is seen as a tool to steer towards certain sustainability goals, such as reduced emissions or congestion. Other research concludes the concept of MaaS in itself could have a sustainable impact without further details or on general principles MaaS should adhere to be sustainable, but does not delve into the details on how an MSP should accomplish this (Aapaoja et al., 2017; CIVITAS, 2016; Dror, 2019; König et al., 2016; Sarasini et al., 2017; Signor, Karjalainen, Stefaneli, & Galli, 2019).

Wittstock and Teuteberg (2019) have carried out a scoping study to map the current literature on the topic. They found that sustainable impacts by MaaS are still conceptual and carry great uncertainty due to the complexity of the system. They conclude there is still much research to be done on this part to take away this uncertainty and to be able to make accurate predictions about the contribution of sustainability by MaaS.

Investigation at the business model level could provide firm-level insight on sustainability for MaaS. A stream of literature on sustainable business models (SBMs) in general is reviewed first.

3.4.2. Sustainable business models

One of the earlier works devoted to SBMs is written by Stubbs and Cocklin (2008). They argue that SBMs are driven by an alternative worldview to the profit-normative neoclassical economic worldview: ecological modernization (EM). They state companies subscribing to an EM perspective focus on being profitable, improving the welfare of their stakeholders and minimizing their environmental impact and sustaining these outcomes. This corresponds to the three dimensions of sustainability: environmental, social and economic. While the authors state EM has more specific dimensions, these three dimensions are the overarching concepts that the SBM is anchored in. In their empirical research into two SBMs they found that an SBM:

- Draws on economic, environmental and social aspects of sustainability in defining an organization's purpose.
- Uses a TBL (Triple Bottom Line) approach in measuring performance.
- Considers the needs of all stakeholders rather than giving priority to shareholders' expectations.
- Treats nature as a stakeholder and promotes environmental stewardship.
- Encompasses the systems perspective as well as the firm-level perspective.
- Has sustainability leaders, or champions, that drive the cultural and structural changes necessary to implement sustainability.

Stubbs and Cocklin have conceptualized an SBM based on limited empirical findings from two cases. In this approach, they risk coming to non-generalizable findings. Nonetheless they are often cited in later work on SBMs. Other scholars have similarly defined and expanded on normative requirements for SBMs (Boons & Lüdeke-Freund, 2013; Evans et al., 2017; Upward & Jones, 2015). Evans et al. mentioned a more concrete sustainable business model concept, a Product-Service-System that focusses on a transition from ownership to use, something often considered inherent to MaaS.

This research intends to explore how sustainable MaaS business models in the framework agreement are. To judge business models for sustainability with these normative requirements, the business models need to be analysed in-depth. The true intentions of the MSP and detailed descriptions of their business models need to be uncovered for this. Considering the early stage of development, most of these business models are in, this does not seem feasible. Additionally, to create an as broad image as possible of the MaaS market in the Netherlands it is preferred to investigate more MSPs on a higher level of abstraction than a few MSPs in-depth, which is difficult using only these normative requirements.

Some researchers have developed a more practical definition of an SBM. Geissdoerfer, Vladimirova & Evans (2018) have written an extensive review of SBM innovation They found that most literature considers SBMs as a modification of conventional BMs which "either 1) incorporate concepts, principles, or goals that aim at sustainability; or 2) integrate sustainability into their value proposition, value creation and delivery activities, and/or value capture mechanisms." (Geissdoerfer et al., 2018, p. 403). They found that the framework of Richardson (2008), which includes value proposition, value creation and delivery, and value capture structure, is used as the foundation of most work on SBMs. The dimension of value capture structure is modified for sustainability to mean "value capture describes how part of the value generated for a stakeholder can be transformed into value useful for the company." They conclude that for a business to be truly sustainable they must be able to capture the value of sustainable impacts they make, which correspond to the second variety of SBMs.

Schaltegger, Lüdeke-Freund & Hansen (2012) have come to a similar conclusion. They have made a distinction between a business case of sustainability and a business case for sustainability, corresponding respectively to the 2 modifications to a conventional business model Geissdoerfer, Vladimirova & Evans have found. A business case of sustainability achieves economic success with or despite sustainability and a business case for sustainability has the purpose to and realizes economic success through sustainability. They argue for a business case for sustainability if a company wants to pursue a truly sustainable business case. This aligns with the view of Geissdoerfer, Vladimirova & Evans in the sense that a truly sustainable business models must capture created sustainable value.
Researchers have made adaptions to existing or made new ontologies for sustainable business models or have constructed SBM archetypes (Bocken, Short, Rana, & Evans, 2014; Joyce & Paquin, 2016; Upward & Jones, 2015). While useful for future research, due to the focus on only a few elements of the business model and the level of detail this research pursues these do not seem useful to judge MSPs for how sustainable their MaaS-proposition is. Additionally, most of these have a focus on the production of physical goods, which plays a minor role in MaaS.

Apart from actual impacts, which are interesting for the government to have an overview of, the most useful way for evaluating MSP business model for sustainability is to determine whether they can manage to capture sustainable value they create.

Next literature on SBMs for MaaS is reviewed. The literature on this topic is limited. Recently some works have come out that do have specific recommendations and expectations for sustainable MaaS business models, and some have built on the literature on SBM.

3.4.3. Sustainable MaaS Business Models

Empirical evidence is limited. There exists empirical evidence that the MaaS app WHIM has led to more sustainable travel behaviour in Helsinki (CIHT, 2019). Results of pilots in other cities and countries have been published as well. Broader comparisons in a countries' market and among commercial parties however are scarce, and individual business model elements are not often analysed and compared in empirical research.

In a report by IMOVE (2018) a few aspects of the business models for MaaS have been indicated to need extra attention when designing them to be sustainable.

- Pricing models have to be designed to stimulate sustainable travel behaviour. They expressed worries that offering unlimited bundles will stimulate single occupancy modalities and other unsustainable travel behaviour. They recommend mode-specific travel credits that can be carried over to the next month to stimulate effective use of travel resources.
- Implement dynamic pricing during peak congestion.
- Nudging towards sustainable choices. This point has been supported by other reports as well (UITP, 2019).
- Implementing gamification and rewards stimulating sustainable travel behaviour.

These recommendations are written from the standpoint of a government, however. It is not obvious how MSPs would be able to directly capture the value of sustainable outcomes and may need the government to subsidize them for this. It can be valuable however to investigate whether bundles are planned to be used or if nudging and gamification are being considered.

In her thesis, Tol (2017) investigated what MaaS must incorporate in their business models to be sustainable. She found that for a MaaS business model to be sustainable it must:

- Offer sustainable modalities.
- Offer sufficient quality in service for users to develop positive attitudes towards sustainable transport modes.
- Make the users shift to sustainable modalities.
- The financial model has to allow MSPs to capture sustainable value.

The first point is already met by including public transportation and (electric) shared mobility, which is likely for every MSP considering the targets set by IenW. The second is difficult to investigate in a first exploration into business models being developed, since the quality of the service cannot be determined yet. The third point is an end, rather than a means and is not possible to investigate yet either. However, the final point is more valuable. It emphasizes that for a MaaS business model to be sustainable they must be able to capture the value of sustainable outcomes.

One article has focussed on the need for sustainable MaaS business models to capture sustainable value. Sarasini and Sochor (2017) have built strongly on the literature on sustainable business models and placed great emphasis on the need to capture sustainable value. They came to several conclusions when defining what a MaaS business model must do to generate sustainable value and how to capture this.

First, generate sustainable value, a MaaS service must be able to attract customers from the private car segment. This is supported by other reports as well (UITP, 2019). They argue that otherwise there would a risk of a net shift to modalities that are less ecologically sustainable, i.e. access to shared cars becomes easier which could lead to a net increase of car use. They also worry a risk on an increase in car use disincentivizes (public) transport operators to join the MaaS-service since they would worry it could lose them customers to new shared modalities. They note however that increased accessibility to shared mobility could be a form of social sustainability, which in term could boost ridership and profits, allowing MSPs to at least capture this sustainable value. Additionally, if better access to electric vehicles allows the cancellation of a public transport service with very low ridership it is conceivable this has a net positive effect on costs and emissions. This point thus seems not to be an absolute demand for a MaaS business model to be sustainable.

Second, they conclude that MSPs must create incentives for choosing ecologically sustainable modalities, chiefly through pricing. An important caveat is that a pay-as-you-go model does not allow for MSPs to capture the value of sustainable modalities such as walking or cycling and that this requires a bundle model.

Third, data generated in the MSPs MaaS-service can be used to optimize the mobility system which could have ecological and social sustainability impacts. They propose that the MSP could sell this data to actors that could benefit from it by using it to optimize the mobility system which can have social and ecological sustainability benefits. However, in the framework agreement, the participants agreed to share data to a learning environment which does not allow the MSP to sell this data to the government.

Finally, value could be captured together with having an ecological sustainable impact through electrification of the MSPs or transport operator's fleet. If (shared) vehicles will be used more intensely by being included in a MaaS offering, there will be pressure to decrease operating costs. The higher initial costs of electric vehicles could be easier offset by their lower operating costs when they are used more intensely. In theory, MaaS could drive the adoption of electric vehicles this way, which should result in an ecologically sustainable impact. This could as well be stimulated by government incentives.

These publications mention potential sustainability impacts such as increased accessibility to mobility, reduced emissions and congestion which are important to investigate in itself. It is valuable in itself to investigate what impacts MSPs in the framework agreement will try to make, to have an idea of what sustainable value MSPs might create. To the ministry, a sustainable business model is a means to the end of making a sustainable impact

Perhaps more important is to investigate which MSPs have a truly sustainable business model.
The requirement most strongly rooted in sustainable business model literature is the necessity for MSPs to be able to capture the sustainable value they generate for themselves if they are to be truly sustainable. When comparing the identified ways to do this, the following unique methods are found:

- Using MaaS to stimulate societal goals which the government can pay for. This includes nudging, gamification and financial stimuli when the modalities an MSPs tries to stimulate does not allow the MSP to directly capture this added value, such as walking.
- Electrification
- Making mobility more accessible
- Selling data that can be used for optimization of mobility systems.
- A financial model that allows MSPs to capture the value of the use of sustainable travels modes, such as walking or cycling, directly. Often mentioned are bundles with their associated risks.

Especially the final point is a broad but important one. The question what financial model is sustainable remains largely unanswered and is important to investigate.

Methods through which an MSP can create sustainable value or make a sustainable impact, however, but cannot necessarily capture it, are still useful to investigate. If an MSP is not sustainable itself but has the tools and mechanisms to create sustainable value, other parties can pay for this, who could contribute to a sustainable impact.

3.4.4. Summary

In this section, it was found that business models can be evaluated for three types of sustainability: economic, ecological and social sustainability. The most important requirement for a business model to be sustainable is for it to be able to capture the sustainable value it generates. In its respective section, several methods were found for making a MaaS business model sustainable.

3.5. Conceptual model

In this chapter relevant literature has been reviewed on business models and sustainability, both general and specific to MaaS. From this literature, a model has been created, displayed in Figure 5, through which MaaS business models and their degree of sustainability will be investigated. The conceptual model provided a lens with factors through which the interview guide was made, and the results were analysed. The different factors are separated in three fields: the business model, its effects and sustainability efforts. The rectangles contain the factors which will be investigated through the interviews. The arrows indicate which factors influence other factors. Ovals are factors that are influenced but not investigated directly.

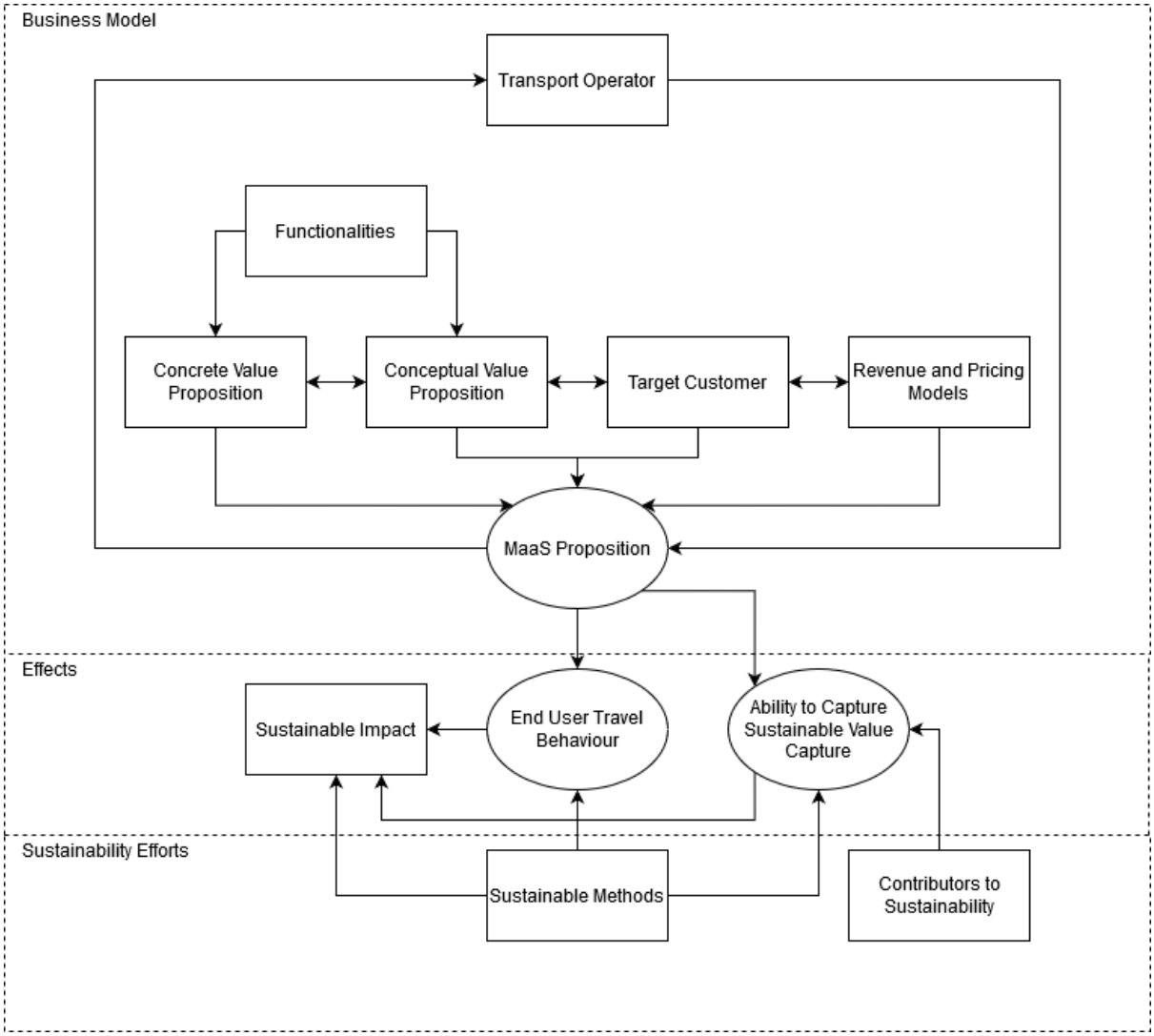

Figure 5: Conceptual Model. Rectangles contain factors that are investigated through interviews questions and arrows indicate which factors influence other factors. Ovals contains factors that are not investigated directly in the interviews but are influenced or made up by other factors.

3.5.1. Business model field

The business model elements within the rectangles in the business model field together make up the MaaS proposition and the business model. These factors can be evaluated for how well developed and thought out they are and investigated how they influence each other, i.e. if there is a concrete value proposition and revenue models coupled to a target customer which all influence each other as well. In addition to this, 7 key functionalities defined by the MaaS-team were included as well, since these are mandatory to be implemented in the pilots and are expected to influence the value proposition directly. Because MaaS-propositions are reliant on transport operators, some interview questions will be dedicated to what transport operators add to a MaaS proposition and what a MaaS proposition offers a transport operator. These are meant as explorative questions to investigate MSPs relations with transport operators that directly influence their business model.

The concrete value proposition, the target customer and revenue and pricing models are central to the business models. The arrows indicate that they influence each other and together make up the whole MaaS proposition. The arrows from the factor functionalities point to the value propositions as they are expected to influence these. The transport operator is placed at a distance from the core factors to the business models, with an arrow indicating its influence on the MaaS proposition, and an arrow back from the MaaS proposition to the factor of transport operators to indicate that the MaaS proposition must also offer the transport operator something in return.

When business model elements are missing, are not well thought out or appear weak, this is an indication the MaaS proposition and with it the business model is weak. Investigating these business model elements should give an indication of what kind of viable business models are possible for MaaS. The variety of business models in the market in general is evaluated as well to investigate how many different business models are being tried out. These findings can be compared to the literature to see to what extent theory aligns with practice.

3.5.2. Sustainability efforts field

The field with sustainability efforts contains a rectangle with the method of the MSPs through which they plan to be sustainable. This includes pricing methods, use of electric vehicles and providing better access to mobility. An external actor, a contributor to sustainability, can pay for the sustainable value created by an MSP directly and in this way enable the MSP to capture the value of its created sustainable value.

3.5.3. Effects field

An important factor for MaaS propositions and their business models is their ability to enable or change end-user travel behaviour, namely, to make users use the MaaS app. This potential influence is indicated by an arrow from the MaaS proposition to end-user travel behaviour, which has been placed centrally in the effects field. This change in travel behaviour determines as well, in part, what the sustainable impact of a MaaS business model will be, i.e. if travellers choose more sustainable modalities this will have a sustainable impact. This is indicated by an arrow as well. This sustainable impact has been placed in a rectangle, since it will also be investigated what sustainable impacts MSPs expect to make. The sustainable methods used by the MSP will influence the change in travel behaviour and thus will influence the sustainable impact that is made, which is indicated by an arrow too.

While it is in large part the sustainable impact that the MaaS-team is interested in, the ability to capture sustainable value determines whether a MaaS business model is sustainable. MSPs cannot be expected to make sustainable value when they cannot capture it. Literature on MaaS specifically has found methods for it to be able to create and capture sustainable value. The way the MaaS proposition is set up also determines how the MSP can capture sustainable value (e.g. this works differently per target customer). The ability to capture sustainable value further stimulates the creation of a sustainable impact of a MaaS proposition from within the business model and thus influences this positively. If a sustainable method does not contain a way to capture sustainable value directly within the business model, and external contributor can pay for this. An example would be a local government that subsidises a change in travel behaviour that is carried out by an MSP. These relations are again displayed by arrows.

A sustainable method could also have a sustainable impact directly, without influencing travel behaviour. An example is the use of electric vehicles. Even if this sustainable method does not yet influence travel behaviour it can make trips that would have been done with fossil fuel transportation done with electric vehicles. Being able to capture the value for this will also incentivize this creation of this sustainable impact.

3.5.4. Use of conceptual model

The results of these interviews are coded in categories corresponding with the factors in the conceptual model. The specific codes are made using concrete examples that have been identified in the literature review and have been presented in their corresponding sections in the literature review. Those that have not been identified in the literature review are coded similarly to add to the results and analysis. It is also expected information will be shared that was not specifically asked for in the interviews, these are coded as much as possible to fit in with the established factors.

The resulting codes and categories are analysed through the lens of this model to come to general findings, implications and policy recommendations. In the next chapter, the results from the interviews and coding is presented.

3.5.5. General topics to pursue

General strategies and expectations of MaaS by MSPs are investigated as well to determine the general standing of MSPs in the MaaS market. Questions regarding the stance and expectations of MSPs towards the government are asked to be able to compare these to the intentions and ambitions of the MaaS-team. These topics are evaluated to see how they might best fit in the conceptual model.

4. Results

In this chapter the results from the interviews are presented to answer the third research questions:

- *Which business models are in use or under development by MSPs in the framework agreement and how do they intend to impact sustainability*?

The results section is organised along broad categories. Corresponding to the conceptual models, there are sections on target customers, revenue models, functionalities, value propositions, sustainability, strategies and expectations, and the government. The conceptual model constructed in the previous chapter has been used both to create an interview guide and to logically code and report the findings from the interviews. Business model elements that have been identified in the conceptual model have been investigated and supplemented with other business model elements found in the interviews. Sustainability impacts and methods have been investigated and reported as well according to the conceptual model and supplemented with other findings.

Per category, the general findings are sometimes illustrated with relevant quotes. The codes have been made more readable and transformed into statements to include in tables in the results. The actual codes have been directly translated from Dutch and are included in tables in appendix B.

First, the process of the interviews is presented.

4.1. The interview process

Based on the model that was constructed in the previous chapter, an interview guide was made.

20 MSPs were sent an email to ask to participate. 2 MSPs responded they were willing to participate over email; the other 11 participants were called. The interviewees consisted of a mix of employees at car leasing companies, public transport operators, platform integrators and IT companies intending to set up or have set up some form of MaaS-service. 12 of the 13 interviewees participated in the framework agreement with the Ministry of Infrastructure and Water Management at the time of writing and the 13th has expressed an interest to join the framework agreement as well. In most cases the MaaS-proposition was developed by a consortium of companies. The questions were worded to get a response on the MSP as a whole. The MaaS activities were placed in a separate legal entity or brought under in one of the existing companies.

Interviews took place in various settings. Two-thirds of the interviews took place at the company offices, 1 interview was done in a café and 3 interviews have been carried out over the phone. The interviews took on average 55 minutes, with some outliers to 40 minutes or 1,5 hours.

The results sometimes mention MSPs have implied something, as opposed to have stated or mentioned something. While some statements were not made outright, something to the same extent could be constructed from other codes and sections of the interview. This has been described as being implied instead of stated by the MSPs.

4.2. Target customer

The first section presents the target customer groups. The target customer is an essential element of the business model. A company tailors its value proposition to the customer it is trying to sell its product to and may have different business models for different target customers.

There has been no separate coding for end users. It was found most target customers have a set target end-user associated with it. Interviewees did not often make a detailed distinction between subgroups of consumers. Because of this, this group is treated as a single group, except car users.
A consumer being the final party to pay for a product which is bundled with transport, such as a train ticket bundled with a museum ticket, is not coded as being the customer. While the consumer may pay for the final product, it is the company that pays for the added value a MaaS offer can bring. The consumer is then a customer of the company the MSP sells their MaaS service to, the consumer only being the user in this case.

In Table 1 the results are presented.

Table 1: Overview of interviewee statements on target customers

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Target customer: Consumer		•			•	•	•		•		•		•	7
> Consumer - will be targeted later				•						•		•		3
> Consumer - the focus will be on car users						•							•	2
Target customer: Employer	•	•		•			•	•	•	•	•	•		9
> Employer - commuters rarely need travel advice	•						•						•	3
> Employer - too slow when trying to draw up contract						•				•				2
Target customer: Business			•				•			•	•	•	•	5
Target customer: MSP				•	•		•	•	•				•	6
Target customer: Government		•		•		•	•							4
> Government - WMO is the end-user		•		•			•							3
> Government - it is difficult to optimize the WMO market				•				•						2
> Government - the WMO market can be optimized										•				1
General: we plan to stick with the target customers we are specialized in		•	•		•			•						4
General: some people will always take the car	•			•		•			•			•		5

4.2.1. Target customer groups

Five broad customer groups have been identified. Often mentioned additional comments to certain target customer groups are included as well.

- **Consumer:** 7 out of 13 interviewees mentioned they will target consumers as customers of which 4 indicated consumers to be their primary target. Of these 4 only 1 MSP plans to target all consumer groups in the short term. All other MSPs plan to aim specifically at tourists, car users or consumers living either in urban or rural areas.
    - **Focus on car users:** 2 MSPs indicated a strong focus on car users.
- **Later focus on consumers:** 3 MSPs indicate they want to target consumers later. All 3 indicated that targeting employers is their primary target now and has to be established before moving to B2C. None of them have given a timeline for this.
- **Employer:** The largest group of target customers are employers. These employers are expected to buy the MSPs services according to different models which will be explained later. 9 out of 13 MSPs have indicated to target this customer group, of which 1 has no plan to target different customers for the time being.
    - **Commuters rarely need travel advice:** 2 MSPs targeting employers mention they don't think commuters will need travel advice often and that a multimodal planner alone would there not be enough to convince them to use it.

    - **Employers are slow in contract negotiations:** 1 MSP does not target employers specifically because the process of securing them as customers takes too long. 1 seeks to circumvent this by letting the employee pay first, allowing him to split bill easily, and then let the employer reimburse the employee.
- **Business:** 6 MSPs aims to enrich the value proposition of a business by offering its MaaS-service to the business to bundle transport with their product. An example of this is bundling transportation with a ticket to a museum or offering transportation in combination with a plane ticket.
- **MSP:** 6 MSPs plan to offer their MaaS-platform, or parts of it, to other business setting up a MaaS-proposition. The most common method among the interviewees was to offer a white-labelled MaaS-platform for a fee to a company that wants to start up a MaaS-proposition and to let them put their brand on the app and add on their services. These include potential MSPs inside and outside the framework agreement.
- **Government:** 4 MSPs actively aim for the government to be a source of income, of which 3 will aim at WMO transportation. WMO is a group with a reduced capacity to travel due to physical or mental impairments and which receive a stipend from the government to travel with taxis for the price of public transportation tickets. 1 MSPs thinks it can stimulate government policy for which it expects to receive compensation.
    - **The difficulty of optimizing WMO travel:** 2 MSPs mentioned it is difficult to optimize the WMO market, of which one plans to try anyway. They see difficulties in enabling travellers with an impairment to use cheaper mass transportation. Another MSP that says there is great potential in this is however not planning to move into the WMO market and gives no reason why.

MSPs rarely target a single customer group. The consumer, MSP and government are never the sole customer group.

MSPs did not often give reasons for why they target a certain customer group. All MSPs that were interviewed already existed (or have a mother company that already existed) as a company engaged in some way in the mobility and transportation market. They seem to have stayed with their original target customer and branched out from there, except some smaller IT companies. 4 MSPs explicitly state they intend to not branch out from their existing speciality target customer group soon. They mention that they expect their competitors to be able to do this better and faster. One of these MSPs worded it this way:

"We focus ourselves on the commuter market in the Netherlands and I think it is more like that we will target the commuter market in England or Germany than that we will target the occasional traveller market in the Netherlands."

The only customer groups for which the MSPs gave a reason they target them are employers and businesses. In the case of employers, 3 MSPs have stated they target these because of their large scale compared to individual consumers. 1 MSP mentioned that, together with maybe tourists, this is the only group that has the money to pay for additional services on mobility.
1 MSP mentioned they target business because they have an interest in people being able to reach them efficiently and would, therefore, be willing to pay for this.

Finally, 5 MSPs stated they expect a certain group of private car users will always stick to this car and indicated that they do not expect much result from targeting this group of potential users.

4.2.2. Number of customers necessary

For 3 of the identified customer groups, interviewees mentioned estimates of how many customers or users they would need. This data was not practical to code, so this has been taken straight from the interview transcripts. While all interviewees were asked for an estimated number of customers necessary to run a profit, they varied widely per business model. Not every MSP had an estimate either. Those that did have an estimate, estimated the following numbers of customers to be necessary:

- **Consumers:** 50,000-100,000 paying customers. The number of trips a month necessary however varied widely as well, ranging from 3 or 4 to 20 trips a month per customer. More accurate estimates were not available. When own wheels are included estimates lie in the 2000 range.
- **Employers:** 2000-100,000 employees, with normal commuting behaviour. A possible explanation for these numbers to vary widely is that the MSP that estimated 2000 employees plans to charge a subscription fee per employee, whereas the MSP that estimated 100,000 employees intends to charge per trip, which they expect will bring in less per employee. MSPs giving estimates within this range give a wide range of numbers, planning to offer a mix of bundles, pay-per-use, subscription fees, service fees. From these, there is no clear sign a certain business model requires more or fewer consumers than the others.
- **WMO:** 2000. This estimate is based on only one interviewee who had an estimate for this target group.

Other than needing to invest in marketing and offering a good enough value proposition, MSPs did not elaborate on how they intend to increase their customer base in the consumer, business or MSP group. Some MSPs state they target employers to gain volume quickly. This was also implied to an extent by MSPs targeting businesses and the WMO market. Acquiring a single customer there in theory brings in many end-users that have to be paid for.

Some MSPs when asked for risks to their business model stated that not acquiring enough customers would be a risk. However, all of them specified this to be a general risk but did not expect the risk to be high.

4.3. Revenue Model

In this section, the results relating to revenue models are presented. These revenue models are how the MSPs plan to earn profits. The related value propositions and sustainability impacts, strategies and considerations are presented in their own sections.

In Table 2 the results are presented

4.3.1. Revenue models

Table 2: Overview of interviewee statements on revenue models

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Service fees on administrative and control services (e.g. split billing and control over user travelling options)	•	•		•			•	•	•	•	•	•		10
Income on own wheels	•	•			•		•			•	•	•		7
> Income on own wheels - An MSP is unable to benefit own wheels and can only give neutral travel advice if it wants to succeed		•			•					•	•	•		5
> Income on own wheels - An MSP that has own wheels cannot be as neutral as an MSP without own wheels			•			•		•						3
Kickback fee from transport operators		•	•		•		•	•	•	•	•			8
> Kickback fee from transport operators - bad for neutral travel advice	•			•										2
> Kickback fee from transport operators - good for neutral travel advice		•					•							2
Sales and service fee for mobility card	•	•					•	•		•	•			6
Subscription fees on white label services to businesses				•	•		•	•	•				•	6
Service fee for offering mobility bundled with product of businesses			•				•			•	•	•	•	6
Fee for advising employers on their transportation policy	•	•					•	•		•				5
Developing IP and expertise for MSP				•		•	•		•				•	5
Sales of (unlimited) mobility bundle	•			•			•	•						4
Government projects						•	•	•		•				4
Fee for taking care of WMO mobility		•		•			•							3
Service fee on tickets to consumer													•	1
> Service fee on tickets to consumer - A consumer does not want to pay a service fee		•	•	•	•	•	•	•	•	•	•			10

Most revenue models are not mutually exclusive. The revenue models are not necessarily exclusive to an MSP or MaaS in general, but all revenue models included here are intended to be used in what the MSP in question considers a complete MaaS-offering. What the MSP exactly considers to be MaaS can differ from the definition used by the ministry of IenW and from other MSPs.

The revenue models are only described in broad terms and a generic form. Many revenue models were not finished yet and still in a conceptual form. The most common generic revenue models and how many MSPs intend to use these are described here:

- **Administrative services**: 9 MSPs will charge fees for administrative services. These include tools to steer employee travel behaviour and to optimise transportation policy, as well as split billing. All of them are aimed at employers or business travellers. These fees are paired either with a pay as you go model, where the service is in these administrative services and transportation is not further bundled or paired with a bundle model. In this bundle model, the fees are usually included in the price of the mobility bundle, where the employer pays a flat fee per employee to cover all transportation expenses. If the bundle model was not explicitly mentioned, most MSPs implied the customer would have to pay-per-use on top of the fees for administrative services.

- **Own wheels**: these MSPs are a transport operator as well and make money on these services. These own wheels are not exclusive to the MaaS-offerings and neither do they intend to offer only their own wheels in their MaaS-service. 7 MSPs have this as a business model. Some mention that having own wheels makes marketing easier. Out of these 7, 4 have own wheels as their core business model to earn money. Part of their business model for MaaS is then also to generate more users for these own wheels. An MSP giving travel advice could, without regulation, in theory favour their own wheels or certain transport operators over the others. Opinions on how neutral the advice of MSPs can be were divided, but most MSPs commented on the topic in some way.
    - **An MSP can only give neutral advice:** 5 MSPs think MSPs can only give neutral advice. This often came after asking an MSP whether they would try to steer customers towards their own wheels, although others mentioned it themselves. They think MSPs can't afford to try to steer customers towards the more profitable modalities, since customers would not accept this. They therefore expect there is little risk MSPs will benefit their own modalities. One MSP phrased it as follows when asked the question if they would try to benefit their own wheels:

      "No, that would be a utopia for us, if I could do it, I would have. But you can't. You offer people what they want and then they do that. And you make that easier, better, whatever. It is not as if you advise them something and they just do it, they are simply not that stupid. They think it's raining, I'm not going to cycle, fat chance."

      Most MSPs with this opinion had own wheels themselves or in their consortium.
    - **Having own wheels endangers neutral travel advice:** In contrast, 3 MSPs do fear that MSPs with own wheels will be tempted to steer customers to their own wheels, because those modalities are more profitable to them. One phrased it as follows:

      "For some parties, you can see they have an interest, they have wheels and those wheels have to ride. 80% of their business model is in those wheels, if not more. I think you have a much stronger incentive to steer on the use of those than alternatives".

- **Kickback fees**: 8 MSPs aim to charge transport operators per journey to generate income, although some will not start with this immediately to enable them to connect to as many transports operators as fast as possible. This kickback fee usually takes the form of a certain percentage of the ticket price being paid by a transport operator to the MSP that manages to sell that ticket. Kickback fees are not permitted in some concession for public transportation but only 1 MSP mentioned that this is an issue and does not plan to ask for kickback fees in general. 3 MSPs have stated negotiating has proven difficult and mentioned their lack of a large customer base as a potential explanation. A few MSPs mentioned whether kickback fees are desirable.
    - **Kickback fees enable neutral travel advice:** 2 MSPs think they kickback fees are important to give neutral travel advice. They say these are necessary to offset the risk of benefitting their own wheels: if you make money both of your own wheels as well as other modalities, there will be no risk of giving wrong advice to customers. One MSP phrased it as follows:

      "I think it is important to have a commission model within your business model, otherwise it becomes skewed. We also earn revenues from share bikes, maybe not exactly the same but that is not what it is about. It is about being able to provide in the demand for mobility. If we can't profit off of that, that would be a weird model."

    - **Kickback fees hamper neutral travel advice:** 2 others think kickback fees will negatively influence the neutrality of travel advice. According to them kickback fees will differ per transport operator, and MSPs will be tempted to steer customers towards operators that pay them higher kickback fees. On MSP phrased it as follows:

"The danger in working with these kinds of things in your business model, is that you become dependent on other parties because of which you can't give neutral travel advice anymore. And you have to be careful about this, you want to safeguard your company goals. You want to include the personal preferences of the user. You have to find the middle ground and give advice on that. And it can't be that if you give a certain advice you hurt your bottom line. You want to be able to give neutral advice."

- **Mobility card**: this type of mobility solution already exists, for example, the NS business card or the Shuttel card. This is not the same as including an OV-chipcard to offer access to public transportation, these mobility cards always include monthly billing and usually allow to pay for parking, gasoline and charging as well. 6 MSPs sell a card like this. These are aimed at employers. One group aims to offer this parallel to their MaaS offering. A second group sees this as a, sometimes temporary, part of their MaaS offering where the app around the mobility card offers the added value.
- **White label**: 6 MSPs aim to offer their MSP platform to other companies that want to set up a MaaS or otherwise transportation-oriented service, but always in conjunction with another source of income. One MSP is planning to eventually make this their sole source of income.
- **Enriching company services**: 6 MSPs plan to offer their MaaS service to be bundled with a target company's product, such as admission tickets for a museum or concert. MSPs often call this a destination focussed approach.
- **Mobility bundle**: often closely associated with MaaS since one of the more well-known MaaS providers, Whim, offers this is Helsinki. The customer pays a flat fee and all transportation is covered. The MSP then makes money off the difference in price between the purchases of transportation and the sale of the bundle to the customers. No MSP intend to sell these to consumers yet, only to employers or to the government for WMO travellers, which is then usually bundled with administrative services.
- **IP and expertise development**: 4 MSPs mentioned explicitly that the development of their MaaS services could serve their company in developing IP and expertise. This way even if their MaaS offering fails or does not become very profitable, the results of their investments can be used elsewhere in the (mother) company.
- **Government projects**: 4 MSPs stated they would aim for government projects, such as projects aimed at stimulating commuters to avoid rush hour. These were coupled with administrative and control services when necessary to carry out the desired project.
- **WMO mobility**: 3 MSPs aim to sell their MaaS-service to the government to take care of WMO mobility. This may be coupled with selling mobility bundles.
- **Advice**: Some MSPs will offer advice to employers that want to optimize their transportation policy. Always paired with selling administrative services. Will be offered by 5 MSPs.
- **Service fee to consumer**: Only planned by 1 MSP but worth mentioning because many MSPs explicitly mentioned they do not consider this to be a viable business model:
    - **Service fee to a consumer is not viable:** 10 out of 13 MSPs indicated that they do not believe a consumer will pay just for the app on top of transportation. One MSP phrased it as follows:

      "You can't ask a consumer 10 euro's per month for a MaaS-app, they will never be willing to pay that"

      The MSP that charges the customer a service fee per journey have themselves indicated that this is not and will not be their main business model and source of income.

Other revenue models were mentioned only twice or less. Of these the only ones specific to MaaS were charging a connection fee to MSPs and transport operators to their platforms, to sell data generated by their MaaS-service and to sell extra services to a consumer with their MaaS-proposition (such as Wi-Fi). The associated codes can be seen in the appendix.

4.4. Value proposition

In this section, results are presented regarding the value propositions the MSPs offer their customers. These value propositions are what the MSP offers the customer and with which it hopes to convince the customer to purchase their services. This section excludes value propositions directly related to making an impact on sustainability goals. These results will have their own section. App support, as presented in the section on functionalities, is not considered here as a separate value proposition since this is inherent in the MaaS offers. This goes for the inclusion of an OV-chipcard and 'offering access to transport' in general as well, since these are not value propositions stemming from the MaaS-service.

4.4.1. Conceptual value propositions

Table 3: Overview of interviewee statements on general value propositions

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Improved convenience		•	•	•	•	•	•	•	•	•		•	•	11
Cost reduction	•		•	•		•	•	•	•	•	•		•	10
Imroved reliability		•		•	•	•		•	•		•	•		8
Improved flexibility	•		•		•	•	•		•	•	•			8
Shorter travel times	•						•	•	•				•	5
Contribution to user's health	•	•					•			•		•		5
Improved efficiency						•		•				•		3
Improved comfort						•							•	2
Seamless journey		•				•			•			•		4
Complete mobility	•	•							•			•		4
General: bundled modalities are not a vp		•	•		•					•		•		5
General: car is most reliable					•			•						2
General: give what the customer asks for	•	•	•		•	•	•	•	•	•	•	•		11

This first group of value propositions that were named by MSPs are offered to a large range of target customers and are more conceptual, as opposed to something tangible such as a reduction in administrative tasks or concrete expenses. For an overview see Table 3. These value propositions are often (but not always) backed up by concrete examples or mechanisms.

- **Convenience:** 11 MSPs mentioned convenience as one of their selling points and is with this the most prominent value proposition. Concrete examples are most often less administrative tasks for employers. To the consumer this is backed up less, the MSPs mention offering a fully integrated multimodal journey should offer convenience.
- **Cost reduction:** 10 MSPs mentioned a generic cost reduction. These were backed up with concrete value propositions for employers in the form of less administrative tasks and less need for parking space, and the government in the form of better optimized public transportation and lower costs for WMO travellers. For customers, cost reduction was mentioned less, and when it was, it was backed up by stating they could show customers the cheaper options, not make the options cheaper in and off itself. Cost reduction was mentioned once for businesses, in the form of needing less parking spaces.
- **Reliability:** Mentioned by 8 MSPs, mechanisms mentioned for supporting this value proposition usually included some form of guaranteed availability of transportation.
    - **Car is most reliable:** 2 MSPs mentioned that nothing beats the car in reliability.
- **Health:** Was mentioned by 5 MSPs, most often related to stimulating employees to cycle or walk to improve their health.
- **Flexibility, Speed, Efficiency and Comfort:** these value propositions, mentioned to a more or lesser extent but almost every MSP mentioning one of these at least once, were rarely backed up with concrete examples or mechanisms other than offering the user several travel options optimized for different for speed, costs or CO2 emissions.

Two general value propositions were more concrete:

- **Seamless journey and Complete mobility**: Both were named by 4 MSPs with no extra explanation on how exactly they would offer this apart from the fact that their MaaS-Service would offer it.

In general, the MSPs seem to agree they will give the customer what they ask for. Although this is a vague statement, this answer was not given to an explicit question yet was mentioned by 11 out of 13 MSPs. It was often mentioned when talking about what functionalities to implement and the role of customers and transport operators when shaping the MaaS-service. One MSP remarked:

"Look, if you look at our customers, those are employers. Those employers do not think in terms of MaaS functionalities. They think in terms of costs, in terms of CO2-reduction and terms of satisfied employees."

All MSPs seem to agree that they should offer more than combined modalities to a customer as a value proposition, since all of them plan to offer more than just that. 5 MSPs stated explicitly that a combination of modalities is not a MaaS value proposition

4.4.2. Concrete value propositions

For an overview see table Table 4

Table 4: Overview of interviewee statements on concrete value propositions

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Tools to steer travel behaviour	•	•	•			•	•	•	•	•	•		•	10
Less administrative tasks	•	•		•			•	•	•	•	•	•		8
Less parking spots necessary	•			•	•		•		•	•				6
Improved employee satisfaction	•			•				•						3
Mobility card	•									•	•			3
Improved productivity	•													1
A (white label) MaaS platform				•	•		•	•	•				•	6
Enriching customer's product			•				•			•	•	•	•	6
Extra services for consumer												•		1
Customers for transport operators	•		•	•			•				•			5
> TOs scared to lose revenue		•	•			•			•	•	•			6
> TOs scared to lose contact with customer		•		•		•				•	•	•	•	7

MSPs that target employers came with the most concrete value propositions.

- **Tools to steer travel behaviour:** The most often mentioned thing MSPs think they can sell to employers are tools to steer employee travel behaviour, mentioned by 10 MSPS. Most mention that it is up to the employer to decide how to steer the behaviour, for example on sustainable travelling.
- **Less administrative tasks:** 9 MSPs think they can sell their MaaS offer to employers because it offers them less administrative tasks, which will save them money as well.
- **Less parking spots necessary:** 6 MSPs think they can offer employers a reduced need for parking spots. This goes hand in hand with tools to steer travel behaviour, because the employers have more control on whether employees take their car to work.
- **Mobility card:** 3 employees think offering a mobility card in and the lower administrative costs this brings is a good enough value proposition on its own already.
- **Productivity**: 1 MSP says they can offer employers higher employee productivity, since they will have to spend less time travelling and relatively more time in a train where they can work.

The value proposition to the government in the sense of the Dutch state, as opposed to their other role as an employer, is mostly presented in the section on sustainability in the form of impact on sustainability. This is because a positive impact on sustainability can in principle be considered a value proposition to a government that has sustainable mobility and a sustainable country as a goal. When they are offered tools to steer travel behaviour that can be seen in that same context of sustainability.

Two specific value propositions for businesses were mentioned, one for MSPs specifically and one for other types of businesses.

- **Platform:** this value proposition is a very tangible one, mentioned by 6 MSPs, and corresponds directly to the business model of offering (white label) platforms to other MSPs. Conceptual value propositions are rarely linked to this value propositions.
- **Enriching customer's product:** This directly corresponds to the business model of enriching an offer of a customer. This value proposition rarely has a conceptual value proposition coupled to it either. This is more likely to sit on the side of users, who are offered the convenience to book their transportation together with their admission tickets. For the business buying the service, it is likely meant to make their product more attractive. One MSP phrased it as follows:

  "We were thinking, how do we get money for a smart [mobility] planner. Then we thought, who would benefit from this planner, what is behind that. A parking provider, or whatever. That's a difficult market, because they say we will do it ourselves, or they say Google already exists, that kind of remarks. A destination, they can benefit from this."

Concrete value propositions to consumers are rare. Most MSPs targeting consumers mentioned convenience and reliability as conceptual value propositions with little to back that up outside of the 7 functionalities of MaaS. The exception 1 MSP that wants to offer travellers added services such as wi-fi or delivery services. Many MSPs, when talking about the consumer market, stated that for a consumer to pay something extra on top of their actual transportation cost, the value proposition would have to be sufficiently attractive. They rarely mentioned what this would be, apart from reliability, convenience, comfort and other conceptual value propositions. 10 MSPs stated (as presented in the section on business models) that consumer will be unwilling to pay for just the functionalities of the app.

One value proposition is different from the others. It is not aimed at one of the target customer groups indicated by MSP:

- **Customers for transport operators:** Most MSPs acknowledge they need a customer base to get transport operator to connect to their MaaS-proposition. 5 MSPs mention they can already offer more customers to transport operators. They expect this to be a reason for TOs to pay them kickback fees. This value proposition is an outlier, because MSPs have not spoken of transport operators as if they were customers. It is also the value proposition that is the most heavily contested by the group it is aimed at:
  - **Transport operators are scared to lose revenue:** 6 MSPs have mentioned that transport operators have voice concerns that they might lose revenues instead if they connect to an MSP.

4.5. Strategies and expectations

Some general statements on strategies of the MSPs and expectations on the development of MaaS are presented in Table 5. These can provide context to the answers the MSPs have given in the other sections.

Table 5: Overview of interviewee statements *on strategies and expectations for MaaS*

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
The MSP operates internationally	•	•		•								•	•	5
> The MSP operates internationally - Plans to do so at a later point			•		•	•	•	•	•					6
MaaS should be use to optimize mobility	•	•		•	•	•		•	•	•	•		•	10
MaaS has limitations right now and still has to develop	•				•	•	•		•		•			6
the market for MaaS will stay small		•				•	•						•	4

Most MSPs had comments on the development of MaaS or particular strategies. Few were broadly carried or mentioned. However, 2 things were often mentioned:

- **International activities:** 11 out of 13 MSPs are operating internationally or intend to do so later on. Reasons given for this are they are either already an internationally operating company (or their mother company is), or they do not expect to be able to gain the necessary scale to be profitable if they restrict themselves to the Dutch market.
- **MaaS has limitations and has to develop first:** 6 MSPs indicate they run into the limitations of MaaS already and indicate it has to be developed further before they can fully implement their business model. Other than a general statement on the market not being mature yet, MSPs specifically mentioned that many stakeholders do not yet understand MaaS well enough, there is insufficient coverage of shared mobility and business model are not mature yet.

Most MSPs commented in some way on how they think MaaS should and will develop, but only the following was broadly supported:

- **MaaS should be used to optimize mobility:** According to 10 MSPs, the goal for MaaS should be to optimize mobility where possible. All MSPs mentioning this state in some way that there is a place for many modalities in the mobility system that should be used as efficient as possible, including private cars. Many explicitly state there needs to be a balance, since no single modality can facilitate all travels and that an MSP should provide multiple modalities. Some mention having to look holistically at MaaS. For example, an increase of last-mile transportation by car might seem undesirable, but if this means the rest of the journey is carried out by public transportation instead of by car this is still a desirable development.

About a third of the MSPs doubt the long-term scalability and viability of MaaS:

- **The market for MaaS will stay small:** A small group of 4 MSPs think the spread and development of MaaS will stay very limited, despite them participating in the framework agreement. The most common reason they give for this is that they expect that the vast majority of travellers will stick to their know routines and will not need MaaS often. One MSP phrased it as follows:

  "If you look at the MaaS-product, and you are looking for a business case or value case, at this moment I see that the difference between ambition and what is realistically possible is very big at the moment. I don't know if a hype is the right word for it, but the ambitions are very high right now."

  However, all of these MSPs operate or intend to operate internationally, potentially indicating they have found or can find a niche to operate and scale in.

4.6. Functionalities

In this section, the results on the implemented functions in the MaaS apps are presented. The 7 functionalities defined by the MaaS-team are enforced through the tenders for the pilots and thus shape the business model and strategy of the MSPs in the framework agreement. Not all MSPs had a clear vision yet on what would be included in their app in the short- to midterm but all did say what they intended to include at the moment. Full integration means planning, booking, paying, personalized travel, on-trip support and travelling are implemented without the use of deep-links and OV-chipcards but through own implementations or an integration platform. Some information is supplemented with information from the app or website of the MSPs.

4.6.1. Implemented or planned functions

The statements related to functions are shown in Table 6.

Table 6: Overview of interviewee statements on implementing functionalities

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Paying	●	●	●	●	●	●	●	●		●	●		●	11
Booking	●	●	●	●	●	●	●			●	●		●	10
Adaption	●	●		●			●	●						5
> Adaption - including alternative transportation						●		●	●					3
Personalized travel	●					●	●	●						4
Multimodal planning		●	●	●	●	●		●		●	●			8
Travelling		●	●	●	●	●	●	●			●		●	9
> Travelling - deeplinks are used	●							●		●				3
> Travelling - OV-chipcard is used	●	●			●	●	●	●		●	●			8
> Travelling - OV-chipcard will be phased out					●		●			●	●			4
Full integration									●			●		2
Cancelling		●							●					2
International MaaS		●											●	2
General: not all functionalities are necessary						●	●	●			●		●	5

Many MSPs have indicated they will implement certain functions but did not want to or could not elaborate yet on how extensive the implementation will be. It is at this time difficult to determine how extensive the implementations will be, since most MSPs don't know exactly themselves. Most functions have different levels of implementation, and there is no consensus on any of them as to how extensive the implementation should be for a MaaS offering or that all functionalities should be included at all.

- **Planning:** ranges from integrated navigation, to a link to Google Maps.
- **Booking:** ranges from reserving shared mobility and seats, to the 'booking' of a day ticket for public transportation. It is debatable whether this last thing can be defined as booking at all.
- **Paying:** ranges from iDeal or credit card payment for the full journey in a single transaction, to a bundled statement at the end of the month for expenses made with an OV-chipcard.
- **Adaption:** ranges from rerouting when there are disruptions in the planned travel and detailed transfer support, to Google Maps traffic information.
- **Personalized travel:** ranges from full personalization including walking speed and private car specifications, to only being able to select your preferred modality.

The Ministry of IenW mentions a 7th functionality, on-trip support. With this functionality is meant on trip customer support, be it through chat, phone or other means of communication. None of the MSPs mentioned this functionality explicitly.

Since many of the MaaS offerings are still being developed, no distinction is made between already implemented functions and functions that will be implemented during the pilots.

The interviewed MSPs have implemented or plan to implement the following functions:

- **Planning:** except for 2, all MSPs will implement a multimodal planning function in their app.
- **Booking:** Except for 1, every MSP will implement the booking function for at least a part of their MaaS-service, although what modalities can be booked will differ slightly.
- **Paying:** All MSPs have indicated to implement this functions. There is a caveat. Many MSPs still see a role for the OV-chipcard in their offer. Whether travelling with the OV-chipcard and providing the customer with a bill for the journeys made with it at the end of the month can be considered integrated paying is debatable. This has existed for a long time already as mobility cards. In that case, only 5 MSPs implement paying without an OV-chipcard involved in any modality.
- **Travelling:** 11 MSPs have indicated they will implement travelling in their app. Implementing travelling here means that at least a portion of their offered modalities can be travelled with, with only their app.
    - **OV-chipcard:** 8 of these MSPs have indicated to still use an OV-chipcard for a portion or all of their offered public transportation. 4 have indicated they intend to phase out the OV-chipcard of which only a single MSP stated this would happen soon. The others indicated it simply is not possible yet or too much of a hassle.
    - **Deeplink:** 3 MSPs have indicated that a part or all of their other transportation (like taxi's, UBER or Felyx) will be accessible through deep links to the operator's app.
    - **International travelling:** Only 2 MSPs have plans to immediately offer international travelling, although more have stated the ambition to go international.

  In the end, only 5 MSPs plan to fully implement travelling with all modalities through their app and without deep links and the OV-chipcard. These solutions vary from NFC, QR-codes or tickets that have to be validated on sight.
- **Personalized travel:** This functionality means a user can fill in their personal characteristics and preferences, or the app learns these itself, and the app will use this to tailor the travel options to the specific user. 6 MSPs said to implement personalized travel. Most of the MSPs that did not mention implementing these functions have mentioned value propositions such as worry-free travelling, or the best possible advice for customers. These suggest that they will have these functions in their app to some extent. A possible reason for this is that many travel apps today already give travel information and the interviewee considers it so obvious a function that they forget to mention it. Only 2 MSPs have explicitly stated not to include these functions
- **Adaption:** This functionality means the app gives on-trip travel information and/or offers alternative transportation if the initially planned trip is disrupted. 7 MSPs plans to offer on-trip travel information. Similar to the personalized travel information function, it is possible on the on-trip travel information function is so obvious to some interviewees they failed to mention it.
    - **Alternative transportation**: A more advanced more of adaption. This functionality means the MSP intends to guarantee alternative transportation if the initial trip has been disrupted. 3 MSPs intend to add this functionality.

Some MSPs have stated they implement all functions mainly because the government demanded this in the pilots. Results on this topic are further presented in the section on value propositions.

- **Not all functionalities are necessary:** 4 MSPs explicitly stated that they don't consider the travelling or booking function essential to a MaaS app, while 1 MSP suspects not all functions are useful to every customer group and still wants to investigate which function is necessary for which target customer. See for example the following quote from an MSP that does not consider booking an essential function:

  "That is the misconception, or rather, the difference in opinion between us and the government. They want it to be possible to book the whole journey so that it is a done deal. Everything is reserved, and done is done. Those are pipe dreams, it's not happening. And above all, it is not necessary."

  In contrast, some MSPs think it's essential that all functionalities are implemented in a MaaS offer:

  "Call it a travel experience. People have to go from A to B, and the technology cuts it up in small pieces from a multimodal travel plan, whether that is a bike or anything else, based on your preferences, but after that it is one integrated journey towards the customer. This way it is just like your car keys, you have that app and you go from A to B. This is the tool to travel, this is your key. Eventually, except for your preferences, it should not matter to you how you get there. You booked the trip, you walk out of here and something is waiting for you outside."

4.7. Sustainability

In this section, the results on impacts on sustainability are presented. Additionally, results on who the MSPs expect to have to contribute to sustainability, through choices, policies or money are presented. This is relevant to see to what extent MSPs plan to take up the task of making a sustainable impact, and to who else they look to contribute.

Sustainability can be divided into 3 types: ecological, social and economic sustainability. Economic sustainability refers to the company's ability to be long-term economically stable and profitable. Social sustainability considers to what extent the company contributes to society, local and in a broader sense. Examples are improving equality, local development of services and jobs and providing better working conditions. Ecological sustainability refers to the impact on nature, such as emissions and waste generated by a company. Statements on sustainability were varied. Those mentioned by two MSPs or less have been excluded unless they were particularly relevant.

In the interviews, MSPs were explicitly asked for all three types of sustainability, but economic sustainability has been only sparsely commented on and is therefore not reported on much. Ecological and social sustainability was more widely commented on. The results are divided into impacts on sustainability and methods to enact these impacts.

4.7.1. Impact

In Table 7 the results related to impacts on sustainability are presented. Most impacts are related to social sustainability. These impacts concern the impacts an MSP thinks or intends to make with their MaaS-service. If an MSP mentioned they wanted to make a sustainable impact without further specification, these comments were excluded from this section. For example:

"I strongly believe in CO2-reduction, stimulating health, and those kinds of things"

A statement like this, if it is not further backed up by concrete mechanisms or reasoning, is not considered enough to determine that an MSP makes an impact.

Table 7: Overview of interviewee statements on impacts on sustainability

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Social: Easier access to mobility		•	•	•	•		•		•	•	•	•		9
Social: Reduce congestion		•	•	•	•		•		•					6
Social: Contribution to user's health	•	•					•			•		•		5
Social: Contribution to local development		•	•			•								3
Ecological: Reduced harmful emissions	•	•		•	•	•	•		•		•	•		9
Economic: Positive influence on long term economic health of MSP			•	•		•		•	•					5
General: No negative impact	•	•												2
Negative: More cars on the road			•		•	•		•						4

Expected positive impacts on social sustainability are:

- **Easier access to sustainability:** This broad impact was mentioned by 9 MSPs to result from their MaaS offering. This code covers better access in rural areas, for lower social-economic classes and travellers with an impairment.
- **Reduced traffic congestion:** Mentioned by 6 MSPs. Included in this code is less space necessary for cars in general as well.

- **Local development:** 3 MSPs aim to contribute to their local community, in the form of job creation or talent development.
- **Health benefits:** Taken from the value proposition section, a healthier community is a contribution to social sustainability as well. Mentioned by 5 MSPs in the section on value propositions, mostly related to employee health, a healthier populace can be considered a contribution to social sustainability as well.

Only the following was commented on concerning ecological sustainability:

- **Reduced emission:** 9 MSPs expect lower emissions as a result of their MaaS offering.

And the following on economic sustainability:

- Positive influence on long term economic health: 5 MSPs stated explicitly they plan for a long-term business model and thus want to develop an economically sustainable business model, but the same was implied by most other MSPs and was seen as self-evident by most

Interviewees were asked if they foresaw potential negative sustainable impacts of their MaaS offering.

- **No negative impact:** 2 MSPs explicitly said they expect no negative impacts on the sustainability of their offer.
- **More cars:** the most often mentioned negative impact they foresaw was an increase in car use. 4 MSPs indicated this might be a possibility.

All other potential negative impacts were not mentioned often. No interviewee expected these negative impacts. They saw these impacts as a possibility when explicitly asked about, but don't expect these to come to pass.

4.7.2. Method

In Table 8 statements related to how MSPs intend to have an impact on sustainability are presented.

Table 8: Overview interviewee statements on methods for sustainability

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Show emissions per travel option	•					•	•		•	•	•		•	7
> Show emissions per travel option - is useless			•		•									2
Electrification of the fleet and use of electric vehicles	•	•			•		•				•	•		6
Offer sustainable alternatives	•	•	•									•		4
Do not offer unsustainable travel options		•												1
Guidance and information on app to increase ease of use				•	•		•		•		•	•		6
Demand based travel		•							•					2
Unlimited bundle or fixed price per kilometre				•			•		•					3
Optimization of public transportation		•							•		•			3
Tools to steer travel behaviour	•	•	•			•	•	•	•	•	•		•	10
> Offering a reward for sustainable travel behaviour	•						•		•	•			•	5
> Influencing private travel behaviour through employer	•				•				•					3

There are multiple methods MSP have planned to have an impact on ecological sustainability

- **Show emissions per travel option:** The most common method is for MSPs to show the emissions generated by their travel options. The assumption is that this stimulates the choice for sustainable travel options. In all cases, this is restricted to CO2, but some have mentioned the possibility to include other harmful emissions.
    - **Useless:** 2 MSPs stated they found this to be useless. One of these 2 had it included in their app previously but have since removed it.
- **Electrification:** The second most-often mentioned method is the electrification of the fleet and the use of electric vehicles. This was mentioned by 6 MSPs.
- **Offer sustainable alternatives:** 4 MSPs think offering sustainable alternatives in itself should have an impact on the choices of travellers.
- **Do not offer unsustainable travel options:** 1 MSP explicitly stated they do not want to offer unsustainable travel options.

Methods to specifically have a socially sustainable impact are:

- **Guidance and information for ease of use:** The most common method in this category, mentioned by 6 MSPs, was to ensure the app has travel information and guidance (e.g. showing the route to the platform when transferring or indicating when to press a button to stop the bus). This is expected to make it easier for vulnerable groups of travellers to use transportation.
- **Demand-driven mobility:** 2 MSPs mentioned that demand-driven mobility can improve access to mobility in rural areas. This was seen separately from optimizing public transportation.

Two methods can have an impact on both social and ecological sustainability:

- **Unlimited bundle or fixed price kilometre:** 3 MSPs argue their business model is intrinsically sustainable because of their use of an unlimited mobility bundle or a fixed price per kilometre. They do not offer certain modalities, but a trip from A to B in whatever way possible. This is argued by them to be intrinsically sustainable because travellers will be put in mass transport as much as possible to minimize the cost per kilometre travelled. For WMO travellers it is argued they will make more trips for less money, a socially sustainable impact since this group will get to participate more in society. The ecological benefit might be offset by the fact they could start travelling more. A bundle for employees or consumers would likely not lead to more travel and is thus more ecologically sustainable due to lower emission per passenger. It is socially sustainable due to the reduction in congestion when people move from cars to mass transit.
- **Optimization of public transportation:** This has been mentioned by 3 MSPs. According to these MSPs, their MaaS-offering can be used to optimize inefficient connections without decreasing accessibility to transportation. When asked why this is a positive impact, the most common answer was that it allowed the government to use the money spent on public transportation more efficiently and thus improve access to mobility. It should also lead to less emissions due to less empty busses driving around.
- **Tools to steer travel behaviour:** Mentioned 10 times in the section on value propositions, this also plays an important role in how MSPs expect to have an impact on sustainability. All MSPs that offer these tools mention It can be used by the government or an employer to steer users to choose more sustainable options, generally to reduce congestion and emissions, as well as improving employee happiness.
    - **Offering a reward for sustainable travel behaviour:** 5 MSPs explicitly state a reward is necessary to steer this travel behaviour and it is often implied by the others. Only a single MSP plans to give rewards themselves, the others leave that to the employer or government.
    - **Influencing private travel behaviour through employer:** 3 MSPs expect to be able to make private travel behaviour of employees more sustainable by influencing their commuting behaviour.

Only a single MSP explicitly mentioned wanting to use nudging or gamification as a method.

4.7.3. Other contributors

MSP have indicated which other groups they expect to contribute to sustainability through not only money but also through choices or policy. The results are presented in Table 9.

A distinction has not been made between ecological and social sustainability for MSPs in this section. For potential contributors, an expectation to contribute to sustainability is derived from the methods employed by MSPs (e.g. offering tools to employers to steer travel behaviour but let the employer decide if they do so for sustainability) and explicit expectations of them driving sustainability. It was often ambiguous which sort of sustainable impact was intended and achieved here, but it was often still implied. For example, if an employer contributes to sustainability this was usually mentioned with the specific ecological example of reducing CO_2 emissions by stimulating the use of public transport. While not specifically mentioned, this usually leads to less congestion as well, and implies a form of social sustainability. A clear distinction was therefore not made.

Table 9: Overview interviewee statements on contributors to sustainability

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Government	•			•	•	•	•		•	•			•	8
Consumer			•		•								•	3
Employer	•			•			•	•		•	•	•		7

MSPs expect the following groups to have a role in sustainability:

- **Government**: 8 MSPs say it is the government's task to stimulate a sustainable impact, through regulations or subsidies.
- **Employer**: 7 MSPs think it is the task of employers to steer their employees towards more sustainable travel behaviour and determine for themselves what takes priority. This could just as well mean the company does not see this as a priority and this offer having no sustainable impact.
- **Consumer**: Very few MSPs see a role for consumers to choose sustainable alternatives. Many MSPs think consumers have no innate desire to choose sustainable travel options.

Absent as drivers are businesses. Only a single MSP mentions something related, stating that these companies see value in reducing congestion around their events. Reducing this congestion does not seem to come from a drive for sustainability however, but simply to have satisfied customers who do not have to sit in traffic for so long.

4.8. Government

In this section the results regarding the role of the government in the success of the MSPs business models. This section is particularly relevant for recommendations to policymakers.
For an overview see Table 10.

Table 10: Overview interviewee statements on the role of the government

Statement	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Has to secure an open ecosystem and level playing field		•		•	•	•		•		•	•	•	•	9
> Has to protect MSPs from public transportation companies					•			•		•	•		•	5
> Has to protect MSPs from large tech companies										•	•			2
Has to stimulate MaaS with policy and regulations	•	•				•	•	•	•	•	•	•	•	10
> Has to alter fiscal policy in favor of MaaS	•					•		•	•		•		•	6
> Has to force to's to allow reselling of all tickets		•							•		•	•	•	5
> Has to improve shared mobility permit policy					•	•					•			3
Tries to steer and shape the market too much				•	•	•	•	•			•		•	7
Has an unclear role		•	•		•	•			•				•	6
The MaaS business case should not need subsidies									•	•	•		•	4
Subsidies are sometimes necessary				•		•	•							3
Subsidies can work as a catalyser									•	•	•			3

4.8.1. Wishes and criticism

Most MSPs expect the government to stimulate or safeguard the development of the MaaS market in some way or the other.

- **Has to secure an open ecosystem and level playing field:** 9 MSPs see a role for the government to safeguard a level playing field and secure a level playing field for the MSPs. Specifically mentioned are reigning in the public transport operator's market power and to apply the same market rules for every party. One MSP worded it as follows:

  "Something that is mentioned sometimes, Google and Uber might take over. I think a part of the responsibility for avoiding that lies with the government, to shape the playing field in such a way that the Cowboys can't suddenly grab the whole market."

  - **Protection from tech firms:** 2 MSPs expect protection from large tech companies.
  - **Protection from public transportation companies:** 5 MSPs expect the government to limit the power of the public transport companies such as NS and HTM.
- **Has to stimulate MaaS with policy and regulations**: 10 MSPs expect the government to actively stimulate the development of MaaS. Specific wishes are:
  - **Alter fiscal policy:** 6 MSPs think the government make MaaS more fiscally attractive and make private car use and lease constructions less attractive.
  - **Force the reselling of tickets**: 5 MSPs think the government should implement regulations that force TOs to allow reselling of their whole range of tickets.
  - **Deal better with shared mobility:** mentioned by 3 MSPs having shared wheels themselves or in their consortium. They complain shared mobility policy varies too much between cities in the Netherlands.

Only a single MSP expects neither of the government.

There is also criticism on government policy.

- **Tries to steer the market too much:** 7 MSPs mentioned that the government tries to steer the development of the market for MaaS and the pilots too much. They believe the government should let the market figure out how MaaS should develop. It is mentioned often by MSPs that they don't deem all 7 functionalities desirable for their MaaS-service. One MSP worded it as follows:

  "I think there is a big risk there: that both the ministry and the municipalities go way too far in structuring the market. Also on this point. When you take the MaaS-pilots, we participate in them, we endorse it, we are very happy that the ministry made these steps, and it definitely has a stimulating effect, but on the other hand, we are forced to participate according to the rules. All pilots have been awarded to other parties, so we invest millions without the guarantee that we can make any profit out of it, because the market in another pilot will already have been determined by another party."

- **Has an unclear role:** 6 MSPs expressed their concern that the role and stance of the government is not clear enough and that they should more clearly express their stance and policy regarding MaaS. This does not necessarily contrast with the previous point. This point of criticism usually did not come with a desire to take a particular stance, but rather to take a clear stance to begin with.

MSPs commented as well on the necessity of subsidies from the government.

- **MSPs should not need subsidies:** Subsidies in this context means subsidy other than the pilot subsidies. 4 MSPs stated that MSPs in general should not need recurring funds from the government to run a viable business case.
  - **Subsidies as a catalyst:** 3 of these did elaborate that they think subsidies can be important as the first catalyst for developing a MaaS service.
- **Subsidies are sometimes necessaries:** 3 MSPs stated that some elements of a MaaS service will always need subsidies to be started up or sustained.

4.9. Government expectations

One of the goals of this research is to compare the current reality in the framework agreement to the goals and expectations of the MaaS-team and to come to policy recommendations. To this end, the programme manager of the MaaS-team has been interviewed with the same interview guide as the interviewees from the MSP. The questions have been rephrased to ask about the expectations and goals of MaaS business models according to the MaaS-team instead of the planned business models by MSPs. This interview has not been transcribed verbatim nor open coded. Instead, the most important points have been taken from the recording and compared to the results presented in this chapter. This yielded the following points:

- The MaaS-team expects consumer business models to be possible, likely through kickback fees. The results show that MSPs plan this. However, the MaaS-team also mentioned the possibility these kickback fees may (partially) be passed on to the consumer, as is already the case in at least one of the MaaS proposition in the Netherlands. No MSP made mention of this.
- The MaaS-team stated mobility cards enhanced with extra services are not MaaS. Included mobility cards should only serve as a temporary solution and the MaaS-team expects customers to not want to require the use of cards. According to the definition of MaaS for the national MaaS pilots, MaaS means payment by an app. MSPs are less convinced of this and see a role for the mobility card for the near future.
- The MaaS-team stated there could be large potential in the optimization of the WMO-market, provided that integration between WMO and public transportation will be allowed. Concrete statements by MSPs on this were mixed, but some MSPs think it's possible since they are developing a business model for the WMO-market
- The MaaS-team stated 50.000 users per day is on the low end for a MaaS-app for a viable business case. For business models to consumer MSPs seem to agree, this is usually mentioned as an absolute minimum. However, for business models to other target customers, they mention very different numbers.
- The MaaS-team stated that the government has to actively steer on sustainability, through policy and legislation and the pursuit of a public-private cooperation. Most MSPs have indicated to want policy and legislation to stimulate MaaS to some degree from the government, but also stated that they currently steer the market too much. However, the MaaS-team states that experience to date shows that without standardisation and national pilots no true MaaS-app (according to their definition) has been developed in the three years it has taken to start up the pilots. They thus consider public-private cooperation to be essential.
- The MaaS-team states that current expenditure on public infrastructure and transportation can be optimized with MaaS. Most MSPs agree with this and think MaaS should be actively used for this.
- The MaaS-team mentions benefitting of own wheels is not allowed and would be a violation of the framework agreement. This will be closely monitored. MSPs without own wheels worry about this happening anyway.
- The MaaS-team expects that if users are made more aware of the choices they make, they will show more sustainable travel behaviour. This expectation is not shared by many MSPs.
- The MaaS-team expects that steering travel behaviour through gamification and rewards is the easiest through employers, but the government can play a role here as well. MSPs mostly agree that these incentives should come from their customers (government or employer), through the MSPs MaaS proposition.
- The MaaS-team expects large tech companies to join the ecosystem given that some larger public transport operators already want to join as well. Some MSPs have nonetheless voiced their concerns over big tech companies crashing in to dominate the MaaS market in the Netherlands. This risk is expected to be minimized if every participant within the MaaS ecosystem and framework adheres to its principles. However, the MaaS-team has seen signs of participants within the ecosystem that seem to aim for a winner-takes-all scenario.

These points can serve as a reference to compare government stances to results from the interviews.

5. Analysis and Implications

The first two sub-research questions have been answered in the literature review. The third research question has been answered in the results section. In this chapter the results are analysed through the lens of the conceptual model and used to answer the following sub-research questions:

- *Which common business models exist in the Dutch MaaS market and how developed are they?*
- *How sustainable are the business models in use or under development by MSPs in the Netherlands*?

Additionally, a start is made on the analysis of results to make policy recommendations. The actual policy recommendations are made in the conclusion.

5.1. Synthesis of results

In Table 11 the most common results on business model elements and sustainability are presented in a single table. The most logical way to order these is by target customer. There are multiple reasons for this. First, this is because any further subdivision soon becomes too specific and would simply be a repetition of the results. Additionally, it is more practical for further reference. Companies are most easily recognized by who they target while specific business model elements, such as using kickback fees as a revenue model, might not be disclosed. Ordering common business models on, for example, revenue models would thus be less useful for policymakers and researchers to work with. Finally, most of the target customer groups have a business model or strategy associated with it specific to that target customer group, offering a logical dimension to group them by.

Target customer groups and their associated revenue models, value propositions and sustainability have been colour-coded: red for employers, yellow for consumers, green for government, blue for businesses and orange for MSPs. Results on all MSPs in general have been colour coded grey.

For sustainability of MSP business models results on impacts and methods have been combined and analysed to determine whether an MSP is sustainable. Almost all MSPs have indicated to place great importance on sustainability but in practice their concrete methods, intentions and expectations vary. Some MSPs only express that they place an importance on sustainability, but the mentioned impacts are not backed up by concrete methods. They were instead voiced as a general expectation that an optimization of mobility in general should have a positive impact on sustainability and that this was an intrinsic part of MaaS. Only an intent to have an impact is not enough for a company and its business model to be sustainable, there needs to be something in the business model that drives it.

This does not mean an MSP cannot incorporate methods enable sustainability. For example, some MSPs offer sustainable alternatives or show emissions per trip. Some do this next to offering mobility that is not sustainable and without actively steering end-users to more sustainable choices or employing other methods to have an impact on sustainability. In these cases, the contribution of the end-user or customer still entirely determine how sustainable the journey will be. The MSP is then not considered sustainable in the sense that I can capture the sustainable value it creates but can have help making a sustainable impact through the efforts of another actor nonetheless. Every MSP enables has been found to enable a sustainable impact.

Some methods that determine whether an MSP drives sustainability have been omitted from the methods section because they were mentioned twice or less but have still been used to determine the drivers for sustainability. All coded methods can be found in the corresponding tables in the appendix. The sustainability of MSPs is analysed in a later section.

Table 11: MaaS business models and sustainability

	MSP	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
Revenue models	Service fees on administrative and control services	●	●		●			●	●	●	●	●	●		9
	Fee for advising employers on transportation policy	●	●					●	●		●				5
	Sales and service fee for mobility card		●					●	●		●	●			5
	Sales of (unlimited) mobility bundle	●			●			●	●						4
	Service fee to consumer						●							●	2
	Government projects						●	●	●		●				4
	Sales of (unlimited) mobility bundle2				●										1
	Service fee for mobility bundled with product			●				●			●	●	●	●	6
	Subscription fees on white label services to MSPs				●	●		●	●	●				●	6
	Developing IP and expertise for MSP				●		●	●		●					4
	Income on own wheels	●	●			●		●			●	●	●		7
	Kickback fees from transport operators		●			●		●	●	●	●	●			8
Concrete vp	Less administrative tasks	●	●		●			●	●	●	●	●	●		9
	Tools to steer travel and behaviour	●	●					●	●	●	●	●			7
	Less parking spots necessary	●			●			●		●	●				5
	Enriching customer's product			●				●			●	●	●	●	6
	A (white label) MaaS platform				●	●		●	●	●				●	6
	Customers for transport operators	●		●	●			●				●			5
Conceptual vp	Improved convenience		●		●	●	●	●	●	●	●		●	●	10
	Cost reduction	●			●		●	●	●	●	●	●		●	9
	Imroved reliability		●		●	●	●		●	●		●	●		8
	Improved flexibility	●				●	●	●		●	●	●			7
	Contribution to user's health	●	●					●			●		●		5
Sustainability	Business model is ecologically sustainable	~	●			~		●		●		●	~		4/7
	Business model is socially sustainable	●	●	●	●	●	●	●		●		●	●		10
	Employer as contributor	●			●			●	●	●		●	●		9
	Government as contributor	●			●										5
	Consumer as contributor					●								●	2
	Government as contributor					●	●	●		●				●	5
	Consumer as contributor														0
	Government as contributor				●		●	●							3

Legend: Employer | Consumer | Government | Business | MSP | General | ~: sustainable through electrification

Table 11 shows there is nothing that applies to all MSPs or that all MSPs agree to. Neither are there any duplicate business models among the interviewed MSPs; all MSPs have their unique combinations of target customers, revenue models and value propositions. MSP D10 stands out as targeting almost every target customer group, offering almost every value proposition and using almost every revenue model, while D6 is the opposite. All other MSPs lie on a spectrum between these.

Some business elements are broadly used, however, and there are business models that show great similarities, such as the business models towards employers. Other patterns and combinations are more erratic and require zooming in to specific sections of the table. These patterns are analysed in-depth in the following sections.

5.2. Dominant business models

Most MSPs gave the general impression to be still in the middle of developing their business model for their MaaS activities. Examples of pricing models were rare, and many indicated they were still searching for a business model.

The combinations of business models for the MSPs vary widely, even within target customer groups. Own wheels and kickback fees are very common revenue models used in conjunction to the dominant business model in a target customer group. Especially smaller (IT) companies have mentioned that building up IP and expertise created value for them as well.

However, there are dominant common business models for each target customer group. The goal for these common business models is to have a broad overview of what kind of business model can be expected in the Dutch MaaS market. Only the more common, found in more than half of the MSPs targeting that customer group, or especially relevant business model elements have been included.
The following business models were dominant.

5.2.1. Employers: administrative and control services

The dominant business model targeted at employers is the sale of administrative and control services. They offer less administrative tasks, and tools to steer travel behaviour, coupled with a revenue model to asks fees for these services. They often supplement this revenue model with several others, including selling a mobility card, kickback fees from transporters, a fee for advising on mobility policy and income on own wheels. The value propositions associated with these revenue models are both concrete, such as fewer parking spots necessary, or more conceptual such as cost reduction or improved flexibility.

Most of these revenue models already existed, centred around a mobility card.

About half of the MSPs targeting employers see a role for mobility bundles, which, are often thought of as integral to a MaaS-proposition (regardless whether this is justified). The business model around offering mobility bundles generally did not have a pricing model yet.

5.2.2. Consumer: kickback fees

Most MSPs target consumer in some way, although it is the main target customer for only 4 MSPs. The MSPs that plan to target consumers only in the long term have been excluded since they had no particular business model for this target customer planned yet.

There are two distinctive revenue models towards consumers:

- **Direct income from consumers:** 1 MSPs sees potential in charging fees and the other already charge fees directly to consumers for the use of their app.
- **Indirect income from consumers:** 5 MSPs aim to earn money on consumers through kickback fees from transport operators. Except for 1, they combine this with income from their own wheels. In principle, this means that the margin for profit lies within the transportation, and not in the added MaaS-service, which is added on for free towards the customer.

No MSP currently offers a more concrete value proposition than cost reduction, and even this value proposition is general and not backed up with concrete value propositions or mechanism that would achieve this. This indicates that there is no business case for the average consumer yet.

No MSP in this category sees a role for mobility bundles.

5.2.3. Government: WMO-travellers and projects

The business model towards the governments works differently for MaaS. In principle, the value proposition to the government is the same for any MSP that target the government: a sustainable impact. These are analysed separately, but in general, all MSPs that target the government as a customer have a sustainable impact as a value proposition. The revenue models are compared though.

The business models towards the government can roughly be divided into two categories:

- **WMO:** 3 MSPs aim to develop their MaaS-service for WMO travellers. This user group has its mobility subsidized by the government. These MSPs hope to offer lower subsidy costs for the government by optimizing the use of mobility by WMO travellers. This would have a socially sustainable impact which would warrant a premium for their services. This type of business model is internally divided by:
    - **Income through the sale of mobility bundles:** One MSP hopes to buy and resell an unlimited mobility bundle with a profit by optimizing the actual mobility expenses made by the WMO travellers
    - **Income through kickbacks and mobility cards:** The other 2 MSPs expect to see extra revenues come from kickback fees and the sale of mobility cards for WMO travellers.
- **Projects:** 2 MSPs expects to earn income through carrying out policy and projects of the government for which they would get paid.

5.2.4. MSP: offering white label services

Almost half of the MSPs plan to offer access to their MaaS-platform (white label) to a company that wants to set up their own MaaS-service for a fee.

The majority of MSPs in this category supports this business model with income from kickback fees, except for 1. Developing the technology for their MaaS-platform is already considered a source of value captured by halve of the MSPs in this target customer group.

The revenue model of offering subscription fees is only coupled by a single concrete value proposition and no conceptual value propositions. Conceptual and other value propositions are for the purchasing MSP to offer in their own MaaS-proposition.

5.2.5. Businesses: offering mobility bundled with customer products

6 MSPs plan to or already offer to bundle mobility with the product of their customer.

4 MSPs plan to generate more income from the side of the transport operators. 4 MSPs plan to earn money on own wheels as well. The business model towards businesses seems dry and cut. The main revenue model is directly coupled to 1 concrete value proposition and lack conceptual value propositions, similar to business models aimed at MSPs.

5.3. Implications

In the next section, these implications of these findings are analysed.

5.3.1. No strong business model for consumers

IenW expected there to be a possible business model towards consumers but it seems to be lacking. The biggest factor impeding the development of a strong business model towards consumers is the lack of a concrete value propositions associated with it.

Other target customers have concrete value propositions aimed at them. MSPs mention that employers, the government, businesses and MSPs have tangible problems that need to be solved. The government has a task to deal with congestion, accessibility to cities, emissions and other problems regarding sustainability, which MSP say they can provide tools for to deal with. MSPs said that employers currently often spend a lot on mobility, both due to overhead and the use of more expensive modalities than necessary, and that many inefficiencies can be optimized, which in the end saves the employer money. Businesses have a product they want to sell and customers that need to reach their location, which an MSP say they can take care off. Companies that want to set up a MaaS-proposition do not always want to develop the platform themselves and want an outsourced solution.

What these target customers have in common, is that they have an end-user that is not themselves. A MaaS-service enables those customers to steer end-users towards travel behaviour that benefits them or have something they want to sell that end-customer themselves.

This is different for the general consumer. There is no need for an overview of expenses to claim a reimbursement for business travel expenses (this would be included in the MaaS-app for the employer or independent contractor), no end-user whose behaviour they want to steer and no product to sell to an end-user further down the line. The value proposition is a seamless multimodal journey and the conceptual value propositions that come with it. This seamless multimodal journey, besides how an MSP wants to offer this, is already considered inherent to a MaaS offering and is therefore not something an MSP can typically distinguish themselves with, apart from exactly how convenient or reliable it is. No MSP went into detail on how exactly to differentiate themselves from other MaaS-propositions with aspects that differ from what a MaaS-proposition already has to satisfy according to the MaaS-team. There was only a single MSP that wanted to add extra services in their MaaS-offer to consumers, such as being able to pay for wi-fi or delivery services, to increase convenience and comfort. This MSP only plans to target consumers in the long run.

This is likely the reason behind why MSPs do not believe they can charge the average consumer a service fee. A way in which they seem to try to circumvent this is by charging kickback fees to transport operators and not let consumers pay service fees but they will still need to offer the consumer enough of a value proposition, such as a discount in travel partially paid out of kickback fees, for them to take the effort to use the MaaS-service instead of falling back in their existing travel behaviour. The MaaS-team expected as well that customers could potentially share in the lower cost of operation a MaaS could bring to a transport operator which it would pay back in kickback fees. No MSP indicated they would offer the transport operator lower operating costs, let alone passing these along to the consumer.

An advertising model was absent as well, which could indirectly be interpreted signalling the lack of a strong model towards consumers. The value proposition must be strong enough to outweigh the nuisance of advertisements in the app, and that is likely to not be the case.

MSPs are not planning to offer mobility bundles (yet) to consumers. This is especially surprising since the most well-known MaaS-service, WHIM, offers these bundles. When asked why these are not offered the MSP usually indicated that these bundle models did not work with little extra explanation why.

There is a notable exception: the foreign traveller. 2 MSP mentioned foreign tourists and 1 MSP mentioned foreign students as being potential end-user which have a problem to be solved, namely being facilitated in navigating the mobility system of the Netherlands without speaking the language, without having an OV-chipcard and without a Dutch bank account. Even then this foreign traveller is approached as an end-user, and not a customer. They all stated they will offer their platform to another business, such as ISIC (an international student organisation) or the VVV (the Dutch tourist bureau). The customer buying the services of the MSP is then still left to figure out the pricing, exact value proposition and marketing to this group of end-users.

This lack of differentiating value propositions towards customers could be an indication that there is simply no viable business model towards consumers yet. The value proposition stays conceptual without differentiating concrete value propositions to back these up. Without a good enough value propositions, consumers will not pay for their MaaS-proposition. Similarly, there are few revenue models and pricing models associated specifically with consumers indicating the same as the lack of value propositions. The wide bandwidth of with how many customers an MSP expects to be profitable in the case of consumers without proper explanation for this, also indicates a lack of a fully developed business model. The general impression from the interviews also indicated that MSPs are still searching for a viable business model towards consumers.

There is an important note to make on this. Apart from the smaller MSPs newly entering the market, 11MSPs already had a customer base in the mobility market or MaaS market, for themselves or in their consortium, before entering the framework agreement, although they vary in size. It could be that they expect this existing customer base to give them the initial customers and subsequent word-of-mouth the need to grow. Additionally, while not mentioned by the MSPs, it could be possible the MSPs see winning a pilot as a good method to acquire paying customers. However, this is speculation

It is expected that the consumer market will thus likely stay with the MSPs which are already active in it, and with larger MSPs that have more bargaining power to secure kickback fees and an ability to generate income with own wheels.

5.3.2. Other business models are stronger

The case for targeting employers is stronger. There is a variety of value propositions, both conceptual and concrete, and revenue models. The business models used, however, are often not novel. Many MSPs targeting employers seem to build on old revenue models and concrete value propositions, which they make stronger with MaaS. It does not have to be a problem that the business models are not novel. However, there could be a risk existing mobility card providers and employers are satisfied enough with their current arrangement and consider a MaaS-proposition not enough added value. They might similarly not search for something better if they are satisfied with the current mobility card. The sales of mobility bundles, and the promised cost reduction and other associated value propositions might make the business model towards employers stronger for MSPs, if this is an adequately strong value proposition. Much will depend on the actual cost reduction this might bring, which is not clear yet.

The business model aimed at the government depends on whether the MSP can optimize and improve WMO-mobility. The MSPs explained that they expect to be able to generate a cost reduction by optimizing the WMO-mobility system and at the same time allow WMO-travellers better access to mobility. Although the MaaS-team has indicated that subsidies are not desirable, the WMO-mobility is paid for by the government. This proposition promises to lower government expenses or allow for kilometres travelled per euro spent. Everything hinges then on whether the MSP manages to optimize WMO-mobility, which they gave little detail on. As for government projects to execute policy: these are already being carried out by some MSPs and some simply want to continue doing that through their MaaS-proposition. This has worked for them in the past but is heavily dependent on whether the political climate calls for such projects.

The business models towards other MSPs and businesses seem most clear cut. The MSP offer its platform, white label usually, and bundles transportation with the businesses product or sells access to its whole platform to another MSP. The business model to businesses already exists, NS for example offers transportation by train to certain attractions. An MSP doing this, but instead including all possible modalities, is likely to find customers here. The business model towards other MSPs however hinges on the other MSP's success, and their value proposition. As long as MSPs want to purchase white label solutions, and they stay successful, so does the MSP that sells their platform.

5.3.3. Belief in MaaS among MSPs is mixed

The amount of trust MSPs place in the success of MaaS can be an indication of how well they can develop a viable business model. The MSPs themselves give mixed signals on whether they believe in the success of MaaS. 4 MSPs stated they did not expect MaaS to become big, or called it a hype, while a total of 6 MSPs indicated the market for MaaS is not mature yet, citing immature business models, insufficient coverage of shared mobility and too limited understanding of MaaS by transport operators and other stakeholders. Unsurprisingly, more than half of the MSPs targeting consumers said they did not expect MaaS to become very big which likely has something to do with the inability to find a strong business model. In contrast, 11 of the MSPs operate internationally or indicate they plan to. This does indicate they have some level of trust in the success of MaaS and their business model.

5.3.4. Heavy reliance on kickback fees

More than half of the MSPs, as well as half of the MSPs in every target customer group, plan to earn revenue on kickback fees. MSPs did not provide much insight into exact percentages they pursue or get from transport operators, but numbers that were provided ranged from 1 to 10%. In a sense this makes transport operators a customer to the MSP as well, but with a different product and value proposition: more customers.

Heavy reliance on these kickback fees may prove problematic for MSPs. First, profit margins, especially in public transportation are slim. For transport operators to pay a kickback fee, it needs the leeway in its profit margins to do so. This is especially true for small transport operators. Additionally, larger companies, for example, the NS, may not see the need to pay kickback fees for more customers. They reason instead that connecting them to a MaaS-proposition provides an MSP with much-needed coverage. Some MSPs have indeed mentioned running into this or are concerned this will be an issue. Finally, some of the smaller MSPs at this point cannot make this value propositions yet. They do not have a sufficiently large customer base to be in a position to ask for kickback fees.

The value proposition of more customers may thus not be enough. MSPs indicated that even with the proposition of more customers, transport operators were still worried to lose the direct contact with their customer or where even worried to lose instead of gain revenue if they connect to an MSP. The MSP may have to offer more. In theory, the MSP could be able to reduce the overhead of transport operators or optimize their operations with the data generated with their MaaS-proposition. The savings could be passed on in part through kickback fees. Hardly any MSP mentioned this possibility, however.

This is expected to endanger the possibility of a business model for consumers. If there is not a sufficient kickback fee to share, in the form of discounts, with the consumer, it becomes increasingly difficult to offer a sufficient value propositions to the consumer.

Heavy reliance on kickback fees may also make it more difficult to ensure a fair ecosystem for MaaS. First, kickback fees may prohibit neutral travel advice when used incorrectly. Some MSPs mentioned kickback fees are necessary for neutral travel advice, while others stated they prohibit it. However, it depends on whether the same percentage is charged to all transport operators. If one transport operator pays higher kickback fees, this could be an incentive for an MSP to favour this transport operator. Additionally, even if kickback fees are equal for all transport operators, there is a danger these fees may place the MSP in an unfairly strong position of power when it grows in size. Takeaway.com started with low kickback fees to its restaurants, offering a supreme value propositions and gathered as many restaurants as possible on its service. When it became an indispensable service to be connected to, due to its size and dominance on the market, it increased its fees to its restaurant several times over. Restaurant owners can choose to disconnect from takeaway.com, but this will likely cost them more than it saves them. They are then stuck to the service. If an MSP becomes sufficiently dominant on the Dutch MaaS market, there is a risk it may follow this same strategy.

5.3.5. Reliance on other revenue models

Especially smaller (IT) companies have mentioned that building up IP and expertise created value for them as well.

Own wheels are very common revenue models used in conjunction with the dominant business models. However, this can be considered a business model next to the MaaS business model. The MaaS-team would like the business case for a MaaS-proposition to stand on its own, even without the own wheels. It is not clear to what degree the income from MSPs will lean on the revenues generated from own wheels. If MaaS business models prove to need this revenue model to be viable in the short or long term, this could give an undue advantage to bigger MSPs that already have own wheels. On the other hand, own wheels could ensure that the MSP stays afloat in the first stage of rolling out its business model while requiring less subsidies. Whether the support of MaaS business models with own wheels can be considered a strength then depends on whether the risk of unfair advantages is worth the reward of needing less subsidies. MaaS-propositions without any of the three previous revenue models are rare.

It is expected that MSPs with an ability to generate income through additional revenue models will have an easier time starting up their MaaS proposition.

5.3.6. Comparisons to the literature

Almost all revenue models, target customers (although in this research the consumer group was treated as a whole) and value propositions that were conceptualized or found before were also present among the interviewed MSPs in the framework agreement.

The most striking absence was advertisements. None of the MSPs mentioned the intention to implement advertisements into their MaaS-proposition once. This is especially surprising for the MSPs that were also transport operators, since these often already have advertisements in their transportation. Since no MSP even commented on this revenue model it is difficult to say why no MSP plans to do this. Possible MSPs that don't have experience with advertisement revenues do not want to be dependent on another company besides their partners and transport operators. A likelier reason is due to the lack of a proper differentiating value proposition for consumers, since this is the only target customer group that is likely to accept advertisements. If it is already difficult to make consumers use a MaaS-app, it is made even less attractive by including advertisements. However, this could be solved by sharing the profits of the advertisement with the consumer, in the form of cheaper transportation. Why no MSP does this is difficult to say, again due to the lack of comments on this topic. It is expected that when a sufficient value proposition can be found for consumers, this revenue model will see more widespread use.

The sale of data that was suggested in the literature was also not mentioned often as a potential revenue model. The reason for this is that the participants in the framework agreement are obligated to share data with a learning environment, for which they will not be paid. The value they extract from this is getting to participate in the framework agreement with all associated benefits. Selling detailed data to other companies should still technically be possible, and an MSP indeed mentioned they consider doing this.

5.4. Sustainability

Which MSPs are sustainable is shown in Table 11. A distinction has been made between ecological and social sustainability. Economic sustainability has been mentioned little in the interviews and has thus been omitted. In the literature a prerequisite was found for a business model to be sustainable: the business model must both create and capture sustainable value.

The business models aimed at businesses or MSPs have been excluded when looking at sustainability. Generally speaking, in this business model, the services of the MSP are offered to their customer, who can be expected to then determine how sustainable their business model will be, and which parties contribute to sustainability. When offering an MSP, a white-label platform it is offered as a tool to that MSP, without a business model attached. The business being offered mobility to bundle with their product similarly determines the business model on how and with what modalities the transportation is offered to their end-users and thus determines who drives sustainability. Interviewees made no comments on the extent that they could or would influence the use of their product offered to MSPs and businesses. Due to this lack of information these common business models were not evaluated for their impact on and drivers of sustainability.

All MSPs that do not have an ecologically or socially sustainable business model at least in some way can enable it. The most common method for enabling sustainability is 'Tools to steer travel behaviour' which requires the government or an employer to be the contributor. Other methods are offering sustainable alternatives or showing emissions per trip in the MaaS-app. If a MaaS level of 4 (Sochor et al., 2018) can be considered enabling the enactment of societal goals through MaaS, all investigated MaaS propositions can be considered level 4. When a narrower definition is used, i.e. if the MaaS business model must be sustainable itself, less MaaS propositions can be considered level 4. This is further presented in the following sections.

5.4.1. Ecologically sustainable business models

7 MSPs out of 13 have concrete plans for an ecologically sustainable business model. 2 business models are ecologically sustainable by using an unlimited travel bundle or a fixed price per kilometre. The MSP is encouraged by its business model to let their customers travel as much with cheaper mass transport or cycling and walking as possible, which generally is more ecologically sustainable. All expenses that the MSP saves by making a user travel with cheaper mass transport, increases the difference between the price that is paid for the bundle or per kilometre and the expense the MSP has to make to purchase the transportation from the transport operators. This margin allows them to capture their created sustainable value.

2 business models are sustainable by optimizing the use of public transportation. Sustainable value is generated by increasing occupation rates of public transportation, which lowers the emissions per traveller. It is possible to capture the value of this in several ways; an MSP with own wheels might lower its expenses on public transportation or kickback fees from public transportation may be increased due to the added value the MSP offers the transport operator by allowing it to optimize its network.

6 out of the 7 ecologically sustainable MSPs do so through electrification of and the use of their electrified fleet of which 3 through electrification only. Business models that are ecological sustainability only through electrification are indicated with a '~'.

5.4.1.1. Electrification

Whether electrification of its fleet makes the MSPs sustainable is debatable. Electrification of the own wheels of these MSPs were often already part of concessions or the general strategy of the company. In the case of electrification of shared mobility, this electrification would likely have happened without MaaS. What's more, electrification of the fleet does not have a sustainable impact of itself, if anything the materials and energy to first make an EV will have a negative impact on sustainability on its own. It is about the actual use of electric vehicles that replaces the use of transportation that uses fossil fuel that has a sustainable impact. Problematic is that most interviewees did not make a clear distinction between the use of electric vehicles or electrification of their fleet and usually phrased it as if they wanted to make a sustainable impact by doing the latter.

However, especially because electric vehicles are more expensive to purchase than fossil fuel vehicles and vehicles are not purchased not to be used, the MSP likely has a drive to use these as much as possible. It can be assumed that the interviewees meant this when commenting on electric vehicles. As has been found in literature, the use of electric vehicles in a business model allows for self-reinforcing creation and capture of sustainable value. It is in the financial interest of the MSP to use their electric vehicles where possible due to their lower operating cost. The use of electric vehicles thus both creates sustainable value through lower emissions and lets the MSP capture it through lower operating costs. A MaaS app may be more ecologically sustainable than a separate transport operator with electric vehicles this way, because it enables the use of electric vehicles of all available modalities and offers it next to existing fossil-fuelled modalities that the end-user is already using. It removes the need for the end-user to specifically go looking for an operator that offers electric vehicles.

5.4.1.2. Mismatch between perceived and actual ecological sustainability

Almost all MSPs considered themselves to be ecologically sustainable. Since only 7 can be considered to be so, there seems to be a disconnect between how ecologically sustainable MSPs think they are and how sustainable they are. The other MSPs simply enable ecological sustainability but are not sustainable. Additionally, the ecologically sustainable impact is considered quite one-dimensional by MSPs. They only spoke of a reduction of CO_2 emissions, with a rare few including other harmful emissions in their consideration, while none of the MSPs mentioned the potential positive impact of needing fewer resources to manufacture vehicles. There is a risk MSPs may thus not fully exploit the potential of this sustainable impact.

5.4.2. Socially sustainable business models

10 out of 13 MSPs have concrete plans for their business models to be socially sustainable. The most common method, used by 6 MSPs, is making transportation more accessible through adding accessibility functions to their app or expanding accessibility to remote regions through their app. Next to creating sustainable value, this allows them to capture the value as well since more people will be able to use and pay for the MaaS-proposition.

3 MSPs are socially sustainable due to the use of a price per kilometre or an unlimited bundle. When used for the WMO-market this creates sustainable value because WMO-travellers will be able to travel more for the same expenses. With other target customers, the increased use of mass transport or cycling and walking can reduce congestion. Another form of sustainable value is a contribution to a user's health, if users are recommended using shared bicycles or walking. The value is captured the same way as has been described in the section on ecological sustainable business models.

In general, MSPs mentioned more explicit and implied intent to drive ecological sustainability than social sustainability. This might be because CO_2 targets are a prominent topic today. Only 7 are ecologically sustainable, however. In contrast, 10 out of 13 MSPs are expected to have a socially sustainable impact in some way and are drivers for social sustainability to a certain extent.

5.4.3. Sustainability of common business models

To see if a particular target customer group can be associated with more sustainable business models these have been evaluated per target customer group. For the target customer groups of employers, consumers and the government, at least half of the MSP business models are sustainable. It differs per customer group however who they expect to contribute to sustainability as well.

Little more than half of MSPs lets the employer set the targets for sustainability. More than half of the MSPs in this category can be expected to be sustainable as well. However, in this category, the actual impact on sustainability by most MSP is through electrification and optimization of public transportation. Only 2 MSPs do so through an intrinsically sustainable business model. The most substantive contribution to sustainability will then have to come from employers if this is not achieved by an intrinsically sustainable business model.

When targeting consumers, the majority of MSPs have a socially sustainable business model. The most prominent impact is increasing the accessibility of mobility. As for ecological sustainability, the majority is achieved through electrification. Only a single MSP will offer an unlimited bundle or price per kilometre to consumers. Most MSPs don't seem to believe that a drive for sustainability will come from consumers, which has been explicitly stated by several MSPs, and see the main role for the government in this.

The MSPs can be expected to have a socially sustainable business model but only half can be expected to drive ecological sustainability. The government itself will have to set the ecological sustainability targets and be a contributor to sustainability.

5.4.4. Comparisons to the literature

MSPs seem to use a different definition of sustainability than the literature has brought forth. Most MSPs consider their company and business model to be sustainable but when evaluated for being able to capture the sustainable value they create considerably less are. Still, more than half of the MSPs satisfy this main criterium even if they may be unaware of it themselves.

The literature identified some of the most common methods to both create and capture sustainable value. Electrification and making mobility more accessible are found widely in the business models, thus confirming these findings by earlier literature. In contrast, nudging and gamification are only mentioned by a single MSP, but this was most likely because this was not explicitly asked in the interviews.

3 MSPs seem to be aware of the possibility of the use of data to optimize public transportation. However, the possibility of selling this data to capture this sustainable value, like literature suggested, is largely impossible. The terms of the framework agreement the MSPs agreed to necessitate them to share this data in a learning environment for free. It is thus impossible to capture this value directly. Instead, they should be able to capture this value in indirect forms. Participating in the framework agreement gives MSPs access to the pilots and the ecosystem the other MSPs operate in. Additionally, they will receive data as well which allows the MSP to improve their service.

This research has yielded only a few results on pricing models that allow MSPs to capture value from sustainable travel options like walking and cycling. The bundle model was proposed by 2 MSPs. To avoid stimulating unsustainable travel behaviour through the use of bundles, it was suggested to use mode-specific travel credits. These MSPs however suggest to only guarantee transportation from A to B, and not guarantee the use of certain modalities. This would allow the MSP to steer the travellers to the travel option with the best cost, speed and sustainability ratio. More expensive and less sustainable modalities are only offered when necessary. A third MSP similarly suggested guaranteeing travel from A to B, but with a fixed price per kilometre with possible differentiation between quality, similar to first and second class. This pricing method was not found in the literature

5.5. Functionalities

In addition to the other business model elements, the implemented functionalities were also investigated. the MaaS-team has set requirements for these functionalities and will thus play a part in how the business models develop and how the MaaS-team judges them. Most functionalities are implemented or will be implemented among the MSPs. This is unsurprising since requirements for the implementation of these functionalities have been included in the framework agreement. The functionalities adaption and personalized travel have likely been forgotten by most MSPs because they are so essential to navigation and planning apps already. The same goes for on-trip support, with which is meant customer service, which is also likely to be considered a given for any product a company offers.

5.5.1. Mismatch between ambitions

The degree of implementation and exact form of the functionalities differs per MSP. Full integration is only planned by 2 MSPs and even for these, it did not become clear how extensive the implementation will be. Especially the functionality of travelling is planned very differently from MSP to MSP. Pilot winners are forced to connect transport operators through the API provided by the ministry, but plenty of MSPs have indicated they do not intend to do away with the OV-chipcard anytime soon or will keep including deep links.

Particularly salient is the statement by 5 MSPs that not all functionalities are desirable or necessary for their MaaS-proposition. Pilot winners have stated they plan to implement functionalities they had no initial desire to implement, and MSPs that lost pilot tenders have indicated they will drop certain functionalities from their proposition.

There are some possible explanations for the difference in ambition between the MaaS-team and some MSPs. One possibility is that the requirements set up by the MaaS-team stem from existing literature on MaaS and an ideal image they have of MaaS. The MSP on the other hand may reason from the demand it sees among its (potential) customers. However, MaaS is not a clearly defined concept and cannot be considered common knowledge yet. It is possible their target customers do not know what Maas functionalities they want yet since they either do not know about them or cannot see the benefits it might bring them. Both parties likely reason from a different frame of reference. Which functionalities are essential and to what degree will become clearer when more MaaS-apps go live.

Another reason is that the MSPs likely do not share the same goals as the MaaS-team for MaaS. The ministry wants to stimulate the development for MaaS not primarily for economic reasons, but to avoid negative side effects and to use MaaS for the public good as well. Although there are socially responsible companies as well, their primary reason is to make money. Some functionalities may cost more than they yield in extra profits but benefit the traveller and the public good.

It can thus be reasonably expected that the 7 core functionalities defined by the MaaS-team will not be implemented by all MSPs when they are not forced due to contractual obligations in the framework agreement and pilots.

5.5.2. Cancellation

The absence of any mention of the cancellation functionality by most MSPs may be cause of concern. Most public transportation in the Netherlands can be used with an OV-chipcard, with which you pay for your trip when you make it. If there are disruptions, or the weather or your plans there is no pre-bought ticket to cancel. Special discount tickets, for example, seasonal tickets with NS, have to be bought beforehand and may not always be cancelled. However, for this you receive a discount, which for customers can be worth foregoing the option to cancel. Some MaaS-apps will require the user to pay for the whole trip at the moment of planning and booking, also for modalities they would usually pay with an OV-chipcard. If there is no option to cancel the trip, or legs of the trip, in that MaaS-proposition, it may make the proposition a lot less attractive.

A large part of the convenience and flexibility an MSP offers the customer could be lost, especially harming the already thin value proposition to consumers if the inability to cancel is not coupled with a discount. It is of course possible that MSPs consider this functionality a given as well and therefore not name it.

However, it is likely MSPs still using an OV-chipcard have not concerned themselves with this problem yet. MSPs that did mention cancellation indicated they are not sure yet how exactly to solve this issue. It is expected that MSP will resolve this issue when they encounter it and can find a solution to it.

5.6. Expectations of the government

The expectations the MSPs have of the government and the criticism on their role in the MaaS-ecosystem so far shows a contrast.

On the one hand, MSPs expect the government to actively stimulate the MaaS-market. They expect the government to stimulate the use of MaaS through fiscal and mobility policy and are asked to regulate the resale of tickets, so they can force large transport operators to allow resale of all their tickets. What's more, the government is suspected to protect the nascent MaaS-market from power abuse by large transport and tech companies.

On the other hand, more than half of the MSPs thinks that at the same time the government dictates the development of the MaaS market too much. This includes the requirements of the 7 functionalities by the MaaS-team in the pilots.

This is not as much of a paradox as it might seem at first glance. The MSPs want protection of their interests and access to as much of the mobility market as possible and look to the government for regulation and policy to do this. Policy and requirements that restrict MSPs in the development and operation of their business models are criticized. These comments should therefore not come as a surprise but is typical for any party that wants to protect its interests. It is expected regulators will find a balance between stimulation, protection and regulation.

There is one statement that is worth mentioning separately from these: the role of the government is sometimes unclear. Almost half of the MSPs stated that they want more clarity from the government in a variety of cases. Much is still uncertain in the MaaS-ecosystem and MSPs want certainty where possible. At the same time, the MaaS-team and local governments are searching as well for the optimal way of regulating MaaS, but also shared mobility, the placement of hubs, fiscal rules, etc.

Finally, comments on subsidies were mixed. Surprisingly it was not necessarily the larger companies that indicated they do not need subsidies and smaller companies saying they do. It had more to do with how fast they estimated they could run a viable business case and recoup their investments.

6. Discussion and Conclusion

In this final chapter the findings from the literature review, results and analysis are used to answer the sub research questions which together answer the main research questions and are used to evaluate the conceptual model. After that, the limitations of this research are discussed. Policy recommendations and implications for current literature are then presented. Finally, avenues for further research are presented.

6.1. Answering the research questions

The sub research questions will first be answered based on the previous chapters.

6.1.1. Which business models for MaaS have been identified in literature?

The current literature on business models and business models for MaaS has been reviewed. It was found that several target customers, revenue models and value propositions have been theorized but little empirical research exists, and complete business models are scarce. Instead, most literature describes separate business model elements.

Proposed target customers are locations (such as events, attractions or other businesses), government (including WMO), employers and consumers. Proposed revenue models are kickback fees from transport operators, service fees, income on own wheels (including busses, or shared mobility), fees for bundling transportation with products of other companies (e.g. a museum ticket), fees for administrative services, advertising, subsidies for carrying out public tasks and fees for added services to mobility (e.g. Wi-Fi). The identified concrete value propositions are the integration of mobility services in a unified platform, single booking, ticketing and payment (i.e. seamless journey), data provided for demand management, incentives for sustainable mobility and lowering of administrative burden. Identified conceptual value propositions are convenience, cost reduction, flexibility, sustainability, accessibility and personalization

6.1.2. What makes a MaaS business model sustainable?

The literature on sustainable business models and sustainable MaaS business models have found methods for generating sustainable value. Sustainability is divided in 3 dimensions: ecological, social and economic sustainability. More importantly, it was found that for a business model to be sustainable it had to be able to create as well as capture sustainable value. Literature specifically on sustainable MaaS business models found that sustainable value can be created and captured by using MaaS to stimulate societal goals which the government can pay for, electrification, making mobility more accessible, selling data that can be used for the optimization of mobility systems and a financial model that allows MSPs to capture the value of the use of sustainable travels modes, such as walking or cycling, directly.

The answers to the previous research questions were then used to construct a conceptual model through which the rest of the research question were approached.

6.1.3. Which target customers, value propositions, revenue models and sustainability impacts are being developed and considered for MaaS business models in the Dutch market?

The answers to this research question were shown in the results chapter and synthesized in Table 11. A wide variety of business model elements were found, both aligning with and adding to those found in the literature review. It was found that besides intending to have a sustainable impact, with or without a concrete method, MSPs also had expectations of other stakeholders to contribute towards achieving a sustainable impact.

MSPs were also found to have a range of expectations and critique on the MaaS-team. MSPs indicated to implement the functionalities required for a MaaS-proposition by the MaaS-team to varying extent and in different forms. These results were then analysed to answer the next sub research question.

6.1.4. Which common business models exist in the Dutch MaaS market and how developed are they?

The results were synthesised in a single table. This brought forth the following most common business models per target customer group:

- **Employer:** Administrative and control services
- **Consumers:** Kickback fees
- **Government:** WMO-optimization and government projects
- **MSP**: Sales of white label services
- **Businesses:** Bundling mobility with customer products

Especially smaller (IT) companies have mentioned that building up IP and expertise created value for them as well. More than half of the MSPs' business models rely on kickback fees. This may be cause for concern and prove to be a weakness in the MaaS business models and to the public value case. Own wheels are very common revenue models used in conjunction with the dominant business models. MaaS-propositions without any of the three previous revenue models are rare.

The level of development and the strength of the business models vary strongly per target customer groups but is by far the weakest for consumers. The MaaS-team expected that there are viable business models for consumers, but the reliance on kickback fees and own wheels, and the problems that these revenue models bring, are problematic.

There is a much better-developed business model present for the other target customers groups. Business models towards employers are both the strongest and least novel of the business models with an actual end-user it is being developed for (as opposed to the model towards MSPs). The MSPs developing these business models showed less willingness to fully implement all functionalities than other MSPs.

The business models for the WMO market seem to tackle the problem the MaaS-team wants them to: optimization of the WMO-market. The MSPs that are developing a MaaS-proposition for the WMO market show faith in being able to deliver this optimization but offer little insight into how they would achieve this.

The business models towards businesses is a strong one since it first finds a problem to solve. Even though the MaaS-team does not consider this type of MaaS-proposition central to what they want to achieve with MaaS in the Netherlands, it nonetheless can contribute solutions to specific problems. The business model towards other MSPs is also not central to the development of MaaS according to the MaaS-team but may be essential for the MaaS ecosystem to proliferate and flourish, nonetheless.

Some MSPs seem not convinced of widespread implementation of MaaS and this will likely be reflected in the ambition and scale of their business models. Additionally, the absence of a cancellation functionality could severely weaken MaaS business models and should be investigated. Finally, not all MSPs are motivated to implement all functionalities the way the MaaS-team requires them to and there seems to be a mismatch in the ambitions on how extensively these functionalities should be implemented.

6.1.5. How sustainable are the business models in use or under development by MSPs in the Netherlands?

Nearly all MSPs have voiced the intention to develop a sustainable business model and nearly all of them employ methods to enable a sustainable impact somehow. They provide tools to steer travel behaviour or they show the emissions per travel option. Less MSPs had a sustainable business model that allowed them to both create and capture sustainable value.

Little over half of the MSPs have an ecologically sustainable business model. This stems in large part from their intention to use electric vehicles. When asked outright if they are sustainable, nearly all MSPs considered themselves or intended to be ecologically sustainable but only half were. There thus seems to be a disconnect between how ecologically sustainable MSPs think they are and how sustainable they are. The reverse was true for social sustainability. This was mentioned significantly less often by MSPs, but more than three-quarters of their business models generate and capture sustainable value. This was most commonly done by making mobility more accessible and thus generating more customers.

the MaaS-team expects consumers to want to travel sustainably when giving the choice and when given information but MSPs do not share this expectation. They look to the government to come with incentives to entice them to choose sustainably, which they can accommodate through their MaaS-proposition. Towards employers, employers are often expected to set the targets for CO_2 reduction and sustainable travel behaviour and see comparatively less responsibility with themselves here. Business model towards other MSPs or businesses cannot be expected to be sustainable unless the buying MSP is sustainable. The customer is mostly expected to shape the final value proposition towards the end-user, the MSPs selling their services show no intent to steer this much or create sustainable value themselves other than offering steering tool and emission information.

6.2. Review of the conceptual model

In this section, the conceptual model is reviewed that has been used to gather data, code and analyse in this research. The original conceptual model has been included again in Figure 6.

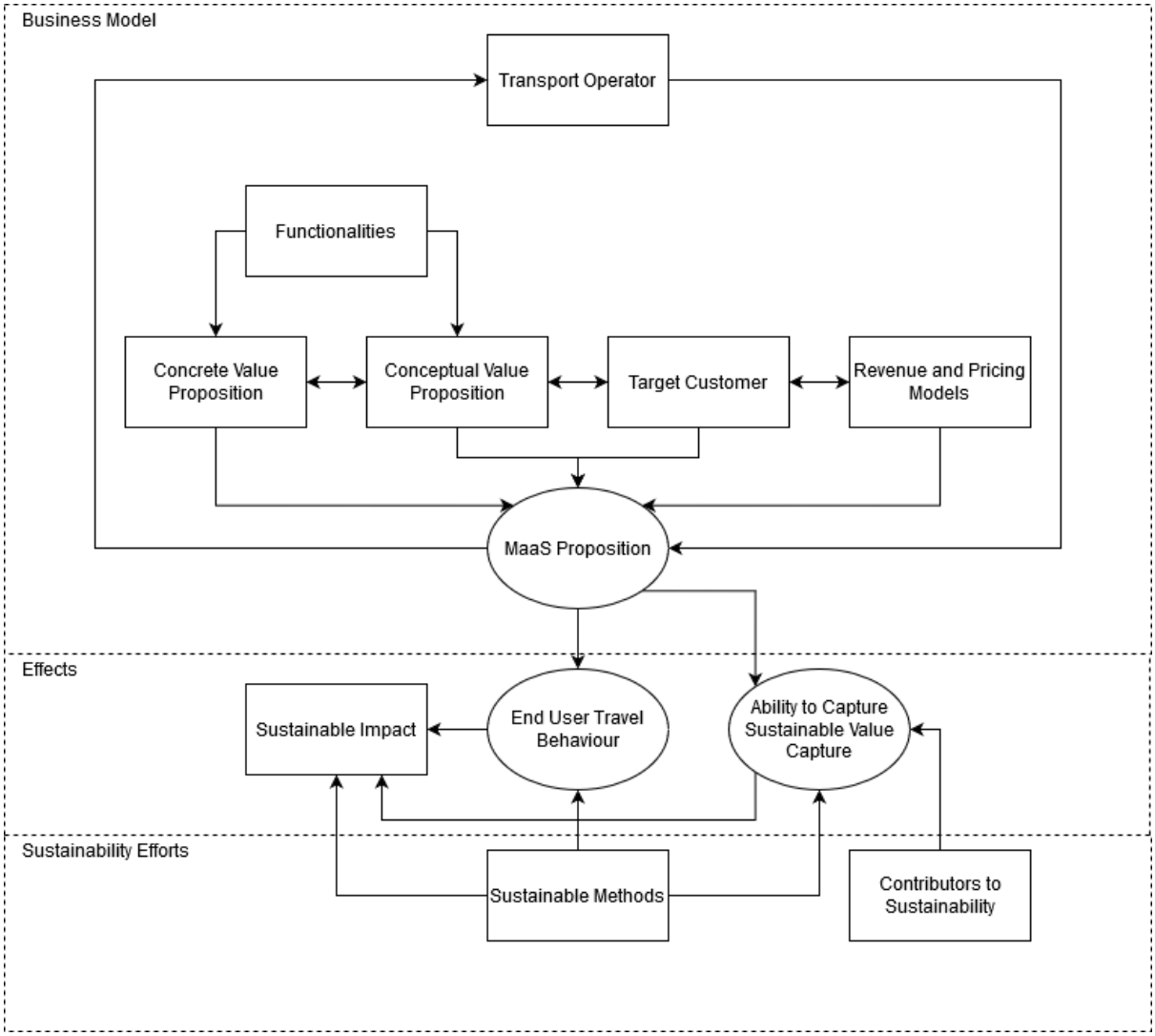

Figure 6*:* Conceptual Model. Rectangles contain factors that are investigated through interviews questions and arrows indicate which factors influence other factors. Ovals contains factors that are not investigated directly in the interviews but are influenced or made up by other factors.

6.2.1. Business model field

The factors in the business model field are useful to investigate business models for MaaS. The value proposition, target customer and revenue and pricing models give a good first image of the MaaS proposition being developed by the MSP. The MSPs in general had a clear idea on what functionalities they wanted to implement and explicitly mentioned how these would influence the value proposition of their MaaS proposition. These factors have been used to judge the strength or weakness of the MaaS business models.

It was also found that not only the value proposition, target customer and revenue and pricing models influence each other strongly but so do the functionalities and transport operators. What's more, these business model elements are mostly developed with a clear target customer in mind which is central to the MaaS proposition. Different target customer had different business model elements and functionalities associated with them. Additionally, there are both target customer-specific revenue models and general revenue models.

Additionally, it was confirmed that the transport operator plays a key role in the MaaS-proposition. It was confirmed as well that MSPs must think about what value proposition they offer a transport operator and that they are aware of this. Especially when they rely on kickback fees as a revenue model it is essential to offer the transport operator a reason to pay these. The relation with the transport operators has been used as well to evaluate the strength or weakness of the MaaS business models, in particular those relying on kickback fees.

The conceptual model has been adapted to reflect the interplay between all the business model elements and the MaaS proposition, and the centrality of the target customer better.

6.2.2. Sustainability efforts field

On the side of the sustainability efforts, adaptions to the conceptual model are suggested for future researchers and for other stakeholders aiming to use it to gain further understanding of the sustainability of MaaS business models. This research has mostly investigated the sustainable character of the MaaS business models separately from the 'traditional' business model. This was done partially to simplify the data gathering, but also because of how most literature on sustainable MaaS business models has treated these separately. Questions on sustainability were asked separately from those on the business model.

This may have resulted in misunderstandings on the side of MSPs. One of the findings of this research is that there is a mismatch between how sustainable MSPs think they are and how sustainable they are. This worked both ways: MSPs thought they were more ecologically sustainable than they were, and thought they were less socially sustainable than they were. This likely reflects a lack of understanding on the side of MSPs of what a sustainable business model is: a business model able to both create and capture sustainable value. There needs to be a clear distinction between an intent to be sustainable, mechanisms that enable a sustainable impact and business model elements that make a business model sustainable.

Additionally, it was found that it is difficult to separate the sustainable methods employed by the MSPs from their other business model elements. The 'traditional' business model elements influence the sustainable methods and vice versa. In many cases, the sustainability method was a traditional business model element with a sustainable character. For example, the concrete value propositions 'tools to steer travel and behaviour' is just as well a method to create sustainable value. It may be valuable for further investigations to use a conceptual model that reflects this. Instead of treating sustainable methods separately, it would be valuable to incorporate the sustainability of business model elements in the business model part of the conceptual model. Similarly, interview guides should reflect this.

6.2.3. Effects fields

The sustainable impact MSPs expected to make was investigated and supplemented with impacts that are likely to be expected from the employed sustainable methods. The ability to capture sustainable value has been evaluated as well, based on the sustainable methods employed by the MSPs and input from contributors to sustainability and investigated on how they would have a sustainable impact. End-user travel behaviour was more difficult to evaluate, since only expectations of MSPs and some logical reasoning could be used for this.

6.2.4. Further additions

Government policy has not yet been incorporated in this conceptual model but is likely to play a large role in the functioning and developing of MaaS business models as well as how the MaaS proposition influences end-user travel behaviour. This is because of the active stance of the MaaS-team, but also of the strategy of MSPs. Government policy is supported and welcomed by the MSPs, barring some unwanted interventions. It is useful for an improved version of the conceptual model to reflect this as well and to incorporate this in further investigations.

Many MaaS propositions rely on a customer using the tools offered by a MaaS proposition to steer end-user travel behaviour. This direct control is offered to customers and used by them to change how a MaaS proposition influences end-user travel behaviour. This is different from simply paying money to enable an MSP to capture sustainable value they create. The revised conceptual framework reflects this.

6.2.5. Revised conceptual model

The considerations mentioned in the previous sections have been used to modify the original conceptual framework. The sustainability efforts field have been integrated into the business model field and in the new external input field that follows from the further additions to the conceptual model. Sustainable efforts are now not a separate factor but should be included in the evaluation of the business model elements.

The target customer has been made central to the business model and the model has been adapted to reflect that all business model elements influence each other strongly through the forming of a MaaS proposition together.

The MaaS proposition is affected by external government policy and provides the tools its customers can use to steer the use of the MaaS proposition by its end users. Arrows from government policy and use of control tools by customers aim the arrow from MaaS proposition to end-user travel behaviour because these influence the effect of the MaaS proposition on the end-user travel behaviour. The new conceptual framework is shown in Figure 7.

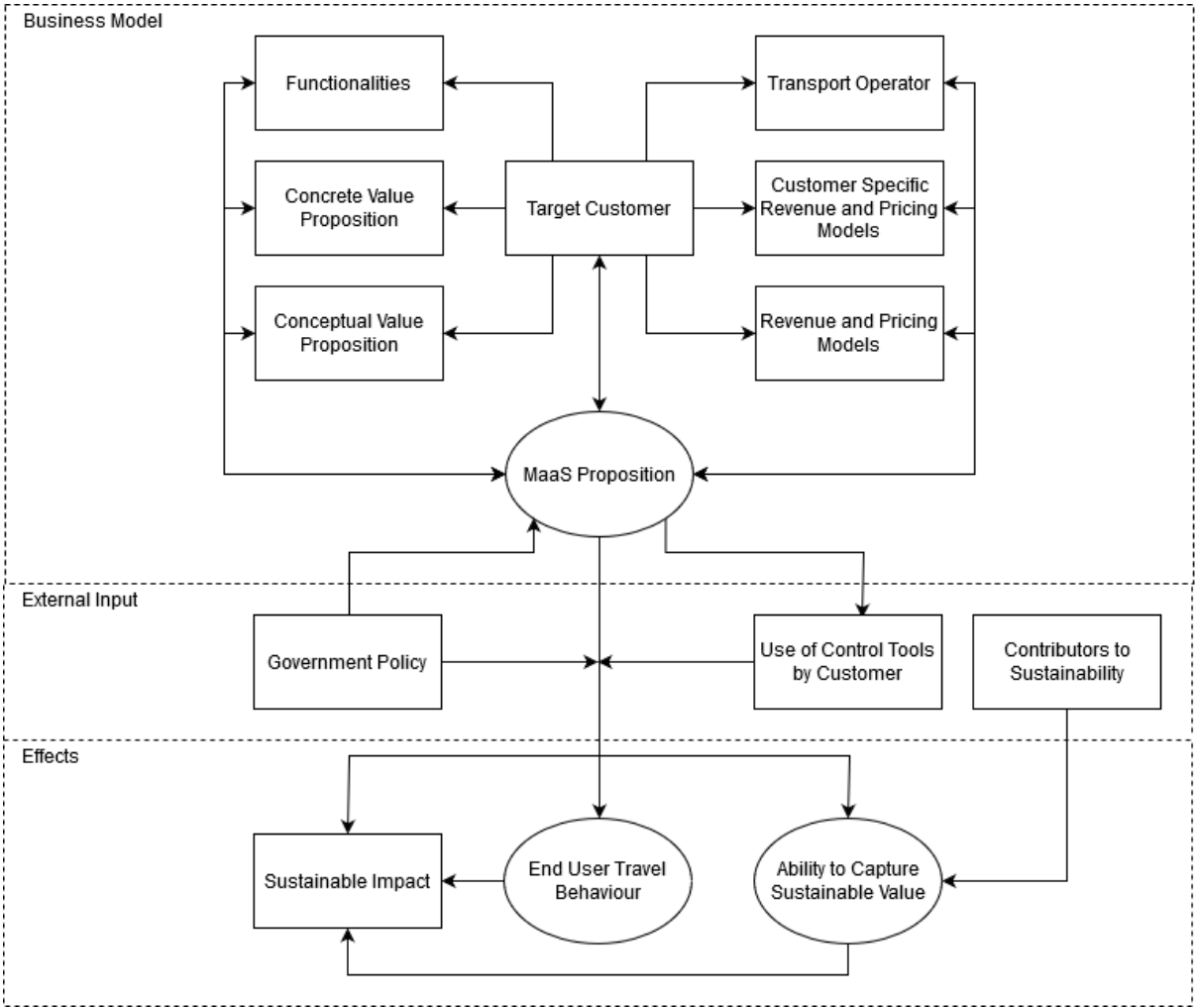

Figure 7: Revised Conceptual Model. Rectangles contain factors that are investigated through interviews questions and arrows indicate which factors influence other factors. Ovals contains factors that are not investigated directly in the interviews but are influenced or made up by other factors.

6.3. Generalizing to other markets

Most findings are likely generalizable to other contexts. The value propositions do not seem to be specific to the framework agreement or Dutch context. For example, most companies have to deal with transportation cost and have to spend resources on the administration of this. Conceptual value propositions seem logical as well to apply to other contexts. For example, a desire for more comfort, flexibility and lower costs is quite universal to product-offerings although priorities differ between markets. If demand for these value propositions exist in other contexts MSP will likely try to meet these. Similarly, other markets also have consumers, employers, government, businesses and MSP target customers. Even though their specific wishes may vary in other contexts, these markets likely have these target customers too. The revenue models are similarly not specific to the Dutch context either. Only selling data and revenues on advertisement could be subject to different rules in other markets, but these are not possible or not attempted respectively among the interviewed MSPs. The question is whether MSPs in other markets are aware of these possible business model elements.

Generally, findings on which business models exist are likely to translate well to other contexts. However, there will be differences in exactly how strong or weak they are, since this is partially reliant on local context.

Because this research investigated MSPs in the framework agreement set up by the MaaS-team in the Netherlands, generalizing findings to other markets should be done critically. Framework agreement and Netherlands specific circumstances and policies are different from other markets. For example, fiscal policy on how employers pay transportation for their employees or how the market for subsidized transportation is arranged is likely to be different in other markets. Additionally, the framework agreement is a different approach than that of many other countries and is likely to yield different business models. Between the framework agreement and the rest of the Dutch markets, there are differences as well: the sharing of data, the use of a standardized APIs and the requirements of the 7 functionalities do not apply to these MSPs. Besides that, other markets operate under different laws, a differently arranged transportation system and deal with a different culture. These differences will likely not preclude translation to other contexts but require researchers and policymakers to be observant about relevant differences in their local context.

Findings on sustainability can be expected to translate to other contexts as well. In other markets, MSPs may even have another way to be sustainable, by selling data to optimize mobility. Making mobility more accessible or offering tools to steer travel behaviour is likely to be offered in other contexts as well and sustainable bundles or kilometre prices are not specific to the framework agreement either. The only method to be sustainable that may not translate to foreign contexts are electric vehicles. Not all countries have the infrastructure yet to support these on a relevant scale. In markets where there is a minor role for electric vehicles MSPs are thus expected on average to be less ecologically sustainable. In these markets, vehicles with lower mileage, which emit less harmful emissions and lower operating costs, may to a lesser extent allow MSPs to create and capture sustainable value similar to how they would do with electric vehicles.

The conceptual model was made with international literature, mostly not specific to the Dutch context. Yet many of the identified business model elements and findings on sustainability were found in this research. This is an indication that at least the findings not directly related to Dutch policy or market structure will reversely be to some extent generalizable to the international context. Additionally, most MSPs have the ambition to go international or already do so. This indicated that they expect or have found that their business models should be viable in other markets as well.

6.4. Limitations of the research

There are several limitations to consider alongside this research.

First, although this research seeks to investigate the business models and sustainability of MaaS service providers, some of the interviewees are not purely MSPs. Interviewees include transport operators, integrators, lease companies and public transport companies. Due to this, some differences in statements on the various topics can be contributed to the diverse nature of the interviewed companies. To avoid accidentally disclosing the identity of the MSPs, this dimension has not been covered in detail. The questions were slightly adapted during the interviews to make sure answers pertained the MaaS-proposition part of the MSP.

Second, the results of the interview must be considered to be expectations, opinions and intentions for MaaS, MaaS business plans and sustainability about MaaS by the interviewees. This research does not attempt to accurately forecast the developments surrounding MaaS but attempts to gauge the current state and intentions of Dutch MSPs. It is too early to investigate what these MSPs do in practice and forecast future developments. Only when the pilots are further underway, and the MaaS-market is further developed it is possible to make more accurate observations and predictions. Additionally, the MaaS market develops fast, and so do the business models. Statements given at the time of research may not be current anymore at the time of publishing or reading.

Third, all but one of the MSPs that have been interviewed participate in the framework agreement and compete or have competed for the pilots. Participation in the framework agreement influences how they develop their business models. It is therefore not possible to say findings of this research translate to the Dutch or international MaaS market one-to-one. However, the framework agreement does include a large portion of the would-be MSPs in the Dutch market. Additionally, talks are underway to open up the framework agreement to more parties. To do so, these parties have to accept the terms of the framework agreement. Considering many parties are considering doing this, it seems the MaaS-market in the Netherlands as a whole may move towards the general findings on this research.

Fourth, the interviewees have been selected based on availability. Since this research was carried out at the Ministry of Infrastructure and Water Management, contacting parties within the framework agreement was the easiest. Even then it took effort to find enough MSPs willing to be interviewed. Because of this, an availability bias may have been introduced in the results. MSPs with business models they want to keep secret during development may have not been willing to be interviewed. Additionally, even though the conditions of the interview were kept similar as much as possible, length sometimes varied, and three interviews were done over the phone instead of in person. Especially in the shorter interviews, there is a risk some important information did not come to light. However, since it was known at the start of these interviews that they would be shorter, the most important questions were prioritised.

Fifth, because the identity of the MSPs could not be disclosed, more fine-grained analysis of the results and the consideration of their company traits was not possible. Doing this could provide valuable insights. This was a conscious trade-off to make sure MSPs felt comfortable disclosing otherwise confidential information.

Sixth, the execution and coding of the interview was done by 1 researcher and were done in Dutch. The translation can possible have led to loss of information, while the coding by a single researcher inevitably introduces a bias towards their own opinions and ideas into the research. To provide rigour the coding was done in several iterations and continuously improved and adjusted as new imperfections came to light.

Finally, a complete business model includes more business model elements than the ones investigated in this research. To get the full image of a business model, it is essential to investigate these too. The investigation of these first business model elements could provide a base for this.

6.5. Policy recommendations

The MaaS-team has as its broad goal to stimulate the nascent MaaS-market in the Netherland. In addition to this, it wants to avoid negative side-effects and for MaaS to have a positive sustainable impact. Based on the answers to the previous sub research questions, the following policy recommendations are made.

6.5.1. Stimulate the use of MaaS by consumers

It was found that there is no well-developed business model for consumers, even though their use of mobility takes up a sizable part of the total amount of travel movement. Additionally, most MSPs indicated they do not expect consumers to choose sustainable travel options. This means that stimulating the use of MaaS-apps by consumers and simultaneously stimulating the choice for sustainable travel options is an important part of ensuring MaaS has a positive impact on sustainability. Until consumers have a more broadly carried intrinsic drive to choose sustainable alternatives, there is a role for the government to stimulate this.

The most concrete value proposition likely to be effective is a monetary benefit. Fiscal policy that makes leasing a car through your employer more expensive compared to using it in a MaaS-app together with sustainable modes of transportation could be effective. In the Netherlands, if a person wants to use their business lease car for private use they incur a so-called 'bijtelling': a percentage of the value of the car is added to the income of the person leasing it, which is then taxed through his or her income tax. Instead of this flat addition to one's income, the lease car could be added to a MaaS proposition and taxed based on use. The use of more sustainable modalities could be rewarded with a lower tax burden. The use of the lease car and other modalities could be tracked through the MaaS app.

However, this could prove to be unpopular under current car owners and difficult to pass in legislation. An alternative would be nudging or gamification to subtly steer the consumer towards sustainable travel options. However, if this costs the MSP money, it is not likely they will implement this of their own accord. The government will thus have to stimulate MSPs to implement nudging and gamification that benefits sustainable modalities through either fiscal measures or direct subsidies. Other than that, the government should continue with public campaigns to try to enact a cultural change towards sustainable travel behaviour. Such a change is difficult and can be expensive as well.

6.5.2. Accept the current MaaS-propositions towards employers

If the primary goal for the Dutch government is for MaaS to have a positive impact on sustainability, the MaaS-propositions being developed for employers right now are most likely to have an effect in the short term. Employers can require their employees to adopt certain travel behaviour when commuting or travelling for business. Additionally, if an employee adopts sustainable travel behaviour at work, he or she may adopt this in their private travel behaviour as well, which is a 'free' way of stimulating a behavioural change and MaaS use under consumers. These new MaaS users might also inspire people around them to try MaaS

This includes accepting the role of mobility cards for the short term. Employers increasingly try to reduce the emissions they generate through mobility. MSPs are ready to offer them these tools, but not all are willing to do away with their mobility cards yet for various reasons. The same goes for deep linking to other transport operator apps. This was also noticeable in how many MSPs stated they thought the MaaS-team steers the market too much especially on the point of requiring functionalities.

Demanding all participants in the framework agreement to do away with these in their MaaS-propositions may prompt mobility card providers to leave the framework agreement or offer it parallel to their MaaS-proposition, but without the tools MaaS provides to steer for more sustainable travel behaviour. If too few MSPs remain and their specific business models do not work, the employers are left with no MaaS-propositions.

Additionally, current mobility cars providers engaged in long term contracts should not be deterred from offering their current customers a MaaS-proposition.
Instead, it is recommended to be lenient in requiring full travel integration and determine these requirements per target customer, not for MaaS as a whole. This does not mean an MSP should be able to call a mobility card on its own MaaS. The currently considered MaaS seal of approval could still allow the government to select MaaS-proposition to an extent, but it may turn out not all functionalities are required for all MaaS-propositions to every target customer. If the fully integrated MaaS-proposition is the best one, the employers should choose that one eventually anyway. In the meantime, if as many MSPs as possible offer a MaaS-propositions with tools to steer to sustainability, the largest number of employers will be enabled to make their mobility more sustainable.

6.5.3. Experiment with MaaS-propositions for students

While the government is already planning to let MSPs develop business models for the WMO market, there is another large traveller group that is paid for by the government. Students make up a large part of travel movements, especially in rush hour, and get their public transportation paid by the government. In the current business models, they would be approached as a consumer. It is extremely unlikely a student will choose to use a MaaS app if their public transportation is already free and incompatible with any MaaS app. This is an ideal group to experiment with, since young and highly educated travellers are a target group with large potential and the government has control over their mobility budget. They could be given the choice for the unlimited public transportation they get now, and a MaaS-proposition that gives them a fixed budget but access to other modalities. This would allow the government to experiment with MaaS. It may also motivate young traveller groups to stick to using MaaS after they are done with studying, expenses on their mobility by the government may be decrease and busy trains and busses in rush hour may be unburdened.

Additionally, more sustainable travel choices could be made cheaper or more attractive for students. This would have a direct effect on their current travel behaviour and could potentially continue in their travel behaviour after they lose the right to student travel rights.

6.5.4. Provide clarity and regulations to MSPs and be willing to make concessions

MSPs have indicated that they see a role for MaaS for sustainability and optimization of the mobility system as well. They want clarity from the government and regulations that could help achieve this. The MaaS-team should be clear in their communication to MSPs in how they intend to regulate and stimulate the MaaS market. They should come with concrete policies on thing such as a CO_2 budget, regulation of kickback fees, regulation of shared mobility and harmonization of regional regulations. This does not necessarily mean that all these policies should be implemented, that all municipalities should have the same regulations or that everything the MSPs want should be done. The market needs regulations to avoid excesses.

However, what the MSPs need is clarity on what the MaaS-team does and does not plan to do, including things that will not be done. Similarly, the MaaS-team should learn what the actual intentions and expectations are of MSPs and be willing to seriously consider them. In the framework agreement, they are already well underway with this and regularly hold consultations with the MSPs. The identified mismatch between ambitions and expectations of the MaaS-team and the MSPs show that this will have to remain an essential activity throughout the framework agreement and pilots. A mismatch between ambitions is likely unavoidable between government and market stakeholders, but the more they can be aligned the better. This may require concessions on both sides on functionalities, sustainability and the exact shape of a MaaS-proposition.

Additionally, these pilots offer a great opportunity to experiment with some of these new regulations and policies on a small scale, within specific pilots. There is a role for the MaaS-team to include other ministries and government agencies, e.g. the tax department to allow experiments with fiscal policies to stimulate MaaS. The current 'stikstofcrisis' in the Netherlands, which requires all sectors to reduce their emissions of nitrogen compounds, could also provide opportunities to experiment with MaaS, together with other government agencies and ministries.

6.5.5. Focus on the business and MSP business model as well

These business models are right now not central to the goals of the framework agreement and pilots, but especially the MSP business model, or rather the selling of access to white label MaaS services itself, could play an important role in a healthy MaaS ecosystem.

The business model towards businesses is an already existing one that can be made more attractive with MaaS. This could be a good way for consumers to become acquainted with MaaS which may then transition to a broader MaaS app aimed at consumers.

The MSP business model allows for the proliferation of more business models for MaaS without requiring costly investments by small companies with good ideas, as long as no single MSP becomes a monopolist with a platform. This could be done in a way comparable to the telecom market, where there are virtual providers that pay for access to the physical networks of providers that have their own infrastructure. This could foster competition and the creation of MaaS propositions tailored to (niche) target customer groups that would otherwise not be served.

The MaaS-team should include these in the focus of the framework agreement and stimulate them next to the business models that are currently being focussed on. This would allow the MaaS-team to monitor these more closely, stimulate them, and avoid negative side-effects.

6.6. Managerial implications

There are also some takeaways for MSPs in this research.

6.6.1. Specialize in smaller groups of consumers

One of the findings of this research is that there is no strong business model to consumers yet. An MSP may deal with that by targeting a smaller group of specific consumers and find a problem to solve for them. As an MSP already identified, foreign visitors may be one such group. These consumers may have difficulty navigating the Dutch mobility system. This is a problem they may well be willing to pay for to be solved. It is up to MSPs to find other such target customers to solve a problem they might have. An MSP might need only small adaptions of a general MaaS-proposition with which they can target multiple smaller groups and still gather a large customer base.

6.6.2. Develop your value proposition to the transport operators

Transport operators are essential in a MaaS-proposition; they can make or break it. Additionally, many MSPs expect kickback fees from their transport operators and rely on kickback fees for their business models. However, they offer them little else than “more customers”. There may be potential in offering to take on part of the operations of the (smaller) transport operators, such as their booking or payment system. When MSP acquire enough scale, they may be able to do this cheaper centrally then all small transport operators separately, similar to what an Uber Eats or Takeaway.com has done for the home delivery market. The cost reduction this could bring the transport operation could be paid in the form of kickback fees and shared between transport operator, MSP and customer. This should be done in cooperation and consultation with the transport operators to mitigate their worries about handing over this control to an MSP.

6.6.3. Reach consumers through employers

If an MSP manages to secure a large customer base with their business model for employers, they may be able to capitalize on this by extending their proposition to consumers. The employees also have mobility needs besides their role as an employee. If the employee has a pleasant experience using a MaaS-proposition or may even be able to save up rewards for sustainable travel behaviour for private use, they may be enticed to use the same MaaS-app for private mobility.

6.6.4. Explore the profitability of sustainability

Companies can profit of becoming sustainable by both creating and capturing sustainable value. Not all companies seem to be aware of the possibilities regarding this. MSPs are urged to explore how they can make their business model more sustainable (e.g. using the methods outlined in this research) and profit at the same time. This may yield them other favourable side effects. Becoming more sustainable can have a positive effect on their image, may make it easier to win tenders when they have sustainability requirements and qualify for subsidies.

6.7. Implications for literature

There are several implications for the literature.

First, almost all revenue models, target customers (although in this research the consumer group was treated as a whole) and value propositions that were conceptualized or found before in literature were also present among the interviewed MSPs in the framework agreement. The most striking absence was advertisements. The sale of data that was suggested in the literature was also not mentioned often as a potential revenue model. Literature should consider more how and why these business model elements appear so little.

On the other hand, business model elements that did not appear much in the literature were found. For example, the value proposition of control services, for either the government or employers, should be considered more in literature. It was being developed by many MSPs and is expected to play a big role in MaaS business models. Additionally, the use of multiple revenue models by most of the investigated MSPs is not found as prominently in most literature making this a potentially valuable finding.

Second, most MSPs consider their company and business model to be sustainable but when evaluated for being able to capture the sustainable value they create, considerably less actually are sustainable. This disconnect between perceived sustainability and actual sustainability could be a valuable addition to literature, especially among some literature that considers MaaS potentially sustainable as a concept alone already. Future research should carefully consider this when investigating the sustainability of MaaS

Third, the sustainable methods of the use of electric vehicles and making mobility more accessible are found widely in the business models, thus confirming these findings by earlier literature. In contrast, nudging and gamification are only mentioned by a single MSP. This signals a potential disconnect between theory and reality.

Fourth, this research has yielded only a few results on pricing models that allow MSPs to capture value from sustainable travel options like walking and cycling. The bundle model was proposed by 2 MSPs. These suggest to only guarantee transportation from A to B, and not guarantee the use of certain modalities. This would allow the MSP to steer the travellers to the travel option with the best cost, speed and sustainability ratio. More expensive and less sustainable modalities are only offered when necessary. A third MSP similarly suggested guaranteeing travel from A to B, but with a fixed price per kilometre with possible differentiation between quality, similar to first and second class. This pricing method was not found in the literature. Considering the mobility bundle is so prominent in the literature on MaaS, these varieties of the bundle model are a valuable addition to the literature and provide clarification on how this pricing model might work.

Finally, while some literature has treated several potential MaaS business model elements separately it was found that these influence each other too much to effectively research them in isolation. Literature should be careful to make blanket statements about MaaS when instead certain findings might only pertain to business models aimed at specific target customers or in specific markets.

6.8. Future research

There are several directions of research that can be pursued based on this research.

First, further research can be done on the role of kickback fees in the MaaS market. It has been found that many business models lean on this revenue model and has found that this may be problematic. Researcher could investigate whether transport operators have a high enough margin to offer kickback fees. Additionally, they could investigate whether MSPs offer a good enough value proposition for transport operators to be willing to pay kickback fees. Finally, researchers could investigate whether there is a risk MSPs will get an unfair amount of power if their market share grows.

Related to this, the business model for MSPs with kickback or connection fees to transport operators show characteristics of platform business models like Uber or booking.com. Government around the world, including the Dutch government, struggle with the negative side effects of platforms like Uber and try to steer MaaS before negative side effects appear. Comparing MaaS business models with those of established platform business models may allow researchers to extract lessons from the latter and develop recommendations to improve the former. Additionally, these platform markets as a whole or research during and into their early market phases could be compared to the nascent market for MaaS to add direction to the research field of MaaS and to form policy recommendations.

Another possibility for future research becomes relevant when business models for MaaS are further developed and more of them exist. The performance of different MaaS business models could be quantified and quantitatively investigated. This current research is based mostly on intentions and business models under current development, but quantitative research could allow for more substantive predictions on the viability of business models for MaaS. This would address several of the limitations of this research: being able to choose from more MSPs allows to diminish the availability bias and actual outcomes can be investigated instead of expectations. Additionally, when MSPs are in a more advanced stage of operation, they may be less secretive and willing to be interviewed with their names included. This would allow for more in-depth analysis and reporting of the MSPs and allows for including company characteristics in the investigation.

Similarly, the sustainable impact of MaaS business models can be investigated quantitively when they have been in use for some time. This current research has investigated whether MaaS business models are sustainable but not to what degree. A quantitative investigation of the sustainable impact of (future) MaaS business models can allow government to develop effective policy instruments to steer MaaS business models to be more sustainable. Again, actual outcomes can be investigated instead of expectations.

Additionally, MaaS is expected to become an international service. This research has narrowed its scope to the Dutch market, but to understand its place in the larger European and global mobility system, business models in foreign markets have to be compared to the Dutch market. There may be incompatibilities and barriers for MaaS business models in the Dutch market to function with business models developed in foreign markets that will have to be avoided or overcome. This would address the current limitation of this research of being focussed on the framework agreement within the Dutch market.

Finally, future research could build on these first partial business models and expand them to describe all business model elements. This likely requires more intensive case studies, since 1-hour interviews will likely not yield enough information to do this. Complete business models allow to investigate the interlinks between the business model elements and which might be weak points under certain scenarios. This would address the current limitation of only describing a partial business model.

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Appendices

Appendix A – Interview Guide

The underlined questions where meant to be broad question after which the interviewee got time to form a comprehensive answer. The questions below it were meant to further investigate if the answer left these topics out. The questions in boldface had priority

Original version

Voorstellen
Ik stel de vragen als onderzoeken en zal de resultaten niet direct delen met het ministerie van IenW. Het interview gaat over het bedrijf of consortium als MaaS-dienstverlener behalve als expliciet wat anders wordt gevraagd.

Basisvragen

1. Mag dit gesprek worden opgenomen?
2. Wat is uw positie in dit bedrijf?

<u>Kunt u het businessmodel van uw bedrijf beschrijven</u>?

1.1. Hoe past MaaS binnen uw bedrijf?
1.2. Wat is uw aanbod?
1.2.1. Op welke behoefte speel deze in?
1.2.2. Voldoet dit aanbod reeds aan de zeven functionaliteiten zoals gedefinieerd door IenW?
1.3. Welke eindgebruiker of gebruikers richt uw aanbod zich op? Welke klant richt u zich op?
1.4. Hoe overtuig u deze beoogde klant om klant te worden?
1.4.1. Indien consumenten: hoe denkt u consumenten hun oude reispatroon te laten verbreken en uw MaaS-aanbod te gaan gebruiken?
1.4.2. Indien werkgever: Uit ervaring blijkt dat bedrijven lastig te overtuigen zijn op een nieuwe mobiliteitsaanbieder over te stappen als dit een pilot betreft, laat staan hiervoor te betalen. Hoe gaat u hiermee om?
1.5. Hoe ziet uw interactie met de klant eruit?
1.6. **Hoe ziet de technische architectuur eruit van uw MaaS-dienstverlener?** *[Denk aan platform, payment provider, etc.]*
1.6.1. In hoeverre wordt de benodigde technologie in house ontwikkeld?
1.6.2. Welke bedrijven zorgen voor welk deel van de technologie?
1.7. **Wat zijn uw grootste kostenposten binnen en eventueel buiten de pilots?** *[V.B.: investeringskosten, vaste kosten, variabele kosten, bundels bij vervoerders?]*
1.8. Wat zijn of worden uw inkomstmodellen op korte en lange termijn?
1.8.1. Reacties op inkomstmodellen:
1.8.1.1. Service fee: hoe gaat u klanten overtuigen service kosten te betalen?
1.8.1.2. Kickback fee: In hoeverre kunnen kleine (deel)vervoersaanbieders u voldoende inkomsten bezorgen? In hoeverre schat u de bereidheid van grotere partijen in wat betreft het betalen van kickback fees?
1.8.1.3. Toegevoegde diensten: Wat voor diensten denkt u aan en hoe verwacht u hieraan te verdienen?
1.8.1.4. Subsidie/overheid: hoe verwacht u WMO-vervoerders aan boord te krijgen en hoe deelt u de winst met hen? *[Risico op verlies klanten]*
1.8.1.5. Data verkoop: Hebben zich reeds partijen getoond die interesse hebben in het aankopen van data? Ziet u problemen omtrent privacy?
1.8.1.6. Advertenties: Hebben partijen hier zich reeds geïnteresseerd in getoond?
1.8.1.7. Abonnement: alleen abonnement of pay as you go? Hoe verwacht u hoe die verhouding ligt?
1.8.1.8. Bundel: Hebben klanten hier interesse in getoond? Er bestaat een vertekend beeld van wat consumenten denken wat een privé voertuig kost, hoe gaat u daar mee om?
1.8.1.9. De MaaS-activiteiten ondersteunen het hoofd businessmodel: *[Als het bedrijf een vervoersaanbieder is]*: Ontwikkelt u MaaS om te voorkomen dat u klanten verliest of omdat u potentie ziet meer klanten te werven?
1.8.1.10. Transactiekosten of aansluitkosten vervoerder: Hoeverre denkt u dat vervoersaanbieders hiertoe bereid zijn

1.9. **Wanneer en met hoeveel gebruikers denkt u winst te gaan maken**?
1.10. Hoe verwacht u de groei van gebruikers in de eerste twee jaar en op langere termijn?
1.11. Wat voor risico's en kansen voorziet u zelf voor uw beoogde businessmodel?
1.11.1. Hoe zit dit met overheidsbeleid?
1.12. Welke problemen loopt u nu reeds tegenaan wat betreft uw businessmodel?
1.13. Hoe ziet u uw toekomstige groei, nationaal en internationaal?

Hoe gaat u om met uw partners en vervoersaanbieders?

2.1 Wat bieden u en uw partners elkaar in deze samenwerking?
2.1.1 In hoeverre zou u zeggen dat zij een partner zijn versus dat ze een partij zijn die u een dienst leveren om uw aanbod als MDV te kunnen bieden? Denk ook aan strategisch partners versus onderaannemers.
2.1.2 Behalve een technologische bijdrage, wat zijn de resources en capabilities die partners aan uw samenwerkingsverband bijdragen?
2.2 Heeft u aandeelhouders en oefenen deze druk uit?
2.3 Hoe gaat u om met het aansluiten van vervoersaanbieders?
2.3.1 Bent u van plan te differentiëren tussen aanbieders? Bijv. Op basis van kwaliteit of kwantiteit?
2.3.2 Tonen de vervoersaanbieders zich bereid aan te sluiten en in welke mate stellen zij kaarten beschikbaar ter doorverkoop?
2.4 Worden vervoersaanbieders actief betrokken bij de opzet en vormgeving van uw MaaS-aanbod?
2.5 Wat bieden de vervoersaanbieders en uw bedrijf elkaar in deze samenwerking?
2.6 Hoe worden inkomsten verdeeld? Krijgen partners een vast contractueel vastgesteld bedrag voor geleverde diensten of delen zij in de winst?
2.7 In hoeverre bent u van plan samen te werken met andere MDVs?
2.8 Hoe gaat u om met de verdere stakeholders?

Is in uw businessmodel (en het ontwikkelen daarvan) expliciet aandacht voor duurzaamheid, en zo ja in welke vorm?

[Uitleggen dat ik dit in brede zin bedoel: ecologisch, economisch en sociaal]

3.1 Hebben jullie een 'sustainability strategy'?
3.2 Hebben jullie een 'sustainability leader'?
3.3 Zo nee, in welke vorm denkt u dat uw aanbod toch een duurzame bijdrage zal kunnen leveren? *[Op sociaal, economisch en ecologisch gebied]***.**
3.4 In hoeverre denk u dat duurzaamheid nastreven uw bedrijf waarde kan bieden?
3.5 Zo ja, wat ziet u als uitdagingen en barrières voor deze duurzame uitkomst?
3.6 Wordt duurzaamheid een onderdeel van de pitch naar klanten?
3.6.1 Worden klanten gestimuleerd duurzaam te kiezen?
3.7 Beoordeelt uw resultaten als bedrijf, in de context van MaaS dienstverlening, op zowel sociaal en ecologisch als economisch vlak? [Triple bottom line]
3.8 Wat ziet u als mogelijke negatieve effecten op duurzaamheid van uw aanbod?
3.9 Heeft u andere drivers naast duurzaamheid die voor u belangrijk zijn?
3.10 Zijn jullie geïnteresseerd in certificeringen? (E.g. maas waardigheid of CO2 certificering)
3.11 De overheid hoopt beleidsknoppen te ontwikkelen waarmee [mobiliteit] gestuurd kan worden om een duurzame impact te maken. Hoe kijkt u hier tegenaan? Bijv. aanpassen parkeernormen

Overig

1. **Zijn er vragen die ik u niet heb gesteld maar die u wel had verwacht gezien het onderwerp?**
2. **Zijn er overige opmerkingen of vragen?**

English translation

An English translation has been included.

Introduction
I ask these questions as a researcher en will not directly share the results with the Ministry of IenW. This interview is about this company or consortium as a MaaS Service Provider except if something else is asked explicitly.

Basic Questions

1. May I record this conversation?
2. What is your position in this company?

Can you describe the business model of your company?

1.14. How does MaaS fit in your company?
1.15. What is your proposition?
1.15.1. What need does this proposition satisfy?
1.15.2. Does this proposition satisfy the 7 functionalities defined by IenW?
1.16. Which end-user or users do you target? Which customer do you target?
1.17. How do you convince this potential customer to become a customer?
1.17.1. If consumers: How do you think you can convince consumers to break their old travel patterns and start using your MaaS-proposition?
1.17.2. If employers: Experience shows companies are reluctant to switch mobility providers if this is only a pilot, let alone pay for this. How do you deal with this?
1.18. How do you interact with the customer?
1.19. **What does the technical architecture of your MaaS-proposition look like?** *[platform, payment provider, etc]*
1.19.1. How much of this technology is developed inhouse?
1.19.2. Which companies develop most of your technology?
1.20. **What are your biggest expenses, within or potentially outside the pilots?** *[E.g.: investments, fixed costs, variable costs, bundles with transport operators?]*
1.21. What are or will become your revenue models in the short and long term?
1.21.1. Reactions to revenue models:
1.21.1.1. Service fee: how will you convince customers to pay a service fee?
1.21.1.2. Kickback fee: To what extent can small transport operators provide you with enough revenues? To what extent do you expect the larger transport operators to be willing to pay kickback fees?
1.21.1.3. Added services: what kind of services are you thinking of and how much revenue do you think you can generate through this?
1.21.1.4. Subsidy/government: How do you expect WMO mobility providers to participate and how will you share the profits with them? *[risk on losing customers].*
1.21.1.5. Selling data: Have parties shown interest in buying this data already? How do you deal with problems regarding privacy?
1.21.1.6. Advertisements: have parties shown interest already?
1.21.1.7. Subscription: Will you offer only a prescription, or also pay-as-you go? How do you expect the ratio between these to be?
1.21.1.8. Bundle: Have customers shown interest in this? Consumers have a skewed view of what a private vehicle costs. How do you deal with this?
1.21.1.9. The MaaS activities support the main business model: *[if the company is a transport operator]*: Are you developing a MaaS-proposition to prevent the loss of customers, or because you see potential in getting more customers?
1.21.1.10. Transaction fees or connection fees for transport operators: To what extent do you expect that transport operators are willing to pay these?
1.22. **When and with how many users do you expect to make a profit**?
1.23. How do you expect the growth of users in the next two years and in the long term?
1.24. What risks and chances do you see for your planned business model?
1.24.1. What about government policy?

1.25. Which problems do you already encounter regarding your business model?

1.26. How do you see future growth, nationally and internationally?

How do you deal with partners and transport operators?

2.9 What do you and your partners offer each other in this collaboration?

2.9.1 To what extent would you say they are a partner as opposed to a party that supplies you with a service to enable your company to offer its MaaS-proposition? Also consider strategic partners versus subcontractors.

2.9.2 Apart from technological contributions, what re the resources and capabilities that you partners bring to your collaboration?

2.10 Do you have shareholders, and do they try to influence you?

2.11 How do you deal with connecting transport operators?

2.11.1 Are you planning to differentiate between operators? E.g. based on quality or quantity?

2.11.2 Are transport operators willing to connect to your service and to what extent do they allow resale of their tickets?

2.12 Are transport operators actively included in the development of your MaaS-proposition?

2.13 What do the transport operators and your company offer each other in this collaboration?

2.14 How are the revenues divided? Do partners get a set contractually determined fee for delivered services or do they share in the overall profits?

2.15 To what extent are you planning to collaborate with other MSPs?

2.16 How do you deal with other stakeholders?

Is there explicit consideration for sustainability in your business model (and the development thereof) and if yes in what form?

[explain sustainability must be understood broadly here: ecological, social and economic]

3.12 Do you have a 'sustainability strategy'?

3.13 Do you have a 'sustainability leader'?

3.14 If not, how do you think your proposition might still have an impact on sustainability? *Socially, economic and ecological]***.**

3.15 To what extent do you think pursuing a sustainable impact can bring value to your company?

3.16 If yes, what do you consider barriers and challenges to a sustainable impact?

3.17 Will sustainability be a part of the pitch to customers?

3.17.1 Will customers be encouraged to make sustainable choices?

3.18 Do you evaluate the results of your company, in the context of MaaS, for social, ecological and economic results? [triple bottom line]

3.19 What do you see as potential negative impacts on sustainability of your proposition?

3.20 Do you have drivers besides sustainability that are important to you?

3.21 Are you interested in pursuing certifications? (e.g. MaaS-readiness or CO_2 certifications)

3.22 The government hopes to create policy instruments with which mobility can be steered to have a sustainable impact. What is your view on this? E.g. altering parking policy.

Miscellaneous

1. **Are there questions I haven't asked but you expected to be asked regarding this topic?**
2. **Do you have any remaining remarks or questions?**

Appendix B – Code Tables

The codes have been translated to English from the original codes in Dutch.

Table 12: Code occurrences for customer category

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
customer: consumer		•			•	•	•		•		•		•	7
customer: consumer - later				•						•		•		3
customer: consumer - car user						•							•	2
customer: employer	•	•		•			•	•	•	•	•	•		9
customer: employer - commuters rarely need travel advice	•						•						•	3
customer: employer - don't know their true expenses on transportation				•										1
customer: employer - too slow when tryng to draw up contract						•				•				2
customer: company			•				•			•	•	•	•	5
customer: MSP				•	•		•	•	•				•	6
customer: government		•		•		•	•							4
user: WMO		•		•			•							3
user: WMO - difficult to optimalize				•				•						2
user: WMO - can be optimalized										•				1
customer: there is a risk of not acquiring enough customers			•		•	•			•	•		•		6
customer: stay with specialty		•	•		•			•						4
customer: some people will always take their car	•			•		•			•			•		5

Table 13: Code occurrences for revenue model (previously coded under the coding group bm)

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
bm: administrative services	•	•		•			•	•	•	•	•	•		10
bm: own wheels	•	•			•		•			•	•	•		7
bm: kickback fees		•	•		•		•	•	•	•	•			8
bm: mobility card	•	•					•	•		•	•			6
bm: white label services to companies				•	•		•	•	•				•	6
bm: enriching offer of customer			•				•			•	•	•	•	6
bm: advising employers on their transportation policy	•	•					•	•		•				5
bm: mobility bundle	•			•			•	•						4
bm: developing IP and expertise for MSP				•		•	•		•				•	5
bm: government projects						•	•	•		•				4
bm: WMO mobility		•		•			•							3
bm: selling data acquired when running MaaS-service									•			•		2
bm: pay per km					•				•					2
bm: connection fee to transporter or MSP													•	1
bm: paying for reserving a parking spot			•											1
bm: discount subscription					•									1
bm: reserving a charging point			•											1
bm: lease	•													1
bm: transaction fee								•						1
bm: service fee to consumer													•	1
bm: MSP can only give neutral advice		•			•					•	•	•		5
bm: with own wheels an MSP is less neutral			•			•		•						3
bm: kickback fee - bad for neutral advice	•			•										2
bm: kickback fee - good for neutral advice		•					•							2
bm: a consumer does not want to pay a service fee		•	•	•	•	•	•	•	•	•	•			10
bm: bundle model does not work						•						•		2

Table 14: Code occurrences for strategies and expectations category (previously coded under the coding group bm)

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
bm: later international			●		●	●	●	●	●					6
bm: international	●	●		●								●	●	5
bm: behavioral change necessary for bm to work	●	●									●			3
bm: large and risky investments are necessary				●		●			●					3
bm: problem solving approach				●			●					●		3
bm: there is a risk in having to do large investments				●		●			●					3
bm: optimizing mobility	●	●		●	●	●		●	●	●	●		●	10
bm: MaaS still has to develop	●				●	●	●		●		●			6
bm: MaaS will stay small		●				●	●						●	4
bm: MaaS optimize mobility	●	●		●	●	●		●	●	●	●		●	10

Table 15: Code occurrences for functionalities category

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
function: paying	●	●	●	●	●	●	●	●		●	●		●	11
function: booking	●	●	●	●	●	●	●			●	●		●	10
function: adaption	●	●		●			●	●						5
function: adaption - alternative transport						●		●	●					3
function: personalized travel	●					●	●	●						4
function: multimodal planning		●	●	●	●	●		●		●	●			8
function: planning - external	●													1
function: travelling		●	●	●	●	●	●	●			●		●	9
function: travelling - deeplink	●							●		●				3
function: travelling - ov-chipcard	●	●			●	●	●	●		●	●			8
function: full integration									●			●		2
function: cancelling		●							●					2
function: OV-chipcard - will be phased out					●		●			●	●			4
function: not all are necessary						●	●	●			●		●	5
function: international travelling		●											●	2

Table 16: Code occurrences for government category

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
government: has to secure an open ecosystem and level playing field		●		●	●	●		●		●	●	●	●	9
government: big transportation companies					●			●		●	●		●	5
government: big (tech) companies										●	●			2
government: has to stimulate MaaS with policy	●	●				●	●	●	●	●	●	●	●	10
government: should alter fiscal policy in for MaaS	●					●		●	●		●		●	6
government: has to regulate reselling of tickets		●							●		●	●	●	5
government: tries to steer the market too much				●	●	●	●	●			●		●	7
government: unclear role		●	●		●	●			●				●	6
government: process shared mobility must be improved					●	●					●			3
government: the MaaS business case should not need subsidies									●	●	●		●	4
government: subsidies				●		●	●							3
government: subsidies can work as a catalyser									●	●	●			3

Table 17: Code occurrences for value proposition category

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
vp: convenience		●	●	●	●	●	●	●	●	●		●	●	11
vp: cost reduction	●		●	●		●	●	●	●	●	●		●	10
vp: reliability		●		●	●	●		●	●		●	●		8
vp: flexibility	●		●		●	●	●		●	●	●			8
vp: speed	●						●	●	●				●	5
vp: health	●	●					●			●		●		5
vp: efficiency						●		●				●		3
vp: comfort						●							●	2
vp: tools to steer travel behaviour	●	●	●			●	●	●	●	●	●		●	10
vp: less administrative tasks	●	●		●			●	●	●	●	●	●		8
vp: less parking spots necessary	●			●	●		●		●	●				6
vp: employee satisfaction	●			●				●						3
vp: mobility card	●									●	●			3
vp: productivity	●													1
vp: optimalise PT		●							●		●			3
vp: platform				●	●		●	●	●				●	6
vp: enriching customer's product			●				●			●	●	●	●	5
vp: extra services for consumer												●		1
vp: offer consumer sustainable choices	●													1
vp: seamless journey		●				●			●			●		4
vp: complete mobility	●	●							●			●		4
vp: mass	●		●	●			●				●			5
vp: TOs scared to lose revenue		●	●			●			●	●	●			6
vp: bundled modalities are not a vp		●	●		●					●		●		5
vp: car is most reliable					●			●						2
vp: give what the customer asks for	●	●	●		●	●	●	●	●	●	●	●		11
vp: doesn't want to lose customer contact		●		●		●				●	●	●	●	7

Table 18: Code occurrences for sustainability category - impact

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
sustainability: impact - better access to mobility		●	●	●	●		●		●	●	●	●		9
sustainability: impact - reduced emissions	●	●		●	●	●	●		●		●	●		9
sustainability: impact - reduce congestion		●	●	●	●		●		●					6
sustainability: impact - long term economic health			●	●		●		●	●					5
sustainability: impact - local development		●	●			●								3
sustainability: impact - less cars		●					●							2
sustainability: impact - last mile transport more sustainable		●												1
sustainability: impact - no negative impact	●	●												2
sustainability: impact - more cars			●		●	●		●						4
sustainability: impact - more trips				●							●			2
sustainability: impact - less walking and cycling				●			●							2
sustainability: impact - people can feel you take something from them				●								●		2
sustainability: impact - bigger mobility inequality										●				1
sustainability: impact - high costs to sustainability												●		1

Table 19: Code occurrences for sustainability category - method

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
sustainability: method - show emissions per option	•					•	•		•	•	•		•	7
sustainability: method - show emissions per option is useless			•		•									2
sustainability: method - guidance and information on app				•	•		•		•		•	•		6
sustainability: method - electrification	•	•			•		•				•	•		6
sustainability: method - reward necessary for behavioral change	•						•		•	•			•	5
sustainability: method - offer sustainable alternatives	•	•	•									•		4
sustainability: method - bm intrinsically sustainable				•			•		•					3
sustainability: method - optimization of public transportation		•							•		•			3
sustainability: method - behavioral change is difficult		•									•		•	3
sustainability: method - change private behaviour through employer	•				•				•					3
sustainability: method - demand based travel		•							•					2
sustainability: method - invest along with shared mobility			•											1
sustainability: method - enable working from home	•													1
sustainability: method - do not offer unsustainable travel options		•												1
sustainability: method - nudging/gamification										•				1
sustainability: method - stimulate cycling	•													1

Table 20: Code occurrences for sustainability category – contributor (previously coded under the sub-coding group from)

Code	D1	D2	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	Total
sustainability: from - government	•			•	•	•	•		•	•			•	8
sustainability: from - company	•			•			•	•		•	•	•		7
sustainability: from - consumer			•		•								•	3